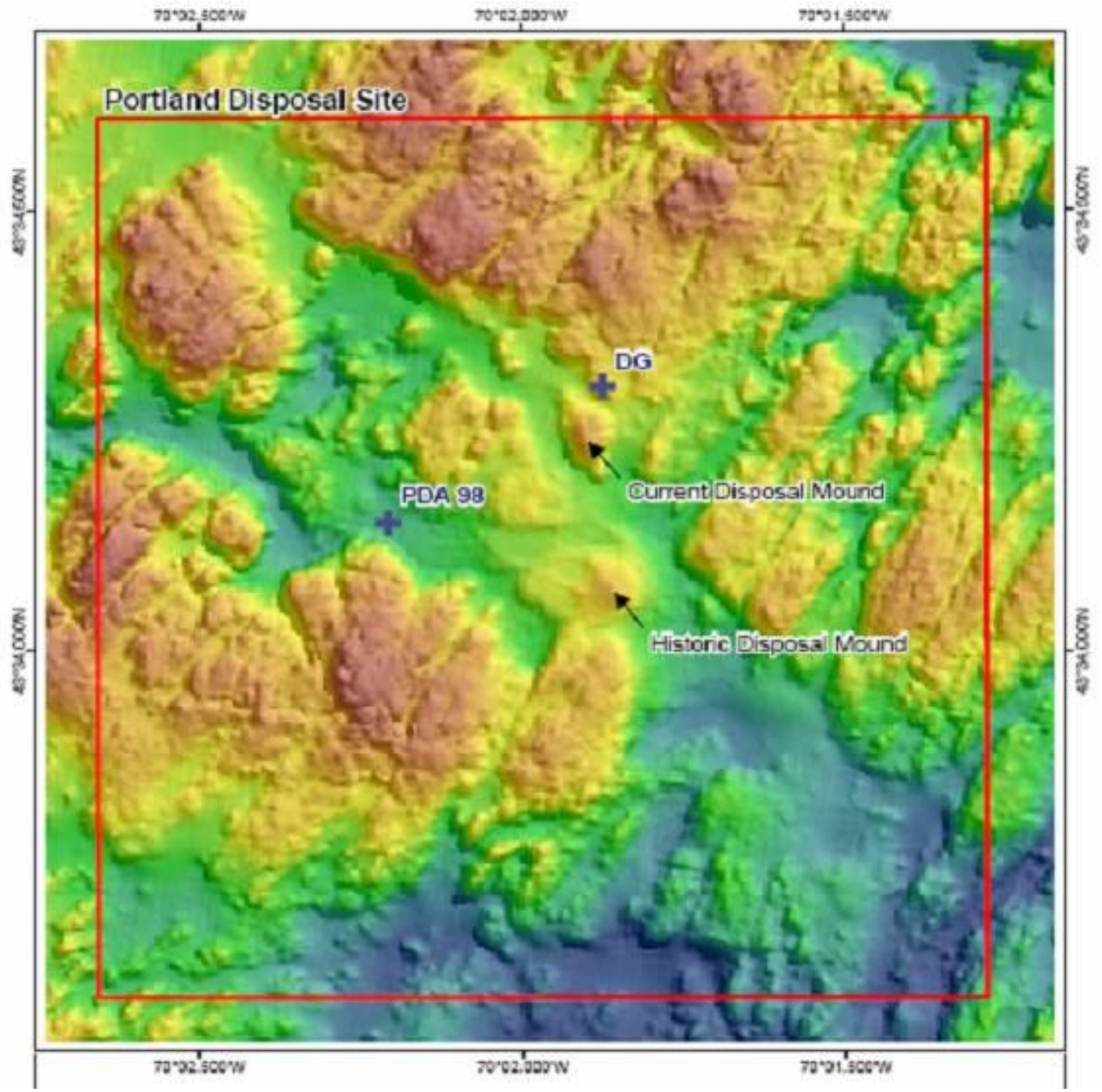
SITE MANAGEMENT AND MONITORING PLAN
FOR THE
PORTLAND DREDGED MATERIAL DISPOSAL SITE



U.S. Environmental Protection Agency, New England Region
U.S. Army Corps of Engineers, New England District
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ATTACHMENTS

ACRONYMS AND KEYWORDS

CAD	Confined Aquatic Disposal
CFR	Code of Federal Regulations
CPUE	catch per unit effort
CWA	Clean Water Act (Federal Water Pollution Control Act)
cy	cubic yards
CZM	coastal zone management
DAMOS	Disposal Area Monitoring System
DDT	1,1,1-trichloro-2,2-bis(*p*-chlorophenyl)ethane
DEIS	Draft Environmental Impact Statement
DMSMART	Dredged Material Spatial Management Record Tool
DO	dissolved oxygen
EIS	Environmental Impact Statement
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
EPA-NE	U.S. Environmental Protection Agency, New England Region
ESA	Endangered Species Act
km^2	square kilometers
MDEP	Maine Department of Environmental Protection
MDOT	Maine Department of Transportation
MPA	Maine Port Authority
MSPO	Maine State Planning Office
m	meters
mcy	million cubic yards
mg/l	milligrams per liter
mg/kg	milligrams per kilogram
MPRSA	Marine Protection, Research, and Sanctuaries Act of 1972
NAD83	North American Datum 1983
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRC	National Research Council
nm	nautical mile
nm^2	square nautical mile
OSI	Organism Sediment Index
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PDS	Portland Disposal Site
ppb	parts per billion
pptr	parts per trillion

psu	Practical Salinity Unit
QA	quality assurance
RHA	Rivers and Harbors Act
RIM	Regional Implementation Manual for the Evaluation of Dredged Material Proposed for Disposal in New England Waters
RPD	Redox Potential Discontinuity
SAIC	Science Applications International Corporation
SMMP	Site Management and Monitoring Plan
TOC	Total Organic Carbon
TSS	Total Suspended Solids
USACE	U.S. Army Corps of Engineers
USACE-NAE	U.S. Army Corps of Engineers, New England District
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service (Department of the Interior)
WRDA	Water Resources Development Act of 1992 (Public Law 102-580)
wt	weight

1.0 BACKGROUND

Maintenance of adequate navigation depth in the states' marine terminals, port facilities, and private marinas is vital to the economies of Maine and New Hampshire. Both commercial and recreational industries throughout Maine and New Hampshire rely on continuous access to these areas. To ensure continued use, economic viability, and safety of the region's navigation channels and navigation-dependent facilities, periodic dredging must be performed to remove accumulated sediment. In September 1987, the U.S. Environmental Protection Agency, New England Region (EPA-NE) designated the Portland Disposal Site (PDS) for long-term use for the disposal of dredged material from Maine and New Hampshire. Dredged material from federal and private projects of any size that satisfy the requirements of the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA), and for which a permit for disposal is obtained, may be disposed of at the site. Prior to use of the site, each project must receive a permit issued by the U.S. Army Corps of Engineers (USACE) under Section 103 of the MPRSA, 33 U.S.C. §§1413 (hereafter cited as MPRSA §103), and 40 Code of Federal Regulations (CFR) Part 227, with concurrence by the EPA.

Section 506 of the Water Resources and Development Act (WRDA) of 1992 amended the MPRSA to require EPA and the USACE to prepare a Site Management and Monitoring Plan (SMMP) for all Ocean Disposal Sites. MPRSA §102(c)(3)(F) requires that the SMMP include a schedule for review and revision of the SMMP which shall not be reviewed and revised less frequently than 10 years after adoption of the plan, and every 10 years thereafter. This document represents an update to the original January 1997 SMMP for the PDS and reflects minor revisions based on a review by federal agencies, state agencies, and dredging stakeholders.

In accordance with MPRSA §103(a), disposal activities at the site, "will not unreasonably degrade or endanger human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities." The purpose of this SMMP is to synthesize prior site monitoring results and outline a management plan and monitoring program for the site that complies with the requirements of MPRSA.

The SMMP serves as a framework to guide the development of future project-specific sampling and survey plans developed under the monitoring program. The data gathered from the monitoring program will be routinely evaluated by EPA-NE, the U.S. Army Corps of Engineers, New England District (USACE-NAE), and other agencies such as the National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Services (USFWS), and state regulatory agencies (see Section 9.0), to determine whether modifications in site usage, management, testing protocols, or additional monitoring are warranted.

As discussed in the guidance for development of SMMPs issued by EPA and the USACE ("Guidance Document for Development of Site Management Plans for Ocean Dredged Material Disposal Sites," February 1996), management of the disposal site involves: regulating the times, quantity, and physical/chemical characteristics of dredged material that is disposed at the site; establishing disposal controls, conditions, and requirements; and monitoring the site environment to verify that potential unacceptable conditions are not occurring from past or continued use of the disposal site and that permit terms are met. In addition, the plan incorporates the six

requirements for ocean disposal site management plans discussed in MPRSA §102(c)(3), as amended. These are:

1. a baseline assessment of conditions at the site [§102(c)(3)(A)];
2. a program for monitoring the site [§102(c)(3)(B)];
3. special management conditions or practices to be implemented at each site that are necessary for protection of the environment [§102(c)(3)(C)];
4. consideration of the quantity of the material to be disposed of at the site, and the presence, nature and bioavailability of the contaminants in the material [§102(c)(3)(D)];
5. consideration of the anticipated use of the site over the long term, including the anticipated closure date for the site, if applicable, and any need for management of the site after closure [§102(c)(3)(E)]; and
6. a schedule for review and revision of the plan (which shall not be reviewed and revised less frequently than 10 years after adoption of the plan, and every 10 years thereafter) [§102(c)(3)(F)].

1.1 DISPOSAL SITE HISTORY

The Portland Disposal Site is a one square nautical mile (nm^2) area located approximately 7.1 nm east of the most eastern point of Cape Elizabeth, Maine (Figure 1) and centered at 43° 34.111' N, 70° 01.9386' W (NAD 83). The range of water depth at the site is 42 to 62 meters (m).

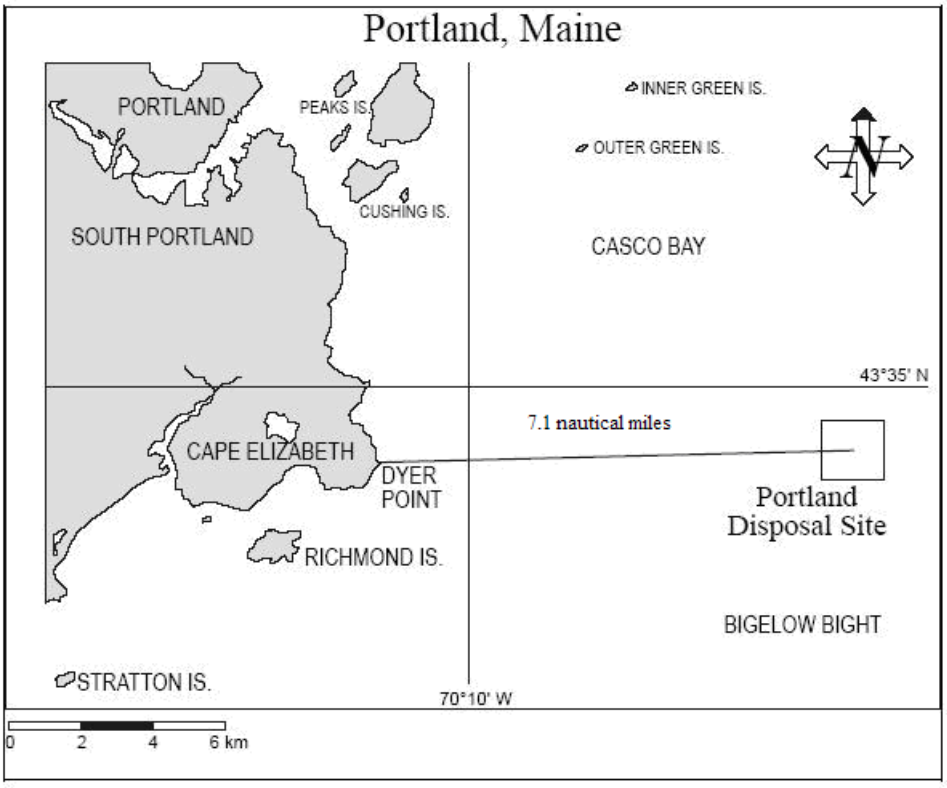

Figure 1. Location of the Portland Disposal Site (PDS).

Disposal operations have been documented in the PDS vicinity since 1943. In 1943 a large, irregularly shaped site was established by the War Department (now the Department of Defense) for disposal of material from Portland Harbor. Disposal activity continued at this site until the early 1970s with less regulatory oversight and record-keeping than exists today. Although the disposal site has been used intermittently since 1943, it was not until 1977 that the site was formally designated by the EPA as an "interim" site for the disposal of dredged material. Efforts to formally designate the site for long-term use were initiated in 1980 with a draft EIS; the final EIS and rulemaking to designate the site as an Ocean Dredged Material Disposal Site (ODMDS) were issued by EPA in 1987 (Figure 2).

The dredged material disposed at PDS has come from a number of industrialized and recreational harbors and rivers from Maine, primarily Portland Harbor, and New Hampshire. The site serves much of Cumberland County and the northern reach of York County ranging from Harpswell to the Wood Island/Biddeford Pool area. The PDS and other nearby open-water sites (now closed) received nearly 7.6 million cy of material from these harbors between 1950 and 1993 (Normandeau Associates Inc., 1994).

More recently, an average of 99,000 cubic yards (cy) of dredged material is deposited annually in the PDS at specified disposal coordinates located in the northern region of the site, or at an alternative buoy placed at the site by the USACE in years with heavy disposal activity. The dredged material released from barges in close proximity to the placement locations coalesces into a single large seafloor deposit, composed of multiple layers of material originating from many different projects. The USACE Disposal Area Monitoring System (DAMOS) has managed the disposal of dredged material at the PDS so that, in general, distinct "mounds" of dredged materials have been formed. This disposal approach minimizes the area of sea floor impacted, and allows more efficient monitoring for long term effects. Four separate mounds have been created at the site: the 84 mound (also referred to as DG), the 89 mound, the Royal River mound, and more recently the PDA mound (see Figure 2). Table 1 summarizes the volumes of dredged material disposed of or permitted for disposal at the PDS.

Table 1. Disposal of Dredged Material at Portland Disposal Site

(USACE, NAE unpublished files).

Year(s) of Use	Volume
1942 - 1980	2,472,000 cy
1980 - 1990	1,250,000 cy
1990 - 2000	1,000,000 cy
2000 - 2005	750,000 cy

Schedules of disposal operations are dependent only on the availability of the dredge, tug, barge, and weather conditions. Historically the operational schedule has been conducted at any time, weather permitting. The site designation did not establish any time-of-year restrictions for disposal operations. Dredging operations, however, often are subject to time-of-year restrictions to avoid fish and shellfish migration or spawning, and other resource considerations.

Information on the 84 and 89 Mounds was discussed in the 1997 SMMP and is not repeated herein, rather, the discussion below focuses on the more recent disposal events.

1.2 PDA MOUND

The PDA Mound was formed on the PDS seafloor in the fall of 1998 and winter of 1999 by the placement of sediment dredged from the federal channel and various marine terminals in the Fore River and Portland Harbor. In November 1998, the DAMOS disposal buoy "PDA" was placed at coordinates 43°34.147´ N, 70°02.209´ W over a natural seafloor containment basin having an estimated capacity of over 1,308,000 cy. Due to various project logistics, the dredging of the harbor was divided into three phases. The first phase of dredging consisted of the removal of 381,282 cy of sediment from the upper reaches of the Fore River. This material was transported to PDS and placed at the PDA buoy position, followed by an additional 7,457 cy of sediment dredged from individual berthing areas and marinas in the harbor as part of the second phase. The third phase of the dredging project occurred in the spring of 1999. Approximately 24,198 cy of material dredged from marine terminals in the Fore River were transported to PDS and placed at the PDA buoy. An additional estimated barge volume of 203,786 cy was removed from the outer reaches of the federal channel in Portland Harbor. However, this material was placed at the DG buoy located 500 m to the northeast of PDA (Figures 2 and 3). In July 2000, a post-disposal precision multibeam bathymetric survey was performed over a 4.41 km^2 area encompassing PDS to document changes in bottom topography resulting from dredged material deposition. The survey results confirmed the formation of two detectable sediment deposits on the PDS seafloor (SAIC, 2003b). The larger of the two deposits was detected in close proximity to the PDA buoy location and consisted of approximately 412,936 cy of dredged material from Portland Harbor.

1.3 CAPPING DEMONSTRATION PROJECT

A DAMOS/Casco Bay Estuary Project/EPA-funded investigation from 1995 to 1997 used two different sediments, both suitable for unconfined open water disposal, to conduct a capping demonstration project at the PDS to evaluate whether dredged material can be capped, or isolated from the surface, in deeper waters. Both of the sediments originated from the Royal River, with sediments from the inner portion of the project being "capped" with sediments from the outer reaches of the channel. To better evaluate capping, the PDA buoy was temporarily moved from 1995 to 1997 to an area of the PDS where no dredged material had been previously disposed. The result of this project was the creation of the Royal River Mound in the southeastern quadrant of the PDS. Over 80,000 cubic yards of material from the Royal River were disposed at the PDA 95 buoy (Morris et al., 1998). Overall, the PDS Capping Demonstration Project served its purpose by demonstrating that dredged material can be effectively placed, capped, and monitored at this relatively deep-water disposal site (Morris et al., 1998).

Figure 2. Map showing the current Portland Disposal Site and the Historic War Department Site, as well as three of the recent disposal mounds and the three reference areas. Map taken from Figure 2-1 (SAIC 2003a).

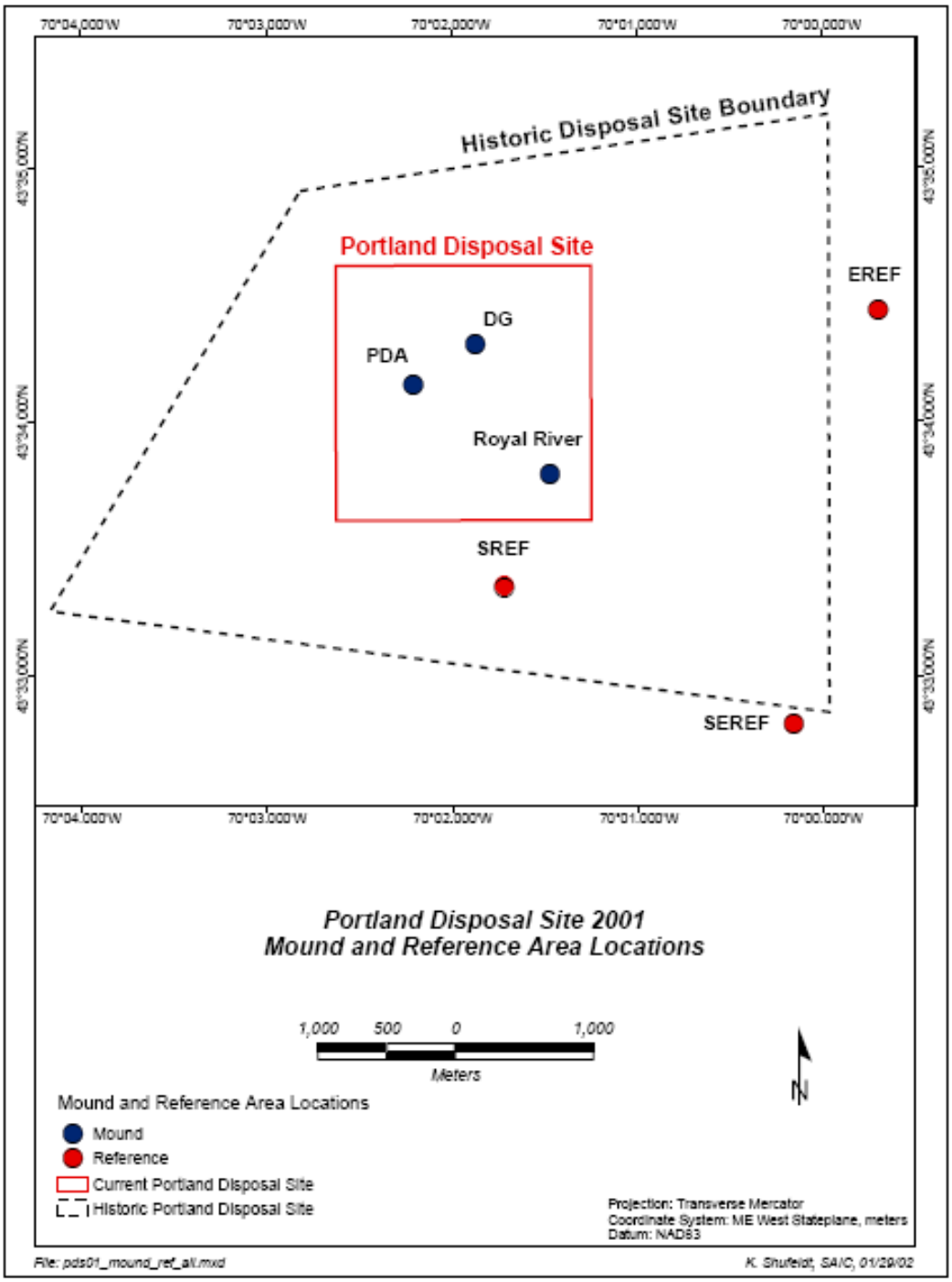

Figure 2-1. Map showing the current Portland Disposal Site and historic disposal site boundaries, as well as the disposal mounds and reference areas sampled during the August 2001 REMOTS® survey.

2.0 SMMP OBJECTIVES

The intent of this SMMP is to provide a management framework and monitoring program (Section 6.0) that strives to minimize the potential for significant adverse impacts to the marine environment from dredged material disposal. To this end, the SMMP identifies actions, provisions, and practices necessary to manage the operational aspects of dredged material disposal at the PDS. The Ocean Dumping Regulations at 40 CFR §228.10(a) requires that the impact of disposal at a designated site be evaluated periodically, and 40 CFR §228.10(b) specifically requires consideration of the following types of potential effects when evaluating impact at a disposal site:

- Movement of materials into sanctuaries or onto beaches or shorelines [228.10(b)(1)].
- Movement of materials towards productive fishery or shellfishery areas [228.10(b)(2)].
- Absence from the disposal site of pollutant-sensitive biota characteristic of the general area [228.10(b)(3)].
- Progressive, non-seasonal, changes in water quality or sediment composition at the disposal site when these changes are attributable to materials disposed of at the site [228.10(b)(4)].
- Progressive, non-seasonal, changes in composition or numbers of pelagic, demersal, or benthic biota at or near the disposal site when these changes can be attributed to the effects of materials disposed at the site [228.10(b)(5)].
- Accumulation of material constituents (including without limitation, human pathogens) in marine biota at or near the site (*i.e.*, bioaccumulation [228.10(b)(6)]).

The regulations at 40 CFR §228.10(c) require that a disposal site be periodically assessed based on the entire available body of pertinent data and that any identified impacts be categorized according to the overall condition of the environment of the disposal site and adjacent areas. Because knowledge and understanding of impacts resulting from dredged material disposal have advanced substantially over the past several decades, the monitoring approach defined in this SMMP focuses on those factors that provide an early indication of potential unacceptable effects and provides for further assessments should these early indicators suggest potential impact may be occurring. The plan also incorporates ongoing regional monitoring programs that can provide additional information to inform the periodic assessment of impact, such as NMFS trawl surveys.

The specific objectives of this SMMP are:

- **Objective 1: To ensure site management practices and disposal options are sufficient to avoid significant degradation or endangerment to the environment.** Management of the disposal site involves 1) regulating the timing of disposal(s), quantity of material, and physical/chemical characteristics of dredged material placed at the site, 2) instituting disposal controls, conditions, and requirements that avoid or minimize potential impacts to the marine environment, 3) ensuring permit conditions are met, and 4) monitoring to verify that unanticipated or significant adverse effects are not occurring from use of the disposal site. The phrase "significant adverse impact" is inclusive of all significant or potentially substantial negative impacts on resources within PDS or its vicinity. Factors to be considered under this objective include:

  - evaluation of compliance with MPRSA permit conditions and initiation of enforcement actions where warranted and as appropriate; and
  - provision of reasonable assurance that use of the site will not adversely affect beaches, shorelines, or productive fish and shellfish areas.

- **Objective 2: To ensure a monitoring program and data review process that evaluates whether disposal of dredged material at the site unreasonably degrades or endangers human health and welfare, the marine environment, or economic potentialities.** The factors to be evaluated under this objective include:

  - biotic characteristics on dredged material mounds and nearby areas;
  - progressive, non-seasonal, changes in water quality or sediment composition at the disposal site;
  - progressive, non-seasonal, changes in composition or numbers of pelagic, demersal, or benthic biota at or near the site(s); and
  - accumulation of material constituents in marine biota near the site.

To achieve these objectives, the SMMP includes the following components:

- Current conditions against which future monitoring results can be compared;
- A description of special management conditions to be applied;
- A plan for monitoring; and
- A schedule for review and revision of the SMMP.

Recognizing and correcting any potential unacceptable condition before it causes any significant adverse impact to the marine environment or presents a navigational hazard to commercial and recreational water-borne vessel traffic is central to this SMMP. Therefore, the plan includes a monitoring program that uses a "leading indicator" approach to provide early evidence of unexpected responses as further described in Section 6.0. The identification of unacceptable impacts from dredged material disposal at the site will be accomplished in part through comparisons of the monitoring results to historical (*i.e.*, baseline) conditions, and in part through comparison to unimpacted nearby reference locations measured concurrently with site measurements. The timing of monitoring surveys and other activities will be governed by funding resources, the frequency of disposal at the site, and the results of previous monitoring data.

If site monitoring data demonstrates that the disposal activities are causing unacceptable impacts to the marine environment as defined under 40 CFR §228.10(b), the site managers may place appropriate limitations on site usage to reduce the impacts to acceptable levels. Such responses may range from withdrawal of the site's designation to limitations on the amounts and types of dredged material permitted to be disposed or limitations on the specific disposal methods, locations, or schedule.

3.0 SITE MANAGEMENT RESPONSIBILITIES AND AUTHORITIES

The PDS will continue to be jointly managed by EPA-NE and the USACE-NAE. As described in Section 1, MPRSA §102(c)(3)(F) requires that the SMMP include a schedule for review and revision of the plan no less frequently than 10 years after adoption of the plan, and every 10 years thereafter. EPA and the USACE began to review and revise the 1997 SMMP in 2006, and coordinated their efforts with other federal and state agencies through the New England Regional Dredging Team (NERDT). The NERDT's interagency technical working group, commonly referred to as the Sudbury Group, comprises representatives from EPA, USACE, NMFS, USFWS, and state regulatory agencies in Maine, New Hampshire, Connecticut, Rhode Island and Massachusetts. EPA and the USACE also coordinated with the Maine Dredging Team, which includes representatives from the same federal and state agencies, as well as local. Other meetings may be called in response to unusual physical events or unexpected monitoring observations. During these meetings, monitoring data will be evaluated and the SMMP will be revised as necessary depending on current conditions and available site-specific and scientific information.

3.1 FEDERAL REGULATORY/STATUTORY RESPONSIBILITIES

The primary authorities that apply to the disposal of dredged material in the United States are the Rivers and Harbors Act of 1899 (RHA), the Water Resources Development Act of 1992 (WRDA), the Clean Water Act (CWA) and MPRSA. The RHA regulates dredging and discharge of material in navigable waters and WRDA addresses research and funding in support of specific water resource projects for various needs (*i.e.,* transportation, recreation). It also modifies other federal laws, as necessary (*e.g.,* MPRSA).

Section 404 of the Clean Water Act (33 U.S.C. §1344) governs the disposal of fill, including dredged materials, in waters of the United States within the three mile territorial sea. This applies to discharges landward of the baseline of the territorial sea and in instances seaward of the baseline when the intent is to fill or nourish beaches. The Section 404 permit program is implemented by the USACE and covers the discharge or placement of dredged or fill material into inland waters of the United States and therefore does not apply to dredging projects that utilize the PDS.

Under MPRSA §102, 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. USACE-NAE determinations to issue MPRSA permits are subject to EPA review and concurrence.

Under MPRSA §103, the 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 open-water disposal sites for dredged material disposal to the maximum extent feasible.

All dredging, dredged material transport, and disposal must be conducted in compliance with the permits issued for these activities. To ensure compliance, the MPRSA provides for both

surveillance and enforcement. The USACE and EPA share surveillance responsibilities at the disposal site. The U.S. Coast Guard may also assist with such surveillance (33 U.S.C. §1417[c]). The permittee is responsible for ensuring compliance with all project conditions including placement of material at the correct location and within applicable site use restrictions. The EPA and the USACE will cooperate to ensure effective enforcement of permit conditions.

The USACE and EPA also share responsibility for monitoring of the site. Monitoring data may be generated by the agencies or through coordination or use of data gathered under other programs. Monitoring data from other agencies will be utilized as appropriate to maximize the availability of information at the site. The USACE DAMOS Manager will direct the disposal of dredged material at the site. EPA will lead the evaluation of these data for potential impacts from disposal. Under MPRSA, EPA has the responsibility for determining if an unacceptable impact has occurred as a result of dredged material disposal at the site. However, such determinations will be made in consultation with other agencies and be based on available monitoring data. The USACE and EPA share responsibility for developing any necessary mitigation plan. EPA is responsible for determining any modification to site use or de-designation.

As in the past, disposal will continue to be practiced using a taut-wire buoy or specified coordinates, to ensure that disposal locations are known and that post-disposal monitoring is effective. On-board inspectors or electronic tracking systems will be used by the USACE for all disposal activities at PDS to ensure compliance with this policy. Inspectors will be trained and certified by the USACE specifically for the dredged material disposal program.

Prospective inspectors are required to submit their qualifications to the USACE prior to being approved for training. Every inspector must have basic knowledge of seamanship, which includes shipboard navigation equipment, buoy identification and the ability to chart location using whatever navigation equipment is available on board. Many of the existing disposal inspectors hold Master's licenses or are merchant marine academy graduates. All inspectors must have a basic understanding of the USACE Regulatory Program, especially permit and enforcement requirements. This information is provided in a USACE disposal inspector certification training session that all inspectors are required to attend and also included in an Inspector's Manual provided during the training.

Communication is an essential part of the inspector's duties. This includes coordination with the permittee, the dredging and towing contractors, and the USACE-NAE headquarters office in all instances where problems arise. Disposal activities will not generally be performed during poor sea conditions. Inspectors have been issued specific guidance on disposal under these conditions (USACE-NAE, 2006).

The inspector must carefully review and fully understand the specific details of the project to be inspected before embarking on a trip to the disposal site. Before leaving for the disposal site, the inspector must understand the exact location of the specified disposal point for the specific project. The inspector must also know the planned route that will be taken from the dredging area to the specified disposal point. The inspector must be alert at all times and ensure the route on charts is followed during the trip to make certain the disposal operation is accomplished as planned. Unusual events during the trip that affect the disposal of the dredged material must be

reported on the scow logs. An example of this would be discharge of the material at a location other than that specified.

The inspector must complete an Inspector's Daily Report of Disposal by Scow (scow log; see Attachment B) for each and every disposal trip. The permittee must send the original of the scow log to the USACE-NAE disposal inspection program manager within one week of the date of the disposal trip. The inspector, not the permittee, must also submit a monthly report to USACE-NAE, Regulatory Division, Policy Analysis and Technical Support Branch for each month the inspector performs disposal inspections. The monthly report includes permittee name, permit number, trip dates and estimated cubic yards discharged. At the completion of a dredging project, either final or seasonal period, the permittee must submit to the USACE-NAE disposal inspection program manager the completion report form. The form is included with the letter authorizing the initiation or continuation of open-water disposal at the disposal site.

If any apparently illegal disposal-related activity is discovered or is about to occur, the inspector must advise the responsible party of the requirements for proper disposal, the apparent violation, and the possible legal ramifications that could ensue should the action occur. Any instances of non-compliance observed by the inspectors must be reported to the USACE within 24 hours and in writing to both the USACE and EPA within five working days of the observed violation. Both agencies will cooperate to ensure effective enforcement of all disposal requirements. Section 105 of the MPRSA gives authority to EPA to enforce permit conditions. Egregious violations of permit conditions may be referred by the USACE or EPA to the Department of Justice for criminal prosecution. Illegal disposal can lead to penalties that include revocation or suspension of the permit as well as fines of up to $65,000 and imprisonment for one year.

Monitoring surveys at and near the site will be conducted periodically as available funding permits. The monitoring objective for each survey will be based on prior monitoring results and recommendations of the EPA and the USACE-NAE, in consultation with Maine and New Hampshire state dredging teams and their representatives.

4.0 MANAGEMENT APPROACH

Dredged material disposal at the disposal site will be authorized under MPRSA §103 and the site will be managed in a manner that ensures the following site management goals are met:

- Ensure and enforce compliance with permit conditions.
- Minimize loss of sediment from the disposal site.
- Minimize conflicts with other uses of the area.
- Maximize site capacity.
- Minimize environmental impact from sediments placed at the site.
- Recognize and correct conditions before unacceptable impact occurs.

The practices that will be applied to address these management goals at the disposal site include coordination among federal and state agencies, testing of material for acceptability for disposal at the site, review of general and specific permit conditions, review of allowable disposal technologies and methods, implementation of inspection, surveillance and enforcement

procedures, periodic environmental monitoring at the site and at relevant reference sites for comparative evaluation, and information management and record keeping.

4.1 MANAGEMENT PRACTICES

EPA-NE and the USACE-NAE will jointly manage the disposal site. The effectiveness of the management approach depends on having efficient planning processes, consistent compliance and enforcement, a robust yet flexible monitoring plan, and an effective communication structure that includes timely receipt and review of information relevant to the site management goals. One component of this communication structure is the Maine Dredging Team, which will review the SMMP with respect to current information and conditions as well as scientific advancements.

Management of the site will include the following practices for the disposal site:

- Evaluation of the suitability of material for disposal, conducted in accordance with the applicable requirements for the specific type of project (i.e., MPRSA), is determined through the Regional Implementation Manual for the Evaluation of Dredged Material Proposed for Disposal in New England Waters (RIM) (EPA and USACE, 2004).
- Specification of disposal conditions, location, and timing in permits as appropriate (e.g., to ensure that dredging windows for fisheries are met or disposal may be restricted during spring tides to ensure that water quality criteria are not exceeded outside the boundaries of the site).
- Enforcement of all permit conditions.
- Use of a grid system for the disposal of dredged material on a case by case basis.
- Use and maintenance of disposal buoys at the site with disposal specified to occur at the buoy or designated coordinate.
- Use of disposal inspectors or electronic vessel tracking or both to record all disposal events.
- Conducting disposal site monitoring in a consistent, systematic manner.
- Holding technical advisory panel meetings for the monitoring program, as needed.
- Specification of de-designation (*i.e.*, closure) conditions and dates.

In addition, special management practices may exist at the site for individual projects to improve site management, anticipate future disposal requirements, or improve the conditions at the site. Examples include:

- Specification of the dredged material volume that can be placed at specific locations within the site or the total dredged material volume placed in the site.
- Modifications to the site designation or to disposal methods, locations, or time of disposal.
- Monitor mounds on a rotating basis as determined during annual planning meetings.

In addition to management practices for the disposal site and individual projects, the SMMP must also include a monitoring plan (as described in detail in Section 6) and a coordination/outreach component. Coordination and outreach will be continuous and include

state and federal agencies, scientific experts, and the public. To ensure communications are appropriate and timely, site management activities and monitoring findings will be communicated through many mechanisms: scientific reports, peer reviewed publications, participation in symposia, the USACE and EPA websites, public meetings, and fact sheets.

4.2 TESTING REQUIREMENTS

National guidance for determining whether dredged material is acceptable for open-water disposal is provided in the Ocean Testing Manual (Green Book, EPA and USACE, 1991). The RIM (EPA and USACE, 2004), consistent with the Green Book, provides specific testing and evaluation methods for dredged material disposal projects in New England. Any updates and revisions will take precedence at the time of notification by the agencies.

These guidance documents are consistent in their application of test procedures used to determine acceptability for MPRSA §103 projects. All projects that propose to use PDS for disposal of dredged material must adhere to the guidance documents or superseding versions of these documents.

4.3 DISPOSAL CONDITIONS, LOCATION, AND TIMING

The following list represents special conditions that will be applied to projects using PDS for disposal. These conditions may be modified on a project-by-project basis, based on factual changes (*e.g.*, administrative changes in phone numbers, points of contact) or when deemed necessary as part of the individual permit review process.

1. At least ten working days in advance of the start date, the U.S. Coast Guard Sector Northern New England, 259 High Street, South Portland, ME 04106-0007 (207-767-0320) shall be notified of the location and estimated duration of the dredging and disposal operations.

2. Every discharge of dredged material at the disposal site must be witnessed by an onboard inspector who has been trained by, and who holds a current certification from, the USACE-NAE. The disposal inspector shall be contracted and paid for by the permittee. A list of currently certified inspectors can be obtained from the New England District Regulatory Division at 978-318-8292. The inspector will require that all permit conditions and other special requirements are followed as applicable.

3. For the initiation of disposal activity and any time disposal operations resume after having ceased for one month or more, the permittee or the permittee's representative must notify the USACE-NAE. Notification must be made at least ten working days before the date disposal operations are expected to begin or resume by contacting the USACE Policy Analysis and Technical Support Branch at 978-318-8292. The information to be provided in this notification is: permit number, permittee name, name and address of dredging contractor, estimated dates dredging is expected to begin and end, name of disposal inspector, name of the disposal site and estimated volume of material to be dredged. Disposal operations shall not begin or resume until the Policy Analysis and Technical Support Branch issues a letter authorizing the initiation or continuation of open-water disposal. The letter will include disposal-point coordinates to use for this

specific project at that time. These coordinates may differ from those specified for other projects using the same disposal site or even from those specified earlier for this project. It is not necessary to wait ten days before starting disposal operations. Disposal operations may start as soon as this letter is issued.

4. The permittee shall ensure that a separate USACE disposal inspection report (scow log; see Attachment B) is fully completed by the inspector for every trip to the disposal site and that this report is received by the USACE-NAE within one week of the trip date. The Regulatory Division telefax number is 978-318-8303. The original of this report must be mailed to: U.S. Army Corps of Engineers, Regulatory Division, Policy Analysis and Technical Support Branch, 696 Virginia Road, Concord, MA 01742-2751. For each dredging season during which work is performed, the permittee must notify the USACE upon completion of dredging for the season by completing and submitting the form that the USACE will supply for this purpose when disposal-point coordinates are specified.

5. Except when directed otherwise by the USACE DAMOS Program Manager, all disposal of dredged material shall adhere to the following: The permittee shall release the dredged material at a specified buoy or set of coordinates within the disposal site. All disposal is to occur at the buoy or specified coordinates with the scow at a complete halt. The USACE will provide buoys and the coordinates. This requirement must be followed except when doing so will create unsafe conditions because of weather or sea state, in which case disposal within 200 feet of the buoy or specified coordinates with the scow moving only fast enough to maintain safe control (generally less than one knot) is permitted. Disposal is not permitted if these requirements cannot be met due to weather or sea conditions. In that regard, special attention needs to be given to predicted conditions prior to departing for the disposal site.

6. EPA and the USACE (and/or their designated representatives) reserve all rights under applicable law to free and unlimited access to and/or inspection of (through permit conditions): 1) the dredging project site including the dredge plant, the towing vessel and scow at any time during the course of the project; 2) any and all records, including logs, reports, memoranda, notes, etc., pertaining to a specific dredging project (federal or non-federal); 3) towing, survey monitoring, and navigation equipment.

7. If dredged material regulated by a specific permit issued by the USACE 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 USACE Disposal Inspector shall immediately notify the USACE of the incident, as required by permit. In addition, both the towing contractor and the USACE-certified disposal inspector shall make a full report of the incident to the USACE and EPA within ten (10) days. The report should contain factual statements detailing the events of the emergency and an explanation of the actions that were ultimately taken.

4.4 ALLOWABLE DISPOSAL TECHNOLOGIES AND METHODS

Dredging and dredged material disposal in Maine has historically been accomplished using a bucket dredge to fill split hull or pocket scows for transport to the disposal site. Typically, 1,000 to 6,000 cy vessels are used, but allowable size is not specified by EPA or the USACE. The volume of material allowed in a barge may be restricted for any given dredging project depending upon the results of predictions from a disposal plume dispersion model (e.g., the USACE numeric model for short-term fate of plumes, also known as STFATE).

4.5 MODIFICATIONS TO DISPOSAL PRACTICES AND THE SITE

Based on the findings of the monitoring program (Section 6), modifications to the site use may be required. Corrective measures such as, but not limited to those listed below, may be developed by EPA-NE and the USACE-NAE.

- Stricter definition and enforcement of disposal permit conditions.
- Implementation of more conservative judgments on whether sediments proposed for dredging are suitable for open-water disposal.
- Implementation of special management practices to prevent any additional loss of sediments to the surrounding area.
- Excavation and removal of any unacceptable sediments from the disposal site (an unlikely, worst case scenario given that the permitting program should exclude such material from the site to begin with, and since excavation could make matters worse by releasing contaminants during the process).
- Closure of the site as an available dredged material disposal site (*i.e.,* to prevent any additional disposal at the site).

4.6 OTHER MANAGEMENT CONSIDERATIONS

In addition to the management practices outlined in Section 4.1, other management considerations may be determined on a project by project basis through consultation with the NMFS and the USFWS, and coordination with other state and federal agencies. These may include the following:

- Use of marine mammal observers during disposal operation.
- Establishment of dredging windows.
- Compliance with Essential Fish Habitat (EFH) recommendations.
- Endangered Species Act (ESA) concerns.

Any changes to special permit conditions may be discussed at New England Regional Dredging Team meetings.

5.0 BASELINE ASSESSMENT

MPRSA §102(c)(3)(A) as amended by WRDA 1992 requires that the SMMP include a summary of baseline conditions at the site. Much of the information provided in this section is based on

surveys conducted by DAMOS. This section includes a general characterization of the site followed by a description of current disposal at the site including information on the dredged material disposal mounds in the site.

5.1 SITE CHARACTERIZATION

The physical, chemical, and biological characteristics are summarized in this section.

5.1.1 PDS Location and Reference Areas

The PDS disposal site is a one square nautical mile area located approximately 13.16 km east of the most eastern point on Cape Elizabeth, Maine. The site is a one nm^2 square with its center at 43˚ 34.105' N and 70˚ 01.969' W (NAD 83) (see Figure 2). The PDS is characterized by rough, irregular bottom topography, with areas of soft sediment accumulation in the basins among bedrock out crops. There are three reference areas for PDS: the SOUTH REF (SREF 43º 33. 351'N 70º 01. 722'W), SOUTHEAST REF (SEREF; 43º 32. 807' N 70º 00.162'W) and EAST REF (EREF; 43º 34. 434' N 69º 59.701'W. The three reference areas are on ambient seafloor surrounding PDS to provide a basis of comparison with conditions over the disposal mounds.

5.1.2 Physical Characteristics

The sea floor at the existing site is predominantly rocky with several small sediment-covered basins, such as the basin located at the center of the site (see Figure 3) . Unlike most of the New England sites, most of the kinetic energy at the PDS is in the residual or random component instead of the tidal component. The hourly averaged near-bottom current speeds range approximately 0 to 20 cm/s^{-1}, with the majority of the variability occurring at periods of approximately 12 hours in association with the semi-diurnal tide. The mean current speed is 7.0 cm/s^{-1}. Analysis of residual currents (after the mean current and the tidal currents had been removed from the observed records) revealed that storms has no effect on the hourly averaged near bottom current s at PDS (McDowell and Pace1998).

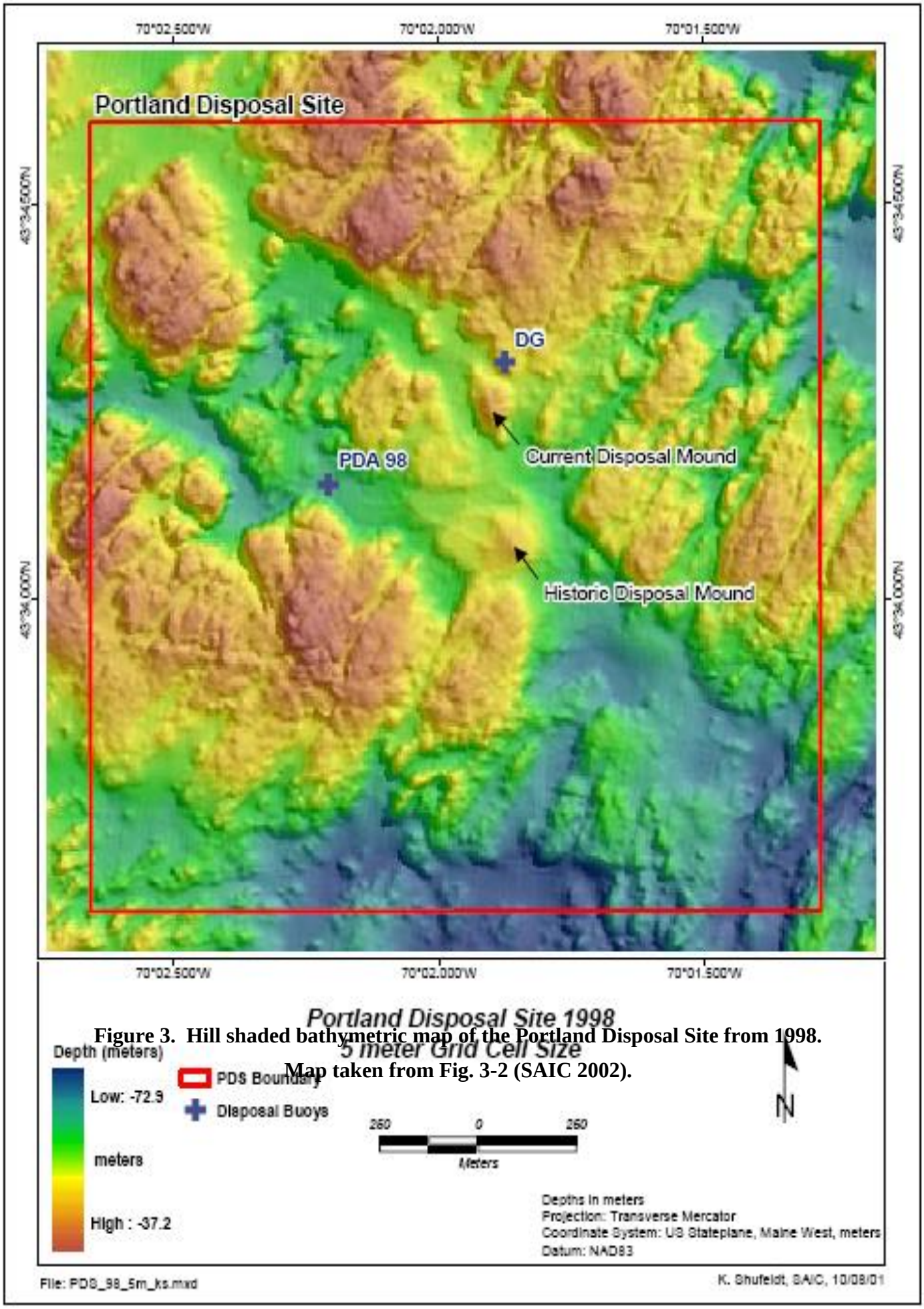

Figure 3. Hill shaded bathymetric map of the Portland Disposal Site from 1998. Map taken from Fig. 3-2 (SAIC 2002).

5.1.3 Surface Wave Climatology

Time-series observations of winds, atmospheric pressure, surface water temperature, and waves from NOAA buoy 44007, which is located approximately 6 km southwest of the site were analyzed to assess seasonal and inter-annual variability in meteorological conditions at PDS from January 1993 through May 1996 (McDowell and Pace, 1998). Analysis of the annual wave statistics revealed that wave characteristics were very similar for the 3.4 years of wave records, and significant wave heights less than 2 m occurred from 90 to 95 percent of the time during each year. The maximum significant wave height observed in each of the four measurement years ranged from 5.6 to 7.3 m. Overall, wave characteristics during the first half of 1996 were typical of other recent years at this location.

Analysis of the seasonal variability in wave conditions at PDS revealed that mean significant wave heights were 1.2 m in winter (December through February), approximately 1 m in spring and fall, and 0.7 m in summer (June through August). Mean wave periods were approximately 8 sec during all seasons, with a standard deviation of approximately 3 sec. Maximum significant wave heights were roughly 3 m in summer, compared to 6 m in winter, and 7 m in spring and fall. Significant wave heights greater than 3 m were observed over 4 percent of the time in winter, compared to 2 percent in spring and fall, and 0 percent in summer.

The duration of large waves during the passage of major storms is relatively brief, often persisting for only a fraction of a day. Quantitative analysis of storm waves revealed 72 events during the 3.4-year analysis period that had significant wave heights between 3 and 4 m; average durations for these events were only 6 to 8 hrs. Wave heights in the range of 5 to 6 m were observed only 22 times; average durations were only 1 to 3 hrs, for a total of 59 cumulative hours over the 3.4 years.

The wave records from March through May 1996 exhibited nine storm events attaining significant wave heights greater than 2 m, with one reaching 5.8 m. This storm activity was similar to that during other recent years and sufficient for analysis of storm generated currents as they affect bottom sediment resuspension.

5.1.4 Currents

Current measurements from within PDS are available for a three-month mean near-bottom current meter deployment in the spring of 1996 (McDowell and Pace, 1998). The three consecutive deployments of moored instrumentation at PDS yielded nearly complete records of near-bottom currents, water temperature, pressure, and relative turbidity over the period from late February to mid-May 1996. Hourly averaged near-bottom current speeds during the measurement period ranged from approximately 0 to 20 cm/sec with the majority of the variability occurring at periods of approximately 12 hours in association with the semi-diurnal tide.

The mean current speed for each of the three deployments was very consistent, but the mean direction varied greatly among the deployments, presumably due to rough topography (e.g., boulders and rock ledges) in close proximity to the moored instrumentation.

Tidal harmonic analysis of the current velocity data revealed that near-bottom tidal currents at this location are very weak and predominantly driven by the lunar semi-diurnal (M^2) tide constituent having a period of 12.42 hrs. The amplitude of the M^2 current was approximately 3 cm/sec, compared to less than 0.5 cm/sec for all other constituents. At this location, the M^2 tidal current rotates in a counter-clockwise direction around an ellipse having a major axis oriented roughly east-west.

Analysis of residual currents (after the mean current and the tidal currents had been removed from the observed records) revealed that storms had almost no effect on the hourly averaged near-bottom currents at PDS. This result is consistent with prior studies in the Gulf of Maine which showed that currents are not coherent with local winds or coastal pressure fluctuations during the passage of storms.

5.1.5 Sediment Quality

The site is in an area of natural sediment deposition, with naturally occurring bottom sediments consisting of sand and silt/clay contents that ranged from 11.7 percent to 75 percent and 18.2 percent and 88.3 percent, respectively. Sediments from the existing site center generally contain less than 30 percent sand and up to 75 percent silt/clay. Samples taken 1.8 nm southeast of the center of the existing site contained sediments of varying textures. A sediment sample collected 0.5 nm northwest of the center, however, was very coarse and contained almost no clay or silt. These variations suggest that the sediment distribution is extremely patchy in this part of the Gulf of Maine (Wiley, 1996).

No toxicity tests have been conducted on native sediments from PDS.

5.1.6 Water Column Characteristics/Circulation

Studies conducted within PDS in 1995, 1996, 1998, 2000, and 2001 (McDowell and Pace, 1998:U.S. Army Corps of Engineers, Waterways Experiment Station, 1998: Morris et. al., 1998: SAIC, 2002, 2003a) gathered physical and chemical information about the water column (i.e., temperature, salinity, turbidity, and dissolved oxygen).

Within the waters of Maine, salinity is generally constant, ranging from approximately 31 to 33 practical salinity units (psu) with the lower values occurring in the surface waters. Surface water temperatures range from 2.8°C in the winter to 15.5°C in the summer. During the summer, temperatures near the bottom can be several degrees cooler than those at the surface as the thermocline intensifies and deepens. Most turbidity (water clarity) measurements for waters of Maine have been based on total suspended solids (TSS), expressed as the concentration of particulate matter in the water. Recent measurements of dissolved oxygen (DO) concentrations in surface waters within the waters of Maine ranged from 7.2 mg/l to 10.8 mg/l (McDowell and Pace, 1998). DO concentrations in water near the seafloor are often lower than those in surface waters because oxygen is consumed as organic matter decays.

5.1.7 Biological Characteristics

Commercial/Recreational Fish and Shellfish Resources

The presence of rocky outcrops or "hangs" tends to limit commercial trawlfishing within the disposal site. However, the site is about one nautical mile shoreward of an important area for finfish trawling where a variety of fish are caught including Atlantic cod (*Gadus morhua),* haddock *(Melanogrammus aeglefinis),* witch flounder *(Glyptocephalus cynoglossus),* and other ground fish. Bottom gill nets are set along the edge of the site in the winter and spring. All commercially important fish in the area have buoyant eggs or spawn in the estuaries with the exception of the Atlantic herring *(Clupea harengus*) which spawns demersal eggs, which are deposited in nearshore gravel and winter flounder (*Pseudopleuronectes americanus*) which spawn on nearshore and offshore sandy shallows. Sport and commercial trawl fisheries are not active in the vicinity of the site. The *Maine Marine Resources Groundfish Trawl Survey* from Spring 1992 through Spring 2005 is presented in Tables 2 and 3 (Maine Department of Marine Resources, 2007a).

Lobster fishing also occurs within and adjacent to the PDS. The statewide fishery is extremely valuable in Maine, worth $296.4 million in 2005 (Maine Department of Marine Resources, 2007b). Lobsters begin to migrate from cold offshore waters toward shallower and warmer waters in late spring. Consequently most fishing efforts begin in water less then 70m deep and are concentrated in areas less than 20 m deep by midsummer. Lobsters begin to return to deeper waters in the fall, where they are fished during the winter.

Endangered and Threatened Species

Endangered, threatened, and "special concern" species known to occur within the region around the PDS are summarized in this section. An endangered species is one whose overall survival in a particular region or locality is in jeopardy as a result of loss or change in habitat, direct exploitation by man, predation, adverse interspecies competition, or disease. Unless an endangered species receives protective assistance, extinction may occur. Threatened or rare species are those with populations that have become notably decreased because of the development or occurrence of any number of factors leading to a deterioration of the stocks or the necessary functions and values within their environment. A species may also be considered as a species of "special concern." This may be any native species for which a welfare concern or risk of endangerment has been documented within a state. Endangered and threatened species are protected by the federal Endangered Species Act, 16 U.S.C. §§ 1531 *et seq.* and state law, while species listed as "special concern" are protected only by state law. Sixteen federally listed species and five species of special concern may occur in or near the waters of the Portland disposal site (see Table 4).

Table 2. Fishery data in PDS vicinity from Maine trawl survey.
Latitude Start 43.51770, Latitude Finish 43.52882, Longitude Start 70.11360. Longitude Finish 70.01850 (personal communication).

	TOTAL NUMBER OF FISH CAUGHT			
	SPRING ' 02	SPRING ' 03	SPRING '05	FALL'03
Northern Searobin				1
Sea Raven			2	1
Longhorn Sculpin	14	9	21	33
Scup				143
Butterfish				12
Atlantic Mackerel				4
Atlantic Window Flounder		4		5
Atlantic Witch Flounder		3	17	9
Winter Flounder	5	6	6	16
Yellowtail Flounder	17	5	4	2
Plaice American	224	250	342	109
Fourbeard Rockling		4		6
Atlantic Red Hake	56	16	26	92
White Hake	10	3	27	93
Pollock		1		2
Haddock	9			2
Silver Hake	252	1396	306	3024
American Shad				5
Alewife	42	136	74	68
Atlantic Herring		133	44	7
Winter Skate			1	1
Spiny Dogfish	2			8
Long Finned Squid				14
Atlantic Rock Crab				1
Shrimp (crangon)		34		
Monkfish	12	13	15	26
Long Finned Squid				6
Short Finned Squid				6
Jonah Crab	4		4	1
Northern Shrimp	532	5046	10,136	17
American Lobster	1	4	5	153
Montagui Shrimp	9	398	1053	24
Dichelo Shrimp	109	1342	72	543
Wrymouth		24		1
Blueback Herring		2		3

Table 3. Fishery data in PDS vicinity from Maine trawl survey.
Latitude Start 43.51770,. Latitude Finish 43.52882, Longitude Start 70.11360, Longitude Finish 70.01850 (personal communication).

SPECIES	NUMBER OF FISH CAUGHT			
	SPRING ' 02	SPRING ' 03	SPRING '05	FALL'03
Sea Scallop	*1*		*3*	
Acadian Redfish	*1*	*94*	*24*	
Atlantic Cod		*14*	*2*	
Ocean Pout		*1*		
Cusk		*1*		
Rockling Fourbeard		*5*	*6*	
Little Skate		*2*		
Ocean Quahog Clam		*1*	*1*	
Snow Crab		*1*	*2*	
Fourspot Flounder		*1*		
Atlantic red			*8371*	
Krill				
Atlantic Wolffish			*1*	
Northern Stone Crab			*1*	

Endangered and Threatened Marine Mammals: In general, the six federally listed whales (Table 4) and other marine mammals are frequently observed in the waters of Maine. Fin whales have the greatest likelihood of occurrence in the waters of Maine. These whales feed in coastal areas along the 130 to 165 ft depth contour and therefore can occur in the vicinity of the PDS. The other listed whale species generally occur in more offshore locations on the continental shelf or in deeper waters and, therefore, are not expected to be found in or near the PDS except as an occasional transitory visitor during migration or possibly when feeding opportunities arise in the summer months. Therefore, we have concluded that use of the PDS is unlikely to adversely impact whales.

Endangered and Threatened Reptiles: Five species of turtles have migration and feeding patterns that occasionally may bring them into the area that includes PDS (Table 4). Three of these turtle species (loggerhead, leatherback, and green turtles) are more common in the shallow, coastal areas in the summer time where they search for food. The frequency of observation decreases in the winter months when most turtles migrate from the area or hibernate to avoid being cold-stunned by local water temperatures. Hawksbill and Kemp's Ridley Sea turtles prefer warmer waters, even during the summer month in Maine. They are unlikely to be present at or around the PDS. Because loggerhead and green turtles typically feed in waters shallower than 50 feet and leatherback turtles rely on a diet of jellyfish, these three species are not expected to be present at the PDS. Based on these findings, we conclude that the existence and use of the PDS is unlikely to adversely impact any of the five sea turtle stocks.

Table 4. List of Federal and State Endangered or Threatened Species in the Waters of Maine.

Species	Federal Status – NMFS[1]	Federal Status – USFWS[2]	ME status[3]
Blue Whale (*Balaenoptera musculus*)	Endangered	NA	Endangered
Finback Whale (*Balaenoptera physalus*)	Endangered	NA	Endangered
Humpback Whale (*Megaptera novaeangliae*)	Endangered	NA	Endangered
Right Whale (*Eubalaena* spp. – all species)	Endangered	NA	Endangered
Sei Whale (*Balaenoptera borealis*)	Endangered	NA	Endangered
Sperm Whale (*Physeter catodon*)	Endangered	NA	NA
Green Turtle (*Chelonia mydas*)	Threatened	Threatened	NA
Hawksbill Turtle (*Eretmochelys imbricata*)	Endangered	Endangered	Endangered
Leatherback Turtle (*Dermochelys coriacea*)	Endangered	Endangered	Endangered
Loggerhead Turtle (*Caretta caretta*)	Threatened	Threatened	Threatened
Atlantic Kemp's Ridley Turtle (*Lepidochelys kempii*)	Endangered	Endangered	Endangered
Bald Eagle (*Haliaeetus leucocephalus*)	NA	Threatened	Threatened
Piping Plover (*Charadrius melodus*)	NA	Threatened	Threatened
Roseate Tern (*Sterna dougallii dougallii*)	NA	Endangered	Endangered
Common Loon (*Gavia immer*)	NA	NA	Species of special concern
Common Tern (*Sterna hirundo*)	NA	NA	Species of special concern
Arctic Tern (*Sterna paradisaea*)	NA	NA	Species of special concern
Least Tern (*Sterna antillarum*)	NA	NA	Species of special concern
Leach's Storm-Petrel (*Oceanodroma leucorhoa*)	NA	NA	Rare/seriously declining in ME

Source: [1] NMFS, 2002; [2] USFWS, 2002; [3]http://ecos.fws.gov/ecos/reports.do

Endangered and Threatened Fish: No federally or state-listed fish species are documented as occurring in or near PDS waters (see Table 4).

Endangered and Threatened Birds: The bald eagle, roseate tern, arctic tern, and Leach's storm-petrel are the bird species most likely to feed in the open waters (Table 4) and therefore occasionally could occur at PDS. However, a review of these species lifestyles and feeding patterns reveals that they will abandon a feeding area when confronted by human activity. As the barges carrying dredged material to the site will be assisted by tugboats and the two vessels travel at approximately 3 to 5 knots, there is little chance of avian interactions with dredged material vessels using the PDS. The other threatened or endangered bird species listed under the state or federal ESA (piping plovers, common loon, common tern, and least tern) are creatures of the nearshore, coastal areas of Maine and are very unlikely to be found using the area of the PDS. Based on that assessment, we have determined that these species are unlikely to be adversely impacted by use of the PDS.

Based on the species assessments presented above it is concluded that the use of the PDS is not likely to adversely impact threatened or endangered species listed under either the state or federal programs. Should these conclusions become effected by new data or insights the agencies will seek to re-open the state and/or federal ESA consultations as required by Section 7 of 16 U.S.C. §§ 1531 *et seq.*

5.1.8 Sediment Profile Imaging or REMOTS®

REMOTS® (Remote Ecological Monitoring of the Seafloor) or Sediment Profiling Imagery (SPI) technology can rapidly collect and process information on sea floor conditions while documenting organism-sediment relationships. REMOTS®/SPI will determine grain size, evaluate benthic habitat conditions, document the process of recolonization in the PDS, map out areas of erosion and deposition, determine the redox potential discontinuity depth for degree of bioturbation and recolonization, determine extreme levels of organic loading by analyzing for sedimentary methane, and the Organism-Sediment Index (OSI). REMOTS®/SPI will be able to derive physical dynamics at the site from the sedimentary structures observed.

Stage I organisms are small, opportunistic short lived polychaete worms which rapidly (i.e., within 1-2 weeks) colonize new disposal mounds and which do not penetrate into the sediments very deeply. Stage II species are tubicolous amphipods and surface deposit-feeding or filter-feeding mollusks that are expected to occur 3 to 6 months after disposal has ceased. These taxa represents a more transitional stage, and they may or may not hold permanent positions in the long term benthic community structure. Stage III animals represent an equilibrium level, or sere, with organisms typified by deeper dwelling, head-down deposit-feeding polychaetes. This stage can also occur during the first year after disposal, but additional time for larval recruitment from off-site locations may be required. It is common to find more than one successional sere present at any one location (e.g., a Stage I sere active above a Stage-III). Repeated disposal at one location in the site may keep the benthic community in Stage I or Stage II sere; however infrequent use of the site, depending on a number of conditions including frequency of disposal activities, may allow Stage III communities to develop.

The three disposal mounds were comprehensively sampled to evaluate benthic recolonization of the individual dredged material deposits relative to conditions on the ambient seafloor at the reference areas. The PDA Mound was formed in the fall of 1998 and winter of 1999 by the placement of 412,804 cy of sediment dredged from the interior reaches of the federally maintained channel within Portland Harbor and the Fore River. The August 2001 survey confirmed the continued benthic recolonization of the PDA Mound at 2.5 years post disposal (SAIC, 2003a). An advanced Stage I on III population was present at each station that displayed soft sediment in the REMOTS® images. Based on the findings of the 2001 survey, the PDA Mound is expected to fully recover as the foraging activity associated with Stage III deposit feeders continues to consume the organic matter entrained within the deposited sediments and increases the level of oxidation below the sediment-water interface (SAIC, 2003a).

The DG Mound is located approximately 500 m to the northeast of the PDA Mound and corresponds to the location of a US Coast Guard Class A special purposes buoy “DG” that was historically located at PDS. Depth difference comparisons between the September 1998 and July 2000 multibeam bathymetric surveys detected a sizable accumulation of material at the DG Buoy

location resulting from disposal activity. Disposal logs indicate that a total estimated barge volume of 186,450 m^3 of sediment dredged from the Fore River and Portland Harbor has been deposited in close proximity to the DG buoy between 1999 and 2001. A 25-station REMOTS® survey performed over the DG Mound in August 2001 detected benthic conditions analogous to those of the PDA Mound (SAIC, 2003a).

The Royal River Mound was formed in the southeast corner of PDS between 1995 and 1997 as part of a capping demonstration project at this relatively deep water disposal site. Sediments were sequentially dredged from the Royal River in Yarmouth, Maine and deposited at the PDA 95 buoy to successfully form a capped mound on the PDS seafloor. The August 2001 survey was performed to evaluate benthic habitat conditions over the Royal River Mound four years after the completion of the demonstration project. The surface sediments were characteristic of historic dredged material with a generally gray color relative to 1997 sediment profile images, suggesting a reduced organic load. The benthic habitat conditions detected over the Royal River Mound were found to be comparable to that of the ambient, Gulf of Maine sediments at the reference areas.

6.0 MONITORING PROGRAM

Effective environmental monitoring programs draw on available knowledge and understanding to establish approaches and clearly define monitoring objectives that focus on the primary issues of concern. Historically, monitoring of disposal sites in New England has relied on the USACE DAMOS Program as the tool for data collection. The DAMOS program uses a Tiered monitoring framework (Germano *et al.,* 1994). The monitoring program presented in this section incorporates many of the features of the DAMOS framework. The goal of the monitoring program for the disposal at PDS is to generate information that will:

- indicate whether disposal activities are occurring in compliance with permit and site restrictions;
- support evaluation of the short-term and long-term fate of materials based on MPRSA site impact evaluation criteria; and
- support assessment of potential significant adverse environmental impact from dredged material disposal at the site.

To achieve this goal, data will be developed in two areas: 1) compliance with conditions in disposal permits and authorizations and 2) environmental monitoring of the disposal site and nearby regions (as defined in Section 6.3). The latter information will be evaluated together with historic and ongoing dredged material testing data and other accessible and relevant databases (*e.g.,* Dredged Material Spatial Management and Resolution Tool [DMSMART]). These data may be provided to the EPA, USACE, and states of Maine at least one month prior to the Interagency Regional Dredging Team meeting. The evaluation of impacts from disposal at the site will be accomplished through a comparison of the conditions at the disposal mound(s) to historical conditions (*e.g.,* changes in historic mound height and footprint) or to unimpacted nearby reference stations. The meeting participants may use this information and the monitoring data gathered in the previous year to assess the potential impact and assist in plan monitoring surveys. EPA and the USACE will coordinate to implement the appropriate action (e.g., field

surveys, additional investigations, or management actions [or subset of actions]) within the Tiered Monitoring Program and to define appropriate actions to mitigate unacceptable situations.

This monitoring plan provides a general framework for the monitoring program and guides future sampling efforts at the disposal site. Specific details about those efforts (*e.g.*, sampling design, statistical comparisons) will be developed in project-specific survey plans considered during the annual agency meeting. Similarly, the schedule for the monitoring surveys will be governed by the frequency of disposal at the site, results of previous monitoring surveys, and funding resources. The data gathered under this monitoring plan will be evaluated on an ongoing basis to determine whether modifications to the site usage or designation are warranted.

Section 6.1 describes the organization of the monitoring program and summarizes the measurement program, schedule, and results that would lead to implementing additional studies. Sections 6.2 and 6.3 respectively, provide general information quality assurance requirements and a summary of the primary data collection tools.

6.1 ORGANIZATION OF MONITORING PROGRAM

The monitoring program is organized into two parts: compliance monitoring and environmental monitoring. Compliance information includes data relevant to the conditions in permits and authorizations and will be gathered separately from the environmental data.

The environmental monitoring program for the disposal site is developed around four fundamental premises that establish the overall monitoring approach from a data acquisition perspective as well as the temporal and spatial scales of the measurement program.

Testing information from projects previously authorized to use the site for dredged material disposal can provide key information about the expected quality of material that has been placed in the site.

- Lack of benthic infaunal community recovery on recently created mounds provides an early indication of potential significant adverse impact.
- Some aspects of the impact evaluation required under MPRSA §102(c)(3) can be accomplished using data from regional monitoring programs (*e.g.*, fisheries impact).
- Measurement of certain conditions in the site can be performed at a lower frequency (*e.g.*, long-term mound stability) or only in response to major environmental disturbances such as the passage of major storms.

The first premise requires that historic and ongoing dredged material testing results be available. The remaining premises require various types and scales of monitoring to ensure dredged material disposal at the site is not unduly impacting the marine environment. Thus, the monitoring program is further organized around five management focus areas that are derived from the six types of potential effects required for evaluation under the MPRSA [40 CFR § 228.10(b)] as described in Section 2.

- **Management Focus 1: Movement of dredged material.** This focus combines the requirements under 40 CFR 228.10(b)(1) (Movement of materials into sanctuaries, or onto beaches or shorelines) and 40 CFR 228.10(b)(2) (Movement of materials towards

productive fishery or shellfishery areas) into one focus.

- **Management Focus 2: Absence of pollutant-sensitive biota.** Addresses 40 CFR 228.10(b)(3) (Absence from the disposal site of pollutant-sensitive biota characteristic of the general area).
- **Management Focus 3: Changes in water quality.** Addresses 40 CFR 228.10(b)(4) (Progressive, non-seasonal, changes in water quality or sediment composition at the disposal site when these changes are attributable to materials disposed of at the site).
- **Management Focus 4: Accumulation of material constituents in biota.** Addresses 40 CFR 228.10(b)(6) (Accumulation of material constituents [including without limitation, human pathogens] in marine biota at or near the site [*i.e.*, bioaccumulation]).

A Tiered approach, based on a series of null hypotheses[1], is used to monitor compliance and address concerns under each Management Focus. Tier 1 evaluates a series of hypotheses addressing "leading indicators" that provide early evidence of unacceptable environmental responses or conditions. Examples include documentation of whether recolonization is proceeding as expected or whether mounds are deposited as planned and that no post-deposition movement is occurring. Should the hypotheses under Tier 1 be falsified, the findings would be evaluated and decisions to conduct Tier 2 activities made. The specific condition that will initiate Tier 2 or Tier 3 monitoring will be decided between EPA and the USACE. Based on the type of event/action that has occurred, EPA and the USACE, with advice from other state and federal agencies, will work to implement the appropriate management practice with the Monitoring Program.

The measurement program under Tier 1 focuses on both individual dredged material mounds and the overall site conditions. New mound construction will be evaluated within one to two years of completion and the entire site will be evaluated as needed. While specific monitoring activities are defined under each Tier, the actual monitoring conducted in a given year must be consistent with budgetary constraints. Thus, prioritization of monitoring by organizational focus and findings of the monitoring program must be done annually during the Agency planning meeting.

Tiers 2 and 3 provide for progressively more detailed and focused studies to confirm or explain unexpected or potentially significant adverse conditions identified under Tier 1. For example, if Tier 1 monitoring under Management Focus 2, indicates that the benthic community was not recovering on recently deposited sediments, successive Tiers would enable examination of potential causes by incorporating additional investigation of sediment characteristics and quality. However, if the results from the Tier 1 data do not suggest impact, Tier 2 activities would not be invoked.

The following sections describe the monitoring approach that will be applied to each management focus. Each subsection provides the following:

- Intent of the data gathered under the focus area.

[1] A null hypothesis, H_0, represents a theory that has been put forward, either because it is believed to be true or because it is to be used as a basis for argument, but has not been proved. The null hypothesis is often the reverse of what the experimenter actually believes.

- Statement of relevant questions and hypotheses to be addressed within each Tier.
- Summary of the measurement approach and tools to be used under each successive Tier.

Attachment A provides flow charts that summarize the Tiered approach for each management focus (as questions) and a table that summarizes each of the hypotheses and the leading indicators that would require action.

6.1.1 Compliance Monitoring

Compliance monitoring includes evaluation of information and data relevant to the conditions in permits and authorizations and will be gathered separately from the environmental data. The hypothesis that will be addressed is:

H_0 0-1: Disposal operations are not consistent with requirements of issued permits/authorizations.

This hypothesis will be evaluated by review of the disposal inspectors report and any variances identified will be discussed by the EPA-NE and the USACE-NAE on a project-specific basis to determine the potential magnitude of effect and the appropriate action.

6.1.2 Management Focus 1: Movement of the Dredged Material

This management focus addresses two concerns relative to the disposal of dredged material at PDS. The first is site management and compliance. The second is movement of the material after disposal. The questions that will be addressed include:

- Is the material deposited at the correct location?
- Are mounds constructed consistent with the site designation?
- Are mounds stable and dredged material retained within the disposal site?

The latter question directly addresses management concerns about material moving into sanctuaries, or onto beaches or shorelines and towards productive fishery or shellfishery areas.

Tier 1

The site designation specifies that PDS is a non-dispersive site; therefore significant movement of materials out of the site is not expected. Loss of mound material could mean that the material is being lost inappropriately and may potentially impact areas outside of the site, if transported beyond the site's boundary. For the purpose of Tier 1, this question is addressed through two hypotheses.

H_0 1-1: Changes in elevation for any mound are not greater than 1.0 foot (0.3 meter) over an area greater than 50 by 50 meters:

This hypothesis will be tested by determining the dimensions of disposal mounds created in a given dredging season and performing periodic monitoring of the mound using precision bathymetry techniques (see Section 6.3). The bathymetric baseline data for new or modified mounds will be collected after one year of consolidation. Bathymetric surveys of mounds

(historic and recently completed) and the entire site will also be performed periodically. Information on mound size and height will be compared with previous data to determine if loss of material has occurred. Further study of the characteristic of the mound and surrounding area will be conducted under Tier 2, if large scale (50 by 50 meter) mound changes of more than 1.0 feet (0.3 meters) within any five year interval. A one foot change was chosen because the resolution of the bathymetric techniques is about six inches, and this represents a significant transport of sediment that could affect a biological community.

H_0 1-2: Major storms (greater than 10 year return frequency) do not result in erosion and loss of material from disposal mounds at PDS.

According to DAMOS Contribution #122 (U.S. Army Corps of Engineers Waterways Experiment Station, 1998), a hydrographic model of sediment transport at the PDS using LTFATE estimated that, with a wave height of up to 14.8 meters (i.e. 45 feet or so) and a wave period of 15 seconds, erosion of only 0.11 meters, or less than one foot, would occur.

This hypothesis will be tested by determining the dimensions of disposal mounds within two months following the passage of storms with a ten-year return frequency. Dimensions will be determined using precision bathymetry techniques (Section 6.3.1). The decision to conduct post-storm surveys will be made jointly by the site managers. If a mound changes in height by more than 1.0 feet (0.3 meters) from the previous survey, the site and surrounding area will be examined as defined under Tier 2.

Tier 2

Significant loss of material from the deposited mound may result in changes to sediment quality (See Section 6.3.4) either within or beyond the site boundaries. Change in bathymetry and sediment quality immediately outside of the site would be indicative of potential unacceptable transport. Tier 2 investigates whether significant erosion of mound height determined under Tier 1 results in the relocation of material outside of the site boundaries.

H_0 1-3: Material lost from disposal mounds at PDS does not increase the (a) bathymetry more than 0.5 feet (15 cm) over an area larger than 50 by 50 meters and (b) the organism sediment index is not significantly lower than the reference site in bathymetrically changed areas.

This hypothesis will be tested by determining changes in bathymetry and sediment characteristics beyond the site boundary. The survey design will take into account the expected direction of transport based on the predominant current direction and velocity (*e.g.*, it may not be necessary to survey the entire area within 1 kilometer [0.6 miles] of the site).

Precision bathymetry (Section 6.3.1) will be used to define substantive changes in bathymetry and topography (greater than 0.5 foot [15 centimeters]). Sediment profile imagery may also be used to evaluate changes in sediment characteristics (see Section 6.3.2). The sediment profile imagery can be used to observe layers of material too thin to detect by precision bathymetric methods and can also be used to evaluate if the benthic community in the sediments has been disturbed or is under stress (as defined in Management Focus 2, Tier 2) relative to the reference sites. Comparison of sediment profile imagery data from areas of concern to reference areas will

be used to determine whether the transported material has a potential significant adverse biological effect.

Changes in bathymetry across the mound apex or apron of more than 1.0 feet (0.3 meters) or development of large areas of predominately muddy sediments not previously documented may be an indication of substantial transport of material from the site. If such changes are documented, Tier 3 characterization of sediment quality or further characterization of benthic communities may be required.

Tier 3

The premise of this Tier is that significant transport of material beyond the site boundary could affect the benthic productivity of the area. Therefore, characterization of sediment quality may be required.

H_0 1-4: Material transported beyond the PDS boundaries does not result in significant decreases in sediment quality.

Sediment chemistry, toxicity, and benthic community structure will be measured at representative locations (determined through interagency coordination) from the area where sediment accumulation has occurred and at the PDS reference sites to test this hypothesis (see Section 6.3.5).

Chemical and toxicity testing and analysis will be conducted using methods required by the RIM (EPA and USACE, 2004) or subsequent approved documents. Statistical comparisons and numbers of samples will be determined during project-specific survey planning.

Data from the area of concern will be compared statistically to data collected concurrently from the PDS reference sites to determine if the quality of transported material is unacceptable. The decision of unacceptable conditions will be based on all three measures (*i.e.*, sediment quality, benthic community analysis, and toxicity).

6.1.3 Management Focus 2: Absence from the Disposal Site of Pollutant-Sensitive Biota Characteristic of the General Area

The premise underlying this management focus is that the infaunal community on disposal mounds recovers rapidly[2] after disposal ceases. Therefore, the absence of or slower-than-expected recovery of the benthic infaunal community indicates a potential biological impact at the mound and by implication the ability of the site to support higher trophic levels. The long history of disposal site monitoring in New England has resulted in an excellent understanding of the rate at which benthic infauna recover from disturbances such as those caused by dredged material disposal as well as the types of communities that are expected to recolonize the mounds (SAIC, 1982; Morton, 1980; Morton *et al.,* 1982; Morton and Stewart, 1982; Morton and Paquett, 1983; Morton *et al.,* 1984; SAIC, 1985; SAIC, 1987; Germano *et al.,* 1994; Charles and Tufts, 1997; Morris, 1998; Murray, P.M. and H.L. Saffert. 1999). Thus, the questions that the monitoring program addresses are directed at determining if benthic recovery is proceeding as

[2] Rapidly in this context means up to three (or more) years depending on a variety of factors that influence recolonization in coastal waters.

expected and if pollutant sensitive organisms are growing on the mounds. For Tier 1, these questions include:

- Do opportunistic species return to the mound within a growing season?
- Are the infaunal assemblages consistent with similar nearby sediments or expected recovery stage?
- Are benthic communities and populations similar to surrounding sediments?

If these questions are answered in the affirmative, the biological community on the mounds is recovering as expected and significant adverse impact from the disposal operations is not demonstrated. If the questions are answered in the negative, investigation into potential causes is conducted under Tier 2.

Tier 1

This Tier focuses on the biological recovery of the mound surface by sampling for specific, opportunistic, benthic infaunal species and the recolonization stage relative to nearby sediments.

H_0 2-1: Stage 2 or 3 assemblages (deposit-feeding taxa) are not present on the disposal mound one year after cessation of disposal operations.

This hypothesis will be tested with sediment profile imaging on the disposal mounds created in a given dredging season and by periodic imaging of older mounds (see Section 6.3.2). This evaluation includes estimates of grain size classes, which is a key variable affecting the types of organisms observed in the images. The initial sediment profile imaging survey should be conducted within 12 to 16 months after mound completion. Evaluation of selected historic (inactive) mounds and imaging of the PDS reference stations will be incorporated into each survey of active mounds. Sampling of historic mounds can be sequenced across years depending on budgets and the conclusions of the previous data review at the annual agency coordination meeting.

Significant adverse impact will be determined from comparison of the sediment profile imagery data on the active and historic mounds to that of the reference stations. If the comparison of the mound data to the reference areas is consistent with the expected successional sequence, the biological community on the mounds would be considered to be recovering as expected and significant adverse impact from the disposal operations not demonstrated. If there is significant departure from the successional expectation in the sediment profile imagery data between the mounds and reference site, and the grain size information from the images or reference condition cannot explain the difference, further investigation into the potential causes of the difference is conducted under Tier 2.

Tier 2

This Tier is executed if differences in the benthic recolonization data on a dredged material mound cannot be explained by differences or changes in grain size. The hypotheses are designed to determine if the observations made under Tier 1 are localized (mound specific) or regional and to determine the effect of different sediment grain size distributions on the biological observations.

H_0 2-2: The absence of opportunistic species and Stage 2 or 3 assemblages is not confined to the disposal mounds.

H_0 2-3: The range in sediment grain-sizes on the disposal mound is not different from the ambient seafloor.

These hypotheses examine whether or not the differences observed in Tier 1 extend beyond the disposal mounds and whether the grain size distribution within and outside the site can explain the biological observations. If diminished recolonization (successional) stage data is widespread and substantial movement of material is not observed under Tier 1 or 2 of Management Focus 1 or if poor water quality conditions (*e.g.*, sustained low dissolved oxygen levels) are known to have occurred in the region (Management Focus 3), assignment of the dredged material disposal as the cause is questionable. However, if the differences are widespread and cannot be attributed to other factors, an investigation of cause would be initiated under Tier 3 of this Management focus.

These hypotheses will be tested with sediment profile imaging (see Section 6.3.2). The sediment profile image survey will be designed to sample representative conditions in the site and extend systematically to areas at least 1 kilometer (0.6 miles) beyond the site boundaries.

The full suite of information developed from the sediment profile images will be used to evaluate the similarity or differences of the areas sampled. This evaluation includes estimates of grain size classes, which is a key variable affecting the types of organisms observed in the images. The data will be used to address the above hypotheses. If the results find the effect is widespread and that grain size distributions can not explain the biological observations, additional cause effect studies defined under Tier 3 may be conducted.

Tier 3

Tier 3 is conducted if the benthic recolonization data developed under Tier 2 indicate that potential impacts are widespread (*i.e.*, encompass areas within and beyond the site boundaries). This Tier attempts to determine if the Tier 2 findings are the result of contaminants in the sediments or sediment toxicity. Tier 3 studies will only be conducted after a review and concurrence by the agencies managing the site.

H_0 2-4: The toxicity of sediment from the disposal site is not significantly greater than the reference sites.

H_0 2-5: The benthic community composition and abundance is not equal to that at reference sites.

Sampling and analysis of the sediments for benthic infaunal enumerations and community analysis will be conducted to evaluate the status of the infaunal community and compare the community to measures of sediment quality (see Section 6.3.2 and Section 6.3.5). Sediment chemistry and toxicity will be measured at representative locations from within the deposited material and at the PDS references sites (see Section 6.3.4).

Chemical and toxicity measures will be conducted as defined in the RIM (EPA and USACE, 2004) or subsequent approved documents. Data from the area of concern will be compared statistically to data collected concurrently from the PDS reference sites to determine if the quality of transported material is unacceptable. The decision of unacceptable conditions will be based on all three measures.

6.1.4 Management Focus 3: Changes in Water Quality

The premise underlying this management focus is that water quality in central waters of Maine is affected by many different sources and that dredged material placed at the site exerts minimal oxygen demand on the water column. Moreover, dredged material plume studies indicate the cloud of particles resulting from dredged material disposal has a very short duration in the water column and turbidity levels reach ambient levels within minutes to hours (e.g. SAIC, 1985; Munns et al., 1989; US ACE 1986; Rhoads, 1994; SAIC, 2005). This fact, coupled with required testing that ensures residual material meets water quality criteria within an initial mixing period (within four hours within the site and always outside the site) before the material can be accepted at the site, minimizes any long-term, cumulative impact to the water column. Therefore, it is expected that significant short-term adverse effects are unlikely to result from the disposal operations. Relevant questions for water quality include:

- Is short-term water quality in PDS different during disposal operations than in areas outside the site?
- Does dredged material disposal have a substantive impact on long-term water quality measures such as dissolved oxygen?

As discussed under Management Focus 1 and 2, dredged material placed at PDS must pass the requirements of the RIM (EPA and USACE, 2004) or subsequent approved manuals, for disposal at PDS. Potential water impacts are examined through the permitting process. Although not a concern for most projects, some projects may be required to prove that they are not exceeding Limiting Permissible Concentration (LPC) criteria at the site boundary during dredged material disposal. Thus, a measurement program to document whether short-term changes in water quality during disposal operations (H_o3-0) occurs is not proposed under Tier 1 but may be required as part of a disposal permit.

H_0 3-0: The LPC shall not exceed beyond the boundaries of the disposal site during initial mixing, and shall not be exceeded at any point in the marine environment after initial mixing..

Tier 1

Under this Tier, it is assumed that water quality at PDS and the surrounding region is not degraded by the disposal of dredged material. Measurements under this Tier will be triggered if information developed under Management Focus Area 2, suggests that PDS is the cause of poor water quality and is causing wide-spread benthic impacts in the waters of Maine.

H_0 3-1: Water quality at PDS does not violate ocean quality standards.

This hypothesis will be tested through water quality surveys designed to evaluate short-term changes in water quality during disposal operations. If significant sustained short-term changes

are found, further evaluation of the relationship to dredged material disposal will be undertaken (Tier 2) after discussion by the managing agencies.

Tier 2

Specific hypotheses cannot be defined for this Tier at this time and will be developed through interagency coordination at such time the Tier is deemed necessary. However, they may include special studies that determine the sediment oxygen demand to evaluate the contribution of the site to spatial and temporal dissolved oxygen trends in the water column. Such studies would compare the sediment oxygen demand levels in sediments within and outside the site including the PDS reference locations. Special plume tracking studies may also be mounted to examine the specific effects of individual dredged material plumes on water quality during the disposal season.

Tier 3

No specific hypothesis can be determined at this time. Specific hypotheses will be developed as needed through interagency coordination.

6.1.5 Management Focus 4: Accumulation of Material Constituents in Marine Biota at or Near the Site

The intent of this management focus is to evaluate whether significant potential for bioaccumulation results from disposal of dredged material at PDS. The basic premise of this management focus is that testing of sediments for open water disposal eliminates material that poses an unacceptable risk to the marine environment from disposal at PDS. Moreover, because bioaccumulation of contaminants is a phenomenon, it may not result in the impairment or death of organisms in and of itself. However, because bioaccumulation may result in transfer and possible biomagnification of certain chemicals throughout the food chain, which may pose potential unacceptable risks to marine organisms and humans that are not addressed through the evaluation of benthic community recovery, measurements for potential bioaccumulation are precautionary and prudent.

Such bioaccumulation data can serve two purposes. The first is to help understand whether transfer of chemicals from sediments to organisms could be contributing to a significant adverse biological response (*e.g.*, failure of a benthic infaunal community to thrive). The second is to estimate potential risks posed from bioaccumulation of contaminants at the site. The challenge in the monitoring program is how to best develop the information. Two questions are relevant under this Management Focus:

- Are risk levels from sediments placed at PDS low?
- Does the bioaccumulation potential from the deposited sediments remain low after deposition?

There are several ways to address these questions. The first question is best addressed by continuing to test potential projects for potential risk (as currently practiced in the region) and by compiling test results into a readily available database. Addressing the second question involves

periodically evaluating bioaccumulation potential for sediments at and near the disposal site. Methods for developing this information can range from estimating bioaccumulation potential using bioaccumulation models, to measuring the levels of contaminants in organisms collected from a site, to conducting controlled laboratory bioaccumulation studies with test organisms. These approaches are used in a Tiered manner to address bioaccumulation concerns at PDS.

If either of these questions is answered in the negative, significant adverse impact from the disposal operations may be present. Question 1 will be addressed through evaluation of the testing data submitted as part of the permit application and approval process. Question 2 is addressed under the Tiered approach below.

Tier 1

The premise of this Tier is that bioaccumulation potential at PDS, and thus risk, does not increase after the sediments are deposited.

H_0 5-1: Bioaccumulation potential of sediments collected from PDS is not significantly greater than the range of bulk chemical values measured in permitted projects.

This hypothesis will be tested by periodically collecting sediments from within PDS and its reference areas and measuring the level of contaminants in the sediments. If statistically significant increases in sediment chemistry above permitted dredged material project data are found, theoretical bioaccumulation calculations will be performed. These may be performed in association with any sampling for sediment chemical analysis (*i.e.*, Tier 3 of Management Focus 4). Such surveys should be designed to address other relevant management evaluations. If such sample collections are not performed within any five-year interval, a survey may be planned and conducted as a precautionary evaluation.

If the bioaccumulation modeling indicates a significant increase in potential bioaccumulation relative to baseline conditions or reference areas more specific studies that directly measure bioaccumulation may be conducted under Tier 2.

Tier 2

Direct evidence of bioaccumulation from sediments placed at PDS may be obtained by comparing bioaccumulation in organisms collected from within and near (reference stations) the disposal site. The study may include collection of representative infaunal organisms from these locations and comparing the level of chemicals in their tissues or testing sediments under controlled laboratory conditions (*i.e.,* bioaccumulation bioassays) or both.

The specific study questions and sampling design will be developed and approved by the agencies managing PDS before any study is conducted.

If significant increases in bioaccumulation are determined to exist in the sediments from the site, ecological and human health risk models may be run to examine the significance of the increase. If risks increase significantly, studies described under Tier 3 would be implemented.

Tier 3

This Tier tests for transfer of bioaccumulated compounds at the site into higher trophic levels.

H_0 5-2: Bioaccumulation of material constituents in higher tropic levels that reside at or near the site does not result from disposal of dredged material at PDS.

Proving the source of contaminants measured in higher trophic level species is a difficult and complex task. Therefore, careful experimental design is required to make a cause effect link to the sediments deposited at PDS. The specific study design will be developed and approved by the agencies managing PDS before any study is conducted.

6.2 QUALITY ASSURANCE

An important part of any monitoring program is a quality assurance (QA) regime to ensure that the monitoring data are reliable. Quality assurance has been described consisting of two elements:

- Quality Control - activities taken to ensure that the data collected are of adequate quality given the study objectives and the specific hypothesis to be tested, and include standardized sample collection and processing protocols and technician training (National Research Council [NRC], 1990).
- Quality Assessment - activities implemented to quantify the effectiveness of the quality control procedures, and include repetitive measurements, interchange of technicians and equipment, use of independent methods to verify findings, exchange of samples among laboratories and use of standard reference materials, among others. EPA and USACE, 2004.

Relevant laboratories are required to submit Quality Assurance (QA) sheets with all analyses on a project-specific basis (see the Ocean Testing Manual [Green Book; EPA and USACE, 1991] and the RIM [EPA and USACE, 2004] for further details).

6.3 MONITORING TECHNOLOGIES AND TECHNIQUES

This section describes equipment and approaches typically used to evaluate dredged material disposal sites in the northeast United States. Use of consistent techniques increases comparability with future and historic data; however, monitoring methods used at PDS are not limited to these technologies. New technology and approaches may be used as appropriate to the issues and questions that must be addressed. The applications of equipment and survey approach must be tailored to each individual monitoring situation, as warranted.

6.3.1 Mound Erosion

Loss of deposited dredged material (erosion) at the site will be investigated using bathymetry (SAIC, 1985). Typically, this methodology applies a minimum area bounded by rectangular dimensions of approximately 800 meters to 1,200 meters centered around a disposal buoy and aligned with the major axis of the tidal ellipse at the site will be surveyed. Today's survey techniques and equipment have matured to the place that comparative surveys can detect changes

in the bathymetry of mounds of approximately 6 inches (15 cm) over areas of 50 by 50m. Side scan sonar and sediment profile imaging systems (Rhoads and Germano, 1982; Germano *et al.*, 1994) may also be used and are useful for defining broad areas where grain size may have changed or identify thin layers of dredged material, respectively (Rhoads, 1994). Specific survey requirements and application of these measurement tools will be defined for each Tier and situation investigated. Evidence of mound erosion will need to be evaluated carefully to distinguish between actual erosion and mound consolidation.

6.3.2 Biological Monitoring

Benthic recovery at disposal mounds will be measured by sediment profile imagery (Rhoads and Germano, 1982; Germano *et al.*, 1994). Stations will center on the disposal buoy (if more than one area is used in the year then these additional areas will be surveyed in a similar manner). In addition, stations at each of the reference sites will be obtained. At each station three photos will be taken with the sediment profile imaging camera. Image analyses will provide the following information:

- Sediment grain size.
- Relative sediment water content.
- Sediment surface boundary roughness.
- Sea floor disturbance.
- Apparent Redox Potential Discontinuity (RPD).
- Depth of camera penetration.
- Apparent presence of sediment methane.
- Infaunal successional stage.
- Organism-Sediment Index (OSI).

6.3.3 Water Quality

Should site specific monitoring be required for water quality monitoring, methodologies will be developed.

6.3.4 Sediment Quality

Grab samples of the sediments will be collected and analyzed for grain size, total organic carbon, and selected contaminants such as trace metals (*e.g.*, mercury, lead, zinc, arsenic, iron, cadmium, copper), total PCBs, total PAH, and pesticides (EPA/USACE, 2004). The number of stations and locations will be defined during survey planning and will be sufficient to enable characterization of within and among station variability. A minimum of two replicate samples should be obtained from each station sampled including each of the reference stations.

Toxicity tests will be selected from those used to evaluate dredge material proposed for disposal at PDS (EPA/USACE, 2004). The number of stations and locations will be defined during survey planning and will be sufficient to enable characterization of within and among station variability. A minimum of two replicate samples should be subjected to testing and include each of the reference stations.

6.3.5 Bioaccumulation Measurements

Measurement of bioaccumulation will include collection of representative benthic infaunal species within the site and at reference locations. At least two types of organisms (filter feeders and sediment feeders) will be obtained and genus level species aggregated into field replicates. Sufficient biomass to enable quantifications of bioaccumulatable compounds will be obtained from grab samples (or other appropriate sample collections device). Tissue will be prepared and analyzed using methods consistent with EPA/USACE (2004). The number of stations and locations will be defined during survey planning and will be sufficient to enable characterization of within and among station variability. Between three and five replicate samples should be obtained from each station sampled including each of the reference stations. Laboratory based bioaccumulation testing will follow the requirements outlined in EPA/USACE (2004).

7.0 ANTICIPATED SITE USE AND QUANTITY AND QUALITY OF MATERIAL TO BE DISPOSED

MPRSA §102(c)(3)(D) and (E) requires that the SMMP include consideration of the quantity of the material to be placed in the site, and the presence, nature, and bioavailability of the contaminants in the material as well as the anticipated use of the site over the long term. PDS is designated to receive dredged material only. No other material may be placed in the site.

All dredged material projects using PDS for disposal must be either permitted or authorized under MPRSA (see Section 3). The quality of the material will be determined on a project specific basis under the testing requirements necessary to meet open-water disposal requirements of MPRSA §103. The quality of MPRSA material will be consistent with EPA's Ocean Dumping Regulations (40 CFR Part 227), as implemented under the RIM (EPA and USACE, 2004). Any updates to the RIM will be in force when approved by the EPA and USACE.

A specific closure date for PDS has not been assigned as of the date of this SMMP. The potential capacity of PDS (approximately 20 mcy) is far in excess of the potential site use over the next 20 years. In the last 15 years, according to Table 1, a total of 1.75 mcy has been disposed, therefore developing a closure plan at this time is not critical. The capacity of the site will be evaluated at least every three years, and no legal limit exists on the amount of material that can be placed at the site. At the time that site closure appears likely in the next decade, plans should be made to (1) manage sediment placement to achieve any preferred bathymetric profile, and (2) survey the overall sediment chemical distributions to cover any site areas exhibiting relatively greater contaminant concentrations during the final years of site use.

8.0 REVIEW AND REVISION OF THIS PLAN

MPRSA §102 (c)(3)(F) requires that the SMMP include a schedule for review and revision of the SMMP, which shall not be reviewed and revised less frequently than 10 years after adoption of the plan, and every 10 years thereafter. The EPA, the USACE, and other federal and state agencies have agreed to review this plan as part of the annual agency planning meeting agenda (Section 3.2). A formal review and revision of this SMMP will take place every 10 years beginning from the date of designation unless the frequency is modified during the annual agency planning meeting. Reassessment of the EFH and endangered species issues will also be

conducted on a 10-year basis with NMFS. This document represents an update to the original 1997 SMMP for PDS.

9.0 COORDINATION/OUTREACH

To ensure a disposal program that minimizes impacts to the marine environment, the following management practices will continue to be implemented at PDS as a matter of policy. First and foremost, all proposed dredging projects will be reviewed for suitability for ocean disposal by both the USACE and EPA.

The PDS will continue to be jointly managed by EPA-NE and the USACE-NAE. As described in Section 3, the NERDT's interagency technical working group, commonly referred to as the Sudbury Group, meets approximately every six months to discuss management and monitoring of New England dredged material disposal sites. This team could also provide recommendations on management of the PDS. Other meetings may be called in response to unusual physical events or unexpected monitoring observations. During these meetings, monitoring data will be evaluated and the SMMP will be revised as necessary depending on current conditions and available site-specific and scientific information.

The Maine Dredging Team, composed of representatives from EPA, USACE, NMFS, USFWS, and Maine state representatives, meets approximately every six months to discuss management and monitoring of the PDS and other Maine dredged material disposal sites.

To assess compliance with applicable permit conditions and to track overall site usage, permittees will be required to provide written or electronic documentation of disposal activities to the USACE during disposal operations and after dredging is complete. Disposal permits and authorizations will include standardized requirements for this reporting to include the source of the dredged material, the amount of the material disposed, the rate of disposal, the date, time and coordinates of disposal.

The EPA and the USACE will continue to inform and involve the public regarding the monitoring program and results. For example, the DAMOS Program holds periodic symposia (typically every three years) to report results and seek comments on the program. In addition, DAMOS monitoring results are published in an ongoing series of technical reports that are mailed to interested people and organizations and also distributed at various public meetings and via the internet. The USACE also has prepared and distributed several Information Bulletins and brochures. To better meet this need, a series of presentations on different aspects of the dredging and disposal process has been prepared. In addition, site related reports can be reviewed at both the USACE Technical Library and the EPA regional library:

U.S. EPA New England
Regional Library
One Congress St., Suite 1100
Boston, MA 02114
Hours: Monday-Friday 8:00-5:00

U.S. Army Corps of Engineers
USACE-NAE Technical Library
696 Virginia Road
Concord, MA 01742
Hours: Monday-Friday 7:30-4:00

Any party interested in being added to the DAMOS mailing list should mail the appropriate information to the USACE at:

U.S. Army Corps of Engineers, New England District
Regulatory Division
Marine Analysis Section
696 Virginia Road
Concord, MA 01742

10.0 FUNDING

The costs involved in site management and monitoring will be shared between EPA-NE and the USACE-NAE and are subject to the availability of funds. This SMMP will be in place until modified or the site is de-designated and closed.

These recommendations do not necessarily reflect program and budgeting priorities of the federal government in the formulation of EPA's National Water Quality Program or the USACE National Civil Works Water Resources Program. Consequently, any recommendations for specific activities or annual programs in support of efforts in the waters of Maine may be modified at higher levels within the Executive Branch before they are used to support funding level recommendations. Requests for funding are also subject to review and modification by Congress in its deliberations on the federal budget and appropriations for individual programs. Similarly, state agency programs will depend solely on funds allocated to the programs by those agencies or other supporting agencies.

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Attachment A

Hypotheses Flowcharts

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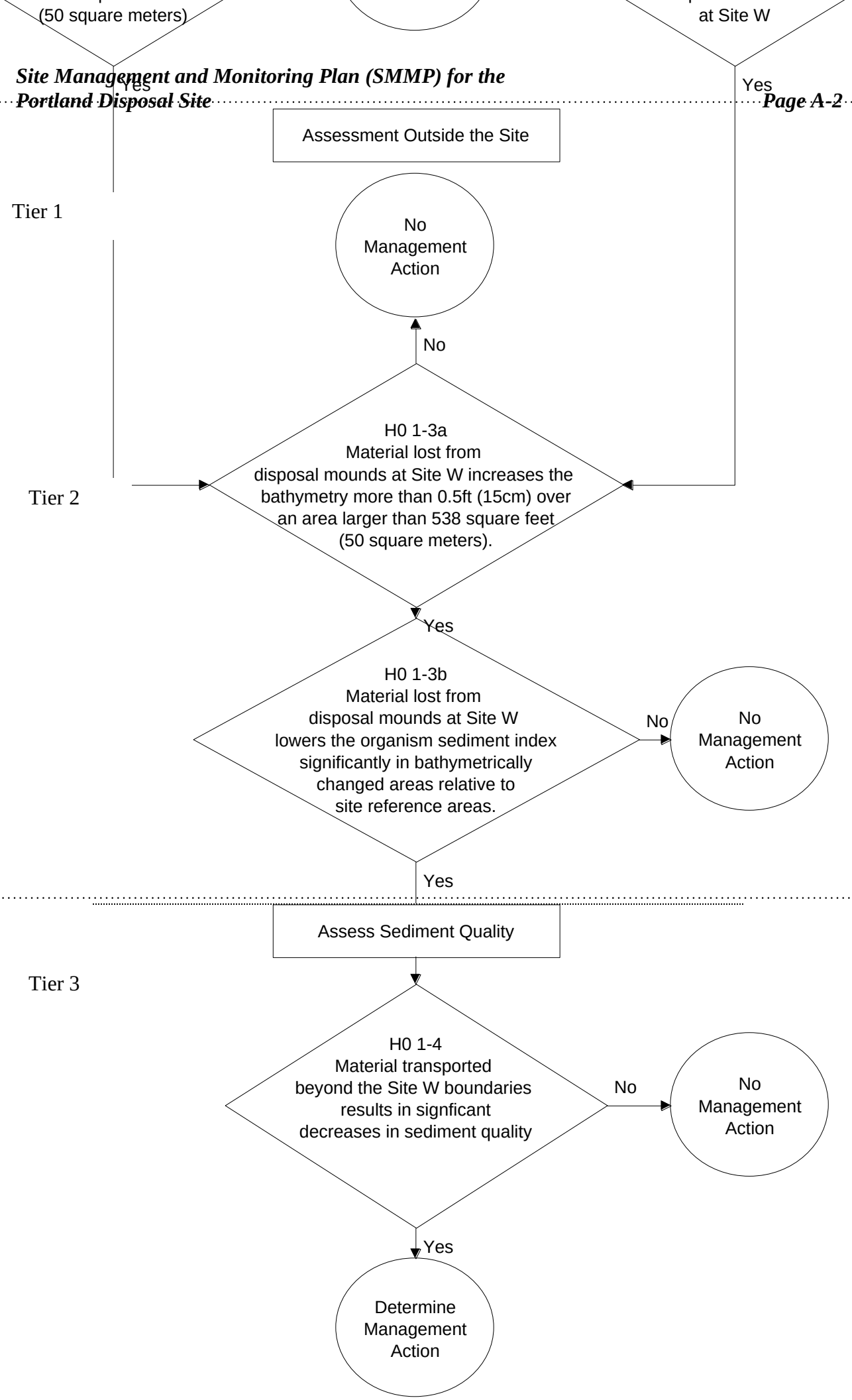
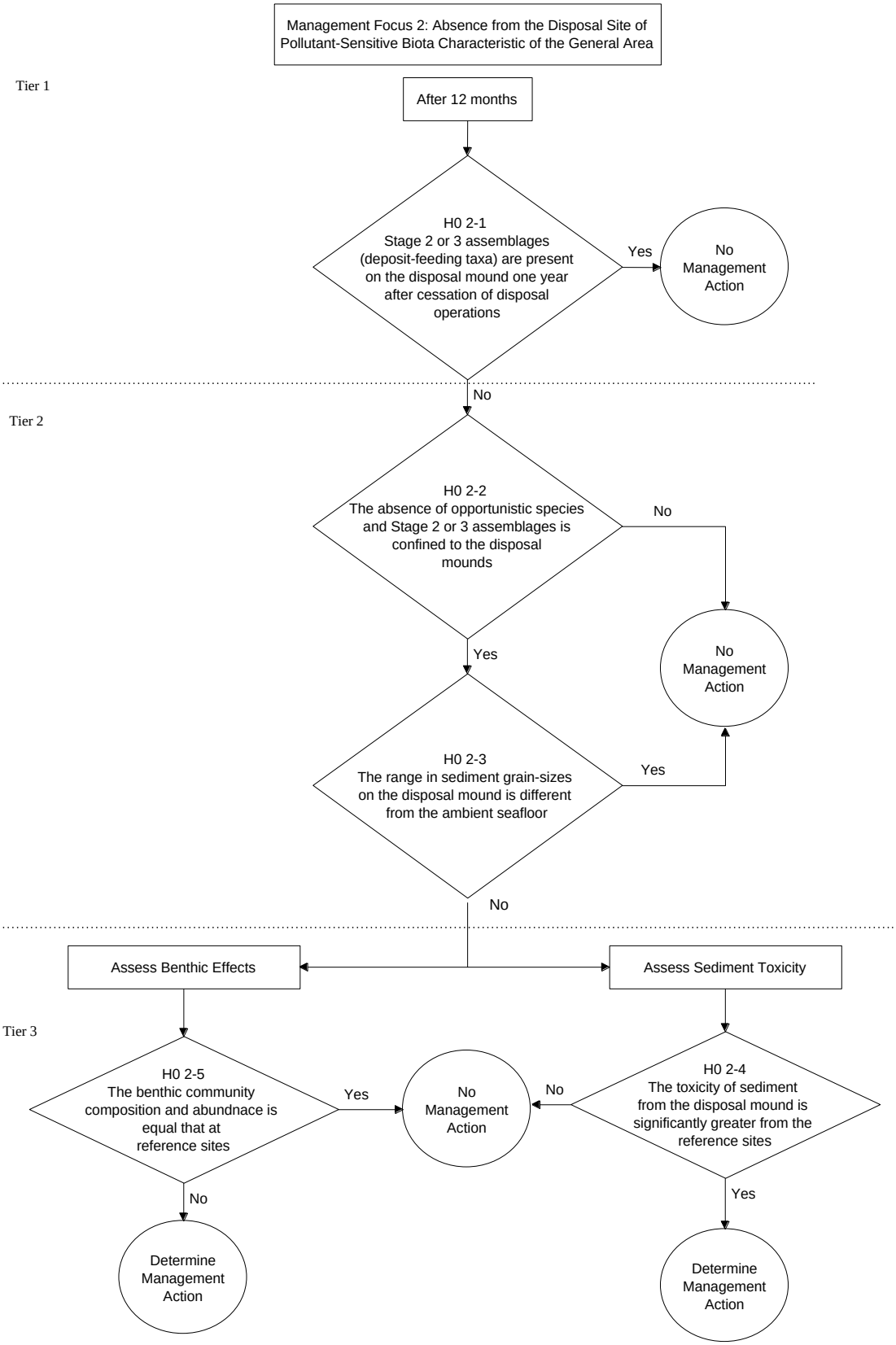
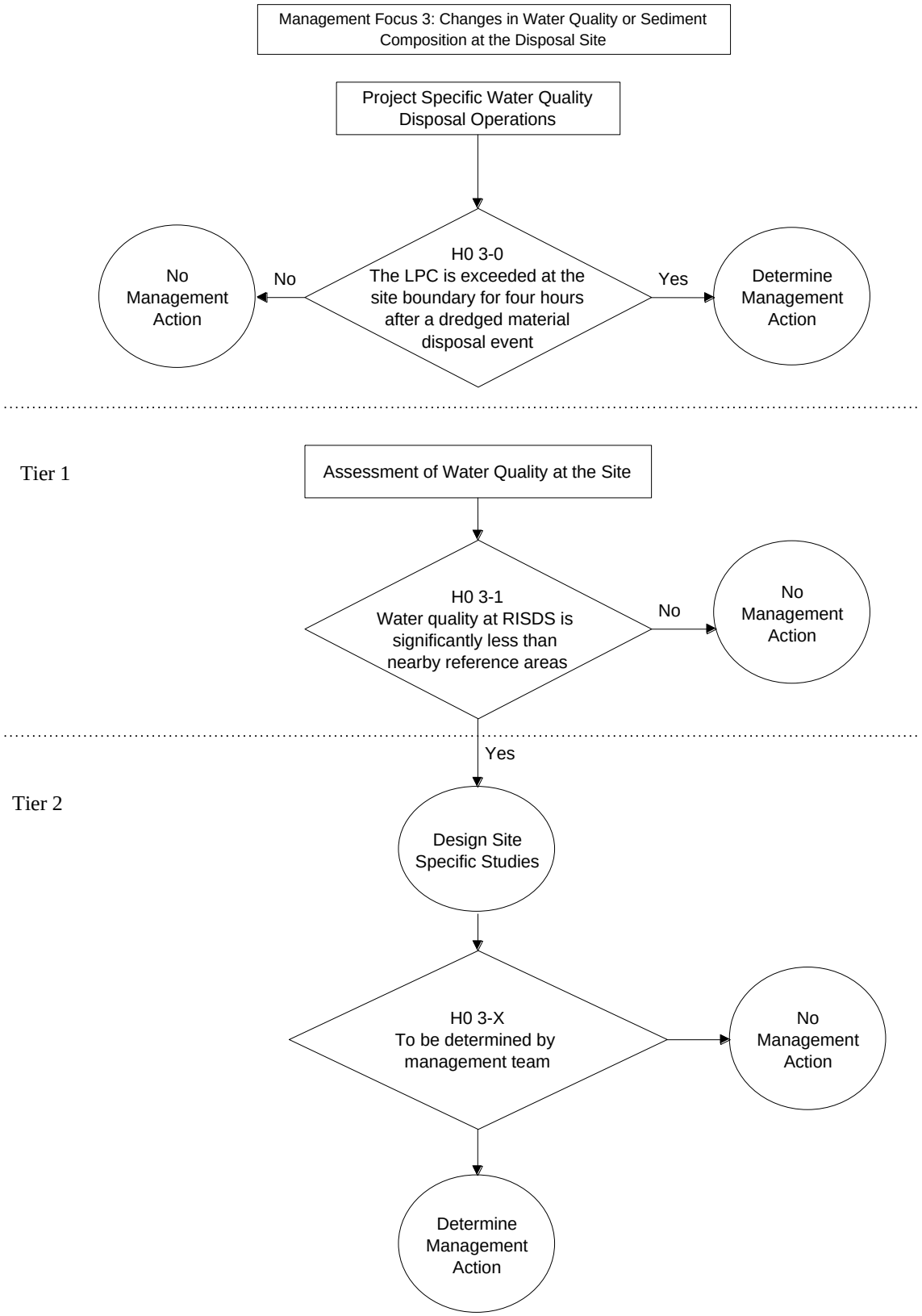
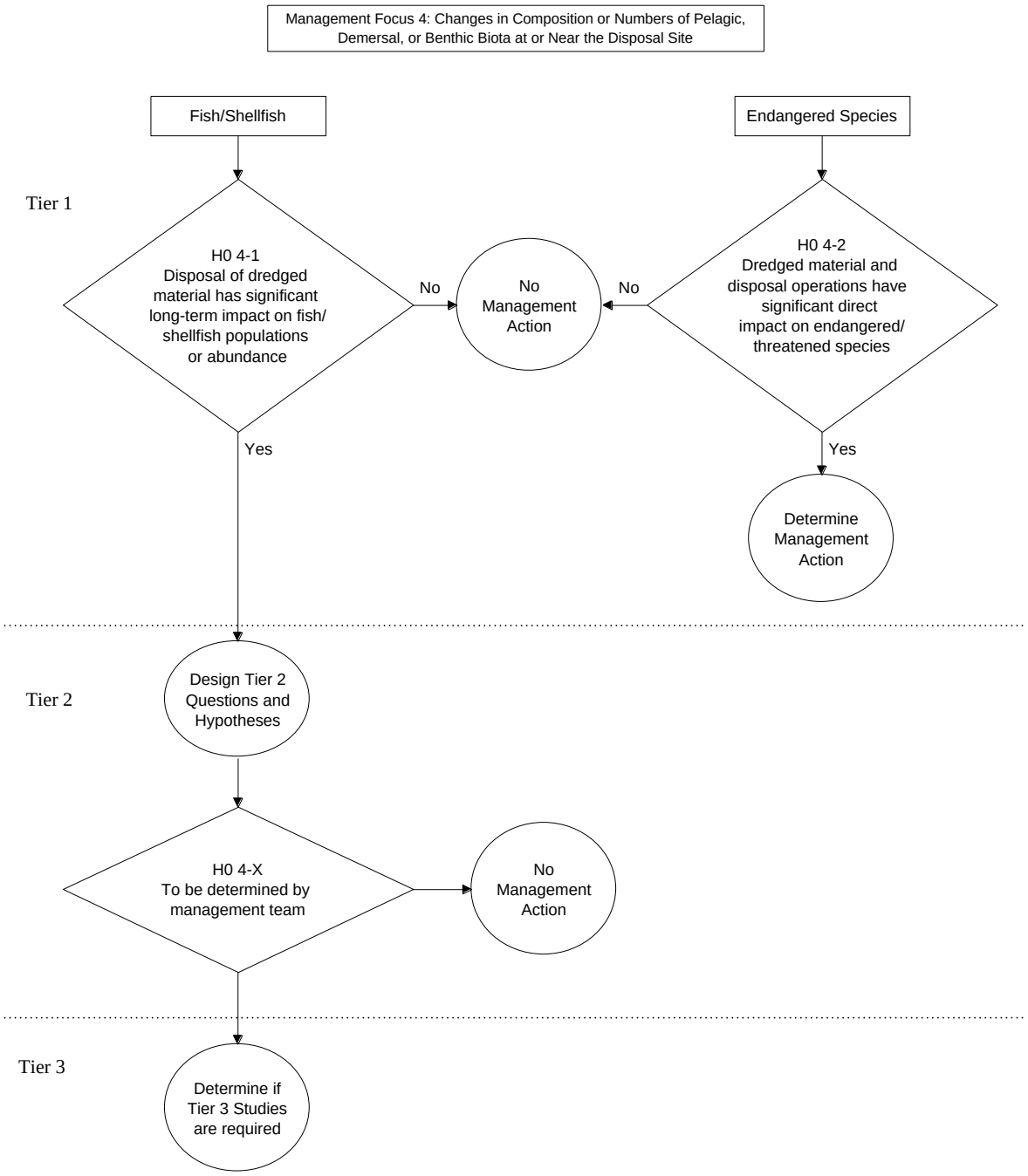
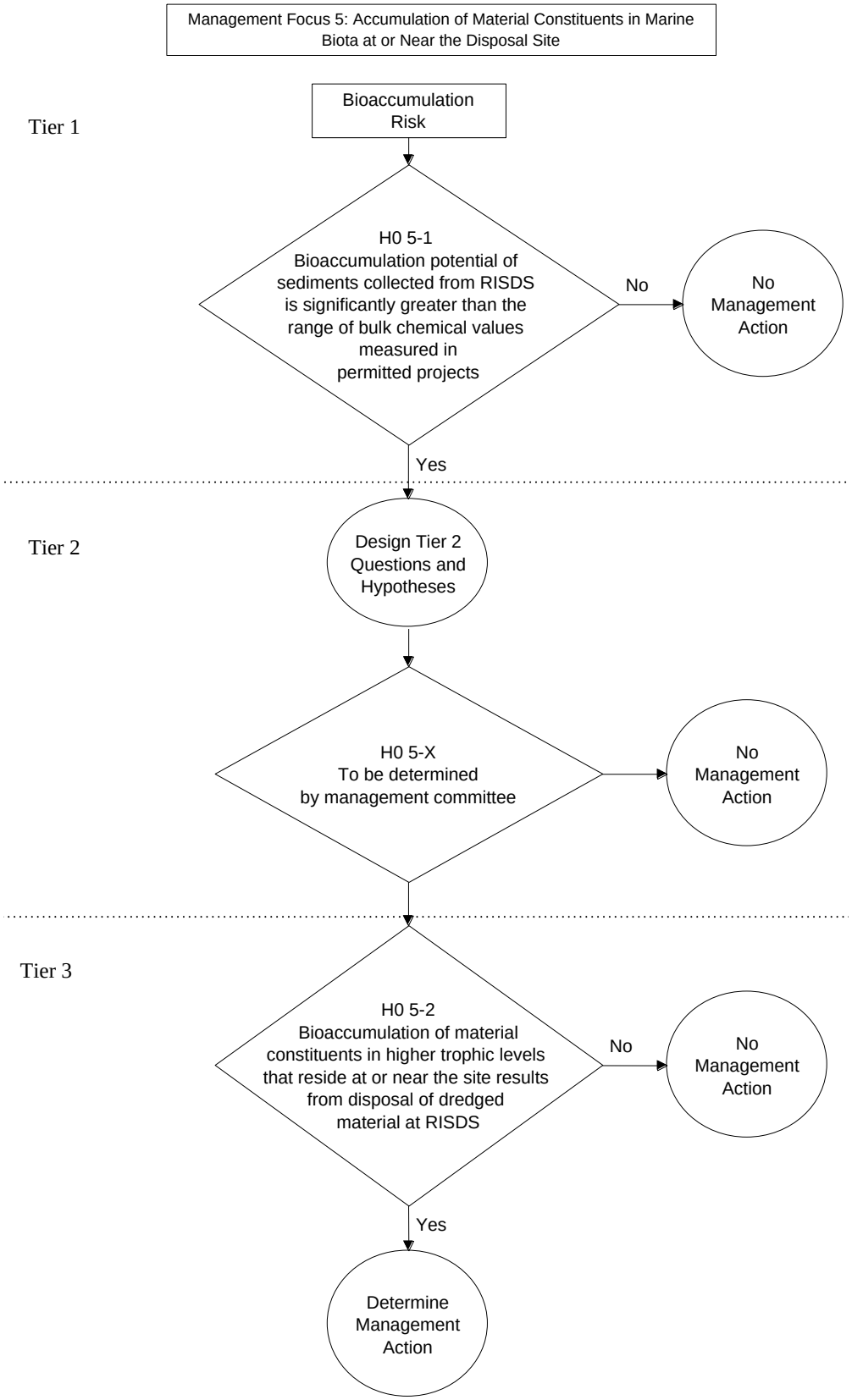

(50 square meters)
at Site W
Yes
Yes
Assessment Outside the Site
Tier 1
No Management Action
No
H0 1-3a
Material lost from disposal mounds at Site W increases the bathymetry more than 0.5ft (15cm) over an area larger than 538 square feet (50 square meters).
Tier 2
Yes
H0 1-3b
Material lost from disposal mounds at Site W lowers the organism sediment index significantly in bathymetrically changed areas relative to site reference areas.
No
No Management Action
Yes
Assess Sediment Quality
Tier 3
H0 1-4
Material transported beyond the Site W boundaries results in signficant decreases in sediment quality
No
No Management Action
Yes
Determine Management Action


Management Focus 2: Absence from the Disposal Site of Pollutant-Sensitive Biota Characteristic of the General Area
Tier 1
After 12 months
H0 2-1
Stage 2 or 3 assemblages (deposit-feeding taxa) are present on the disposal mound one year after cessation of disposal operations
Yes
No Management Action
No
Tier 2
H0 2-2
The absence of opportunistic species and Stage 2 or 3 assemblages is confined to the disposal mounds
No
No Management Action
Yes
H0 2-3
The range in sediment grain-sizes on the disposal mound is different from the ambient seafloor
Yes
No
Assess Benthic Effects
Assess Sediment Toxicity
Tier 3
H0 2-5
The benthic community composition and abundnace is equal that at reference sites
Yes
No Management Action
No
H0 2-4
The toxicity of sediment from the disposal mound is significantly greater from the reference sites
No
Yes
Determine Management Action
Determine Management Action


Management Focus 3: Changes in Water Quality or Sediment Composition at the Disposal Site
Project Specific Water Quality Disposal Operations
H0 3-0
The LPC is exceeded at the site boundary for four hours after a dredged material disposal event
No
No Management Action
Yes
Determine Management Action
Tier 1
Assessment of Water Quality at the Site
H0 3-1
Water quality at RISDS is significantly less than nearby reference areas
No
No Management Action
Yes
Tier 2
Design Site Specific Studies
H0 3-X
To be determined by management team
No Management Action
Determine Management Action


Management Focus 4: Changes in Composition or Numbers of Pelagic, Demersal, or Benthic Biota at or Near the Disposal Site
Fish/Shellfish
Endangered Species
Tier 1
H0 4-1
Disposal of dredged material has significant long-term impact on fish/ shellfish populations or abundance
No
No Management Action
No
H0 4-2
Dredged material and disposal operations have significant direct impact on endangered/ threatened species
Yes
Yes
Determine Management Action
Tier 2
Design Tier 2 Questions and Hypotheses
H0 4-X
To be determined by management team
No Management Action
Tier 3
Determine if Tier 3 Studies are required


Management Focus 5: Accumulation of Material Constituents in Marine Biota at or Near the Disposal Site
Tier 1
Bioaccumulation Risk
H0 5-1
Bioaccumulation potential of sediments collected from RISDS is significantly greater than the range of bulk chemical values measured in permitted projects
No
No Management Action
Yes
Tier 2
Design Tier 2 Questions and Hypotheses
H0 5-X
To be determined by management committee
No Management Action
Tier 3
H0 5-2
Bioaccumulation of material constituents in higher trophic levels that reside at or near the site results from disposal of dredged material at RISDS
No
No Management Action
Yes
Determine Management Action

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Attachment B

Scow Log Sample

INSPECTOR'S DAILY REPORT OF DISPOSAL BY SCOW

NOTE: Dredged material volume stated below is approximate and shall not be used for measurement and/or payment.

Permittee _____ Disposal Area _____
Permit/Contract No. _____ Date _____
Project _____ Towboat _____
Dredging Contractor _____ Owner _____

Trip No.	Scow No.	Started From Place	Time	Disposal Time	Returned To Place	Time	Round Trip Time	Dist.	Lat/Long Coordinates* Specified	Actual	Dist./Dir. From Buoy

Trip No.	No. of Pockets Loaded	Dumped	Reason Pocket Not Dumped	Disposal Depth	Speed	Weather	Sea Conditions/ Visibility	Approx. Volume (cy)	Scow Draft

Comments:

*Check the datum used ___NAD27 ___NAD83. Also note any factors that may affect reliability of navigation instrument and readouts.

Time On	Time Off	Hours On Duty
Total Hours On Duty		

Reviewed By: Permittee's Representative or, for Corps Projects, Corps' Resident Engineer or Field Inspector

To the District Engineer, U.S. Army Engineer District, New England, Concord, Massachusetts:

I certify that I informed the tug captain of the conditions of the U.S. Army Corps of Engineers permit or contract regarding the distance from the buoy and the speed of the scow during the release of the dredged material. I also informed the captain that failure to comply with these conditions would constitute a violation of the permit and would be reported to the USACE. I certify that this report is correct and that I am not an employee of the dredging or towing firm, or the permittee, nor have I been employed by any of them at any time during the past six months. The approximate volume of dredged material stated on this report is only an estimate. It was made either by me, the dredging or towing contractor, or the Corps of Engineers Resident Engineer of Field Inspector. I do not certify that it correctly states the volume of material dredged.

Signature of Disposal Inspector (Certification No.)

Print Name Here

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