U.S. Army Corps of Engineers
New York District

Dredged Material Management Plan for the Port of New York and New Jersey

DRAFT

Implementation Report

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ABBREVIATIONS AND COMMONLY USED TERMS

AK – Arthur Kill
AKA – Also Known As
CAD – Contained Aquatic Disposal (Subaqueous Pit)
CARP – Contaminant Assessment and Reduction Program
CCMP – Comprehensive Conservation Management Plan
Cd – Cadmium
CDF – Confined Disposal Facility
CY – Cubic Yard
DDT – Dichlor diphenyl trichloroethane
DMMIWG – Dredged Material Management Integration Work Group
DMMP – Dredged Material Management Plan for the Port of New York and New Jersey
DEIS – Draft Environmental Impact Statement
EC – Engineering Circular
EDC – New York City Economic Development Corporation
e.g. – *Exempli Gratia* – For Example
EIS – Environmental Impact Statement
ESDC – Empire State Development Corporation
Harbor – New York and New Jersey Harbor
HARS – Historic Area Remediation Site
HEP – Harbor Estuary Program
Hg – Mercury
HMDC – Hackensack Meadowlands Development Commission
i.e. – *Id Est* – That Is
IGT – Institute of Gas Technology
KVK – Kill Van Kull
MA – Massachusetts
MCY – Million Cubic Yards
MPRSA – Marine Protection, Research and Sanctuaries Act
N/A – Not Applicable or Available
NBCDF – Newark Bay Confined Disposal Facility
NEPA – National Environmental Policy Act
NJ – New Jersey
NJDIG – Conceptual Contractual Mechanism Developed by the New Jersey Dredging Inter-Agency Group
NJMR – Office of New Jersey Maritime Resources
NJPDES – New Jersey Pollutant Discharge Elimination System
NY – New York
NYCEDC – New York City Economic Development Corporation
NYD – New York District Corps of Engineers
NYSDEC – New York State Department of Environmental Conservation
PA – Pennsylvania
PAH – Polyaromatic hydrocarbons
PANY/NJ – Port Authority of New York and New Jersey

ABBREVIATIONS AND COMMONLY USED TERMS (CONT.)

PCB – Polychlorinated biphenyl
PEIS – Programmatic Environmental Impact Statement
Port – Port of New York and New Jersey
RCRA – Resource Conservation and Recovery Act
SERG – Senior Executive Review Group
S/S – Solidification/Stabilization
TBD – To Be Determined
TEU – Twenty-foot Equivalent Unit
USACE – U.S. Army Corps of Engineers
USEPA – U.S. Environmental Protection Agency
WRDA – Water Resources Development Act
YR – Year

1 INTRODUCTION

1.1 WHAT IS A DREDGED MATERIAL MANAGEMENT PLAN?

U. S. Army Corps of Engineers (USACE) policy (EC -1165-2-200) requires each of its Districts to prepare a Dredged Material Management Plan (DMMP) for maintaining Federal navigation channels for at least 20 years. A DMMP must identify how much material has to be dredged to maintain the Federal channel(s) and how that dredged material will be managed in an economically sound and environmentally acceptable manner. The plan is intended to ensure that Federal navigation projects can be maintained in an environmentally acceptable, cost-effective manner, thereby justifying continued investment of Federal funds. The DMMP for the Port of New York/New Jersey (the Port) goes beyond this basic goal of maintaining Federal navigation channels. The DMMP for the Port includes private and local/state dredging needs as well, as recommended in the "Port Dredging Plan" prepared by the Port Authority of New York and New Jersey (PANY/NJ, 1996). In this manner, this DMMP strives to develop a regionally supported, comprehensive plan to meet all the dredged material management needs for the Port.

The Port does not exist on its own, but within the confines of the estuary. The estuary with its diverse natural resources is invaluable to the region. To maintain or enhance one without the other is unacceptable. Just as the economic goal is to maximize and expand the use of the Port, the environmental goal is to maintain and enhance the estuary in which the Port is located (see Figure 1 – 1). This gives this DMMP a dual goal that profoundly affects the evaluation and selection of dredged material management options for the Recommended Plan that is presented in this report.

Figure 1 - 1: Port of New York & New Jersey

1.2 WHY IS DREDGING NECESSARY?

The NY/NJ Harbor is a vital economic and environmental resource both regionally and nationally. According to a PANY/NJ report (PANY/NJ, 1995) updated to reflect 1997 statistics, the Port provides a total of 166,600 direct and indirect jobs (80,550 to NJ residents and 86,050 to NY residents). The Port serves the largest regional market in the country, and exports to more than 150 countries worldwide, handling over 1.7 million loaded containers annually (in addition to bulk cargo, automobiles and petroleum). If the Port is able to maintain and improve its system of channels to meet current and anticipated shipping needs, that volume of containers could increase to 4 million containers by 2010, and double that again by 2040, providing an additional 74,400 direct and indirect jobs.

The NY/NJ Harbor (the Harbor) is naturally shallow (approximately 19 feet). Periodic dredging to maintain or increase channel depth is essential to maintain safe navigation channels in the Port for oil tankers, bulk vessels, and container ships, many of which require depths exceeding 45 feet. An economic analysis of the benefits of maintaining navigation in each of the Federal channels in the Port was performed by the New York District of the Corps (NYD). The analysis compares the total benefits derived from container, tanker, and barge transportation to the historical total quantity of dredged material expected for each channel. The results of this analysis are described in more detail in Section A of the DMMP Technical Appendix. The average annual benefit to the nation (on a per cubic yard basis) of maintaining the various Federal channels in the Port varies considerably from $3/CY to well over $100/CY. This economic benefit clearly demonstrates the need for continued maintenance dredging in most of the Port's waterways.

Though the economic benefits justify dredging most waterways even with substantial increases in the cost of managing dredged material, they do not tell the full story. There are other less tangible, but still meaningful benefits to be derived from maintaining the Port that are not included in calculating the economic benefits. A reduction in overall regional truck mileage, reduced air pollution, and less wear and tear on the infrastructure are some of the more direct benefits of a strong Port. Other environmental benefits can be gained by removing surface layers of contaminated sediments and preventing their uptake by aquatic organisms. In addition, increased use of dredged material to remediate or restore degraded upland and aquatic areas promises substantial additional environmental benefits.

1.3 WHAT IS DREDGED MATERIAL?

Dredged material is naturally accumulated sediment (or existing rock) that is excavated from the bottom of channels, berthing areas and other navigation facilities to create or maintain sufficient depth for safe and efficient vessel operation. The dredged material considered under the DMMP is not sewage sludge, nor has it been historically characterized as hazardous (including toxic) or radioactive waste under the Federal Resource Conservation and Recovery Act (RCRA) standards. In fact, any dredged material characterized as hazardous would not be managed under

the DMMP, but regulated by the appropriate responsible agencies and disposed of at a properly permitted hazardous waste facility.

However, much of the dredged material addressed in this plan does contain some contaminants at varying concentrations, as does much of the sediment throughout the Harbor. These contaminants enter the waterways of the Harbor from a number of different sources, many of which originate outside the Harbor (including many upland sources). While the concentrations of contaminants in much of the dredged material are low or non-detectable, a large portion of the material does not pass current criteria for unrestricted ocean placement. This indicates that some contaminants may be present at concentrations that result in an unacceptable risk of toxicity in test aquatic organisms or have the potential to accumulate to unacceptable concentrations within the tissues of these organisms (bioaccumulation). These materials have been excluded from unrestricted ocean placement in the past, and are excluded from current ocean placement at the Historic Area Remediation Site (HARS).

Effects-based biological testing is used to determine if material from a planned dredging project poses such a risk. These tests were the basis for determining what dredged material was suitable for ocean disposal at the ocean disposal site (Mud Dump) prior to its closure in October 1997. This testing has since become the basis for determining if material can be used to remediate the Historic Area Remediation Site (HARS), an area in the New York Bight Apex designated by the U.S. Environmental Protection Agency (USEPA) for the purpose of remediating adverse impacts from past ocean disposal practices. In the event that dredged material is tested and found unsuitable for placement at the HARS, it would then likely require different tests to determine its suitability for placing it at other options. It is important to note that not all dredged material must be tested under ocean disposal protocols. Material intended to be managed elsewhere would be tested and compared to criteria specifically designed for the other management option chosen.

Dredged material is thus determined to be HARS suitable or HARS unsuitable; and these categories are used to distinguish between the two main types of dredged material that are included in the DMMP. Early estimates (based on initial test results under the 1992 guidelines) suggested that up to three-quarters of the Federal maintenance material in the Port might be unsuitable for the HARS. More current estimates place the figure at around two-thirds of the maintenance volumes, as shown on Table 1 – 1 (this assumes no contaminant reduction). Thus there is a strong need to develop and include suitable alternative management options to the use and remediation of the HARS in the DMMP.

1.4 HOW MUCH DREDGED MATERIAL DOES THE PLAN NEED TO MANAGE?

Besides differentiating dredged material based on its suitability for use with different management options, the DMMP must estimate the amount of dredged material from maintenance dredging, both Federal and non-Federal, as well as material that may be generated from deepening projects.

Federal and non-Federal maintenance volumes used in the DMMP are based on past dredging activities and a survey of needs and plans of past and current users. This needs survey is considered a fairly reliable estimate of annual maintenance volumes through 2005. Beyond that, projections become less reliable, and maintenance needs are based on an annual average, adjusted to include increased maintenance needs for deeper channels. The annual average volume projection used in the DMMP for Federal and non-Federal maintenance dredging needs includes the predicted increased sedimentation rates for the deepened channels currently authorized or likely to be proposed for improvements in the New York and New Jersey Harbor Navigation Study (under development). Thus, this overall average annual maintenance volume, calculated from 2000 through 2040, is currently estimated at 2.3 million cubic yards (MCY) of HARS unsuitable material and 1.4 MCY of HARS suitable material. (Note though that the long-term average annual maintenance volume projection for HARS unsuitable material is somewhat higher (2.7 MCY) due to increased sedimentation in deepened channels.)

To accommodate larger and deeper draft vessels, construction is underway to deepen the Kill Van Kull (KVK) and Newark Bay Federal channels to 45 feet, with similar study recommendations being reevaluated for Arthur Kill (AK) and Port Jersey. The NYD is also conducting a study of future deepening needs to meet anticipated shipping requirements. The New York/New Jersey Harbor Comprehensive Port Study is evaluating the potential deepening of several channels in the Port to depths of 50 ft or more.

The 10 year DMMP (through 2010) is intended to manage all planned maintenance material plus the dredged material generated from deepening the Federal channel in Kill Van Kull/Newark Bay to 45 feet (begun this year), as well as the deepening of Arthur Kill and Port Jersey to 45 feet. It also includes material from additional deepening of select channels being studied in the Comprehensive Port study. This 2010 plan would thus have to manage for about 27.3 MCY of HARS unsuitable material, 54.1 MCY of HARS suitable material, and 9.6 MCY of rock. This large percentage of rock and HARS suitable material is the direct result of the deepening projects, which generally remove deeper sediments that have not been exposed to contaminants.

The long-term 40-year DMMP (through 2040) would have to plan predominately for maintenance of the deeper channels, as well as the current channels and berths that are still in use. An additional 80.5 MCY of HARS unsuitable material and 45.7 MCY of HARS suitable material would have to be dredged just to maintain these existing and improved channel depths. This larger percentage of HARS unsuitable material is the result of a proportionately larger volume of maintenance dredging (most of the new work deepening projects are scheduled to be completed by 2010). As channel deepening tends to remove deeper sediments not exposed to contaminants, maintenance dredging tends to remove more recently deposited material where elevated concentrations of contaminants may be found.

Table 1 – 1 presents the total (new work and maintenance) HARS suitable and unsuitable material by year. In all, the maintenance and the planned and potential deepening of the Port could produce an estimated 107.8 MCY of HARS unsuitable material, 99.8 MCY of HARS suitable material and 9.6 MCY of rock through the 40 year life of the DMMP (2040). This estimate is based on the assumption that contaminant levels in the sediments remain constant.

Table 1 - 1: Dredged Material Management Plan Volume Projections

However, current data suggest a decline in these levels, which could be accelerated by ongoing contaminant reduction efforts of both states. If successful, a contaminant reduction program will likely reduce the future volumes of HARS unsuitable material, allowing less costly beneficial use options to be utilized for management of this material in the future. This program, and its consequences for managing dredged material, is discussed in more detail in Section 2.1 of this report.

1.5 HOW WILL DREDGED MATERIAL BE MANAGED?

The dual goals of dredging the naturally shallow Port while restoring and preserving the estuary were identified in an Interim Report (NYD, 1996). The management options identified in that Interim Report represent alternatives to the historical practice of disposing most dredged material in the ocean. This movement away from the ocean for disposal of dredged material (as opposed to remediating the ocean site with suitable material) is consistent with the Marine Protection, Research and Sanctuaries Act (MPRSA). MPRSA permits the use of a designated ocean disposal site only if there is a demonstrated need to dredge and no practicable alternative exists (40 CFR; part 227). The examination and inclusion of non-ocean options (including other aquatic options) that stress beneficial use and environmental protection/restoration is also consistent with the Comprehensive Conservation and Management Plan (CCMP) of the New York/New Jersey Harbor Estuary Program (HEP).

In identifying options to include in the DMMP, those that best manage dredged material as a resource would take preference as follows:

1) Reduce the level of contaminants and the volume of material dredged in the future (contaminant and sediment reduction),
2) Reduce the level or bioavailability of contaminants in dredged material (decontamination and hot spot dredging and remediation),
3) Use dredged material in a beneficial manner (environmental restoration/remediation and construction/transportation projects), and
4) Dispose only material that cannot feasibly be used beneficially.

Many factors are considered in evaluating how the management options meet the priorities that are laid out above. Factors include economic benefits & costs, availability, capacity, environmental impacts (positive & negative), and support by the non-Federal sponsors/partners. Several technical reports detail investigations of various options and provide data on many of these factors. Results are summarized and referenced in the Technical Appendix to this plan (attached). A draft Programmatic Environmental Impact Statement (PEIS), which evaluates environmental concerns and benefits of each of the potential options that are or have been under consideration, has also been prepared and is bound within this document. In accordance with the National Environmental Policy Act (NEPA), the draft PEIS accompanies this plan as a means of providing widespread public review of the potential impacts of the recommended and alternate plans. Chapter 2 of this report summarizes the management options under consideration in the draft PEIS, and highlights their current status as potential components of the comprehensive DMMP for the Port.

Several management options to handle HARS unsuitable material are presently in use as part of state or local ventures, private initiatives, or as public-private partnerships. Many of these options are in accordance with the PANY/NJ plan (PANY/NJ, 1996) and the *Joint Dredging Plan for the Port of New York & New Jersey* (NY/NJ, 1996) developed under the auspices of the two governors. These options provide sufficient capacity for HARS unsuitable material to meet most maintenance needs through 2000 and beyond. Additional efforts are underway to increase placement capacity by some 25 MCY over the next five years, with more to follow. Together, these existing and future sites, described in Chapter 2 of this report, would, when implemented, provide sufficient capacity to meet dredging needs through the 2010 timeframe, at a placement cost that ranges from $23 - $29/CY. Variations of those options that prove most successful will be pursued in accordance with a long-term strategy outlined in Chapter 3 to manage dredged material from the Port through 2040.

1.6 HOW WAS THE DMMP DEVELOPED?

A DMMP Progress Report (NYD, 1997) narrowed down options and sites under consideration, and summarized the status of each option still under investigation. This included several private and/or state supported options from "The Joint Dredging Plan for the Port of New York & New Jersey," prepared and signed by both states (NJ/NY, 1996). Also included were comments and additional feedback from the two states and PANY/NJ, the Dredged Material Management Integration Work Group (DMMIWG) of the Harbor Estuary Program (HEP), and eight public meetings held in the area.

This DMMP Implementation Report is the culmination of that iterative process. It has gone through several working drafts since June 1998, being reviewed by the many stakeholders through the DMMIWG process and a Senior Executive Review Group (SERG). The SERG is made up of the upper-level management from the Corps (North Atlantic Division), USEPA, U.S. Coast Guard, the State of New York, the State of New Jersey and the PANY/NJ. A working draft of the PEIS has also been reviewed by those agencies that agreed to serve as cooperative agencies under NEPA.

The SERG directed the formation of a work team, comprised of staff from each of its member agencies, to work with the NYD to evaluate the remaining options and come to consensus on those that should be part of the plan. This was accomplished by assigning a preference to each option based on its potential to beneficially use dredged material (especially for environmental restoration/remediation), or safely contain it. The following rankings were used to indicate the preference of each option:

1. Preferred option: Options that beneficially use dredged material, often with a positive impact on the estuary.
2. Fall-back option: Options that can safely manage HARS unsuitable material and not pose an unacceptable risk to the estuary when properly sited and utilized.

3. Uncertain option: Options that require more analysis regarding technical or economic feasibility but warrant continued consideration because of their potential to beneficially use dredged material.
4. Least preferred option: Options that have either a low potential for beneficial use and/or a potential for unacceptable risk to the estuary.
5. Non-preferred option: Options that have potentially unacceptable impacts or are technically/economically infeasible.

A "status" ranking was also developed that describes an option's current availability for use with respect to permits, overall sponsor approval, engineering and design development, funding, and technical/environmental evaluation. The status is an indication of the readiness of an option to be implemented, as opposed to its preference for use. It is a measure of the reliability of an option to meet a specific dredging need. The status rankings are:

1. Fully permitted: Option is ready for implementation, as all necessary permits have been issued following review of technical design and environmental assessment.
2. Permit application pending: Option design and environmental assessment currently under (regulatory) review. Implementation dependent upon permit approvals.
3. Evaluation and design completed: Option design and environmental assessment have been completed but not yet submitted for (regulatory) review. Implementation dependent upon permit approvals.
4. Pending evaluation and design: Completion of option design and environmental assessment pending availability of additional technical/environmental information. Implementation dependent upon permit approvals.
5. No longer under consideration: Option design and environmental assessment not under development.

The actual selection and formulation of options into a Recommended Plan is described in Chapter 3. The goal of the selection process is to identify more preference 1 options/sites than are necessary to meet the minimum requirements to manage all dredged material through 2010. This allows for some options to be deferred and still provide a comprehensive plan to meet all the Port's dredging needs in a beneficial manner. It also provides for competition among beneficial use options that will help keep their overall costs down. The preference 2 options provide the back-up to meet specific needs for HARS unsuitable material in a given year if the more preferable beneficial use options are not available in a timely fashion or are not economically sustainable. As such, they serve as fallback options intended to keep the Port operating through all contingencies.

Preference 3 options are not included in assembling the recommended Implementation Plan, but might be added in the future, as more information is developed to confirm their beneficial use potential, environmental impact, and/or economic viability. Such options would have to undergo the same public review and permitting process that preference 1 and 2 options must complete, and would be added to the recommended Implementation Plan for the DMMP through periodic updates of the DMMP (as described later in this section).

Cost is also a factor in this selection process. Over the past few years the cost per cubic yard to manage dredged material has gone up substantially. This is directly tied to costs associated with managing the higher volume of HARS unsuitable material that resulted from implementing the new more comprehensive and environmentally protective ocean disposal test protocols (more sensitive test organisms, and lower threshold values for bioaccumulation on an expanded list of contaminants). Whereas the vast majority of material (over 90%) had been disposed at the old Mud Dump prior to 1992, as much as three-quarters of the dredged material initially tested under the more comprehensive 1992 protocols were deemed unsuitable for unrestricted ocean placement. Estimates of dredging needs over the next 40 years (section 1.3) predict that two-thirds of the maintenance material that would have to be dredged over that timeframe (a total of 107.8 MCY) could also be unsuitable for placement at the HARS (section 1.3), under the same testing criteria.

The large volume of HARS unsuitable material has raised the cost of maintaining or deepening the Port's channels. An increased level of funding would appear to be necessary to maintain the Port's navigation channels. What level of increased cost is justified or sustainable is difficult to project. This is due, in part, to the incalculable value of the environmental benefits provided by those options that treat and use dredged material to remediate or restore upland and aquatic habitats. Multiple options and sites continue to be assessed and/or included in the DMMP to provide competition to keep costs down and to provide enough choices to ensure the Port's viability even if some recommended options are not implemented. There exists a genuine commitment in the region to support and fund efforts to reduce contaminant inputs into the Harbor and to treat what is already contaminated. This is fully consistent with the recommendations of the CCMP of the NY/NJ HEP, signed by both states and the agency stakeholders, including the Corps. It is this local commitment to pursue promising options and bring them on-line at affordable costs that will ultimately keep the Port viable.

This Implementation Report for the DMMP also lays out a strategy for providing for the longer-term needs of the Port through 2040. The longer-term strategy will build on the 2010 plan while providing the flexibility essential to allow the region to take advantage of newer or more promising options, as they become available. This approach provides for opportunities to update and modify the long-term plan, as the needs of the region (both environmentally and economically) and the feasibility of the options are better defined.

Implementation of the DMMP thus focuses attention on new or innovative techniques, partnerships, or policies to meet the ambitious goals of increased beneficial use of dredged material, while also assuring needed placement capacity is available through 2010 and beyond. A full menu of viable options is an integral part of the plan, and provides the certainty needed to maintain confidence in the Port and its future. A flexible plan encourages and gives priority to innovative, non-traditional options that maximize the beneficial use of dredged sediments. Other, more traditional options continue to be developed as a contingency to ensure that the Port always remains viable and able to grow to meet shipping needs, without risk of long-term adverse impact to the estuary.

To fully evaluate some of the new options and to fully define long-term dredging needs will take time. As the 2010 plan has the ability to meet foreseeable dredged material management needs in the immediate future, prudence dictates that further decisions on implementation of the longer-term 2040 options be postponed until it is closer to the time they will actually be needed. As new options prove successful (*e.g.*, become more cost effective or environmentally acceptable), they can be incorporated into the outyears of the plan. A process to periodically evaluate and report on progress in implementing the DMMP provides a structured vehicle for assessing these emerging options and reassigning priorities and funding based on actual need and field results. This would also serve to keep the public informed of proposed changes to the Recommended Plan and options under new or renewed consideration.

As with its development, the implementation of the recommended options in this report will be through a combination of Federal, state, local and private interests. Ultimately though, the responsibility of maintaining the channels and the Port rests with the NYD along with the States of New York and New Jersey. They will make the final decisions as to which options are included. However, these decisions will not be made in a vacuum. To be successful, the plan must have regional support from all the stakeholders and incorporate the findings of various other Port planning studies that may affect the volumes and time frames for implementing selected options.

These studies include the PANY/NJ Port Investment Study, the NYC Economic Development Corporation (NYCEDC) Cross-Harbor Transport Study, the NYD's NY/NJ Harbor Navigation study, the Port Dredging Plan of the PANY/NJ and the Joint Dredging Plan for the Port of NY/NJ. In addition, the HEP, with its existing framework of interested parties and regional commitments, plays an important role in providing a forum in which the many parties can discuss how the DMMP can meet its dual goals for the Port and estuary in a manner consistent with HEP's Comprehensive Conservation and Management Plan (CCMP). In this manner the HEP can serve as a vehicle for regional support of the DMMP. Close coordination will be the key to ensure that all pieces fit together into a unified, comprehensive plan for a thriving Port and a healthy estuary.

This DMMP Implementation Report is not the end of the process. Periodic updates, detailed plans and designs, engineering studies, permit reviews and more site-specific environmental data and NEPA documentation will be required to implement any of the beneficial use or containment options recommended in the plan. In addition, the private sector and the states continue to develop initiatives for other alternatives for consideration as possible additions to the plan. Dredging requirements are laid out so that decision-makers can implement and fund the plan's management options within the appropriate time frames. Obviously, continued close coordination among all the stakeholders will be necessary to see that this flexible plan continues to be molded to meet the needs of the region in an environmentally acceptable and economically affordable manner.

2 MANAGEMENT OPTIONS

Dredged material from NY/NJ Harbor offers formidable challenges due to intractable physical properties (high proportion of fine-grained particles, high water content, and estuarine salinity), and/or a wide range of organic & inorganic contaminants (albeit mostly at low concentrations). Much of the following discussion focuses on material unsuitable for HARS use as it poses issues of increased concern and usually requires more expensive management. While this material may be unsuitable for HARS use, it can be used beneficially in many other options, especially if treated to stabilize or otherwise render the contaminants unavailable to humans or the natural biota. Considerable quantities of such material are already beneficially used in a variety of applications in and around the Harbor region. The intent of the DMMP is whenever feasible to maximize the use of all dredged material as an important resource.

A number of options for managing dredged material unsuitable for HARS placement have been investigated by the Corps and other government and private entities. These options are briefly summarized in this chapter as a means of comparing different methodologies with respect to capacity, cost, reliability, availability and potential impacts and benefits to the estuary. For a more detailed description of these options, the reader is referred to Section B of the DMMP Technical Appendix, which includes a current status regarding ongoing investigations, operational techniques, impacts, and what is required for implementation.

2.1 CONTAMINANT REDUCTION

Contaminant reduction is a regionally-based initiative focused on lowering contaminant levels in the sediments and biota of NY/NJ Harbor. This simply stated goal involves complex scientific, management and political issues. Dredged material with contaminant concentrations that cause it to be unsuitable for HARS remediation can be troublesome and costly to manage. The NYD estimates that approximately two-thirds of the dredged material from maintenance projects may not be suitable for remediation at the HARS. Recent annual dredging budgets have confirmed this, averaging four to five times historical dredging budgets. These sediments are contaminated as a result of a complex history of pollution events that have occurred over decades. The long-term average volume of Federal and non-Federal maintenance material that is unsuitable for HARS use is estimated at approximately 2.7 MCY per year.

Dramatic decreases in sediment contamination from 1960s levels have been documented in certain areas of the Harbor, while studies conducted in other areas have proved inconclusive. If trends toward cleaner sediments were to continue throughout the Harbor, significant reductions in the volume of contaminated dredged material would be realized. This in turn would have profound effects on long-term dredging budgets, Port planning decisions, selection of management options and overall restoration efforts in the estuary. Currently, there is insufficient data to accurately quantify contamination trends in the sediments for the entire Harbor area. This inability to accurately predict future contaminant levels constrains the region's ability to plan and budget for future needs.

The NYD developed two methods to generate estimates of the quality of dredged material beyond 2005. In making predictions, emphasis was placed on toxicity and the bioaccumulating contaminants that impede HARS use of NY/NJ Harbor dredged material (*e.g.*, DDT, PCBs, dioxin and furans). The analyses provided two conclusions. There is a continuing, long-term contaminated dredged material problem in NY/NJ Harbor and there are large uncertainties surrounding the reduction of future contaminant concentrations in dredged materials.

Given the uncertainties associated with these predictions, the DMMP does not attempt to predict the amount of contaminant reduction expected over the next 40 years but rather sets a goal for the regionally-based contaminant reduction program. The target is to reduce the annual amount of dredged material unsuitable for HARS placement to 0.5 MCY by the year 2040. Attaining this goal would require a total volume reduction of HARS unsuitable material of approximately 34 MCY. At a typical placement cost for HARS unsuitable material of $29/CY, the cumulative potential cost savings is almost 1 billion dollars over the next 40 years. If starting in 2015, the following reductions in contaminated material were realized, the goal could be attained: a logarithmic 3% decline in volume from Newark Bay and the Kills, a 5% decline in the Upper Bay, Hudson & East Rivers and a 10% decline from the Lower Bay and Jamaica Bay.

These goals may be within the reach of a cooperative and aggressive contaminant reduction program. The Harbor Estuary Program (HEP) is coordinating an approximately 25 million-dollar regional Contaminant Assessment and Reduction Program (CARP) principally funded by the States of New York and New Jersey. The primary objective of the CARP is to assist dredged material managers by:

(1) identifying and evaluating sources of contaminants that need to be reduced or eliminated to ensure that in the future, newly deposited sediments in navigational waterways will be clean enough for ocean remediation activities;
(2) defining what actions will be the most effective in abating the sources; and
(3) determining how long it will take for sediments to achieve "cleanliness".

The NYSDEC work-plan "Sources and Loading of Toxic Substances to New York Harbor" and NJDEP's "NJ Toxics Reduction Workplan" describe the majority of the monitoring and contaminant track-down activities associated with the program. In addition, the State of NJ and the PANY/NJ have appropriated $2.9 million for the development of a Harbor-wide contaminant fate and transport model. The model will be calibrated using data collected by the two states as part of the CARP initiative. The NYD is providing data management for the program and both states are funding a quality assurance and quality control program. Data, interpretation and modeling results produced by CARP are expected to be used to track down, reduce and prevent contamination. These coordinated efforts are excellent steps toward the reduction target outlined above. As a result, these targeted reductions will be used in the formulation processes that analyze the contaminant reduction management option.

A reliable assessment of the proportion of dredged material that is contaminated is an essential element of a successful dredged material management and planning program. The collection and analysis of additional data on contaminant levels and sources is ongoing and will provide the basis for generation of more reliable estimates. These projections would in turn facilitate the

evaluation and possible implementation of shorter term and lower capital cost dredged material management scenarios. The DMMP is designed with considerable flexibility to accommodate and react to increasingly reliable estimates of future dredging volumes and material types.

The NYD, the states, the Port business community and, ultimately, the public are beneficiaries of the lower costs of managing dredged material, and the reduction of environmental exposure to contaminants, associated with a successful contaminant reduction program. Other programs, such as habitat restoration, will provide the additional benefit of reducing the overall exposure of contaminated sediments to benthic organisms through containment and capping. The NYD will continue to participate in partnerships designed to reduce both the volume of contaminated dredged material and the uncertainty associated with dredged material management.

2.2 SEDIMENT REDUCTION

High sedimentation rates within some of the channel areas of NY/NJ Harbor necessitate frequent dredging to keep the channels open for safe and efficient navigation. Sediment reduction focuses on reducing the amount of sediment settling within the navigation channels. The sediment reduction strategies can be classified into four main types: Watershed Sediment Reduction Controls, Channel Design Optimization, Advanced Maintenance Dredging and Structural Modification.

Watershed Sediment Reduction Controls are specific strategies to reduce the amount of sediment reaching a waterbody. Techniques include the implementation of Best Management Practices and Total Maximum Daily Loads. These techniques are designed to the reduce the volume of sediment laden runoff from agricultural lands, redirecting runoff to collection basins or other pervious surfaces where infiltration to the ground water can occur and protecting and reinforcing steep slopes and stream banks.

Channel Design Optimization involves decreasing the sedimentation rate within the channel by re-engineering the channel. Straightening channels, called channel realignment, tends to increase the water velocity within the channel. The higher water velocity entrains a larger percent of material suspended in the water column and decreases the amount of material settling out and accumulating in the channel. Channel design optimization strategies are examined during initial project design and as part of the routine maintenance procedures. Many of the Channel Design Optimization strategies have already been incorporated into the existing channel designs. Consequently, little additional benefit might be gained from further analyses at this time.

Advanced Maintenance Dredging has been used as a short-term means of reducing dredging cost and frequency by dredging below the desired channel depth. Sediment settling in the channel will eventually fill the channel to the authorized depth, and the time between maintenance dredging operations will increase. This lowers cost by avoiding several expensive mobilization and demobilization cycles of dredging equipment and reduces the frequency of dredging, which may reduce any short term, localized environmental impacts associated with more frequent dredging.

Structural Modifications are physical constructs designed to keep sediment moving through (instead of settling in) a channel or berth area or to prevent sediment from entering the channel or berth area. Typical structures include flow training dikes and sills, scour jets, gates and curtains, pneumatic barriers, and sedimentation basins. Several technologies have been proposed for reduction of sedimentation in berthing areas. While some of these systems have been used elsewhere in the country with some success, there is no data on their efficacy in the NY/NJ Harbor.

Before recommending or permitting the widespread use of these technologies, the NJDEP has requested that demonstration projects be conducted with concurrent modeling of sediment loading and ecological effects. NJMR has contracted Air Guard, Inc. of Trumbull, CT to design, install and monitor the efficacy of a pneumatic sediment suspension system at two locations in New Jersey. In addition, CITGO Petroleum of Pennsauken, NJ has begun discussions with NJMR and NJDEP on the demonstration of a turbo scour system at its facility on the Arthur Kill. Neither of these systems is designed to resuspend already deposited sediment but rather prevent settling.

The New York and New Jersey Harbor Navigation Study will further evaluate the feasibility of the Sediment Reduction options as well as the potential for further cost reductions from channel alignments, during its study of navigation improvements for the Harbor.

2.3 BENEFICIAL USES

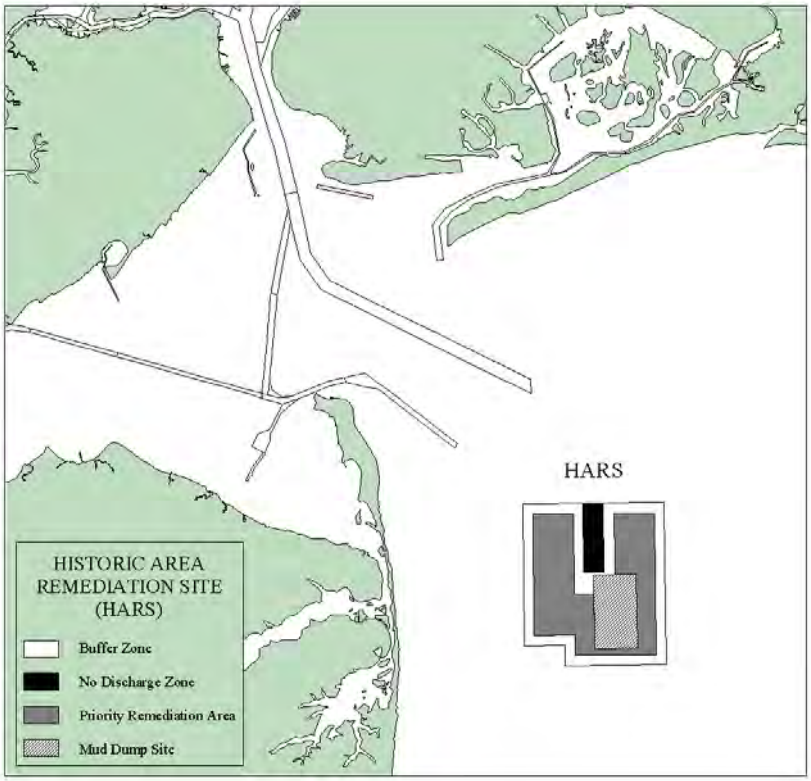
2.3.1 HISTORIC AREA REMEDIATION SITE

On August 28, 1997, the USEPA promulgated a final rule that de-designated and terminated the use of the New York Bight-Dredged Material Disposal Site (also known as the Mud Dump Site) and simultaneously designated it as the Historic Area Remediation Site (HARS) (Figure 2 – 1).

The HARS is being remediated with suitable dredged material that meets current Category I standards and will not cause significant undesirable effects including through bioaccumulation. According to EPA Region 2, this is the first time in U.S. history that dredged material is being used to remediate contaminated areas of the ocean floor. Based on current projections, remediation of the HARS is expected to require at least 40 MCY (based upon a one-meter cap) and will utilize HARS suitable dredged material for at least the next decade or more.

The USEPA is now performing a public and scientific peer review process of the HARS dredged material testing evaluation framework. This may result in a change of standards for determining if dredged material is suitable for placement in the HARS. For the purposes of the DMMP planning efforts, the current standards for remediating the HARS are assumed not to change.

Figure 2-1: Historic Area Remediation Site Map



2.3.2 HABITAT CREATION, ENHANCEMENT, AND RESTORATION

Much of the dredged material from the Port (*i.e.*, HARS suitable material, rock material, HARS unsuitable material or treated dredged material) can be used for a variety of habitat applications. The specific method to accommodate dredged material varies with the particular application and location. Although these beneficial uses may not be capable of handling all of the dredged material derived from the Harbor, the volume used (if all feasible applications are fully utilized) is potentially significant. More than 100 MCY of HARS suitable and HARS unsuitable material could be used for habitat improvement in the Harbor, depending on detailed site specific environmental reviews of impacts and benefits as well as the constraints imposed by permit requirements, agency responsibilities and NY/NJ state policies.

Based on a preliminary assessment of potential habitat uses for dredged material (see Section B of the DMMP Technical Appendix), a number of feasible applications to create, enhance, and/or restore habitats with dredged material were evaluated for use in the estuary. Applications for the beneficial use of dredged material for habitat creation, enhancement and restoration in the Harbor fall into two categories: proven and potential. Proven applications are wetland creation/enhancement, creating reefs with dredged rock, establishing oyster beds and, in some cases, creating bird habitat. All of these are possibly feasible in the Harbor and are included in the DMMP. The other applications require varying levels of planning and data collection and

demonstration before implementation. Of these application, those that have support or interest by individual sponsors (*e.g.*, filling degraded pits) are included for consideration in the DMMP.

These include the following:

1. Uplands (particularly landfills)
2. Degraded borrow pits
3. Treatment wetlands
4. Habitat wetlands
5. Re-contouring in shallow water
6. Filling dead-end basins
7. Artificial reefs
8. Bird habitat
9. Shellfish habitat
10. Mud flats habitat
11. Oyster reefs
12. Submerged aquatic vegetation (SAV) habitat

The volume of dredged material capable of being accommodated by any single application varies from a few hundred thousand cubic yards (*e.g.*, oyster beds) to roughly 85 MCY (borrow pits), and the placement costs range from $0 - $35/CY (Table 2 – 1). However, these costs do not account for the tangible environmental benefits of removing contaminated sediment from the estuary and/or the isolation of surficial contaminants in areas such as the bottom of degraded borrow pits and dead-end channels.

Several potential sites have been identified for some of these applications. Habitat restoration at degraded borrow pits and other recontouring appears potentially beneficial at select pit locations in Jamaica Bay and Lower Bay. Use of dredged rock for designated artificial reef sites in the New York Bight Apex is also viable. Potential sites for upland or shore bird habitat creation have been identified at Floyd Bennett Field, Hoffman-Swinburne Islands and Prall's Island. Potential sites for inter-tidal/sub-tidal bird feeding habitat have been identified at Shooter's and South Brother Islands. Areas that could potentially benefit from filling highly degraded dead-end basins have been located in Newtown Creek, Gowanus Canal and Bowery Bay. Feasible areas for wetland and mudflat habitat creation using dredged material appear to exist in Arthur Kill, Jamaica Bay, Newark Bay and the Raritan River. These are areas of degradation and habitat losses due to filling/erosion, where it is possible that the conversion of existing degraded habitat can provide habitat of greater value or need. Oyster and clam habitat restoration is most feasible in the Lower Bay, although also possible in other areas. Potential sites for treatment wetlands are in the Brooklyn inter-pier areas and certain dead-end canals in Jamaica Bay (Thurston and Bergen Basins, and possibly others). Many landfills in the NY metropolitan area are located on or near tidal waters and could be candidates for creation of upland habitat with dredged material cover, while some may also warrant consideration for creating wetlands for leachate filtration.

Other applications may exist, but require further screening to locate potentially feasible sites. Several policy and technical issues need to be resolved before some of the more innovative applications can be implemented, probably necessitating field data collection and experimentation, but many of these applications could be available by the year 2001. Some applications have a long life span because there is not just one "project" for each application, but potentially many, depending on location, cost and other factors (*e.g.*, landfill cover). Many of the applications have been undertaken at limited locations, either locally or elsewhere, but may need their applicability demonstrated in this region (*e.g.*, borrow pits). Still other applications, including building tidal treatment wetlands might require additional research and monitoring before they could be fully implemented on a Harbor-wide basis.

Currently, several of the options listed above are included as preference 1 options for use in the DMMP. These include use of rock for artificial reefs, creation of shorebird habitat, saltmarsh and oyster or shellfish habitat, and a pilot project to determine the potential for restoration of existing but chronically degraded borrows pits. Each of these still has issues that need to be addressed before they can be fully implemented, including completing environmental assessments and obtaining permits. Examples of issues that need to be addressed include: The current value/use of borrow pit habitats that might be lost; the potential release of contaminants during placement operations; and, for shellfish/oyster habitat creation, public health issue**s** related to promoting shellfish expansion into areas that may be closed to harvesting because of water quality problems.

Given the potential volume of HARS unsuitable material that could be contained through the restoration of selected borrow pits, the cost-effectiveness of the operation (roughly $1-2/cubic yard for placement), and the opportunity to restore large areas of degraded bay bottom, this option to restore degraded pits remains for continued examination and development. A sequence of small-scale, localized and comprehensively monitored projects could be employed to prove the feasibility of pit restoration, initially using only HARS suitable dredged material. Norton Basin and Little Bay, located within a sheltered area of Jamaica Bay along its southeast shore contain adjacent borrow pits where this type of project might best be undertaken. Preliminary surveys of the benthic community indicate that the habitat in this area is degraded. This may be caused from poor water circulation resulting from the artificial water depth and the constricted nature of this area. However, to assess the suitability for remediation using dredged materials, Norton Basin and Little Bay will require more extensive baseline biological and physical investigations to verify/confirm degraded habitat value. The Norton Basin Pit could then be filled with up to 1.8 MCY of fine-grained, but HARS suitable material, and systematically monitored. Once the monitoring established that the material could be placed without significant loss, the adjacent Little Bay borrow pit could be filled with 700,000 CY of HARS unsuitable material, capped with HARS suitable material, and similarly monitored. Only after the monitoring results are fully evaluated, and can substantiate that the operation can be accomplished in an environmentally safe and beneficial manner, would proposals for expansion into the other larger pits, in Jamaica Bay (*e.g.*, Grassy Bay) be considered.

Currently, only the Norton Basin pilot project is considered a preference 1 option, because of its potential to restore degraded habitats using only HARS suitable material. The other Jamaica Bay

pits (Little Bay, Grassy Bay, Jo-Co) are designated preference 3, pending the outcome of the initial pit filling, if it is implemented, and on baseline studies to determine their habitat value.

If the placement of dredged material into degraded areas of Jamaica Bay results in a net environmental benefit, borrow pits in the waters of Lower Bay could be considered for a similar approach, if monitoring results confirm locations with degraded habitats. Two pits near Hoffman and Swinburne islands and the West Bank pit are other sites suspected of having degraded habitat, providing a potential site for expansion of the pit restoration effort. Neither of the East Bank pits or the CAC pit are currently candidates for restoration, given their apparently acceptable fish usage, benthic assemblages and water quality. Given their potential to utilize large volumes of dredged material to meet DMMP priorities for beneficial use, both Hoffman-Swinburne Pits are considered potentially beneficial uses. However, in that their need and effectiveness has still to be confirmed they are designated preference 3, pending outcome of the Jamaica Bay pilot project. These options, including the biological investigations conducted so far, are discussed in more detail in Section B of the Technical Appendix.

TABLE 2 – 1: Summary of Habitat Beneficial Use Applications

Note: Please reference footnotes below or Section B of the DMMP Technical Appendix to avoid misinterpretation of this table. Assumptions and level of confidence differ widely with each application. Volume estimates are extremely variable except for borrow pits.

Application	Potential Volume (MCY)	Generic Placement Cost ($/CY)	Year Potentially Available	Type of Dredged Material Used
Landfill Cover*	100+**	5 – 15	2000	H, T, G, C
Wetlands (habitat)*	1 – 5	15 – 35	2002	H, T, G, C
Wetlands (treatment)*	7 – 10	25 – 35	2002	H, T, G, C
Fish Reefs	10+	0	On-going	R
Filling Basins*	3 – 5	35	2003	H, T, G, C
Landfill Leachate*	1 – 4	25 – 35	2002	H, T, G, C
Birds*	1 – 3	7 – 10	2002	H, T, G, C
Mudflats*	0.5	15 – 25	2002	H, T, G, C
Oysters	0.5	5 – 15	2002	H
Shellfish	0.1	1 – 5	2002	H
Degraded Borrow Pits*	85	1 – 10	2002	H, T, G, C

C – HARS unsuitable material isolated by HARS suitable dredged material
H – HARS suitable material
R – Rock
T – Treated/processed dredged material
G - Glacial clay (if acceptable to EPA)

* These applications would require capping (covering) with HARS suitable dredged material if HARS unsuitable material were used as subfill in order to isolate the overlying environment from the subfill material. The appropriateness of using treated dredged material as a cap is undetermined at this time, but is potentially feasible if testing criteria indicates no significant potential for harm.

** Assuming all available upland fill areas (including sanitary landfills) are capped.

2.3.3 LAND REMEDIATION

This option combines the beneficial use of HARS unsuitable dredged material with the environmental and economic restoration of degraded lands. Degraded lands include active and inactive landfills, brownfields (former industrial sites), quarry sites, and abandoned mines.

Prior to use, dredged material is typically amended or processed with binding agents to improve its structural properties. Binding agents include Portland Cement, fly ash, coal ash, lime, and kiln dust. This process also immobilizes contaminants within the material so they do not leach out or otherwise become bioavailable. For this reason, it is also considered a low-end decontamination technology called solidification/stabilization (S/S) (see Section 2.4). The end product is typically a granular, soil-like material. The stabilized dredged material can be manufactured to meet the material and engineering specifications for a specified use such as structural fill, grading material, final landfill cover, or some other application by modifying the proportion and types of admixtures. Other ways to process dredged material to make it suitable for land remediation include dewatering and manufactured-soil production (blending in cellulose waste and biosolids to make fertile topsoil).

Landfills and brownfields offer unique opportunities for the beneficial use of stabilized dredged material. These sites often have environmental safeguards incorporated into the site's design, such as liners and leachate collection systems in the case of landfills and groundwater containment and monitoring at brownfields sites. In addition, the use of dredged material on these sites often saves capital investment needed to otherwise purchase the required fill and grading material for the proper remediation and management.

Land remediation using processed dredged material has already been implemented full-scale in this region. In 1997, the Jersey Gardens Mall Site in Elizabeth, NJ utilized 850,000 CY of treated dredged material for the base of a parking lot at a cost of $56/CY. NJMR has recently estimated that project costs for the majority of the land remediation projects, including processing and material placement at the site, will be $29/CY.

<u>Landfills</u>
The use of dredged material as a low permeability cap and as structural fill, on both active and inactive landfill sites, offers several environmental benefits. Uncapped landfills in the region are estimated to generate approximately 400,000 gallons of leachate per acre per year. The low permeability of the dredged material cap will reduce the amount of precipitation infiltrating contaminated historic fill on the property. This results in a substantial reduction of contaminants leaching out of the soil that would otherwise contaminate both groundwater and surface water in the Harbor region.

- The OENJ Cherokee Corp has developed a site in Bayonne, NJ that encompasses an inactive municipal landfill and a brownfield. It is estimated that 4.5 MCY of amended dredged material could be accommodated on this site as structural fill material. The site was permitted in October 1998 and is awaiting its first dredging contracts with an estimated cost of $29/CY.

- The NJDEP has identified approximately 600 landfill sites, which may require final closure and remediation. Of these, the Hackensack Meadowlands Development Commission (HMDC) has identified eleven major abandoned landfills within their jurisdiction. The NJDEP is working in conjunction with the HMDC and NJMR to develop closure plans for these landfills using clean clay to be excavated during the deepening of navigation channels in the Kill Van Kull and Newark Bay. At a minimum, the projects will require 5 MCY of clean clay. It is estimated that the transfer and placement of the clay will cost $12/CY. However, little is known about the workability or performance of the clay underlying the Bay. The PANY/NJ plans to undertake a 4,000 CY pilot project at the Koppers Coke site during 1999 to assess the workability and performance of the clay as a liner for a stormwater retention basin. Provided the results of the project are favorable the NJDEP and NJMR will perform a 0.5 MCY demonstration project to cap a landfill in the Meadowlands.
- New York City is currently evaluating the potential for using dredged material as fill for rough grading prior to placement of a planned geomembrane liner and as a final planting medium for the restoration of a coastal plant community at the Pennsylvania Avenue and Fountain Avenue landfills. The establishment of a coastal grassland and a mixture of indigenous deciduous and evergreen plants at these sites will greatly improve the environment surrounding Jamaica Bay. An estimate of the quantity of dredged material to be used at these two sites is predicated on the material meeting NY City Department of Environmental Protection soil testing requirements for rough grading fill and landscape planting (cap) and have the support of involved agencies and groups.

Consistent with the view that dredged material is a beneficial resource, all the landfill remediation projects discussed are preference 1 options.

Brownfields

As defined by USEPA, brownfields are abandoned, idled, or under-used industrial and commercial facilities where expansion or redevelopment is complicated by actual or perceived environmental contamination.

- The Koppers Coke site in Kearny, NJ is a brownfield identified for remediation and reuse as a manufacturing or warehousing facility. The site has already accepted 1.1 MCY of dredged material and is permitted to accept an additional 1 MCY under the management of SK Services of Newark, NJ. It is estimated that 2.4 MCY of additional material could be accommodated in Phase 2 of the project, which is currently under permit review by the NYD. Material is currently processed at Koppers for a cost of $29/CY.
- The previously mentioned OENJ Bayonne Site in Bayonne, NJ encompasses a brownfield (as well as an inactive landfill). The site was fully permitted in October 1998.
- The Port Liberte site is a contaminated former industrial site being remediated under direction of NJDEP. The site capacity is in excess of 0.8 MCY.
- Several other brownfields in this region including OENJ Sayreville, NJ; OENJ Port Reading, NJ; and Allied Signal, Elizabeth NJ are being proposed to process and place dredged material with a capacity of 11 MCY at a tipping fee cost of $29/CY (Table 2 – 2).

All brownfield sites are currently preference 1 options.

Quarry Reclamation

Quarries are open excavations for extracting aggregate, limestone, slate, or similar materials. Dredged material can be used to restore contours at quarry sites, thereby eliminating the safety hazards associated with the cut face of the quarry. In addition, restored contours often result in the creation of areas suitable for further habitat restoration or economic development.

- In NJ, Hunterdon Quarry has been identified as a possible placement site for clean sandy dredged material with a capacity of 30 MCY at a cost of $7/CY. This cost is largely associated with the washing of the dredged material to remove any salt prior to placement at the quarry.
- The Upland Confined Disposal Siting Study (Dames & Moore, 1996) identified six potential quarry sites in the region, all located along the Hudson River waterfront in upstate New York. Preliminary estimates indicate that the total potential capacity exceeds 17 MCY. Currently, there is a lack of local sponsorship or support for the use of amended dredged material at these sites.

The Hudson Basin Quarry sites lack local support and are therefore non-preferred options while the Hunterdon Quarry is a preference 1 option.

Abandoned Coal Mine Reclamation

Abandoned mine sites cause a variety of serious environmental problems, including land subsidence, underground mine fires, dangerous high-walls, and most significantly, acid mine drainage. Acid mine drainage is the major cause of water pollution in every Appalachian coal-mining state, and alone impacts over 3,000 miles of Pennsylvania's rivers and streams. Using dredged material to reclaim abandoned coal mines, both strip and deep mines, offers the potential of vast disposal volume and environmental benefits. Thousands of abandoned mines dot the eastern U.S. in relative proximity to the Port of NY/NJ, many with capacities in excess of 100 MCY.

- The Pennsylvania Department of Environmental Protection, in coordination with the bi-state NY/NJ Clean Ocean And Shore Trust and the NJMR, permitted a demonstration project in June 1997 for using treated dredged material for abandoned coal mine reclamation. The mine site chosen for the demonstration project is the Bark Camp Mine Reclamation Laboratory located in Huston Township in Clearfield County, PA. In 1998, NJMR contracted with Consolidated Technologies Inc. of Blue Bell, PA to dredge, transport and place 20,000 CY of amended dredged material from the Perth Amboy Municipal Marina at the demonstration site. An additional 480,000 CY of material from the Harbor is expected to be placed by summer of 2000. While the costs of this demonstration project range from $42 to $86/CY, depending on volume, to date the costs have been heavily subsidized by the State of New Jersey (NJMR) for the user.

Upon successful completion of the Bark Camp demonstration project, the Commonwealth of Pennsylvania may issue a Statewide or Regional Permit, which would allow the beneficial use of dredged material at other mines. The Lehigh Anthracite Mine (with a capacity of 20 MCY) has

been identified as a possible site, due to its favorable location in eastern Pennsylvania. Project costs, following successful completion of the Bark Camp demonstration project and issuance of a general permit by PADEP, are expected to be $29/CY. This cost is contingent on sufficient volumes being processed (0.5 to 1.5 MCY/YR). Additional subsidy may be available through contribution of mine reclamation funds as well as a contribution from funds for use of fly ash, lime and cement kiln dust (these constitute waste streams that require management). Net placement cost to the Port users of $25-30/CY for this application is estimated.

All of the mine reclamation projects are preference 1 options.

Processing Facilities

For the land-remediation options in general, the development of a regional bi-state rehandling facility for low-end processing and shipment of amended dredged material could help ensure continued full-scale use of this option. Such a facility could accept material from many dredging sites throughout the Harbor and export processed material to various remediation sites as needed. End uses of the material will include structural and non-structural fill for transportation construction, land remediation and brownfields projects.

- The NJMR is proposing a state-owned, privately operated facility capable of processing 0.5 MCY/YR for small quantity projects and State channels. The NJMR plans a handling fee of $12/CY, a processing cost of $12-15/CY, and sale of the manufactured-soil product at $8-11/CY. The facility will be designed to accept a variety of additives, and volumes of additives, to create the desired material types.
- Currently there are six independent dredged material processing facilities permitted (or with permits pending) in New Jersey: SK Services (operational), Construction and Marine Equipment Corporation (operational), Consolidated Technologies (permitted), OENJ (permitted), S & W Waste (permitted) and the South Harbor Improvement Processing facility (pending NJPDES permits). The OENJ and SK Services processing facilities are tied to their respective land remediation projects, (OENJ Bayonne and Koppers). Conceivably, material processed by these facilities could go to other beneficial use projects, but new Acceptable Use Determinations would be required. The processing capacity of these facilities is estimated at between 0.5 and 1.5 MCY/YR each.
- The NJMR, the PANY/NJ and the NYD are currently investigating a contractual arrangement called the "NJDIG". For NJDIG, the NJMR would act as a broker of dredged material from NYD and the PANY/NJ projects, agreeing to accept dredged material at a negotiated price. The NJMR would then steer dredged material to various land remediation options depending on the existing need. Benefits of this arrangement would include the ability to guarantee private enterprises a sufficient volume of dredged material to allow them to efficiently scale the processing facilities enabling multiple technologies to remain feasible during their initial development. In addition, the dredging community would be given assurance that the processing and placement schedule will accommodate the dredging project schedule at a predetermined price.

The dredged material processing and rehandling facilities are preference 1 options.

2.4 DECONTAMINATION

Decontamination technologies reduce the harmful effects of contaminants in dredged material by physical, chemical, thermal, and/or biological treatment. Contaminants are destroyed, removed, or immobilized. Not all HARS unsuitable dredged material needs to be treated for beneficial use. However, through treatment, the material could be used in wider and less restricted applications and more types of placement sites. Depending on the treatment process used, the end product may have significant market value, such as clean soil, construction grade lightweight aggregate, blended cement and architectural tile glass.

Low-end processes are relatively simple and inexpensive and include solidification/stabilization (S/S) and manufactured-topsoil (both addressed in Section 2.3.3). High-end processes are typically more expensive, complex, and energy-intensive. These include solvent extraction, sediment washing, and thermal processes.

Section 405 of the Water Resources Development Act of 1992 (WRDA), as amended, mandated the development of procedures suitable for the decontamination of sediments. Under the WRDA process, USEPA-Region 2 and the NYD in collaboration with Brookhaven National Labs, Rensselaer Polytechnic Institute and The Corps of Engineers Waterways Experiment Station (WES) have been conducting investigations and demonstrations of decontamination technologies on dredged material. The WRDA program has progressed through demonstrations of varying technologies at bench and pilot scales and is now being moved to construction of commercial-scale facilities. The step-up procedure has resulted in the reduction in the number of participants based on technical performance, demonstration costs, cost sharing, and the availability of beneficial uses for the treated material.

Two processes were selected for commercial-scale demonstrations:

- BioGenesis Enterprises, Inc. Springfield, VA will demonstrate a sediment-washing process that uses water jets and a proprietary mix of surfactants and chelating agents to strip organic and metal contaminants from dredged material. The end product is a clean manufactured soil material usable for fill, cover or topsoil applications. In March 1999, Biogenesis completed a 700 CY, 10 CY/hr. demonstration and is in the process of fabricating and siting a 250,000 CY/YR facility.
- Institute of Gas Technology (IGT) of Des Plaines, IL will demonstrate a 30,000 CY/YR thermochemical decontamination process in the winter of 1999/2000 using 500 CY of dredged material from upper Newark Bay/Lower Passaic River. With minimal alterations this equipment is scalable to a 100,000 CY/YR facility. The process uses a rotary kiln to produce a pozzolanic material, which is then mixed with Portland cement to yield a construction-grade blended cement. This would be marketed to the construction industries as a substitute to regular Portland cement. IGT has sited their demonstration facility at the Koppers Coke site in Kearny, NJ.

The PANY/NJ and NJMR are also conducting evaluations of sediment decontamination technologies. The PANY/NJ has recently published a report on the results from treatability studies of four processes that produce construction materials such as aggregate and flowable fill. NJMR has selected the following five technologies to conduct pilot testing and possible large-scale demonstration projects.

- BEM Systems of Florham Park, NJ will demonstrate the use of enhanced mineralization (Georemediation™) to decontaminate Harbor sediments. A catalyzing reagent is mixed into the raw dredged material and allowed to react for at least 28 days in open holding/curing basins. Bench scale tests indicate that organic contaminants are reduced and metals are integrated into the crystalline mineral matrix of the sediment. BEM proposes that the decontaminated sediment can be used to make a manufactured soil product that is suitable for use as non-structural fill in roadway construction, brownfields remediation, or as landfill cover. BEM will conduct a 200-400 gallon pilot scale project in the fall of 1999.
- JCI/Upcycle is a joint venture between Jay Cashman, Inc. of Boston, MA and Upcycle Aggregates of New Providence, NJ. JCI/Upcycle will decontaminate Harbor sediments using an existing rotary kiln at the Norlite facility in Cohoes, NY to thermally destroy organic contaminants and fix metals in the mineral matrix. The resulting decontaminated sediment would then be used as feedstock for the manufacture of lightweight aggregate at the same facility. Lightweight aggregate is used in construction throughout the NY/NJ Metropolitan region and is in high demand (approximately 0.9 MCY/YR in the northeast). Bench scale tests performed to date indicate that the resulting product exceeds ASTM standards for lightweight aggregate. JCI/Upcycle is scheduled to process 2000 CY from Stratus Petroleum in a pilot project during the fall of 1999. Pending positive results of the pilot, negotiations will commence on a 50,000 CY demonstration project at Eastchester Creek in Pelham, NY. Funding for project will be secured from some or all of the following agencies: NJMR, NYD, USEPA and Empire State Development Corporation (ESDC).
- WEB Consortium is a consortium of three firms: Roy F. Weston Inc. of West Chester, PA, SK Services of Kearny, NJ and BioGenesis Enterprises, Inc. The Biogenesis sediment washing process utilizes high-energy scrubbing and chemical additives and catalysts to isolate the contaminants from the sediment particles (see above). Resulting process water is treated to remove remaining contaminants and the washed sediment is used as a base for a manufactured soil product. WEB proposes that the manufactured soil is suitable for use as topsoil, construction material, landfill cover, and in brownfields remediation. Bench and pilot scale tests performed under the WRDA program indicate the removal efficiencies for moderate to highly contaminated sediments are noteworthy. WEB is a finalist in the WRDA decontamination program and was awarded a 700 CY pilot that was completed during the spring of 1999. NJMR has also awarded the WEB Consortium a 30-50,000 CY demonstration project that is scheduled to begin in the spring of 2000 with material from northern Newark Bay. In addition, the WEB Consortium will be working closely with NJDEP, USEPA, NYD and NJMR on the decontamination of material dredged from the Passaic River during the construction of Minish Park beginning in the fall of 1999.
- NUI Environmental of Union, NJ proposes to utilize Big Blue ™ sediment washing technology to decontaminate Harbor sediments. The Big Blue ™ process is a high-energy scrubbing and chemically enhanced organic degradation and waste separation process similar

to the BioGenesis system. The intended product is a manufactured soil that could be used as fill material or brownfield or landfill cover. The Big Blue™ process has been shown effective on PAH contaminated sandy sediments, but has not yet been shown to be effective on fine grained sediments contaminated with a complex mixture of pollutants similar to those found in Harbor sediments. NJMR is currently negotiating a contract with NUI Environmental to perform a pilot test of this technology using material from northern Newark Bay. The 200-400 gallon project is expected to begin in the fall of 1999.

- IGT/Endesco is a not-for-profit joint venture between the Institute of Gas Technology and Endesco Services of Des Plaines, IL. Their process has undergone bench and pilot scale testing in the WRDA Sediment Decontamination program (see above) and is moving forward toward commercial scale operation. NJMR is currently negotiating a contract with IGT/Endesco to perform a 50 CY pilot test of material from northern Newark Bay in cooperation with NYD and USEPA beginning in the winter of 1999/2000.

The USEPA, NJMR, NJDEP, NYSDEC, ESDC, PANY/NJ and the NYD will continue to coordinate closely on these projects. Technology advances and economics are expected to be the determining factors for the ultimate success or failure of a given process as they are scaled-up. It is expected that decontamination will be utilized for up to 1 MCY/YR of material by 2004 and the cost will have been reduced from the current cost of approximately $54 to a competitive cost of $29/CY. If economies of scale and technological advances do not enable the costs to be competitive with the other options, high-end sediment decontamination may be limited to remedial activities unless the benefits to the environment and public health are shown to justify the incremental expense.

All decontamination technologies are preference 1 options.

2.5 CONTAINED AQUATIC DISPOSAL FACILITIES (SUBAQUEOUS PITS)

A contained aquatic disposal (CAD) facility is a depression excavated into the bottom of a body of water for the purposes of disposing and confining dredged material. Depending upon the character and nature of the material excavated from the channel bottom, the material excavated to create the CAD facility would either be used beneficially (including remediation of the HARS) or disposed of in an appropriate manner if other beneficial use options were not available or feasible. The subject dredged material selected would be placed into the CAD facility and then covered by natural sedimentation, or if necessary, capped with an appropriate layer of sediment to isolate the contaminants from both the surrounding water column and the marine/estuarine organisms that inhabit the area. A variation on this option is to use existing subaqueous pits ("borrow pits") that were created by sand mining. This variation would fill and cap the borrow pits in the same manner as that for a constructed CAD facility. The use of existing pits solely as a containment/disposal option is no longer under consideration (preference 5). However, for those pits with a demonstrable degraded habitat, the borrow pit option may serve to remediate that condition. Therefore, this case is considered a beneficial use of dredged material and as such is discussed under section 2.3.2, Habitat Creation, Enhancement and Restoration.

New CAD facilities can offer a large volume of disposal capacity at a cost-effective price for HARS unsuitable dredged material. Such containment facilities would have the advantage of being sited and engineered specifically to contain dredged material and minimize impacts. Furthermore, they could also restore degraded areas of the estuary by excavating contaminated surface sediments from berths and channels as well as the CAD site itself and containing them within the facility. Just as siting criteria are employed to select areas with reduced resource use, design and operational measures could be utilized to greatly restrict the loss of material in the water column during disposal and even confine it to a waterbody that has already been exposed to the same material. A final cap, if necessary, would be placed to facilitate benthic recovery of the site after the facility is filled, making any resource impacts temporary. Management methods/techniques and operational practices that would most likely be applied to this option to minimize habitat impacts and contaminant loss are discussed in more detail in Section B of the DMMP Technical Appendix.

In 1997, the PANY/NJ received a permit to construct three CAD cells in a shoal area of Newark Bay. In November 1997, the PANY/NJ completed the construction of the first cell, the Newark Bay Confined Disposal Facility (NBCDF), with a remaining capacity of 1.1 MCY (711,000 CY dredged material, 400,000 CY cap material), of which 830,000 cubic yards of capacity remains. Disposal is restricted to dredged material excavated within the NBCDF draw area, which includes Newark Bay, Kill Van Kull, Arthur Kill and the New Jersey side of the Upper Bay to Liberty State Park. The NBCDF is 70 feet deep and constructed in a water depth of about 3 feet. Results of environmental monitoring and bathymetric surveys indicate that the facility is effective in containing the material disposed into it with no measurable impact outside the boundaries of the facility. More information on this is contained in Section B of the DMMP Technical Appendix. The two permitted (but unconstructed) CAD cells would have a combined additional capacity of 2.0 MCY (1.5 MCY for HARS unsuitable dredged material and 500,000 CY for cap material). The tipping fee at the NBCDF, set by the PANY/NJ to recover construction and monitoring costs is $29/cubic yard.

In Boston Harbor, a similar approach to dredging and disposal of contaminated sediments using sub-channel placement was undertaken. The Boston Harbor Navigation Improvement Project encompassed the deepening of three tributary channels and two areas in the Main Ship Channel. Modeling was effective in dispelling concerns regarding contaminant loss during placement. However, a monitoring program at the pit was implemented to focus on the ability to place and secure the cap. The project is currently being managed jointly by the USACE, New England District and the Massachusetts Port Authority. A more detailed discussion of the Boston Harbor Navigation Improvement Project is found in Section B of the DMMP Technical Appendix.

In the Port region, several potential areas for constructing new CAD facilities have been tentatively identified based on existing and newly collected biological and physical data. Sub-channel CAD facilities (pits that are excavated beneath an existing channel) have been proposed within the Upper Bay. There is a potential capacity of up to 8.5 MCY for CAD facilities under existing channels (sub-channel pits), as well as another 7 MCY outside the channels (in the shallows). In Newark Bay there is a potential capacity for 10 MCY sub-channel placement and

an additional 16 MCY in the shallows. Because of the potential for excavating substantial portions of existing surficial contaminated sediments to construct facilities in the Upper Bay, their placement costs are relatively high, on the order of, $35 - $40 /CY (compared to about $25/CY for new CAD facilities in Newark Bay). Once constructed, however, the existing, exposed contaminated sediments would be isolated within the CAD facilities, providing for a potentially significant restoration of the area for future aquatic populations.

In anticipation of the need for additional capacity, the PANY/NJ has prepared a Draft Environmental Impact Statement (DEIS) to examine four potential sub-channel cell sites in Newark Bay. This study is in its final stages of agency review and is expected to be announced in the Federal Register in late 1999. These cells would be located in the area of the Port Newark/Elizabeth Channel (Figure 1) and have a combined capacity of 3 MCY, if they are all constructed. These and other sub-channel placement cells in Upper Bay are a preference 2 option in that they minimize their short-term impacts to areas already disturbed, but do not represent a general beneficial use of dredged material. Preference 2 options are a contingency option to be used only if other beneficial uses of dredged material are not available to meet project schedules. The Upper Bay and Newark Bay CAD facilities (in the shallows) are preference 4 because they represent an impact to a less disturbed resource, albeit a short-term impact that can be reclaimed through recolonization after the cap is in place.

Additional zones for potential CAD facilities were identified within the Lower Bay (Zone 2) and Raritan Bay (Zone 1). Preliminary volume estimates indicate that both zones have sufficient capacity to meet all maintenance and new work needs through the middle of the next century. The combination of the two zones could provide a mid- to long-term solution to the Port's dredging needs if a series of cells were constructed over time, at a placement cost of $15/CY. Based on feedback from various resource agencies, Zone 1 is now considered infeasible (preference 5) due to concerns of impacts on sensitive biological resources in the Raritan Bay. Zone 2 is located further from the significant habitat complex of the Raritan and Sandy Hook Bays in an area that preliminary data indicates might be of lower habitat value. In that use of CAD facilities in Zone 2 would still represent at least a short-term impact to the bay, some consider it a preference 4 option, and others a preference 5. Until this uncertainty with respect to its potential impacts is resolved, CAD facilities in zone 2 have not been included in formulating the Recommended DMMP or the Base Plan. CAD facilities in this location, though, have the least overall placement cost ($15/CY) of all the CAD pit options.

Sequencing the use of CAD facilities could provide the flexibility to respond to shortfalls in the availability of preference 1 options without committing the region to long-term use of these pits. Essentially they would be constructed for use in a specific time period until the preferred beneficial use options did become available. Sub-channel CAD pits proposed for the Bay Ridge/Red Hook areas of the inner Harbor and Upper Bay would be planned and implemented according to design specifications so as to initially ascertain the feasibility of positive placement techniques of HARS suitable material in the open water environment of the Harbor. A portion of filling the initial cell (approximately 50,000 CY) could be undertaken with fine-grained HARS suitable material to fine tune operations and ensure no unacceptable loss of contaminants with HARS unsuitable material would occur.

2.6 CONFINED DISPOSAL FACILITIES

A confined disposal facility (CDF) involves the construction of dikes or other retention structures lined with impermeable material to contain dredged material isolating it from exposure to the environment. Dredged material can be placed within the dikes of the CDF through a variety of methods. Monitoring is typically conducted periodically in areas adjacent to the CDF to ensure safe containment of the dredged material. Excess surface water is clarified by ponding, treated to meet applicable effluent standards and released. Active or passive consolidation techniques may be employed to maximize the usable capacity of the CDF. Once filled, the CDF is capped with appropriate material, permanently isolating the dredged material. The CDF dikes can be built on land, in water adjacent to land and in open waters to create an upland, nearshore or island CDF, respectively. Upland, nearshore and island CDFs have been used in the U.S. and other countries for the disposal of contaminated dredged material.

Upland CDFs

After a preliminary site screening study to identify potential upland CDF sites, all but one site (located in Belford, Monmouth County, NJ) were dropped from further consideration due to concerns raised by the public and the sponsors (preference 5). The site in Belford, NJ (AKA N61) was historically used for disposal of material dredged from the area and/or dewatering with subsequent transfer to other adjacent locations such as a nearby landfill (See Section 2.3.3). At the request of State and County officials, the site may potentially be utilized in the future for disposal of material generated only from navigation projects located in the waters of Monmouth County. However, at this time the likelihood of future use of the site for temporary or permanent placement of dredged material from Monmouth County water is unknown.

The Belford site covers a relatively small area with an estimated volume capacity of 275,000 CY. However, since the volume of dredged material from the projects located in this area is also small, a CDF designed and constructed on this site may provide many years of maintenance capacity for those local projects. Given the uncertain nature of the future use of the site though, it is classified as a preference 3 option and not included in the formulation of the DMMP.

Nearshore CDFs

This disposal method has been used extensively over the past two centuries for creating land throughout the Port using a broad variety of materials. Several potential nearshore CDF sites have been under evaluation in the Harbor for dredged material disposal. Five different areas (listed on Table 2 – 2) have been identified for potential nearshore CDF construction. Given the relatively limited areas in the inner Harbor potentially suitable for construction of nearshore CDFs, the volume capacity of all five identified nearshore CDF sites is approximately 12¾ MCY with their cost dependent upon each CDF's size and its end use.

New York has taken strides to bring potential nearshore CDF projects forward. ESDC is currently spending $1 million to conduct a fish habitat assessment and mitigation study for potential sites within NY. This will provide needed baseline data for environmental analysis on this option should specific sites be recommended in the future for implementation.

Given the limited available nearshore habitat in the inner Harbor, none of the identified sites are preferred. Based on the existing habitat and the potential for water-dependent development in the different regions of the Port, the preference of the five identified nearshore CDF sites ranges from 2 – 4.

Island CDFs

To be cost-effective, island CDFs (AKA containment islands) are generally constructed and used for dredged material disposal over many years or decades due to the relatively large initial cost of construction. Due to the potential for significant coastal storms in the region, the dike of an island CDF would need to be designed to withstand extreme conditions and to prevent loss of material placed within the facility.

An ongoing engineering and environmental siting process identified sites in the Lower Bay and New York Bight Apex for a potential island CDF. Given the volume and potential lifespan under consideration for an island CDF, an approximate capacity of 50-100 MCY, an approximate size of 350-625 acres, and an estimated placement cost of $13-30/CY (not including potential mitigation costs) are projected. Due to the economies-of-scale involved with island CDFs, the minimum capacity under consideration has been 50 MCY, unless a modular or cellular construction method was employed. Environmental assessment of this option has determined that while the project is feasible from an engineering standpoint, and would be cost effective, both potential and perceived environmental impacts for an island CDF in these waters are unacceptable. An island CDF is therefore a preference 5 option and no longer under consideration (status 5).

2.7 OTHER POTENTIAL CONTINGENCY OPTIONS

In the out-years of the DMMP, conditions may occur that require the development and use of options other than those listed above (*e.g.*, additional ocean sites and contract disposal).

New Ocean Placement Site

It will take an estimated 40 MCY (based upon a one-meter cap) of suitable dredged material to minimally remediate the HARS. Current estimates project that an approximate average of 1.4 MCY of HARS suitable material will be dredged annually from maintenance projects, minimally remediating HARS within the next 25 years. If additional suitable material from planned or potential channel deepening is placed at the HARS, its capacity will be reached considerably sooner. Furthermore, as contaminant reduction progresses, the level of sediment contamination will most likely decline and the annual proportion of HARS suitable dredged material would increase. If this takes place, an alternate site for HARS suitable material may have to be designated to fulfill the commitments established in this DMMP.

Not all HARS suitable material, however, must go to the HARS. For example, some can be used at area beaches or for habitat restoration, however, much of the suitable material that comes from the inner Harbor will be too fine-grained for beaches. The status of some habitat restoration options is presently undetermined and generally limited in scope. Hence, these uses are not unlimited, and if contaminant reduction and other treatment processes successfully increase the volume of material suitable for ocean remediation, there will likely be a tremendous need for the development of new management strategies for this material at some point in the DMMP planning period.

Although all reasonable efforts are being taken to maximize the beneficial uses of suitable dredged material to extend the life of the HARS, designation of a new long-term ocean placement site may be necessary. Once a need has been established, designation of a new ocean site would be the responsibility of the USEPA. The process would encompass a complete assessment of the need, expressed by a sponsor, for such a site balanced against a full consideration of available alternatives in order for the process to be moved ahead. In addition, the process would likely entail a new site screening process and extensive agency and public review, and take 5 - 8 years before any site could actually be used. Many other areas of the New York Bight Apex have been impacted from past disposal activities (*e.g.*, sewage sludge, cellar dirt, acid waste, etc.). Given the potential need for a new ocean placement site, great emphasis would be placed on identifying other sites with potential remediation benefits rather than just disposal. Consequently, a potential new ocean remediation site is given a preference 3 ranking. Because a new ocean disposal site, which would not beneficially use the material, is a non-preferred option in the region, it is given a preference 5 ranking and is no longer under consideration.

Contract Disposal

Under this option, instead of designating a specific disposal site or management option, a dredging contract includes the requirement to dispose of the dredged material at a permitted site of the contractor's choosing. Since sites developed utilizing this option typically have limited capacity, costs for this option can vary widely. Without cost-effective option(s) available for use, there are few reliable means to control costs and promote beneficial use, or to establish any level of certainty that would maintain economic viability of the Port. Contract disposal may suffice to quickly meet emergency or other unanticipated short-term needs, but it is inappropriate for consideration as an integral part of a comprehensive, long-term cost-effective DMMP for the Port.

2.8 SUMMARY

For ease of comparisons, the data on the various options are summarized in Table 2 – 2.

3 FORMULATING THE RECOMMENDED PLAN

Chapter 2 described various options for managing dredged material from the Port. Clearly, no single option or site will be able to meet all the dredged material management needs of the Port. Also, many uncertainties exist regarding actual dredging needs, the future quality of sediment from different parts of the Harbor and the cost effectiveness and efficiency of a number of newer and developing management options. The challenge is how best to combine the various options to meet the short and long-term needs of the Port in an economical and environmentally acceptable manner. The more traditional USACE approach of a fixed plan based strictly on proven solutions and lowest cost does not fulfill this challenge. The plan must be flexible enough to respond to change. Since the timeframe agreed to among the stakeholders for this DMMP is 40 years, some of the decisions in implementing evolving management strategies can be programmed for the future. This will allow the opportunity to test and evaluate a number of promising techniques now under development.

3.1 THE RECOMMENDED PLAN

A flexible plan has options that are able to meet many conditions, and a regionally supported plan stresses those options that accomplish this in a cost-effective and environmentally protective manner. This strategy satisfies the dual goals of the DMMP. In Chapter 2, the various dredged material management options were ranked with respect to their ability to meet the region's goal to beneficially use dredged material (Section 1.4), as well as other technical and practical factors (see Table 2 – 2). These rankings were developed and applied jointly by a DMMP team that consisted of the Corps and EPA, along with the potential project sponsors, the States of New York and New Jersey, the PANY/NJ. The selection process stressed beneficial uses of dredged material (preference 1), especially those with environmental restoration potential, and recommends environmentally acceptable disposal facilities (preference 2) only as a contingency, to be implemented when a beneficial use option is not practicable.

This Implementation Report updates and builds on the DMMP developed by the NYD in December 1998. In addition to considerations such as environmental impacts and cost, it has constraints that partition some of the material dredged based on state boundaries, with material from NY waters not relying on NJ options and material from NJ waters not relying on NY options. This constraint was a decision on the part of both states. It was first applied in the *Joint Dredging Plan for the Port of New York & New Jersey*, October 1996, developed under the auspices of both governors. The Joint Plan consisted of three parts: a bi-state component representing initiatives common to the two states, and individual components particular to each state's dredging needs. This strategy is intended to ensure that the states share in the responsibility to implement and site the recommended options.

Another constraint employed during the selection of options was, to the extent practicable, to keep material confined within the general water basin from which it was removed. This applies particularly to new CAD facilities. For example, material dredged from Newark Bay/Arthur Kill would be targeted to the sites identified in Newark Bay; and material from the Upper Bay,

East/Hudson River to sites in the Upper Bay. However, since new CAD facilities are not included in the Recommended Plan, this constraint had little effect.

While cost was a consideration in the selection process, it was not the primary factor in deciding whether to include an option in the Recommended Plan. This means that in some cases more expensive options were selected because they yield additional desirable benefits (*e.g.*, environmental). Since this was done to meet the region's important environmental goals, the stakeholders accepted the responsibility of the added costs that this approach may incur. The apportionment of these added costs among the stakeholders would need to be evaluated on a project-by-project basis and would be dependent upon several factors. The reader is referred to Section D of the DMMP Technical Appendix for additional information on project cost sharing.

The overall plan, which will be reevaluated by the regional stakeholders on a yearly basis, must be flexible enough to respond to change and take into consideration that preferred options may also affect the justification (as measured in the benefit to cost ratio) for any specific Federal dredging project. These options will continue to be explored in future updates of the DMMP (see Chapter 4), as they become available and specifically identified. The reader should also note that each of the options under development in the Recommended Plan will also be subject to further, supplemental, site-specific NEPA documentation and the regulatory permit review process, as applicable.

3.2 THE 2010 PLAN

This part of the plan covers the next eleven calendar years (beginning in 2000), which includes all the planned and underway deepening projects, as well as the anticipated maintenance dredging to keep the existing or improved channel/berth areas open. The 2010 plan relies exclusively on preference 1 options from Table 2 – 2, looking to create, remediate and restore a variety of existing degraded or impacted habitats in the region with suitable material. The remaining material is treated and stabilized, as needed, and then applied to remediate degraded and potentially polluting areas such as brownfields, landfills, and mines. Some material is also converted to marketable products.

Table 3 – 1 summarizes the recommended 2010 plan. This plan provides more details than in the December 1998 DMMP, and includes ongoing (KVK deepening to 45 feet), planned (Arthur Kill and Port Jersey deepening to 41 feet), and potential deepening (as described in the forthcoming draft NY & NJ Harbor Navigation Study Report). Section D of the DMMP Technical Appendix contains a more detailed breakdown of volumes and options summarized here. In particular, Section D of the DMMP Technical Appendix identifies for the 2010 plan the specific sites for each project by reach, year, material type, state boundaries, and waterbody.

Of the total HARS unsuitable material needed to be dredged through 2010 (27.3 MCY), about two-fifths would be treated and used to remediate various NJ upland sites (listed in Table 2 – 2) and one-fifth treated and used to remediate the Lehigh Anthracite Mine in PA. Another 8.8 MCY are processed and converted to marketable products at the NJ processing facility and the

private decontamination facilities. Of the remaining HARS unsuitable material, another 440,000 would be used to complete the demonstration project at Bark Camp mine in PA. Approximately 200,000 CY of material that meets specifications for soil characteristics for placement as grading fill material are targeted for use at the Fountain and Pennsylvania landfills in NY (prior to placing the final geomembrane liner), and 100,000 CY is used to create marsh habitat at the head of Claremont Channel in Jersey City, NJ. These options and the other remaining preference 2 options combined provide capacity considerably in excess of the currently estimated needs through 2010. Nearly all of these options have a placement cost of approximately $29/CY for HARS unsuitable material or less – in some instances, substantially less. This allows these options to accommodate more material at no greater cost should additional needs develop beyond those currently projected.

Given the plans for deepening in the Harbor, nearly twice as much HARS material (about 54 MCY) has to be managed over this same timeframe. The Recommended Plan takes maximum advantage of the suitability of much of this material for land and ocean remediation, at HMDC landfills (clay only), Hunterdon quarry (sand only) and at the HARS. These three options utilize approximately 49.4 MCY of HARS suitable material. Smaller amounts of material are also used, when possible, for beach nourishment and construction material. Approximately 1.8 MCY of HARS suitable material is used for a habitat restoration project in Norton Basin, Jamaica Bay, NY. The remaining volume is used to create oyster, shellfish and bird habitat, and to cap the Newark Bay CDF.

As mentioned earlier, most options for HARS unsuitable material have a user placement cost of $29/CY or less. It is assumed that additional sites would be approved for processing and decontamination facilities, and that they, along with the other upland remediation options, would be sponsored/supported as needed by non-Federal entities to maintain the $29/CY price. If the price of remediation can't be substantially reduced from its current levels, or sites aren't approved, other options will be substituted using other preference 1 options or preference 2 options listed on Table 2 – 2. These disposal options would be used only if a preference 1 option was unavailable in the timeframe needed. Their use would be limited in duration until a preference 1 option was available.

Of note is the shortfall New York has with respect to options for HARS unsuitable material through 2001. Of an approximately 1.0 MCY of material anticipated from NY waters during those two years, over 500,000 CY currently has not been assigned a DMMP option. Contract disposal (described in Section 2.7) however, may be used to address this shortfall on a project-by-project basis. This could alter or delay some scheduled private maintenance work in NY waters, but is not expected to impact the ongoing or planned Federal deepening projects.

3.3 THE 2040 PLAN

The 2040 Plan covers the Port's needs for the thirty years following completion of the majority of the channel/berthing area deepening and other Port improvements. It is primarily aimed at managing maintenance material, including increased volumes needed to keep the deeper channels open. The plan is based on an assumption that contaminant reduction programs are implemented to meet the targets established in section 2.1 of this report, thereby converting a significant portion of the volume of HARS unsuitable material to HARS suitable material (approximately 34 MCY). It employs only preference 1 options from Table 2 – 2 without the need to use any lower preference options. This plan is summarized in Table 3 – 2, and is shown in greater detail in Section D of the DMMP Technical Appendix. Overall, the 2040 plan is less detailed, because outyear dredging needs, funding, future shoaling and contaminant reduction rates are uncertain.

Similar to the 2010 plan, the 2040 plan relies heavily (in fact, *entirely*) upon the use of land remediation and decontamination methods for the management of HARS unsuitable material. HARS suitable material, which is anticipated to increase on a yearly basis due to future pollution prevention efforts, achieves the minimal requirement for remediation of the HARS relatively early in the 2040 plan (currently estimated to occur in 2018). When the HARS reaches its minimal remediation capacity, the USEPA may then determine whether applying additional remediation material is prudent and beneficial to the site. Reasons for applying further material may include using a cap layer thicker than the one-meter layer currently projected, or replacing material that may have been lost due to erosion or consolidation. At the point that the USEPA does consider the HARS to be fully remediated, the NYD will work in coordination with the other regional stakeholders to identify and develop other comparable beneficial use opportunities for the excess HARS material.

As in the 2010 Plan, maximal uses of all practicable alternatives to the HARS are used. These options include remediation of Hunterdon quarry, NJ with 13 MCY of sandy material and beach nourishment with remaining sandy material (approximately 4.5 MCY). For HARS unsuitable material, approximately 19.3 MCY of stabilized material is used to remediate land sites in New Jersey and Pennsylvania (Lehigh Anthracite mine). Also, 6 MCY are processed over the 30 years at the NJ processing facility. The remaining HARS unsuitable material is managed by utilizing decontamination technologies with beneficial reuse (approximately 20.3 MCY).

3.4 OTHER PLANS CONSIDERED

3.4.1 NO ACTION PLAN (ALTERNATIVE)

This scenario is not a comprehensive management plan for dredged material and is not regionally supported. However, analysis of this scenario is procedurally required under NEPA and is useful for comparison purposes. Without a comprehensive and regionally supported DMMP, dredging and disposal continue on a project-by-project basis, so long as funding and privately developed placement options allow. This type of approach does not take advantage of the economies-of-scale or the reliability inherent in any other alternative; hence, the overall cost would likely be high. This project-by-project approach would also increase concerns by Port businesses about the long-term reliability of maintaining their channels and berths. Concerns such as these are likely to deter investment in the region, negatively impacting the expected increase that is currently projected for Port commerce. This in turn would reduce the dredging required to maintain commerce and for navigational safety, further reducing the reliability and economic viability for Port users. Eventually businesses would likely move out of the region, with a negative long-term effect on the economy.

Without a defined plan, long-term and/or innovative programs are less likely to be investigated or funded through demonstration or pilot phases. This is likely to reduce the potential for decontamination and sediment treatment options coming on line as full-scale, standard options. Similarly, the support for and commitment to contaminant reduction may also be diminished, without the potential economic benefit to the Port to push it. The volume of contaminated sediment that would be removed from the system each year would also be reduced, resulting in a substantial slowdown in the recovery of the estuary. Environmental impacts may again be addressed in a more piecemeal fashion. Plans and funds for restoration projects would be more difficult to pursue and justify. Similarly, other benefits associated with land remediation, such as the reduction in pollutants leaching out of contaminated sites into ground and surface waters, and the return of economic uses of these contaminated sites, would not be likely under the No Action Plan.

3.4.2 ENVIRONMENTALLY PREFERRED PLAN

This plan, also procedurally required under NEPA, would be based solely on environmental benefits to the estuary, without considering cost, proven reliability, or local support, although the state boundary constraint described earlier still applies. This plan places primary importance upon selecting options that maximize the potential for habitat restoration and other environmentally beneficial uses. Both sediment stabilization and high-end decontamination technologies are utilized to remediate existing off-channel hot spots in the Harbor and to create suitable material for land remediation, construction projects and other uses. By remediating off-channel hot spots in the Harbor through the maximal use of decontamination technologies, additional contaminant reduction is assumed causing an even quicker recovery of the ecosystem from past and present pollution. The identification of potential hot spots for remediation,

however, and the potential effect of their removal on the recovery of the ecosystem are (as yet) undetermined.

A variety of potential habitat restoration methods are also used (*e.g.*, creation of marsh, oyster, shellfish and bird habitats, restoration of habitat by filling existing degraded pits). Maximizing environmentally useful options disallows the use of containment or disposal options. With the greater usage of habitat restoration options (*e.g.*, filling existing degraded pits), the cost of the environmentally preferred plan could be *less than* the Recommended Plan of action. However, the State of New York and the NYD have jointly determined that the further utilization of existing degraded pits (*e.g.*, in Jamaica Bay) should proceed only if the data collected from the Norton Basin restoration project illustrates the environmental benefit of the project. This information must also be sufficiently documented to convince involved agencies and public that application of the technique to other existing degraded pits to warrant issuance of permits for further restoration. Since the use of these habitat restoration options assumes this benefit (as currently anticipated but yet unproven), the use of these options in the Recommended Plan is not prudent at this time.

3.4.3 THE BASE PLAN

The Base Plan, a requirement for all DMMPs (EC -1165-2-200), identifies the least costly, environmentally acceptable plan. It identifies the base cost for meeting a given objective (in this case, managing dredged material to keep the navigation channels in the Port open). The reader should note that while Corps regulations require the development of a Base Plan, some of the options used in the plan may never be implemented due to the preference of the region to use more beneficial or reliable options (in accordance with the goals established for the DMMP in Chapter 1).

In developing the Base Plan, the distinction between options using material from each state's waters was still applied in that each state could potentially enter into a different cost-sharing agreement with the Corps. For this economic analysis, all those options with a preference ranking from 1 – 4 were considered (with the exception of a Lower Bay CAD facility in zone 2, which is a non-preferred option by some stakeholders). Options that were not included in the Recommended Plan because they may not meet more stringent state or local criteria may be in the Base Plan, as long as they meet Federal standards. Costs incurred to meet more restrictive standards generally would be considered the responsibility of the entity imposing those standards (see also Section D of the DMMP Technical Appendix for additional information on cost-sharing).

The primary difference between the Base Plan and the Recommended Plan in section 3.1 is the cost savings based on the (presumed) large-scale use in the Base Plan of habitat restoration of degraded pits and the use of additional CAD cells in Newark Bay. Over the course of the 40-year planning horizon, the use of these new Newark Bay CAD facilities and further restoration of Jamaica Bay pits could save over $850,000,000.

Most HARS unsuitable material from New Jersey waters is managed in the Base Plan by constructing new CAD facilities in Newark Bay. Combined, these options manage approximately 26 MCY of material generated from navigational dredging in New Jersey waters and from construction of the facilities themselves. New CAD cells in Newark Bay, constructed to meet annual dredging needs, are not expected to generate significant long-term impacts (a more thorough assessment of the impacts of CAD creation, operation and closure will not be complete until the currently operating NBCDF is closed). By using the Newark Bay CAD facilities, the Base Plan does not provide the environmental and socio-economic benefits of the Recommended Plan, and does not meet regional goals of dual Port and environmental benefits.

The remaining New Jersey material (approximately 18.5 MCY) is managed using a combination of the NJ processing facility, New Jersey land remediation sites, and private decontamination facilities. A relatively small portion of New Jersey material (100,000 CY) is used in 2000 to create marsh habitat at the head of the Claremont Channel in Jersey City, NJ.

However, the use of land remediation and decontamination options (as in the Recommended Plan) does generate substantial environmental and economic benefits to the region. Since these benefits have not been evaluated and quantified from a Federal perspective, they cannot presently be used in the formulation of the Base Plan to counteract the higher cost of the preferred options. Consequently, should the environmental and economic benefits of the land remediation and decontamination options be further evaluated from a Federal perspective, then they may be shown to have the least net cost and would therefore be selected as Base Plan options.

Material from New York waters and, when possible, from shared waters (*e.g.*, KVK, Arthur Kill, Hudson River) is primarily used to restore degraded pits in Jamaica Bay (Little Bay, Grassy Bay and JO/CO Marsh pits) and the Hoffman/Swinburne south pit in the Lower Bay. The total volume of material used as fill in these pits is approximately 28.2 MCY. Approximately 2.2 MCY of material from New York waters is anticipated to be decontaminated in years 2001-2003 while the habitat restoration potential of filling the degraded pits is evaluated.

Based on preliminary studies, the Jamaica Bay borrow pits are believed to have limited habitat value due to poor flushing and impacted surficial sediments. Consequently, restoring the habitat at these pits (by filling with HARS unsuitable material capped with HARS suitable material) is not expected to have a significant adverse impact (This is as yet unproven pending small-scale localized pilot projects described in Section 2.3.2). Therefore, these options are assumed to meet Federal standards for environmental acceptability and are included in the Base Plan.

The Base Plan utilizes the same options for HARS suitable material as the Recommended Plan with the exception that material is not used to remediate the HMDC landfills, the Hunterdon Quarry, and for beach nourishment as these options all have costs notably greater than that of ocean remediation. As the Base Plan utilizes CAD options, a considerably larger amount of HARS suitable material is generated. Consequently, the HARS site reaches its minimum remediation objectives years earlier than in the Recommended Plan.

4 IMPLEMENTING THE RECOMMENDED PLAN

To implement the Recommended Plan depicted in Tables 3 – 1 and 3 – 2, the dredging needs of the Port were broken down into timeframes three timeframes to identify when the various options and contingency decisions would be needed.

4.1 IMMEDIATE NEEDS (1999 – 2000)

Permits are already in place to use dredged material to remediate the Bayonne Landfill site, to finish phase I of the Koppers site remediation, to complete a mine-reclamation demonstration project in Pennsylvania, and to dispose into the NBCDF. These options and those in place for HARS remediation material (including artificial reefs for dredged/blasted rock) combine to provide sufficient capacity to meet the Port's immediate needs through the year 2000 for both maintenance and initial new work activities (ongoing KVK 45' deepening). The placement cost to the user of most of these options, except HARS remediation and reef creation, is approximately $29/CY. Though sufficient capacity is available to meet the immediate dredging needs, restrictions on the first three options may preclude their use for some of the material dredged from New York waters. If the projected dredged material from New York waters does not meet the criteria for HARS remediation, there will likely be a shortfall of up to several hundred thousand CY (from 1999 through 2001) that could hinder dredging projects in the Upper Bay, Hudson and East Rivers, and Jamaica Bay. Options not used in the DMMP (*e.g.*, contract disposal) may be used to address a portion of this shortfall. (As all of the dredging in New York waters in this time period is non-Federal, this is not anticipated to affect any planned Federal maintenance or deepening project.)

4.2 MID-TERM NEEDS (2000 – 2010)

To manage the projected volume for HARS unsuitable material over the next ten years, several additional land remediation sites in New Jersey and Pennsylvania are now under development by private enterprises. Decontamination production-scale and scale-up projects are now under way by the USEPA, Corps and the States of New Jersey and New York. Several habitat creation/restoration projects are now under consideration or implementation in several areas of the Harbor by the Corps, New Jersey and New York. Two processing facilities are now under development by the State of New Jersey and a private developer. Combined, they will have the capacity to treat up to 0.9 MCY a year for use at other land-remediation sites (and other possible beneficial uses). These land remediation and processing options have proposed costs comparable to the use of new CAD facilities (preference 2 options), and more than meet the projected need for all the HARS unsuitable material for the next ten years. This includes all the projected Federal and non-Federal maintenance and deepening material.

Further, contingency options are under consideration for development by the PANY/NJ and the NYD to create CAD facilities in Newark Bay and the Upper Bay, should the need arise. If all recommended facilities operate at the projected processing rates, there will be no need for the

new Newark Bay/Upper Bay pits. However, should the recommended options as a whole not keep pace with dredging needs and schedules, the contingency options will be developed such that they can be implemented and made available for use to keep projects on schedule.

During the mid-term time frame, considerable quantities of HARS remediation material (from regular maintenance and deepening actions) would continue to be used at the HARS (along with material from CAD cell excavation). A smaller volume (up to several MCY) of HARS remediation material will be diverted to a NY State sponsored pilot study for restoring degraded borrow pit habitats, as well as smaller NYD demonstrations for habitat creation (oyster, shellfish, and bird). Initiation is scheduled to occur early in the mid-term, if not sooner, depending on identification and availability of needed authorizations and funding for both construction of the placement options and the dredging projects that would utilize them. Should the planned projects prove successful, further application of habitat restoration at other degraded pit locations could address a significant portion of the mid and long-term Port needs at an economical cost and with environmental benefits, in keeping with the dual purpose of the DMMP.

As the various pilot and demonstration projects are completed, plans for longer-term use of material for mine reclamation, decontamination, and/or habitat restoration can be evaluated with more accuracy. Early in this timeframe, the bi-state contaminant track-down program will be completed and a plan developed to target its findings through an active contaminant reduction program. Several years will then be available to assess the potential and actual success of this effort and determine its effect on the need for treatment or containment options. If these options are practicable at an affordable price, then a sizeable portion (if not all) of the long-term need will be met for the upcoming decades. If most or all prove infeasible or too costly, the planning (including any needed authorizations and funding agreements) for contingency options is also under way to allow sufficient time for implementation.

4.3 LONG-TERM NEEDS (2011 – 2040)

The single most significant and important option recommended for the long-term is sediment contaminant reduction. Its projected impact (based on the targets established in Section 2.1) on the long-term dredging needs amounts to a cumulative cleanup of about 34 MCY of HARS unsuitable material over the years 2016-2040. At an assumed placement cost difference between HARS suitable and HARS unsuitable material of $29/CY, this would amount to an average savings of over $30 million per year. The implementation of additional source track-down measures is well illustrated by the tens of millions of dollars committed to the effort by both states. By complete implementation of this option, the region can ensure that the problem of dredged material contamination does not continue in perpetuity.

While sediment contaminant reduction efforts are implemented, further use of land remediation and processing facilities are utilized in the Recommended Plan for HARS unsuitable material. Expansion of the mine reclamation option into a full-scale operation is planned to utilize approximately 11.2 MCY of material from 2011 to 2024 with additional capacity available, if needed.

Beyond the first decade of the 21st Century, the Port will have sufficient time to assess the capability of more innovative measures like sediment contaminant reduction, land remediation, habitat restoration, and decontamination. If these options are as successful as expected, they will represent the management tools that will keep the Port viable through the long-term. If, however, these measures don't prove feasible, then contingency options (concurrently developed while the mid-term options were underway) may be needed.

By breaking the future into three manageable timeframes, a fairly extensive period of additional evaluation, testing and demonstration can be completed so that decision making can occur without jeopardizing the Port's viability and the estuary's environmental recovery. The need to accommodate Port growth is achievable as long as options can be brought on line fairly rapidly (*i.e.*, on a yearly or as-needed basis). The long-term health of the Port can also be ensured by applying innovative and proven technologies, and by continuing work on more traditional approaches.

4.4 THE ANNUAL REPORT – MAKING THE DECISIONS

Immediate dredged material management needs are met at existing placement sites. To ensure that sufficient placement for all dredged material exists, it is imperative to constantly review past, current, and anticipated needs and performance.

This analysis forms the basis of successful implementation of the DMMP. The NYD will provide a short implementation/update report each year that summarizes the dredging activities of the previous year and the plans for the coming years. The report will provide summary information on all the dredging projects completed, including: project location, volume of material handled and final placement /use of the dredged material. The summary data presented in Tables 3 – 1 and 3 – 2 as well as the volume projections will be updated, as maintenance and deepening needs are better identified. The annual report will also identify requirement/projects for the current year, and confirm available capacity/uses for all anticipated dredged materials. This same comparison will be made for at least the next two outyears to ensure a sufficient planning period to implement the selected options for future needs

In the event of a future shortfall, the NYD in cooperation with the involved agencies will identify necessary actions required to meet the shortfall consistent with the DMMP. The NYD will initiate those actions within its existing budget and authority to prepare additional sites/uses, or identify those other agencies/entities that will need to take on that responsibility. The NYD, as part of this process, will also meet with working groups and other agencies to present the report. In that way, additional input can be garnered and a regionally supportable effort can be pursued.

The mechanism whereby commitments can be formalized to accomplish necessary actions can be Cooperative Agreements between the NYD and the states or cooperative projects between involved agencies, commercial developers, and other groups, as appropriate.

The annual implementation strategy report will also evaluate relevant processes and projects so that continuous improvement and assessment of progress towards the dual goals of economic development of the Port and environmental restoration of the estuary. Private venture projects will also be included in this annual analysis. This report will be instrumental in making informed choices in pursuing environmentally sound and cost-effective options.

4.5 FEDERAL ACTIONS RESULTING FROM THE DMMP

Three separate Federal actions result from the implementation of the DMMP:

1. Annual DMMP Implementation/Update Reports
2. Evaluation and Implementation of Habitat Creation, Enhancement and Restoration Options including
   - Restoring Habitat at Selected Existing Degraded Pits
   - Creating Oyster Habitat
   - Creating Shellfish Habitat
   - Creating Bird Habitat
3. Continued Investigation of Inner Harbor CAD Facility Options for mid and long-term contingency. These potential sites are located at
   - Bay Ridge/Red Hook (sub-channel) – preference 2
   - Port Jersey (sub-channel in turning basin) – preference 2
   - Newark Bay (east of channel) – preference 4
   - Constable Hook Flats – preference 4

The Corps is now investigating the authorizations and funding mechanisms that are available or that may be needed to implement these actions. Currently, possible mechanisms include Corps authority provided under existing channel authorizations, authorizations that may be requested as part of Corps deepening projects, or the initiation of separate, specific Corps studies. Should appropriate mechanisms to implement these actions not be identified and made available in the timeframe needed for the DMMP, maintenance dredging activities, primarily those in New York waters, may be affected.

4.6 CONCLUSION

The process by which decisions are made on managing dredged material in the region is fundamental to the success of the DMMP. Both states have designated points-of-contact for dredged material management issues. These representatives along with the USACE will make the decisions within their respective authorities. Annual evaluations of the options will be closely coordinated with other agencies and public involvement groups through the HEP policy committee and DMMIWG before decisions are reached and commitments made to implement them. These decisions will be made with enough lead-time to allow options to come on-line before future dredging shortfalls occur.

A great economic need exists to maintain and deepen navigation channels in the Port of New York and New Jersey. Equally, the protection and restoration of the estuary is needed. Based on an evaluation of many different factors (including non-Federal sponsor preference, environmental, cost, and reliability), several options have been combined to form the Recommended Plan to meet these two needs. Thus, the flexible management process recommended by this plan meets the regions dredged material management needs.

Regarding the development and proposed annual review of the DMMP, funding limitations were not established. However, budget limitations have, and will continue to be a reality in dredging operations.

4.7 RECOMMENDATIONS

This draft Dredged Material Management Plan (DMMP) Implementation Report has been prepared under the existing Operations & Maintenance authority of the U.S. Army Corps of Engineers for the Federal navigation projects contained within the Port of New York and New Jersey. The District has considered numerous significant aspects in developing the DMMP. These aspects include environmental and economic concerns, engineering feasibility and compatibility of the recommended options with the goals of the States of New York and New Jersey, the Port Authority of NY and NJ, and other interested parties.

The New York District recommends implementation of the preferred options identified in the Recommended Plan (Table 3 – 1 and Table 3 – 2) and development of contingency options if the preferred options cannot meet the projected dredging schedules. With the approval of this DMMP by the Federal government and concurrence by the States of New York and New Jersey, separate Project Cooperation Agreements will be developed and executed, as needed, for those components of this plan that the Federal government will implement.

The plan contained herein reflects the information available at this time and current USACE policies governing formulation of DMMPs. However, it does not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program or the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified at higher levels. The States of New York and New Jersey will also be encouraged to support the plan's execution and will be afforded an opportunity to comment further, both in the finalization of this report and in the development of future Implementation/Update Reports.

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