FINAL

ENVIRONMENTAL ASSESSMENT

EFFECTS of the NY/NJ HARBOR DEEPENING PROJECT on the REMEDIAL INVESTIGATION/FEASIBILITY STUDY of the NEWARK BAY STUDY AREA

U.S. ARMY CORPS OF ENGINEERS
NEW YORK DISTRICT

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ACRONYMS

2, 3, 7, 8-TCDD – 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin

ACDP – Acoustic Doppler Current Profiler

AEC – Areas of Elevated Concentration. Also known as hot spots

AK-41/40 – Arthur Kill Channel 41/ 40 foot Federal Navigation Project

AOC – Administrative Order on Consent

AUD – Acceptable Use Determination

BAP – Benzo (a) pyrene

BAZ – Biologically Active Zone

BMP - Best Management Practice

CAA – Clean Air Act

CARP - Contaminant Assessment and Reduction Program

CCR – Conformity Consistency Review

CDF – Confined Disposal Facility

CERCLA - Comprehensive Environmental Response, Compensation and Liability Act

CEQ – Council on Environmental Quality

CFR – Code of Federal Regulations

COC – Contaminant of Concern

CY – Cubic Yards

CWA – Clean Water Act

DDT - Dichloro-Diphenyl-Trichloroethane

DHI – Danish Hydraulic Institute

DMMP – Dredged Material Management Plan

EA – Environmental Assessment

EIS – Environmental Impact Statement

EFH – Essential Fish Habitat

EPA – U.S. Environmental Protection Agency

ER – Engineering Regulation (USACE)

ERDC – Engineering Research & Design Center

FONSI – Finding of No Significant Impact

HAMP – Harbor Air Mitigation Plan

HARS - Historic Area Remediation Site

HNS – Harbor Navigation Study

HDP – NY/NJ Harbor Deepening Project 50' and the Arthur Kill 41/40' Project combined

HEP – Harbor Estuary Program

HTRW – Hazardous, Toxic, and Radioactive Waste

KVK/NB-45 – Kill Van Kull and Newark Bay Channels 45 foot Federal Navigation Project

LPR – Lower Passaic River

LPRRP – Lower Passaic River Restoration Plan

LRR – Limited Re-evaluation Report

MOA – Memorandum of Agreement

MOU – Memorandum of Understanding

NED – National Economic Development

NEPA – National Environmental Policy Act

NBSA – Newark Bay Study Area

NDT – National Dredging Team

N.J.A.C. – New Jersey Administrative Code

NJDEP – New Jersey Department of Environmental Protection

NJDOT – New Jersey Department of Transportation

NMFS – National Marine Fisheries Service

NOAA – National Oceanic and Atmospheric Administration

NOI – Notice of Intent

NPL – National Priority List

NRDC – Natural Resources Defense Council

NYCDEP – New York City Department of Environmental Protection

NYD – New York District

NYSDEC – New York State Department of Environmental Conservation

NYSDOS – New York State Department of State

O&M – Operation and Maintenance

O&O – Opinion and Order

OCC – Occidental Chemical Corporation, successor to Diamond Shamrock Chemicals Company

OSI – Organism Sediment Index

PA – Particle Analysis

PAH – Polycyclic Aromatic Hydrocarbon

PANYNJ – Port Authority of New York and New Jersey

PCB – Polychlorinated Biphenyl

PCDD – Polychlorinated Dibenzo-p-dioxin

PCDF – Polychlorinated Dibenzofuran

PED – Preconstruction Engineering & Design

PJ-41 – Port Jersey Channel 41 foot Federal Navigation Project

PPF – Public Processing Facility

PRP – Potential Responsible Party

RAO – Remedial Action Objective

REMAP – Regional Environmental Monitoring and Assessment Program

RDT – Regional Dredging Team

RI/FS – Remedial Investigation and Feasibility Study

ROD – Record of Decision

RP – Responsible Party

RPD – Relative Percent Difference

RSM – Regional Sediment Management Task Force

SEIS – Supplemental Environmental Impact Statement

TCDD – 2, 3, 7, 8-tertachlorodibenzo-p-dioxin

TEU – Twenty-foot Equivalent Unit – a measure of cargo container volume. One standard container equals about 1.7 TEUs.

TEQ – Toxicity Equivalency Quotient

TSS – Total Suspended Solid

USACE – United States Army Corps of Engineers

USCG – United States Coast Guard

USEPA – United States Environmental Protection Agency

U.S.C. – United States Code

USDOT – United States Department of Transportation

UT – Uncertainty Threshold

WQC - Water Quality Certificate

WRDA – Water Resources Development Act

WWTP – Wastewater Treatment Plan

EXECUTIVE SUMMARY

Introduction

In addition to meeting NEPA requirements, this Environmental Assessment (EA) evaluated the potential impacts of the New York and New Jersey Harbor Deepening Project (HDP) on the U.S. Environmental Protection Agency's (USEPA) Remedial Investigation and Feasibility Study (RI/FS) being conducted in the Newark Bay Study Area (NBSA). It has been prepared by the U.S. Army Corps of Engineers (USACE or Corps) in response to Court actions subsequent to a lawsuit initiated by the Natural Resources Defense Council (NRDC), GreenFaith and the NY/NJ Baykeeper. The EA concludes that the Proposed Action, deepening the federal channels in Newark Bay and parts of the Arthur Kill and Kill Van Kull, is not likely to have an adverse effect on the USEPA RI/FS.

Project History and Current Legal Setting

Deep-draft navigation occurs in the New York and New Jersey Harbor (the Harbor) from the Lower New York Bay to the various terminals along Upper New York Bay, the Kill Van Kull, Newark Bay, and the Arthur Kill. The overall Harbor Navigation Study (HNS) and the subsequent HDP is a multi-year harbor and channel deepening program aimed at improving Harbor navigation. They were designed by and are being implemented by the Corps. Previous documents, including a Final Environmental Impact Statement (FEIS; USACE 1999) and a subsequent EA (USACE 2004) were completed by the Corps to evaluate the environmental impacts of all HDP alternatives throughout the Harbor in accordance with the National Environmental Policy Act (NEPA).

In February 2004, following concerns raised regarding the potential presence of hazardous substances in Newark Bay, the U.S. Environmental Protection Agency (USEPA) entered into an agreement with Occidental Chemical Corporation (OCC) through an Administrative Order on Consent (AOC) to conduct a Remedial Investigation/Feasibility Study (RI/FS) in the NBSA under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA; a.k.a. Superfund).

Following issuance of the AOC, the NRDC served USACE with a notice of intent (NOI) to sue in January 2005, asserting that a Supplemental EIS be prepared to address potential impacts of the HDP on the RI/FS in Newark Bay. In response to the NOI and associated opinions issued by the US District Court, the Corps issued a Draft EA in June 2005 and an Amendment to the Draft EA in August 2005 which evaluated the potential for the HDP to impact the RI/FS. The Judge identified the following shortcomings in these documents:

1) Failure to take a "hard look" at sediment resuspension and redistribution on the RI/FS due to dredging;

2) Failure to assess cumulative impact of maintenance dredging on the RI/FS;

3) Lack of a proper alternatives analysis; and

4) Lack of substantial assurance that impacts will be minimized through mitigation measures.

This Environmental Assessment (EA) evaluates the potential impact of HDP construction on the NBSA RI/FS and has been prepared as directed by Court Order (05 Civ. 762 (SAS)) dated March 8, 2006) to specifically address the identified shortcomings.

Potential Influence of the HDP on the RI/FS

In the March 2006 Order and Opinion (O&O) the Court noted that essential components of the RI/FS include sampling surface and subsurface sediments to determine the distribution and concentration of contamination, and to develop a historical record of sediment deposition. The O&O identified several ways that the HDP could interfere with the RI/FS:

- Dredging could resuspend sediments that, when transported and deposited on geomorphic areas such as flats, channels, and transition zones (i.e., side slope/areas in between channel and flats), alter the concentrations of chemicals in sediment samples taken from those areas;
- Dredging could remove sediments that contain valuable historic data not available elsewhere and thereby eliminate RI sampling opportunities; and
- Timing conflicts between the dredging and sampling for the RI could delay some data collection for the RI/FS

A Hard Look at HDP and Cumulative Effects on the RI/FS

To address how sediment resuspension and redeposition during the dredging of the HDP may impact the sampling program planned for the RI/FS; a two step approach was employed to quantify the impacts of resuspension on chemical concentrations in surface sediments that would be tested under the RI/FS. First, the mass of sediment resuspended by dredging was estimated, based upon published calculations, and the mass deposited throughout the dredging area was predicted using a mathematical model, the Danish Hydraulic Institute MIKE3 Particle Analysis model (MIKE3 PA). Then, using existing data, including recently collected data from Phase I of the NBSA RI/FS, the concentrations of chemicals in surface sediments before dredging were estimated throughout the NBSA based on these empirical and predicted results. The chemical impacts associated with resuspension of sediments from dredging were estimated by apportioning the concentrations of chemicals in the resuspended, transported and newly deposited material with the mass of sediment predicted to be deposited (Section 4). This analysis was also used to identify areas that may contain "hot spots" known in this document as Areas of Elevated Concentrations (AEC) as well as analyze the Cumulative Effects of other present and reasonably anticipated actions within the study area.

Alternatives Considered and Evaluated

In addition to the No Action alternative, the alternatives considered to eliminate or reduce impacts on the RI/FS are the Proposed Action, timing/sequencing alternative for constructing the HDP in the NBSA, and remedial dredging (Section 3). Each alternative was evaluated for its capacity to meet project objectives within technical, economic, environmental and legal constraints. With the exception of the Proposed Action, the alternatives did not adequately meet the identified objectives and constraints.

Mitigation, Monitoring and Coordination

Avoidance and minimization of project impacts to the NBSA RI/FS are integral components of the preferred action instead of post-project compensatory mitigation. USACE will avoid impacts to the RI/FS by sequential dredging of the side-slopes for S-NB-1. In addition, a mitigation program based on BMPs will be monitored through the use of dredge inspectors. USACE has also developed a TSS monitoring program to evaluate the efficacy of its mitigation measures. To avoid and minimize potential impacts to the NBSA RI/FS, a NBSA Comprehensive Coordination Plan with the USEPA has been developed (Section 7). The NBSA Comprehensive Coordination Plan ensures that potential impacts on the RI/FS associated with the HDP are identified, avoided, and minimized to the fullest extent practicable. All monitoring results are shared and coordinated with NJDEP, NYSDEC and USEPA (Section 6).

EA Results Summary

Overall, the HDP dredging has a very low likelihood of causing impacts to ongoing and proposed sampling and chemical analyses for the RI/FS. The majority of resuspended sediments would deposit in the immediate vicinity of the dredge, with smaller amounts deposited in the channels outside of the dredge contract areas and in the shallows of the bay. Sediment deposition is predicted to result in few changes in sediment contaminant concentrations which are greater than the uncertainty threshold. These effects are not significant. Potential impacts may be further mitigated through coordination of sampling and dredging between the USEPA and the USACE.

Conclusion

This EA evaluated the issue of dredging-induced sediment resuspension and determined that the HDP would not likely alter surface sediment chemical concentrations such that the outcome of sampling results associated with the RI/FS would be adversely altered. In addition, this EA assessed the potential for cumulative impact of maintenance (Federal and non-Federal) dredging on the RI/FS, with findings similar to the HDP-only evaluation. Alternatives to the HDP Proposed Action were evaluated against project objectives and constraints with the result that the Proposed Action was identified as the Preferred Alternative. Mitigation measures, including BMPs, as well as the tailored NBSA coordination plan, were delineated in this EA to provide assurance that impacts will be minimized to the maximum extent practicable.

The Preferred Alternative meets the primary HDP goal of providing safe navigation and does so without significant effects on the RI/FS.

1 PURPOSE AND NEED

1.1 Introduction

Deep-draft navigation occurs in the New York/New Jersey Harbor (the Harbor) from the Lower New York Bay to terminals along Upper New York Bay, the Kill Van Kull, Newark Bay, and the Arthur Kill. The New York and New Jersey Harbor Navigation Study (HNS), which evaluated and recommended deepening federal navigation channels, and the subsequent New York and New Jersey Harbor Deepening Project (HDP), which sought to gain cost/time savings by consolidating various dredging contracts, are multi-year harbor and channel deepening programs aimed at improving Harbor navigation while minimizing impacts to the overall environment.

The Water Resources Development Act (WRDA) of 1996 authorized the U.S. Army Corps of Engineers (USACE) to modify and deepen several Federal navigation channels in the Port of New York and New Jersey (the Port). In compliance with this Congressional authorization and USACE civil works policy, the Corps prepared a Feasibility Study and Final Environmental Impact Statement (FEIS) for the HNS (Dec 1999); and a Limited Re-evaluation Report (LRR) and Environmental Assessment (EA) (Jan 2004) for the HDP.

In February, 2004, following concerns raised regarding the potential presence of hazardous substances in Newark Bay, the U.S. Environmental Protection Agency (USEPA) entered into an agreement with Occidental Chemical Corporation (OCC) through an Administrative Order on Consent (AOC) to conduct a remedial investigation and feasibility study (RI/FS) in the Newark Bay Study Area (NBSA) neighboring the Diamond Alkali Superfund Site (U.S. EPA Index No.CERCLA-02-2004-2010), which is located in Newark, New Jersey. Additional analyses were directed by a Court Order (05 Civ. 762 (SAS)) on March 8, 2006 (Section 1.3). This Environmental Assessment (EA) evaluates the potential impact of HDP construction on the USEPA Remedial Investigation /Feasibility Study (RI/FS) in the NBSA.

1.2 Study Area

The 1999 FEIS and 2004 EA evaluated HDP alternatives and their associated impacts throughout the Harbor (Section 1.3). However, this EA is focused upon the area of the HDP that coincides with the Newark Bay Study Area (NBSA) because this is the area where substantial deepening for the HDP would occur and may arguably negatively affect the RI/FS. The EA also addresses areas in the NBSA, but outside of the HDP (i.e. maintenance dredging locations), where deposition of sediments and contaminants due to resuspension caused by HDP construction may occur. The NBSA, as currently defined by the USEPA, includes Newark Bay and portions of the Hackensack River, Arthur Kill and Kill Van Kull (Figure 1-1).

1.3 Project Background and Completed NEPA Documentation

The Kill Van Kull (KVK) and Newark Bay (NB) Channels were deepened from 35 feet to 40 feet in the late 1980's through the early 1990's (i.e. KVK/NB-40 Deepening). Most of these same channels (i.e. KVK/NB-45) were further deepened to 45 feet beginning in 1999 and ending in 2004. Deepening the Arthur Kill (AK) Channel to 41 and 40 feet (AK-41/40), and the Port Jersey Channel to 41 feet (PJ-41), began in 2002. These navigation channel deepening projects were authorized before the HDP and are referred to collectively as predecessor projects. The predecessor projects were authorized as §101, §102, and §202a of WRDA 1986, Pub.L. No. 99-662.

1.3.1 Harbor Deepening Projects

USACE completed the HNS Feasibility Study (FS) and EIS in compliance with the National Environmental Policy Act (NEPA) in 1999. These studies and evaluations were completed in 1999 with the preparation of the Final Feasibility Report (FR) and EIS for the HNS. The Recommended Plan in the FEIS for the HNS included a fourth Federal channel deepening project (USACE 1999) consisting primarily of deepening the main shipping channels within the Harbor to 50 feet (52 feet in rock or otherwise hard material). This action was authorized for construction by Congress in §101 (a) (2) of WRDA 2000, Pub.L. No.106–541, 11 December 2000 (Table 1-1 for a chronology of events). Federal funds were appropriated in subsequent fiscal years to begin construction of the HDP, as well as continued construction of the predecessor projects.

In 2002, as part of the Conference Report on the Energy and Water Appropriations Act[1], Congress directed USACE to evaluate opportunities to consolidate implementation of the predecessor projects already under construction with the implementation of the HNS' Recommended Plan (U.S. Congress 2002). The Harbor Deepening Project is the consolidation of all projects to deepen the Port to 50 feet. In January 2004, the USACE completed a Limited Re-evaluation Report and EA with a Finding of No Significant Impact (FONSI) to ensure that the Recommended Plan for consolidation remained environmentally acceptable and economically justified.

Table 1-1: HDP: Key Events, Environmental Analyses & Court Actions

Date	Document	Source	Summary
Dec 1999	Final Feasibility Report and EIS	USACE	Feasibility Report for NY/NJ HNS – A comprehensive report detailing existing conditions, evaluating alternatives & offering the Recommended Plan for channel improvements in the Harbor.
Dec 2000	Water Resources Development Act	Congress	Signed by the President & authorized by Congress allowing HNS project start.
2002	Conference Report on the Energy and Water Appropriations Act of 2002	Congress	Orders USACE to consolidate each of its dredging projects into the HDP.
Jun 2002	Record Of Decision		For Final EIS for the HNS
Jan 2004	2004 LRR and EA	USACE	LRR & EA & Finding of No Significant Impact (FONSI) due to consolidation into the HDP.
Feb 2004	Administrative Order on Consent	USEPA	Administrative Order on Consent adding Newark Bay to the Diamond Alkali Superfund Site & requiring Occidental to carry out a RI/FS for the NBSA.
May 2004	Project Cooperation Agreement	PANY-NJ/USACE	PCA between the Department of the Army and the Port Authority of New York and New Jersey for construction of the HDP. Marked the end of the pre-construction & design phase (PED).
Jan 2005	NOI	NRDC et al	Plaintiffs serve USACE with a Notice of Intent (NOI) to sue, demanding that USACE prepare SEIS.
Feb 2005	Preliminary Motion for Injunction	NRDC et al	Plaintiffs move for a preliminary injunction halting the HDP (Feb 16, 2005).
Feb 2005	SOF	USACE	Statement of Findings (SOF) that designation of the NBSA as a CERCLA action does not, by itself, require additional NEPA documentation.

[1] 107th Cong., 1st Ses., 2002. H. Rpt 107-258.

Date	Document	Source	Summary
Jun 2005	Draft EA	USACE	Analysis of HDP navigational dredging impacts on RI/FS
Aug 2005	Aug 2005 Opinion	US District Court	Found that USACE failed to take a "hard look" at the potential impacts of HDP dredging on the RI/FS in NBSA as well as the need to further develop interagency coordination and action plans.
Sep 2005	RI Work Plan	Tierra Solutions	Detailed sampling plan of Phase 1 of the NBSA RI/FS.
Sep 2005	Amendment to draft EA	USACE	Draft EA for assessing HDP potential to impact NBSA RI/FS with expanded technical analysis
Dec 2005	LRR/EA-Mitigation	USACE	Recommends changing the mitigation area from Old Place Creek to Elders Point in Jamaica Bay.
Jan 2006	Amended Final Newark Bay EA	USACE	Detailed evaluation of potential HDP dredging impacts on the RI/FS in NBSA including quantitative analysis of data from CARP, REMAP, Query Manager & the Inventory Report.
Jan 2006	Injunction Request	NRDC et al	Plaintiffs renew request for injunctive relief & file a supplemental memorandum of law.
Mar 2006	Mar 2006 Opinion and Order (05 Civ.762)	US District Court	Plaintiffs request for injunctive relief is denied but the EA is remanded to USACE for reconsideration. Court's Key points: 1) EA failed to take a hard look at sediment resuspension; 2) Failed to assess cumulative impact of maintenance dredging; 3) Lacked proper alternatives analysis; 4) Mitigation measures lack substantial assurance that impacts will be minimized.

Nomenclature:
CARP (Contaminated Assessment & Reduction Program): NYSDEC/USACE sampling matrices of the Harbor water column, sediments & biota.
REMAP (Regional Environmental Monitoring & Assessment Program): EPA trend assessments of aquatic systems across the region.
NOAA Query Manager: Database program that organizes data from multiple studies to access sediment chemistry & toxicity & tissue chemistry.
Inventory Report: Tierra Solutions: Compilation of biological, chemical & physical data from various studies.

1.3.2 Administrative Order on Consent

In February 2004, the USEPA issued an Administrative Order on Consent (AOC) requiring an RI/FS specifically focusing upon the NBSA as an Operable Unit of the listed Diamond Alkali Superfund Site (USEPA Index No. #CERCLA-02-2004-2010). This initiated a multi-year RI/FS in Newark Bay in which data collection is being conducted by Tierra Solutions, Inc, (Tierra) on behalf of the Potentially Responsible Party (PRP), Occidental Chemical Corporation, with USEPA performing overall study oversight. This study will assess the nature and extent of contamination in the NBSA and develop cleanup plans as necessary. Tierra submitted a draft work plan to EPA in June 2004 which was finalized in September 2005, and began sampling and investigating the nature and extent of contaminated sediment within the NBSA in October 2005.

1.3.3 Harbor Deepening Project Environmental Assessment

As a result of the AOC, interested parties claimed that significant new circumstances and information warranted a Supplemental EIS (SEIS) to address potential environmental impacts of the HDP on the RI/FS in Newark Bay. In January 2005, the Natural Resources Defense Council (NRDC), GreenFaith and the NY/NJ Baykeeper (Plaintiffs) served the USACE with a Notice of Intent (NOI) to sue. In February, 2005, the Plaintiffs moved for a preliminary injunction halting the HDP. Plaintiffs later withdrew their injunction motions. USACE subsequently prepared a NEPA analysis focused upon possible impacts of the HDP on the RI/FS. In June, 2005, the USACE provided a draft EA which was amended in September 2005.

The amended final EA, dated January 2006, (January 2006 EA) determined that the proposed dredging of the HDP in Newark Bay and in portions of the Kill Van Kull and Arthur Kill that lie within the NBSA would not result in either unacceptable environmental impacts or impacts to the RI/FS sampling program, consistent with findings of the 1999 Final EIS and 2004 EA, and would not significantly impact the RI/FS. Therefore, the January 2006 EA supported the June 2005 EA conclusion that the Recommended Plan, as identified in the 1999 Final EIS and 2004 EA, represented sound engineering practices and met environmental standards.

1.3.4 Court Actions

In the Opinion and Order (O&O) of August 5, 2005 (August 2005 O&O), the U.S. District Court, Southern District of New York (the Court) determined that the USACE's decision to proceed with contract 2 of the AK 41/40 Deepening Project and the HDP, after the AOC was issued, was made without a "*hard look*" at the consequences of dredging activities "*on the RI/FS, and thus, on the environment.*" (page 57)[2]. The O&O stressed the "*narrowness*" of its holding to the USACE's failure "*to take a hard look at the potential impacts of dredging on the*

[2] Page number references refer to pages in the U.S. District Court, Southern District of New York, Opinion and Order of August 5, 2005.

RI/FS, and at methods of coordination with the EPA…" (page 60). The O&O acknowledged that "*The Corps' extensive prior environmental reviews sufficiently analyzed the environmental impacts of dredging in the Bay, on, inter alia, water quality, noise, odor and aesthetics, geological stability, exposure of biological receptors to contaminants, and human health and safety, and considered methods for minimizing those effects*" (page 49)

Following completion of the January 26 EA, the Court issued an Opinion and Order dated March 8, 2006 (March 2006 O&O), ruling on plaintiffs' renewed request for an in junction and the adequacy of the January 2006 EA. In the March 2006 O&O, the Court denied the Plaintiffs injunctive relief, but remanded the 2006 amended Final EA for reconsideration by the USACE.

The March 2006 O&O specified four primary deficiencies in the USACE's analysis of potential impacts upon the RI/FS, which this Draft EA addresses below. They are:

1) "[The EA] *failed to take a hard look at the effect of resuspension on contaminant concentrations in the surface level sediments for two reasons: 1) it failed to assess resuspension rates for different geomorphic areas and arbitrarily relied on the use of averaging over each contract area; and 2) it did not identify and consider hot spots"* (page 60)[3]. The Draft EA addresses this issue in Section 4 and Appendices 1 and 2.

2) "*The Corps failed to assess the cumulative impact of maintenance dredging on the RI/FS"* (page 60). This issue is addressed in Section 5 of this Draft EA.

3) "*The EA lacked a proper alternatives analysis"* (page 60). This issue is addressed in Section 3 of this Draft EA.

4) "*The Corps' mitigation measures do not provide substantial assurance that possible impacts will be minimized"* (page 60). This issue is addressed in Sections 6 and 7 of this Draft EA.

1.4 Analyses Conducted in Response to March 2006 Opinion and Order

In response to the March 2006 O&O, this EA evaluates the potential impacts of the continued construction of the HDP on the NBSA RI/FS. This EA supersedes the 2005 EA and its supplementary amendment, September 2005, and the Final EA, January 2006. This EA

[3] Page number references refer to pages in the U.S. District Court, Southern District of New York, Opinion and Order of March 8, 2006.

incorporates pertinent components of those previous documents by reference as well as providing additional information which specifically addresses the four areas of deficiency identified by the Court.

In the March 2006 O&O, the Court noted that essential components of the RI/FS include sampling surface and subsurface sediments to determine the distribution and concentration of contamination, and to develop a historical record of sediment deposition which will be used to determine what actions are needed to complete the RI/FS and ultimate clean up of Newark Bay sediments. The Court noted that the HDP could interfere with the RI/FS in several ways:

- Dredging could resuspend sediments that, when deposited on geomorphic areas such as flats, channels, and transition zones (i.e. side slopes/the area between the channel and flat), alter the concentrations of chemicals in sediment samples taken from those areas;
- Dredging could remove sediments that contain valuable historic data not available elsewhere and thereby eliminate RI sampling opportunities; and
- Timing conflicts between the dredging and sampling for the RI could delay some data collection.

To address whether resuspended sediments could deposit and alter the concentrations of sediment chemicals in samples collected for the RI, an analysis was conducted to conservatively predict possible impact within the NBSA. A conservative prediction essentially means that when interpretations and assumptions are made they deliberately lean toward estimating higher rather than lesser impacts. The analysis involved two steps:

- The first step used a predictive mathematical model (MIKE3 PA) to estimate the mass of sediments that could potentially be resuspended by dredging, and consequently transported and redeposited throughout the NBSA. The model divided the NBSA into 15,213 seventy-five (75) meter (m) square grid cells. The results of the model provide information for each grid cell, thus avoiding the use of averages to characterize different areas. Parameters used in the model were chosen to provide conservative results that overestimate, not underestimate, possible effects and the model was calibrated and validated with site-specific total suspended solids (TSS) data. The model is described and its results are detailed in Appendix 1.
- The second step used the recent sediment data collected by Tierra Solutions, during Phase I of the RI/FS, USACE sediment samples characterizing the dredging area and available historic data to assess the existing concentrations of chemical contaminants in surface

sediments in different geomorphic areas (channels, transition zones, and flats) throughout the NBSA. The results of this analysis represent the chemical concentrations that would be present if the HDP were not to proceed, and were used to determine if and how the HDP may impact the RI/FS. Results are detailed in Appendix 2.

1.5 Future Environmental Approvals and Permits

The New Jersey Department of Environmental Protection (NJDEP) issued a WQC on September 2006 for Contract Area S-NB-1. In an effort to ensure that the most recent data are provided to evaluate potential impacts from the dredging on the RI/FS, the Corps (NYD) will submit an amended WQC request to NJDEP a minimum of 90 days prior to the anticipated award date authorizing dredging in Option Area #12 (Outer Slope Area) for Contract Area S-NB-1 which consists of the side slope portions of the deeper Federal navigation channel. In addition, all future environmental approvals and permits as related to water quality, air emissions, noise standards, and the protection of endangered fish and wildlife shall be addressed as required.

2 EXISTING ENVIRONMENT

2.1 Previously Defined Existing Conditions

An assessment of existing water quality and ecological communities within the HDP-area of the NBSA was conducted for the 1999 Final EIS and the 2004 EA. The potential for exposure of these biological communities to contaminants is addressed in the 1999 Final EIS. The composition of the aquatic and terrestrial communities of the NBSA reflect long term exposure to various chemical contaminants in the water and sediments, as well as the significant physical changes that have occurred to the estuary since Newark Bay, the Arthur Kill, and the Kill Van Kull were developed as major shipping facilities.

Following the publication of the 1999 Final EIS and 2004 EA, there have been several biological surveys conducted (by USACE and others) which add to the data describing natural resources within the NBSA. Additional data review confirms the descriptions of the existing environment provided previously and also demonstrates that the habitat conditions that were described previously have not significantly changed. The following sections summarize the new available data.

2.2 New Data /Changes to Existing Environment

2.2.1 Aquatic Communities

The habitat available to aquatic life in the NBSA displays the dynamic conditions typical of an urbanized/industrialized estuary along with human-induced recurring physical disturbance associated with shipping and dredging and natural disturbances (i.e. storm events). Two new investigations confirm that the aquatic communities of the NBSA are similar in terms of the composition and abundance to previous studies within the NBSA.

First, the ongoing HDP Aquatic Biological Survey Program (2001 to present),confirmed the findings of the 1999 EIS with respect to existing conditions in aquatic communities (USACE 2004 and USACE 2005).

Second, as part of the USEPA NBSA RI/FS, a Biologically Active Zone (BAZ) investigation (Diaz 2005) was conducted in the NBSA to determine benthic habitat quality. The BAZ Depth, defined as the depth extending from the sediment surface down to the maximum depth of subsurface biogenic structure, was determined from the analysis of sediment profile images and supplemental grab samples. The BAZ Depth was found to be relatively uniform across three different geomorphic areas: inter-tidal (14.5 centimeters [cm]), sub-tidal (13.7 cm), and channel (16.4 cm). A subsequent literature review found these values to be consistent with the results of similar studies which reported BAZ depths in estuarine areas typically ranging from 10 to 20 cm (i.e., 4 to 8 inches). Moreover, for each of the 14 stations, the investigation calculated the organism sediment index (OSI), a multi-parameter rating which describes the quality of benthic habitat. Twelve of the 14 stations were calculated to have relatively high OSI values (7 and greater) indicative of stable benthic communities, whereas two inter-tidal stations showed low OSI values (<6) indicative of low quality benthic habitat.

2.2.2 Terrestrial and Wetland Communities

In 2004 and 2005, as part of New York City Audubon's ongoing Harbor Herons Project, investigators surveyed Shooter's Island, which is located in the southern portion of the NBSA. No wading bird nesting activity was observed. The island has been abandoned as a nesting location by herons, egrets, and ibises for eight years. Thirty-six Double-crested Cormorant nests were recorded and this total is consistent with observations from previous years, indicating a healthy and stable population. An active Osprey nest was also observed on a piling at the east-northeast end of Shooter's Island. This nest has been active for four years (Bernick 2005). In 2006, an avian monitoring study of Shooter's Island was conducted by USACE-NYD. Results of this study were similar to the Harbor Herons Project. A total of 6 herons were observed: however there was no evidence of nesting (USACE 2006).

2.2.3 Threatened and Endangered Species

Potential impacts to Federal and State protected species were identified in the 1999 Final EIS and the 2004 EA. Based on additional data reviews, the previous findings are still valid; no additional information on protected species has become available from any of the recent studies.

2.2.4 Water Quality

In 2006, as part of the HDP environmental monitoring program, USACE conducted a TSS/Turbidity sampling program during dredging operations in the Arthur Kill, focusing upon channel reaches with predominantly fine sediments (clay and/or silt) where the probability of sediment resuspension and contaminant dispersion would be greatest. Optically measured ambient[4] turbidities varied slightly among sampling days, with mean values ranging from 2.6 to 8.7 Nephelometric Turbidity Units (NTU). Results obtained from the gravimetric analysis of ambient water samples indicated that ambient TSS concentrations fell within the 5.2 to 17 milligram per liter (mg//l) range (mean = 8.4 mg/l) which agreed with the ambient acoustic Doppler current profiler (ADCP) data concurrently collected. This study confirmed the findings of the 1999 EIS with respect to existing water quality conditions in the NBSA.

2.2.5 Contaminated Sediment

The Federal navigational channels within the NBSA have been dredged numerous times throughout the Harbor's development as shown in Table 2-1. The surficial sediment in the NBSA has been exposed to anthropogenic contaminants. Concentrations of contaminants at various locations through out the NBSA have been extensively documented from various human activities (USACE January 2006 FEA; NOAA, 1955; REMAP 1998, 2000; USACE data). Tierra Solutions, Inc. collected sediment cores (October – December 2005) for contaminant analysis as Phase I of the RI/FS sampling program. These data were provided to the USACE by USEPA, and are used to evaluate impacts to the RI/FS in Section 4.

Due to the frequent dredging in Newark Bay, the surficial silty material that is found in the previously dredged navigational channel is recently deposited sediment. However, the concern has been raised that there may be unidentified areas of elevated concentrations of contaminants (i.e. Hot spots) in areas that are likely to contain older, industrial era sedimentary deposits. The history of dredging activity, development and sedimentation within Newark Bay indicates that those deposits are most likely to be found on the side slopes and areas of widening (of the subject

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[4] Ambient TSS data were collected during non-dredging events.

navigation channels) that cut into the older sedimentary deposits of the last century that were not dredged as a result of past deepening or maintenance events (i.e. the period comprising the historical record).

Table 2-1: Prior Deepening Authorizations: AK, KVK, and Newark Bay. Asterisk denotes prior deepening authorizations that are the most relevant to removing industrial age sediments

Approving Legislation or Authority for Project Construction	Remarks
Kill Van Kull and Arthur Kill to Gulfport Reach	
River and Harbor Act 23 June 1874	Original project for a "channel between Staten Island and New Jersey", 150 feet wide, 16 feet deep.
River and Harbor Act 13 June 1902	Recommended a channel between New York and New Jersey passing south of Shooter's Island, 21 feet deep and 300 feet wide except at turns where width would be 400 feet.
River and Harbor Act 25 June 1910	Authorized channel north of Shooter's Island 1 mile long, 300 feet wide and 16 feet deep.
Water Development Appropriations Act 22 September 1922	The original project for "New York and New Jersey Channels", provided for a channel 400 feet wide and 30 feet deep.
River and Harbor Act 30 August 1935	Provided for present project depth of 35 feet and channel 600-800 feet wide.
Section 202 of the Water Resources Development Act of 1986	Authorized deepening the Kill Van Kull to 45 feet MLW from deep water in the upper New York Bay to its junction with the Newark Bay Channels and the Arthur Kill Channel. (Also authorized deepening the Newark Bay Main and Pierhead Channels to 45 feet.)
Section 301(a)(12) of the Water Resources Development Act of 1996	Re-authorized the 45-foot project in the Kill Van Kull and Newark Bay at a higher cost in accordance with Section 902 cap procedures.
Section 202(b) of the Water Resources Development Act of 1986, subject to a Secretary of the Army Report	Authorized deepening the 35-foot Arthur Kill Channel to 41-foot MLW from its confluence with the Kill Van Kull and Newark Bay Channels in the vicinity of Shooter's Island westward to Howland Hook Marine Terminal in Staten Island. The legislation also authorizes a 40-foot deep channel to extend south to the Gulfport Reach.
Section 301b of the Water Resources Development Act of 1996	Authorized a further deepening of the Arthur Kill to Gulfport not to exceed 45-foot MLW.
Water Resources Development Act of 1999	Re-authorized deepening of the Arthur Kill to Howland Hook to 41 ft MLW and 40 MLW to Gulfport in accordance with the 23 July 1999 report.
Newark Bay	
River and Harbor Act 13 June 1902	Provided for a 12-foot deep channel, 200 feet wide on the main axis of Newark Bay.
River and Harbor Act 2 March 1907	Provided for a 20-foot deep channel, 300 feet wide on the main axis of Newark Bay.
River and Harbor Act 24 November 1915	Recommended 400-foot wide channels 20 feet deep in Newark Bay main channels and extending to Port Newark pierhead lines.

Approving Legislation or Authority for Project Construction	Remarks
River and Harbor Act 22 September 1922	Authorized 30-foot channel in Newark Bay and 30-foot channel in Hackensack River below Central R.R. of NJ Bridge.
River and Harbor Act 2 March 1945*	Authorized a 35-foot, 400-foot wide project in the main channel of Newark Bay and the branch channel and inshore channel at Port Newark, along with removal of a portion of rock area at Bergen Point.
River and Harbor Act 23 October 1962*	The Act modified the existing Federal project for Newark Bay, Hackensack and Passaic Rivers. The Chief of Engineers in a report to the Secretary of the Army, dated 29 November 1963, concurred with the views of the Board of Engineers for Rivers and Harbors and recommended modification of the existing project for Federal maintenance after non-Federal construction to a depth of 35 feet of: Port Elizabeth Branch Channel, 500 to 950 feet wide and 3,500 feet long from the junction with the existing 400-foot channel in Newark Bay to Port Elizabeth Inshore Channel; Port Elizabeth South Branch Channel to the Port Elizabeth East and South Channels, minimum width of 550 ft and 1,250 ft long from the junction with the 400-ft channel in Newark Bay to Port Elizabeth; Port Elizabeth Inshore Channel to Port Elizabeth and Port Newark, 500 ft wide and 5,250 ft long; Port Newark East Channel connecting Port Elizabeth and Port Newark Branch Channels, 200 ft wide and 4,150 ft long; Port Elizabeth East Channel 200 ft wide and 3,750 ft long; Port Elizabeth So Channel, 200 ft wide and 3,100 ft long; subject to certain conditions of cooperation.
River and Harbor Act 7 November 1966*	Authorized: a. Widening 35-foot main channel from Port Newark Branch Channel South, from 550 and 400 feet to 700 feet. b. Provision of maneuvering area south of the Central Railroad of NJ Bridge with a width of 300 feet and an effective length of 2,200 feet, of which the southern half would be 38 feet deep at MLW and the northern half 35 feet deep at MLW. c. Provision of maneuvering area north of the Central Railroad of NJ Bridge with a width of 300 feet, an effective length of 2,200 feet and a depth of 35 feet at MLW. d. Widening of the entrance into Port Elizabeth Branch Channel to 1,050 feet with additional removal of 250 feet of the north corner. Also, widening of the entrance into Port Newark Branch Channel to 800 feet. e. Deepening 32 foot main channel, north of Port Newark Branch Channel to the junction of Hackensack and Passaic Rivers, to 35 feet at mean low water and widening from 400 feet to 500 feet. f. Provision of turning basin 35 feet deep at MLW, 1,300 feet long and 900 feet wide at junction of Hackensack and Passaic Rivers.
Chief of Engineers on 2 June 1972 under discretionary authority contained in H.D. 494, 89th Cong., 2nd Session	Authorized modification for widening and deepening of private construction plans for service channel and turning areas adjacent to Port Elizabeth which base plans had been authorized for Federal maintenance after private construction.
Section 202a of the Water Resources Development Act of 1986	Authorized deepening the 35-foot deep Newark Bay Main, Port Newark, Port Elizabeth, Port Newark Pierhead, and South Elizabeth Channels, all to 45 feet MLW. A turning basin off the Elizabeth Pierhead Channel was also approved. Removal of debris of the Central Railroad Bridge to 1,000 feet was also authorized. (Also authorized deepening the Kill Van Kull feeder Channel to 45 feet.)
Section 301(a)(12) of the Water Resources Development Act of 1996	Re-authorized the 45-foot Kill Van Kull and Newark Bay Channels project at a higher cost in accordance with Section 902 cap procedures.

2.2.6 Air Quality

There have been no new air studies or reports relative to air quality within the NBSA. In addition, air quality is not addressed as a component of the HDP impact on the NBSA RI/FS. While there may be changes to regulatory standards for air during the life of the HDP, these would be addressed by the Regional Air Team in the Harbor Air Management Plan (HAMP) which is discussed in the coordination section of this EA (Section 7). Changes in HDP related air emissions and/or mitigation requirements resulting from any deviation from the Proposed Action would be addressed through contract specific Conformity Consistency Reviews.

2.2.7 Sediment Resuspension

Newark Bay is a dynamic system. The mass balance of sediment within the Bay is influenced by the Passaic and Hackensack Rivers as well as the Arthur Kill and the Kill Van Kull. The fine-grained sediments in the Newark Bay area are continuously resuspended and deposited as a result of both natural and anthropogenic (human-induced) forces. Normal tidal flow as well as occasional storm events typically resuspend and distribute fine grain sediments. Moreover, the frequent transits of deep-draft container vessels repeatedly resuspend sediments and contribute to the net sediment resuspension (Appendix 4).

Within Newark Bay, natural physical processes, storm events, and ship movements can periodically account for equivalent or higher suspended sediment concentrations over much larger spatial scales and for longer durations than dredging operations, given that dredging operations are short term. Wind-wave resuspension and seasonal variability in the supply of erodable sediment have been found to be the primary factors in surface and near-bottom TSS concentrations in estuarine conditions; these natural processes and anthropogenic sources of sediment resuspension occur much more frequently than dredging operations, as often as on tidal time scales, and have been found to dominate suspended sediment concentration budgets even during dredging operations (Schoellhamer 2002). Such resuspension occurs within Newark Bay with or without deepening. Field observations also indicate that the effect of dredging-induced resuspension on sediment transport is generally negligible in comparison to the transport induced by natural storm events (Bohlen 1980; Schoellhamer 1996, 2002). In one study in the

Connecticut estuary, dredging plumes increased the total suspended load by approximately 25% over less than 2.5% of the total estuarine area, while storms were observed to increase the total suspended load by a factor of 3 throughout 100% of the estuary (Bohlen 1980).

Sediment resuspension is also a consequence of dredging operations associated with fine-grained unconsolidated sediments. Recent investigation of the suspended sediment “plumes” associated with navigational dredging within the NBSA found a general pattern of rapid plume concentration gradient decay and settlement within the water column. Plumes exhibited minimal lateral diffusion with the maximum spatial extent of the plumes always occurring in the lower water column. Importantly, the study found that sediment resuspension was generally confined within the navigation channel (Appendix 3).

3 ALTERNATIVES ANALYSIS FOR DEEPENING NEWARK BAY

This Section addresses the following deficiency identified in the March, 2006, O&O: *The EA lacked a proper alternatives analysis"* (page 60)

The HDP's potential impact on the RI/FS is the focus of this EA's alternatives analysis. Alternatives to dredging in the NBSA were assessed in terms of contribution to the primary objective of eliminating or minimizing potential impacts on the RI/FS.

In the 1999 FEIS and the 2004 EA, the USACE considered and evaluated the Port in its entirety and conducted a full alternatives analysis to improve navigation in the Harbor. The plan formulation process was conducted consistent with Federal statutes and Corps regulations and policy.

The deepening plan that maximized net benefits to the Nation was a Harbor-wide channel improvement plan with maintained, 50-foot deep channels to the existing terminals at Port Jersey, South Brooklyn, Port Newark/Elizabeth, and Howland Hook (New York Container terminal) (with initial deepening construction to 52 feet in rock or hard material). This plan became the Recommended Plan in the Report of the Chief of Engineers on the HNS (Chief's Report, 2 May 2000) and was authorized by Congress as the Recommended Plan. The Recommended Plan met National Economic Development (NED) criteria in that it maximized net excess benefits and does not result in unacceptable environmental impacts that could not be appropriately avoided or mitigated.

Deepening selected navigation channels in Newark Bay is an integral part of the Recommended Plan in the HNS. The ongoing or anticipated HDP contracts and their expected completion dates are shown in Table 3-1. This HDP schedule is an estimate and subject to change; changes in this schedule in any particular contract does not affect the outcome, so long as they are all done on the same overall timescale. By letter of April 4, 2006 (Mr. Pavlou to Colonel Polo Appendix 5), the USEPA informed the USACE that the USEPA RI/FS field work was estimated to be completed by the winter of 2008 and the Record of Decision for the RI/FS was estimated to be issued by the winter 2012. Should more sampling phases than were anticipated at the time of the letter become necessary, these estimated timeframes could be extended. If necessary, remediation of the NBSA would commence following the issuance of the ROD. The HDP is anticipated to be completed by the winter of 2012.

In addition to the No Action alternative, the alternatives considered to avoid and minimize impacts on the RI/FS are: 1) the proposed action, 2) timing/sequencing alternative for constructing the HDP in the NBSA, and 3) remedial dredging. Each of these alternatives is described in Section 3.1.

Table 3-1: Projected Start and Completion Dates of Remaining HDP Contracts

Contract	Contract Number	Contract within NBSA	Projected Start	Projected Completion
Ambrose 1	S-AM-1	No	Nov. 2005	Dec. 2007
Ambrose 2	S-AM2	No	Apr. 2008	Apr. 2010
Anchorage 1a	S-AN-1a	No	Dec. 2006	Dec. 2007
Anchorage 1b	S-AN-1b	No	Apr. 2008	May 2009
Anchorage 2	SAN-2	No	Jul. 2009	Jun. 2010
Kill Van Kull 1	S-KVK-1	No	May 2008	Jul. 2010
Kill Van Kull 2	S-KVK-2	Partial	Mar. 2005	Mar. 2007
Newark Bay 1	S-NB-1	Yes	Jun. 2007	Feb.2009
Newark Bay 2	S-NB-2	Yes	Nov. 2008	Feb. 2012
Elizabeth Channel	S-E-1	Yes	Nov. 2009	Jun. 2011
Arthur Kill 1	S-AK-1	Yes	Feb. 2008	Dec. 2008
Arthur Kill 2	S-AK-2	Yes	Apr. 2009	May 2010
Arthur Kill 3	S-AK-3	Yes	Aug. 2010	Feb. 2012
Bay Ridge	S-BR	No	Oct. 2010	Mar. 2014
Arthur Kill 41/40’	AK-1	Yes	Jun. 2003	Feb. 2006
Arthur Kill 41/40’ Channel Areas 2 and 3	AK-2/3	Yes	Jan. 2005	Jan. 2007
Arthur Kill 40’ Channel, Area 4	AK-4	Partial	TBD	TBD

3.1 Alternatives

3.1.1 No Action Alternative

The No-Action alternative- which serves as the future baseline condition to which the potential effects resulting from each of the alternatives are compared — assumes that the congressionally authorized deepening of the Federal Navigation channels would not continue within the Newark Bay Study Area until the USEPA RI/FS is completed and a Record of Decision is issued by USEPA; and that routine operation and maintenance dredging of the existing navigational channels would occur, as needed. Potential interference with the RI/FS would be avoided by postponing or delaying HDP construction until the RI/FS is completed and the Record of Decision is issued. USACE anticipates that a ROD will be issued in 2012.

3.1.2 Proposed Action

The proposed action is to continue the deepening of the Federal navigation channels (Figure 1-1) in Newark Bay and the Arthur Kill within the NBSA in accordance with the Recommended Plan (i.e. dredging NBSA Federal channels to 50 feet) and the schedule presented in Table 3-1, except as necessary to avoid direct interference with RI/FS sampling activities. Dredging associated with the HDP will be performed in compliance with the Clean Water Act as implemented by the Clean Water Act section 401 Water Quality Certificate (WQC) requirements and conditions for environmental protection (e.g., BMPs) issued by the NJDEP and NYSDEC, as well as the USACE Clean Water Act section 404 evaluation. The NJDEP requires, at a minimum, the use of BMPs (i.e. closed environmental clamshell bucket, dredging windows, no barge overflow) for silty unconsolidated material and inspection criteria to ensure minimization of potential impacts (e.g., minimization of sediment resuspension) to the environment (i.e. EFH and biological resources) due to dredging. The proposed action would deepen the center of the channel before construction of the side slopes and postpone dredging areas of possible historical deposits or areas of possible elevated chemical concentrations until these areas have been sampled by the USEPA.

Based on testing conducted on sediments that will be dredged during the HDP, all would be suitable for some type of beneficial use, including: remediation of the Historic Area Remediation

Site (HARS), creation of artificial reefs, or cover for landfills or contaminated terrestrial sites in the region outside of the NBSA. If additional testing reveals some dredged material does not meet the standards for beneficial use, an alternate disposal option will be investigated by the USACE, in conjunction with the non-Federal sponsor, and in coordination with the USEPA and state regulatory agencies, and the public; however the existing sediment testing results reveal this need would be unlikely.

Currently, the Newark Bay Confined Disposal Facility (NBCDF) is neither identified as an option for placement of non-HARS material nor is planned to receive material during the HDP construction. Operation of the NBCDF has been monitored and will continue to be monitored to ensure it meets state and federal requirements. If a USACE permit extending its operation were to be issued by the Corps or a management permit issued by NJDEP the NBCDF may become a contingency placement option for non-HARS material in the unlikely event that NBSA sediments would require alternative disposal options.

3.1.3 Timing/Sequencing Alternative

The timing/sequencing construction alternative of the HDP within the NBSA would consist of dividing the dredge contract area into dredge parcels or acceptance areas which would be selected based on the existing chemical data. Through the existing interagency coordination effort, identification and ranking of the areas would be coordinated with the USEPA and the USACE technical teams. Parcels would be ranked according to the likelihood of affecting the RI/FS sampling effort, and construction in areas which might affect the RI/FS would be delayed to allow more time for sampling. Areas identified as having the greatest potential to have an effect on the RI/FS would not be dredged until at least one of the following actions occurs: 1) Collection and analysis of new data to further determine if there are any potential impacts on the RI/FS; 2) Additional sediment testing to confirm the probable location, depth, and size of areas of elevated concentrations of contaminants, if any; or 3) additional BMPs (i.e., if feasible, silt curtains placed around the RI/FS sampling locations) identified and implemented to avoid potential impact to surface sediments. Dredging would only be conducted after one of the above conditions were met and then only by using the required BMPs for the specific area.

3.1.4 Remedial Dredging

Remedial dredging is generally defined as the removal of contaminated sediments in order to reduce risk due to contamination usually pursuant to a Federal or state cleanup authority. Specifically, remedial dredging is conducted to remove contaminants from a body of water where the in-place contaminated sediment has a documented unacceptable risk to human health or the ecosystem. Special dredges and mitigating techniques for dredging, re-handling, transport, treatment and disposal technology are used to conduct remedial dredging. This type of sediment removal is usually part of a Federal or state superfund cleanup. Remedial dredging is not required for the HDP because the sediments, as required by the affected states under WRDA, are not documented as hazardous or toxic and do not pose an unacceptable risk to human health or the ecosystem. However, an alternatives analysis must include alternatives not within the jurisdiction of the lead agency [40 CFR 1502.14(c)]. Therefore, this alternative is considered in this EA. Additional discussion on HTRW sediments in the HDP dredging areas is provided in Section 3.2

3.2 Alternative Evaluation

This EA assesses the impact that the HDP may have on the RI/FS in the NBSA. The primary objective of the alternatives analysis is to consider approaches to dredging in the NBSA that may avoid or minimize potential impacts on the RI/FS should the analysis determine that dredging may impact the RI/FS. Alternatives were evaluated based on whether they met the following objectives; those that did not were not further considered in the EA:

Meet Project Objectives

- The primary HDP goal of providing safe navigation for deeper draft ships must be attained;
- Impacts on the RI/FS must be avoided, minimized or mitigated.

Technical Constraints and Implementability

- Approaches must be technically sound;
- Plans must be realistic and utilize existing technologies;
- Plans must represent sound, safe, acceptable engineering solutions.

Economic Constraints

- Approaches must be justifiable; that is, the proven conditions or expected benefits must warrant the additional costs (real or as time-lost) required;
- Approaches must be efficient. They must represent near optimal use of resources in an overall sense. Accomplishment of one purpose cannot unreasonably impact another system.

Environmental Constraints

- Approaches must not significantly impact environmental resources.

Legal Constraints

- Approaches must be implemented under current Congressional authority through modification of applicable permits and or certifications.

3.2.1 No Action Alternative

While the No Action alternative would have the least potential for dredging-induced impact on the RI/FS, the potential for significant increases in ship traffic due to light loads would adversely impact the environment and the socioeconomics of the New York and New Jersey metropolitan area. Currently, the container vessels entering the Port Elizabeth and Port Newark container terminals must use various measures (i.e., light-load vessels and high-tide transits) to enable the larger deeper draft vessels to use the Newark Bay navigation channels. These measures are temporary which are neither cost effective nor environmentally preferred.

Further, if HDP construction is delayed until after the anticipated issuance of USEPA's Record of Decision in 2012, HDP construction costs for both the deeper channels and the mitigation measures associated with potential impacts to Newark Bay will escalate, requiring re-evaluation for economic viability (i.e. increase in duration due to delays results in an increase in cost to build the project).

This alternative is not the preferred alternative because it does not; 1) provide required relief for safe navigation for deeper draft ships, 2) accommodate the new fleet of deeper draft vessels, 3) reduce environmental impacts associated lightering practices or represent sound engineering solutions, or 4) Represent near optimal use of resources.

Until the HDP is fully completed and the target depth achieved, the environment will be negatively impacted from the increase in vessel draft versus the navigation depth; more vessel trips to the Elizabeth and Newark terminals would be needed due to the vessels entering with light-loads (i.e., less cargo). In addition, vessel keel depth clearance in relationship to Newark Bay bottom depth directly affects the amount of sediment that is resuspended from vessel traffic. If the No Action alternative is implemented, the potential for Newark Bay sediments to be resuspended due to man-made causes (e.g. ship traffic) would continue to occur until the USEPA RI/FS is completed.

Table 3-2: Summary of the Advantages and Disadvantages of the No Action Alternative

Advantages	Disadvantages
No impact to RI/FS from HDP	Objectives of the HDP are not met
	Increases in ship traffic (i.e. more trips with lighter loads)
	Larger ships which attempt to enter the Harbor would encounter potential navigation hazards due to shallow channels
	Increase of environmental impacts due to increase of ship traffic sediment resuspension and increased NOx emissions; potential impact on RI/FS

3.2.2 Proposed Action

The proposed action provides for navigation improvements within Newark Bay. It meets the project objectives and the technical, environmental, economic and legal constraints. The proposed channel deepening will permit larger, more efficient deeper-draft vessels to gain access to the main terminals while loaded in an economically efficient matter. Potential impacts to the RI/FS from dredging will be avoided, minimized and/or mitigated (Section 7) through a series of coordinated dredging contract options that deepen the center of the channel before construction of the side slopes and postpone dredging areas of possible elevated chemical concentrations until these areas have been sampled by USEPA. Dredging contract plans and specifications for S-NB-1 are described below as an example of this.

As defined in the plans and specifications for the upcoming Newark Bay Dredging (S-NB-1) Contract, dated January 2007, scheduled construction on the first NBSA contract will proceed as a Base Contract award with several options to be exercised. Deepening a portion of the center channel prism bottom will occur first; other areas, including channel prism side-slopes with greater probability of undisturbed historical sediments, will be constructed following the award of the base contract. These plans and specifications reflect a revision which allow for the postponement, to the extent possible, as it relates to navigational safety, of work in the outer slope area to allow the greatest opportunities for regulatory review by NJDEP and USEPA, as well as data collection opportunities by Tierra Solutions, Inc. as part of the USEPA NBSA RI/FS should subsequent review of the Phase II WP indicate it is warranted, but would still allow the USACE to move forward with most of the navigation channel deepening in the NBSA thereby minimizing delays to completion of the full project.

The Newark Bay 1 (S-NB-1) contract is divided into 8 options addressing different areas of the channel. USACE anticipates exercising the option areas as funding becomes available. The Contractors would then execute the work in the order they find most efficient within the restrictions of the Specifications. The first option consists of dredging the center of the navigation channel so that the side slopes remain stable. The toe of the center of the channel will be dredged approximately 35 feet as a setback from the existing channel toe of the slope. This will act as a buffer zone and will ensure that the side slopes are stabilized. In addition, the side slopes are historic sediments that are highly consolidated and physically stable.

Option Area 12-Outer slope Area consolidates new dredging of all the side-slopes along the existing Federal channel. This option comprises approximately 101,400 cubic yards (CY) of non-Historic Area Remediation Site (HARS) suitable material[5] of the overall total of 579,700 CY of non-HARS suitable material to be removed, if all of the contract options are exercised. The WQC for the contract stipulates that the side-slope option may not be implemented until the NY District requests an amendment to the WQC. The request must be submitted a minimum of 90 days prior to the anticipated award date for the option and must be accompanied by any additional pertinent data available from the USACE and/or the USEPA. It is unlikely that an amendment of the WQC allowing the dredging of the channel prism side slopes would be

[5] Non-HARS suitable material is generally the surficial silty material that may have elevated levels of contamination and is not suitable for capping material at the HARS.

received by the USACE before September 2007. Which is the earliest that any potentially undisturbed historical sediments would be removed, allowing USEPA ample time during their finalization of the Phase II sampling plan to determine if more samples are needed. The contract is expected to be completed in the first quarter of 2009 which would then be under this alternative.

All future NBSA contracts construction sequencing and optioning will be coordinated in a similar manner and through the WRDA and CWA regulatory coordination and review process, as is required under the projects congressional authority.

Table 3-3: Summary of the Advantages and Disadvantages of the Proposed Action Alternative

Advantages	Disadvantages
Meets primary objective of HDP	Does not meet objective of HDP to provide safe navigable channels until after slopes are removed
BMPs would mitigate potential impacts to RI/FS	Too many sequencing options within a contract area may lead to inefficient dredging process
Larger ships could access the Harbor as scheduled	
Reduction in navigation hazards associated with shallow channels and reduction of NOx emissions.	
Established mitigation plan can be implemented as scheduled	
Meets primary objective of RI/FS with minimal potential for impact on RI/FS	

3.2.3 Timing/Sequencing Alternative

This alternative evaluates the option of dividing the contract areas into parcels based on available chemical data. Areas that have been identified by USEPA and USACE as not likely to have a significant impact on the RI/FS would be dredged in order to provide container vessels with navigation channels that are sufficiently deep and wide in order to provide safe passage, economic benefits (full loads), environmentally efficient (reduced adverse environmental effects from sediment resuspension and NOx emissions), and continued use of the Port. Again, this would afford USEPA additional time to finalize its Phase II plans without removing sediment that may be sampled for the Phase II sampling plan.

The draft Phase II Workplan for the NBSA RI/FS released by USEPA for review in October 2006 and USEPA's letter dated January 23, 2007 indicate no additional samples are proposed for the side-slopes of the HDP or any remaining HDP contract areas. Thus this alternative would needlessly segregate contract areas into small areas and likely delay contracting and dredging operations. Also, this timing alternative does not meet the navigation needs of the Harbor and would result in increased project costs (i.e. demobilization and mobilization costs), logistical problems and increased environmental impacts to air quality and delays to aquatic and benthic recovery efforts.

Table 3-4: Summary of the Advantages and Disadvantages of the Timing/Sequential Alternative

Advantages	Disadvantages
Preserves Historic Sediments to be included in RI/FS sampling	Same disadvantages as the No Action Alternative(see Table 3.2)
Meets primary objective of RI/FS with minimal potential for impact on RI/FS	May create navigation hazard if staggered dredging results in uneven channel bottoms
	Increase of environmental impacts due to increase of ship traffic and resultant sediment resuspension and increased NOx emissions from inefficient navigation

3.2.4 Remedial Dredging

Remedial dredging is conducted when sediments are tested, documented and regulated as highly contaminated. If authorized, remedial dredging could be conducted in certain areas of the dredge contract which contain HTRW-regulated levels of elevated chemical concentrations in fine grained sediments. Silt curtains where appropriate could be used during remedial dredging so as to contain the resuspension of chemical contaminants or be used to protect RI/FS sampling locations during dredging. However, there are a variety of factors which must be considered before they could be successfully and effectively deployed (i.e. water depth, navigation traffic and currents). In addition, it must be determined whether USACE has the authority to conduct remedial dredging within the NBSA.

USEPA's recent guidance on the assessment and remediation of contaminated sediments (USEPA 2005)[6] uses the term "environmental dredging" to describe "dredging performed specifically for the removal of contaminated sediment." The National Research Council (NRC 1997)[7] defines environmental dredging (remedial dredging) as "the removal of sediment contaminated above certain action levels while minimizing the spread of contaminants to the surrounding environment during dredging."

Section 312 of WRDA 1990, Environmental Dredging, as Amended by Section 205 of the WRDA 1996, authorized the Secretary of the Army to remove unacceptably contaminated sediments from the navigable waters of the United States. The USACE has two distinct authorities to conduct environmental dredging as provided by WRDA 1990, Section 312(a) and 312(b) as amended by Section 205 of WRDA 1996. The USACE has the authority to do environmental dredging of areas outside the navigation project under Section 312(a) where it can be demonstrated as cost effective to the Operation & Maintenance (O&M) program; authority exists under Section 312(b) if requested by an appropriate non-Federal sponsor (e.g., a Port) and if it is consistent with current program and budget priorities in effect at the time of consideration. Implementation of Section 312(b) will require agreement by a non-Federal sponsor to provide 50 percent of the costs of removal and remediation. In addition, all costs related to the disposal of contaminated sediment are a non-Federal responsibility.

USACE Engineering regulation (ER) 1165-2-132 policy, states that, "Response measures to relocate HTRW or to treat the HTRW in place in any phase of the project are 100% non-Federal (including responsible parties)". Therefore, civil works funds shall not be used to fund the dredging of HTRW as defined in ER1165-2-132 (USACE Regulation) and Policy Guidance Letter (PGL) No. 49, Section 312 of WRDA of 1996. Thus, the civil works funding authorized by Congress for the HDP cannot be used to conduct environmental dredging for the purposes of

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[6] EPA 2005. Contaminated Sediment Remediation Guidance for Hazardous Waste Sites, United States Environmental Protection Agency EPA-540-R-05-012, Office of Solid Waste and Emergency Response OSWER 9355.0-85.

[7] NRC. 1997. Contaminated Sediments in Ports and Waterways. National Research Council. National Academy of Press, Washington, DC. Available from the National Academies Press Web site at http://www.nap.edu/bookstore.html.

remediating an aquatic site formally designated under Superfund for a response action but Congress could authorize other funds for this purpose.

In addition to the institutional barriers to remedial dredging, remedial dredging could only be applied to soft sediments in selected locations. Different reaches of selected channels may be applicable to different types of remedial dredging such as deployment of silt curtains with environmental buckets or hydraulic dredging. Regardless of the type of remedial dredging employed, additional time and funding must be authorized. Extending the HDP schedule past 2012 would mean that the HDP is under construction at the same time that USEPA is implementing any potential remedial action.

Table 3-5: Summary of the Advantages and Disadvantages of the Remedial Dredging Alternative

Advantages	Disadvantages
Removal of contaminated sediments	USACE not authorized to conduct remedial dredging
Meets primary objective of RI/FS with minimal potential for impact on RI/FS	EPA has not designated remedial measures at this time, remedial dredging may be premature
Can control areas of elevated concentration resuspension	Extends time required to complete HDP past 2012, potentially interfering with EPA remediation, if recommended
	Remedial dredging is not authorized under the HDP funding source nor is funding sufficient; separate funding sources would need to be authorized to complete HDP

3.2.4.1 Hazardous, Toxic, and Radioactive Waste (HTRW)

During the planning phase of the HDP (reconnaissance and feasibility phases) the USACE conducted investigations to determine the potential for HTRW in the study area. Those results are documented in the 1999 Final EIS. Because the HDP involves dredged material and sediments beneath the navigable waters, the USACE's HTRW Engineering Regulation (ER) 1165-2-132 does not define this material as HTRW under CERCLA, 42 U.S.C. 9601 et seq. Dredge material is excluded from RCRA waste definitions and is managed under MPRSA and/or CWA. In order to avoid duplicative regulation, dredged material subject to a permit that has been issued under §103 of MPRSA, or §404 of CWA is excluded from the definition of hazardous waste (63 Fed. Reg. 65874, 65921; November 30, 1998).

To date, no ROD has been issued by USEPA for the NBSA. The USACE cannot unilaterally determine that remedial dredging is either required or approved until the congressionally-authorized agency makes that determination and a designated response action (removal or remedial action) has been identified, as based upon USEPA's CERCLA findings. The Superfund Remedial Response Process consists of a Remedial Investigation, Feasibility Study (Alternatives Analysis), Proposed Plan, Public Comments, Record of Decision (Remedy Selection), Remedial Design, Remedial Action and Operation and Maintenance (USEPA 1999). USEPA (2005) states that, "*Generally, the purpose of a feasibility study for a contaminated sediment site is to develop and evaluate a number of alternative methods for achieving the remedial action objectives (RAOs) for the site. This process lays the groundwork for proposing and selecting a remedy for the site that best eliminates, reduces, or controls risks to human health and the environment*." Thus, the decision whether to implement remedial dredging is the purview of USEPA's Superfund Remedial Response Process and will be contained in the ROD estimated to be issued in 2012.

With regard to other environmental regulations, dredged material is excluded (Sec. 261.4(g)) from the Resource Conservation and Recovery Act (RCRA; 42 U.S.C. 6901 et seq) definition of hazardous waste when the dredged material is subject to a permit that has been issued under section 404 of the Clean Water Act or under section 103 of the Marine Protection, Research and Sanctuaries Act of 1972.

The USACE made an initial characterization of the material to be dredged as part of the HDP during the HNS feasibility phase. This characterization was based on previous characterizations of dredged material in the NBSA and on geological data obtained from previous studies and during the HNS feasibility study. The USACE has also tested the majority of the sediments in the NBSA as a result of prior or interim dredging activities, i.e. KVK/NB 45 and AK 41/40 projects. Since then, the USACE has continued to obtain additional geological and geochemical data from recent USEPA sediment sampling and analyses as well as from sediment testing that the USACE is currently performing under WRDA and Clean Water Act (CWA) regulations to manage dredged material.

Sediments from every channel reach tested in the Kill Van Kull, Newark Bay and Arthur Kill deepening projects that falls within the NBSA that have not been deemed suitable for ocean placement, such as to remediate the Historic Area Remediation Site (HARS) or create artificial reefs, have been found to be acceptable by both States' regulatory agencies for beneficial use as cover for landfills and contaminated terrestrial sites in the region. For example, the recently deposited soft, silty dredged material that overlies some areas of the deepening contracts that the USACE has constructed or is proposing to construct has met both the NYSDEC and the NJDEP criteria established for beneficial use at upland placement sites in New York and New Jersey (i.e. where previously dredged, channel sediments are less contaminated than other sediments within the NBSA). Said placement criteria are established for each contaminated site and/or landfill based on the institutional and engineering controls necessary to remediate the site to be protective of human health and the environment. Dredged material from a particular contract is then evaluated for its use as structural fill material (as a barrier layer or low permeability cap) to aid in the remediation of the site through a NJDEP process referred to as an Acceptable Use Determination (AUD) or a NYSDEC Beneficial Use Determination (BUD). The assessment approaches used for disposal methods rely on similar risk-based approaches as CERCLA.

The AUD process, as detailed in Appendix E of the NJDEP's technical manual entitled "*The Management and Regulation of Dredging Activities and Dredged Material in New Jersey's Tidal Waters*" (October 1997), regulates the use, processing or transfer of dredged material or products containing dredged material. It is noted that the AUD process does not authorize any dredging project or beneficial use of dredged material or product that contains hazardous wastes pursuant to New Jersey's Hazardous Waste Regulations at N.J.A.C. 7:26G et seq. To date, no dredged material removed from the deepening projects that fall within the NBSA has been deemed a hazardous waste under either state's regulatory authority.

If material proposed for dredging does not meet the standards for remediation purposes at the HARS or is unable to receive an AUD or BUD for upland placement, then the USACE, in conjunction with the non-Federal sponsor, may review the few remedial dredging techniques not already included within the HDP dredging as alternatives to incorporate, as needed and in coordination with the EPA and state regulatory agency (ies) to accomplish the purposes of the civil works navigation project.

3.3 USACE Preferred Alternative

The Proposed Action, continued HDP construction with WQC constraints and contract area timing options, for the HDP dredging in NBSA meets the primary HDP goal of improving navigation and does so without significant deviation from the original HDP implementation schedule. In addition, this preferred alternative would not impact the RI/FS. As detailed in Section 4, potential resuspension and redeposition of fine sediments in areas outside the channel deepening areas as a result of HDP dredging, is not expected to have any measurable impact by comparison with on-going events on the sampling analysis and results in the RI/FS.

In addition to contract area timing and sequencing options (i.e. adaptive management) for HDP dredging contracts within the NBSA, thorough coordination between the USEPA and the USACE, as detailed in Section 7, would ensure that any potential issues regarding the Preferred Alternative impact on the RI/FS would be expeditiously addressed and avoided so that the HDP and RI/FS may proceed concurrently. For example, by postponing the dredging of the side-slopes in S-NB-1, USEPA has been afforded time to collect additional samples. All future NBSA contracts construction sequencing and optioning will be coordinated through the WRDA and CWA regulatory coordination and review process, as is required under the projects congressional authority

As discussed in the Alternatives Evaluation (Section 3.2.2), the Proposed Action is technically feasible and avoids issues associated with some of the other alternatives, such as; side slope issues incurred by phased implementation of channel deepening and channel widening (Timing/Sequencing Alternative); economic impacts of project construction incurred due to schedule delays (Timing/sequencing Alternative and Remedial Dredging); economic impacts to the shipping industry incurred to schedule delays and environmental impacts incurred due to increased and inefficient ship traffic (Timing/Sequencing Alternative and Remedial Dredging). These alternatives were not further evaluated because they do not meet the criteria listed in Section 3.2. Section 4 presents a detailed evaluation of the potential impact of the Preferred Alternative, the proposed action, on the RI/FS.

4 EFFECTS OF USACE'S PREFERRED ALTERNATIVE ON THE RI/FS

This Section addresses the following deficiency identified in the March, 2006, O&O:

> " [The EA] *failed to take a hard look at the effect of resuspension on contaminant concentrations in the surface level sediments for two reasons: 1) it failed to asses resuspension rates for different geomorphic areas and arbitrarily relied on the use of averaging over each contract area; and 2) it did not identify and consider hot spots"* (page 60)[8].

4.1 Statement of the Issue and Approaches

To address the effects of sediment resuspension, transport and redeposition during dredging and to take a "hard look" at how dredging Newark Bay may impact the RI/FS, a two-step approach quantifying the impacts of resuspension on chemical concentrations in surface sediments was developed. The mass of sediment resuspended by dredging and its redeposition throughout Newark Bay were predicted using a mathematical model (MIKE3 PA, particle tracking model) which predicted the transport and deposition throughout the bay in 75 x 75-meter cells (Appendix 1). The surface concentration of chemicals was plotted on maps of the NBSA and the areas around each sample location were delineated with Thiessen polygons of various sizes, depending on the chemical concentration distribution. Although all of the new RI/FS and historical chemical data available were used, the chemical polygon area patterns are several times larger than the cell area used by the model for deposition; in other words, the deposition pattern resulting from the model is more detailed than the chemical data distribution. The chemical impacts associated with resuspension of sediments from dredging were estimated by apportioning the concentrations of chemicals in the resuspended, transported and newly deposited material with the mass of the sediment particles predicted to be deposited in a specific model cell area. In other words, the contaminants in the sediments were estimated from site specific data and by using the model to estimate how and where dredge material settles, we are

[8] Page number references refer to pages in the U.S. District Court, Southern District of New York, Opinion and Order of March 8, 2006.

able to predict how or even if the resuspended material would negatively affect the existing surface sediments.

The analysis reported here, quantifying the release, transport and deposition of material dredged and associated contaminants from the HDP, is conservative in several ways:

- The release rate from the dredge of 3% is a factor of three or greater than release rates from closed environmental clamshell dredges available in the literature (Appendix 1). The mass sediment released, transported and deposited is directly proportional to this value, and is therefore conservatively estimated; more sediment is predicted to be resuspended than actually does

- It was assumed that the HDP would be complete prior to any future RI/FS sampling. This is conservative, since much of the RI/FS sampling may be performed prior to completion of the HDP. The proposed NBSA RI/FS Phase II sampling plan does not call for more samples in those areas that would be most affected by dredging.

- The contaminant data were collected almost exclusively in black silt, but were used to represent a mixture of black and red-brown silt. Black silt is relatively recently deposited material and has contaminant levels that are relatively high, generally sufficient to require upland disposal. Red-brown silt, also termed Pleistocene silt and clay, was deposited long before the industrial period; this material has been tested and shown to be basically free of contaminants and, suitable for placement at the Historic Area Remediation Site (HARS). By using only black silt data even in areas where red silt exists, changes in surficial sediments would be higher than actually present.

- The sensitivity analysis (Appendix 2), which was designed to evaluate the impacts of possibly dredging into an area of elevated concentration (AEC or Hot Spots) adjacent to the side slopes, incorporated several conservative assumptions. The potential elevated concentration was estimated using the 90th percentile of increasing chemical concentration of all data collected in a relatively wide surrounding area, at any depth, and including previously dredged core locations. It was also assumed that one entire edge of the dredge area (equal to ½ of the total slope volume) was contaminated at this elevated concentration leading to a conservative conclusion.

To evaluate the potential effect of the HDP on RI/FS sampling, we computed the expected contaminant concentrations in a six-inch surface layer that might be sampled and analyzed following the HDP, and compared these with existing conditions in the top six inches of the sediment bed. A cumulative analysis was performed in the same manner, incorporating other dredging, including maintenance, anticipated in Newark Bay.

4.2 Impact to the Historic Record

In October, 2006, Tierra Solutions prepared a Draft Phase II Remedial Investigation Work Plan (RIWP) for USEPA. This document summarized the data obtained in Phase I and proposed the collection of 18 additional sediment samples during Phase II of the RI/FS. Twelve of the 18 samples are proposed to be collected within the original Phase I NBSA boundaries, and the remaining 6 are located in tributaries and adjacent tidal straits. Of the 12 samples in NBSA, 11 are proposed to be collected in previously sampled areas; one is a new location. None of the Tierra-proposed sample sites are in the Harbor Deepening Project boundary (channel bottom or channel side slopes) and would not be lost if dredging occurred before sampling (Letter from Mr. Pavlou to Col. Tortora, Appendix 5). The impact of deposition caused by HDP on the surface layer of these samples is discussed in Section 4.3.2.7.

The proposed RIWP has been reviewed by USACE, NJDEP, NOAA and other agencies and respective technical consultants. The USEPA has reviewed and compiled the various agencies comments on the draft work plan into the formal USEPA response (February 05, 2007) sent to Tierra for incorporation in the Phase II RIWP. Based upon the USEPA comment letter, the Phase II RIWP, expected to be finalized in the coming months (Spring 2007), is likely to include additional sampling similar to what was recommended in the Draft Phase II RIWP. Consequently by analyzing the impacts of dredging on the proposed samples we should be able to gain insight to possible effects of the HDP on likely Phase II work, and, how such effects might be avoided, minimized, or mitigated.

The draft Phase II RIWP describes the proposed sampling in terms of the goals set for the RI/FS.

Goal 1 of the RI is to determine the horizontal and vertical distribution and concentration of PCDDs, PCDFs, PCBs, PAHs, pesticides, and metals for the NBSA sediments. Obtaining Phase I samples that extended to the 1940 sediment horizon in each geomorphic area was an important objective to achieve this goal. The 1940 horizon was not identified at 11 of the Phase 1 sampling locations. Thus, an objective of the proposed Phase II sampling program is to collect a second sample within 50 feet of these locations and collect the sample deep enough to encompass the 1940 sediment horizon. Deposition on the sediment surface that may be attributable to the HDP will not affect the deep sediments that are the target of these Phase II samples because they are below the biologically active zone (BAZ) and will remain undisturbed.

The Phase II RIWP notes that in general depositional rates were higher in the channels and lower in shallows and sub-tidal flats, but also identified some anomalies:

> "…*there were some anomalies noted within isolated regions of the Sub-tidal Flats. In such areas, anthropogenic features such as former channels, borrow pits, and utility crossings appear to have created preferential deposition areas that once existed in these locations, but have since filled. Such features have been shown by the radiochemistry data to be highly depositional. This was an unexpected outcome, and one that will require further investigation."*

To identify areas which have been highly depositional in the past, and thus, may contain sediments which contain historical records of contaminants depositing in the NBSA over time, an evaluation of the geomorphologic changes in Newark Bay was conducted (USACE 2007). Figures of the bathymetry and shoreline representing selected key timeframes within the Bay were prepared. Timeframes included 1855, 1917, 1934[9], 1969, 2005, and 2012, representing post-HDP construction, as shown in Figure 4-1. Of particular interest are the bathymetric changes that have occurred since 1940, the time period considered to represent possible contamination from the Diamond Alkali Superfund Site. Figure 4-2 was prepared by overlaying the current bathymetry on figures of historical bathymetry. Darker shades of gray indicate areas that were once deeper, but have filled in with sediments. Depending upon the time over which deposition occurred and amount of disturbance to the area during the deposition of sediments, these areas may provide a historical record of contaminants in suspended solids of Newark Bay.

The time-lapse representation in Figure 4-1 demonstrates that while channels have altered the configuration of Newark Bay, the flats retain many features that were present in 1855. These features have persisted despite changes in the channels. This observation implies that the net sedimentation in the flats is exceedingly low, comparable to the rate of sea level rise over the period (*i.e.*, the flats are in dynamic equilibrium to the water column depth).

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[9] 1934 bathymetric survey is the most comprehensive bay-wide survey.

Figure 4-2 identifies general areas with greater than 5 feet historic sediment deposition. The figure demonstrates that the HDP may, in some isolated locations, remove some thicker historical sedimentary deposits that may be useful for characterizing the historic deposition within the NBSA. However, most areas likely to contain substantial historical sediment deposits are outside the boundaries of the HDP and will not be directly affected by the continued HDP construction.

Specifically, the continued HDP construction would widen and deepen the existing South Elizabeth Channel into an area with possible historic sediment deposits (see area 10 on Figure 4-2), thus removing these sediments and any useful historic contaminant information that they may contain. The 1966 NOAA chart indicates that a privately constructed channel (Allied Signal) existed in this area prior to completion of the Port Elizabeth Terminal. Dates on the chart suggest that the channel was constructed or was in existence in 1959. Sediments in this location are likely to have been disturbed during the initial construction of the South Elizabeth Channel or during the most recent deepening of the channel to a navigable depth of -45 feet MLW in 2004. Since construction of the channel, sediments are likely to have been suspended and redeposited many times as vessels entered and exited the South Elizabeth Channel. Thus, the sedimentary deposits in this area may have been anthropogenically disturbed and therefore difficult to interpret correctly. For this reason, the value of sediments in this location to the RI is limited, and any further possible disturbance by HDP would have little impact in sediment that would be useful to the RI.

Figure 4-2 also identifies many other areas in the NBSA that may have relatively thick sedimentary deposits during the time period in question for the RI/FS. As noted earlier, the majority of these historical depositional areas are not located near active federal channels (i.e., federal channels which are either undergoing HDP construction or that are likely to be maintenance dredged). If additional historic data is needed in future Phases, these areas could be sampled, as they would not be impacted by dredging. Further, sediment samples in these locations may have greater value to the RI for a number of reasons. First, sediments in these areas may provide a longer historical record than the sediments that will be removed by widening the South Elizabeth Channel. Second, sedimentary deposits further distant from the active navigation channels are less likely to suffer from possible anthropogenic disturbance. Third, data indicate that at a number of these locations the historical sedimentary deposit may be considerably thicker, thereby making the correlation between time of the sediment deposit and the contaminant concentration in the sediment easier.

Several of the areas with possible historic sediments were sampled in Phase I as a result of prior coordination between USACE and USEPA. These will be sampled again in Phase II to deeper depths (see areas 4, 5, 8, and 12 on Figure 4-2). In recent coordination, a number of new locations that have been identified by USACE were provided to USEPA. These may also be sampled during Phase II.

Goal 2 of the RI is to determine the primary human and ecological receptors of chemicals of possible concern (COPCs) in the NBSA. Sampling associated with this goal will be based upon a Human and Ecological Risk Assessment Plan to be developed by USEPA.

Goal 3 of the RI is to determine on-going sources of contamination and to confirm the impact to select areas of Newark Bay believed to be affected by current or historic sources. Phase II sampling continues the Phase I program by sampling at seven locations: one along the industrial waterfront in the flats, south of South Elizabeth Channel (location 082), and 6 samples in tributaries to the southern Bay. The locations outside of the NBSA were identified for purposes of source identification and have not been sampled previously. Thus, no surface sediment data are presently available for these locations. For the one sample in the NBSA that does not have existing surficial sediment data from Phase I, the Phase I sample closest to this new location was used to estimate the change in concentration that might be attributable to construction of the HDP.

At the time of preparing this EA and as noted above, several additional sampling locations have been identified by the Corps and other agencies and are reflected in the consolidated comments on the draft NBSA Phase II RIWP. The final number and location of these samples are expected to be finalized in spring of 2007 with sediment sampling in the summer 2007. Further phases of sampling may be performed thereafter as part of the RI. As such, an evaluation of these future sample stations is not possible at the time of this EA. However, as demonstrated in the following sections, and based upon the general distribution and deposition attributable to the continued HDP construction onto the surrounding sediments in the NBSA, the likelihood for substantial modification of sediment samples taken in the NBSA in the future in any areas outside of the HDP is low (Letter from Mr. Pavlou to Col. Tortora, Appendix 5).

4.3 Impact to Contaminant Concentrations in Surface Sediments

4.3.1 Resuspension and Deposition of Dredged Material from the HDP

4.3.1.1 Model Description

The Particle Analysis (PA) module of the Danish Hydraulic Institute (DHI) MIKE3 modeling suite was used to simulate the transport and deposition of suspended sediment released by HDP dredging operations in the NBSA (Appendix 1). The MIKE3 PA module tracks a finite number of particles released from a given location in Newark Bay over time based on the descriptions of currents and water levels from a hydrodynamic model. The hydrodynamic component of the MIKE 3 model was developed, validated, and applied previously in the 1999 Final EIS (Appendix 1). Each particle represents a certain mass of resuspended sediments and each particle has similar properties to the sediments represented (i.e., settling velocity, deposition, and resuspension characteristics). The distribution of sediments throughout the Bay may be estimated by recording the number of particles which deposit in each model cell.

The MIKE3 PA model estimated the mass of sedimentation (redeposition) of particles released by the dredge, which was converted to depth or thickness based on the density of Newark Bay sediment samples collected by Tierra Solutions. At representative locations throughout Newark Bay (i.e. navigation channels), sediment particles were released through the water column at a mass rate estimated to match the expected loss rate for the dredge plant. The amount of resuspension, reported as percent of in situ mass, has been the subject of numerous studies and publications. For mechanical dredging of silts and clays, the available literature reports release rates between 0.1% and 9% (open clamshell bucket) (Bolen, 1979; National Academy, 1997; Hayes and Wu, 2001; National Research Council, 2006). Enclosed clamshells are at the lower end of this range and are estimated to reduce release by a factor of 2 over open clamshells (NRC, 2006). Release estimates vary widely depending on type of dredge, type of sediments, rate of dredging, condition of substrate, location of measurements, and analytical methods. A conservative estimate of 3% (upper-end of estimated values for enclosed clamshells) was selected for implementation with the Newark Bay resuspension model. Also, it was used in this analysis because it was recommended in the Declaration of Frank Bohlen in support of Plaintiff's request for injunctive relief.

The MIKE3 PA module does not estimate nor include background Total Suspended Solids (TSS) in its results; thus the deposition or erosion shown by the model output is the change associated with the suspension, transport and redeposition of material only from the dredge scenario(s) modeled. Any additional effects of background TSS are addressed in the cumulative assessment (Section 5).

4.3.1.2 Model Approach

The base bathymetry used in the model represents conditions after completion of the S-KVK-2 and AK-2/3 contracts, i.e., KVK depths at 53 feet, AK depths at 43 feet as currently exist. The Newark Bay depths are representative of fall 2005 conditions.

Two mechanical dredge types are anticipated for the HDP dredging. An environmental closed clamshell bucket shall be employed for recently deposited black silt. The black silt represents recently deposited material which is more likely to contain contamination and is therefore not suitable for placement at HARS and thus designated for upland disposal. Black silt quantities were determined from several sources: pre-dredging geotechnical samples, sub-bottom profiles, surveys of the existing conditions and surveys taken after the previous round of deepening as well as side-scan sonar. These sources provide information regarding the footprint and thickness of the silt and other layers. These thicknesses are used to create an isopach map (i.e. contour map of silt thickness), which is used to calculate the volume of black silt.

An excavator dredge or clamshell dredge shall be used for HARS-suitable clays, sands, and gravel. For the S-NB-1 contract area, approximately 1/3 of material will be removed with environmental clamshell, and 2/3 with an excavator dredge or clamshell. The release rates from the excavator dredge are expected to be less than the environmental clamshell due to the high degree of consolidation or hardness of the in-situ sediment, even after taking into account the reduced sediment loss rate from an environmental clamshell. The volumes of material to be removed were obtained from USACE plans and specifications (Table 4-1).

Table 4-1: Projected Environmental Clamshell Dredging and Loss Volumes

Model Subarea (see Figure 4-1)	Total Environmental Clamshell Dredging (cy)	Modeled 3% Volume Loss(cy)
S-E-1(A)*	414,289	12,429
S-E-1(B)*	215,111	6,453
S-E-1 TOTAL	**629,400**	**18,882**
S-NB-1(A)*	143,164	4,295
S-NB-1(B)*	219,622	6,589
S-NB-1(C)*	214,514	6,435
S-NB-1 TOTAL	**577,300**	**17,319**
S-NB-2(A)*	129,138	3,874
S-NB-2(B)*	200,594	6,018
S-NB-2(C)*	97,068	2,912
S-NB-2 TOTAL	**426,800**	**12,804**
S-AK-1 TOTAL	**120,600**	**3,618**
S-AK-2 TOTAL	**59,100**	**1,773**
S-AK-3 TOTAL	**21,000**	**630**

Note: Values estimated based on proportion of total area. The total volume estimates were provided by USACE. Since the completion of the modeling and chemical analysis the S-NB-1 plans and specifications were completed. During this process the quantities were refined which resulted in a decrease in dredge volume from 577,300 cy to 536,300 cy for this contract area. The revised quantities represent a reduction in volume of 7% in S-NB-1 and 2% for the HDP overall. This DEA does not reflect the decrease in volume; however, the results remain conservative.

The HDP contract areas that may influence the Newark Bay RI/FS (i.e., those contracts operational during the sampling) are: S-NB-1, S-NB-2, S-E-1, S-AK-1, and S-AK 2/3 (Figure 4-3). To assess the transport of potentially contaminated sediments, it is important to trace the path of sediments resuspended from distinct parts of the bay. To that end, each contract area is further subdivided into 2-3 subareas where each subarea is modeled as an individual simulation in MIKE3 PA. Subareas were selected based on similar geomorphic area or dredging type. For instance, the channel widening on the south side of South Elizabeth Channel (S-NB-2(B)) has been assigned a distinct area because this area is primarily new work, excavating an historic berth where sediments may have deposited during the last 50 years.

The model simulates each source (dredge) released particles at varying water depths on a regular cycle to simulate the vertical release distribution of a bucket cycle. The model traced the concentration of particles over the model grid as well as the location and number of particles which settle within each 75 x75m grid cell. Each source also "walks" during the simulation to neighboring grid cells (75m apart) at about 1.5 day intervals so that dredge sources spend an equal duration over each grid cell within the dredging subarea. Each simulation consisted of a 2-week period, encompassing a typical spring-neap tide cycle. The results were scaled to represent the total volume excavated from the subarea over the life of the HDP.

The model tracks the release of particles from the dredge source, the transport by tidal currents, and the eventual deposition to the bed. The model output is given in kg/m^{2} (mass per area) over the domain of the model grid. The model output for each subarea is scaled to represent the total mass of dredging in the subarea estimated for the HDP. The redeposited mass is then converted to depth using the dry density of newly deposited sediments in Newark Bay.

In situ density of sediments was based on cores collected by USACE and EPA in the channel dredge prism between 1998 and 2005. Cores results displayed distinct difference in density (albeit with significant scatter) between the recently deposited surficial sediments, the consolidated sediments of Newark Bay and Arthur Kill. The in situ dry bulk density for the dredged areas was applied as follows: 1500 kg/m^{3} (mass per volume) for Newark Bay channels and Arthur Kill (NB, SE, E, and AK contract areas) HDP material and 800 kg/m^{3} for maintenance dredging material (regardless of location) It is necessary to compute the depth based on dry density to account for the fact that the deposited solids comprise only a fraction of the sediment layer they form. See Appendix 2 for detailed analysis of sediment cores.

To compute the overall estimated sedimentation due to the HDP contracts, the results of the individual simulations were superimposed (additive) resulting in a maximum depth for the life of the project.

4.3.1.3 Model Calibration and Validation

The MIKE3 model was calibrated and verified using TSS measurements from recent monitoring of HDP dredging conducted in the North of Shooters Island Reach in June 2006 and berth dredging in South Elizabeth Channel in July 2006 (Appendix 3). The dredge operating at the site used a closed environmental Cable Arm bucket configured for navigation dredging with an 18-cubic-yard capacity. The production rate varied between 114.8 cubic-yards per hour to 257.7 cubic-yards per hour on average (Appendix 3).

TSS sampling was designed to determine the spatial dimensions, concentration gradients, and temporal dynamics of the suspended sediment plumes associated with mechanical dredging operations and ambient conditions in the main navigational channel of the Arthur Kill (USACE 2006, Appendix 3 in this EA). For all plumes surveyed, a general pattern was apparent for relatively rapid plume concentration gradient decay and settlement within the water column. Plumes exhibited minimal lateral diffusion with distance traveled down-current, seldom measuring more than 70 meters wide at substantial concentrations. Maximum spatial extent of the plumes always occurred in the lower water column. Movements of plumes were generally confined to the basin of the navigation channel, with no evidence of excursion beyond the channel side slopes (Appendix 3).

The model calibration accurately projected the depth- averaged peak concentrations and spatial extent of the measured TSS plume (Appendix 1).

The calibration of the model was verified by comparing the model results to a second, independent dredge event without adjusting model parameters. The second measurement program was conducted at the Elizabeth Berth area over three ebb periods (July 10-11, 2006) during which the overall average production rate was 238.6 CY per hour. The model predictions compared well with measured values (Appendix 1).

4.3.1.4 Deposition from Dredging

Appendix 1 provides figures of the individual model simulations at different locations throughout the HDP. Figure 4-4 presents the composite effect of the remaining HDP project in Newark Bay (2,423,000 CY of dredged material over the next 5 years). The cumulative effects over that period of time, from other dredging, including maintenance and HDP, are discussed in Chapter 5. The chemical assessment of existing and post-HDP surficial sediments which uses the results from the model can be found in Section 4.3.2.

The deposition of resuspended sediments may be summarized by looking at three designated geomorphic areas in Newark Bay: the channel bottoms, transitional zones between channels and undredged flats, and the flats.

Flats: Over the life of the HDP, the mean deposition predicted to occur on the flats is less than 0.8mm (0.03 inch). The variability of deposition is predicted to range between 0.0mm and 44mm (1.7 inches). The flats represent more than 75% of the surface area of the NBSA.

Navigation Channels: The majority of the resuspended sediment is predicted to deposit within the channel limits in the immediate vicinity of the HDP dredge areas. There are two mechanisms at work which focus the majority of deposition on channel bottoms: 1) the sediments which have a higher settling velocity (aggregated sediments) or are released close to the bottom will have a tendency to quickly deposit near the dredge; and, 2) the depth of the channels generally prevents suspended sediments from rising over the side slopes and the sediments remain confined in the channels. Only fine sediments released high in the water column have a high potential to be transported and deposited in the shallows of the Bay. Mean deposition in the channel was 10.0mm (0.4 inches) with variability between 0.0mm and 82.3mm (3.3 inches).

The area of largest predicted sediment deposition thickness on the channel bed is on the southern edge of South Elizabeth Channel (S-NB-2(B)), which can experience redeposition on the order of 80mm (3.1 inches) over the term of dredging. This area is a zone of channel widening, where large amounts of sediment will be dredged over a relatively small area and in shallow water; therefore, the near field deposition is greater than in areas where existing depths are closer to the

50-foot project depth. Elizabeth Channel (S-E-1(A)) also experiences some of the largest sedimentation deposition, 50-60mm (2.0 – 2.4 inches). Currents in Elizabeth Channel are very low and therefore resuspended sediments tend to deposit in the immediate vicinity of the dredge.

Transition Zone: The model shows that sedimentation greater than 2mm is generally found adjacent to the channel boundaries (i.e. transition zones) and the nearby shoals (between South Elizabeth Channel and Arthur Kill, and over the Newark Bay CDF). However, these areas represent less than 2% of the total area modeled. Mean deposition in transition zones was 7.7mm (0.3 inch), with variability between 0.0mm and 60.9mm (2.4 inches).

4.3.2 Effect of the HDP on Contaminant Concentrations in Surface Sediments

4.3.2.1 Chemical Assessment Approach

Dredged material may affect the RI/FS by changing the concentrations of contaminants within the surface layer of sediments being analyzed in the RI/FS. Measuring contaminant concentrations in surface sediments is a typical and an important component of any contaminated sediment evaluation. The NBSA Phase I program included sampling of surface sediments, and future phases are likely to include additional sampling of surface sediments.

Potential impacts of the HDP to the RI/FS are due to the resuspension of dredged material with contaminants, its dispersal throughout the bay due primarily to tides and storms, and then the re-deposition of this material and its contaminants on the surface of the bay sediments. In some cases, the dredged material (DM) may exhibit higher contaminant concentrations than the existing surface sediments, and in some cases, lower concentrations. Both of these situations could potentially alter any conclusions made by the RI/FS and are therefore addressed in this chemical assessment, since in both cases future USEPA sediment samples may exhibit contaminant concentrations different from those that would be observed without the HDP.

The EA addresses potential effects that may occur throughout Newark Bay. This includes areas of the flats that lie adjacent to the channel and that are not disturbed directly by the dredging. These areas are likely to experience more redeposition of DM than other areas of the flats, due to their proximity to the source of the material.

The HDP includes widening of some parts of the channel and expanding the channel footprint of the deeper channels. This results in the removal of material from the existing channel side slopes. Some of this material has either not previously been dredged, or has not been dredged in many years. It is possible that some of these areas could contain sediments with areas of elevated chemical concentrations (hot spots) that have not been previously discovered and would therefore affect any analysis done for the RI/FS. This EA includes an analysis to evaluate potential impacts if such areas are exposed.

The first step in the analysis involved computing the amount of deposition due to the HDP throughout the bay. Second, the affect of this deposition on chemical concentrations in surface sediments was calculated to determine the significance of the impact.

The amount of deposition was predicted using the MIKE3 particle tracking model. The model provided estimates of the total mass of sediment redeposited throughout the bay after dredging for the HDP, in the form of mass of dry sediment per unit area (kg/m^2 Figure 4-4). The thickness of deposition was calculated by dividing this computed mass by the dry bulk density value (kg/m^3; estimated from the NBSA RI/FS Phase I data (Appendix 2). These results were provided on a 75m X 75m grid. Results for all grid elements are displayed in Figure 4-4. The right hand panel shows the interpolated sediment deposition model results. The left hand panel presents the same results individually for each model sediment grid cell. This panel presents the information used in all subsequent calculations. Each circle represents the results for a corresponding model grid cell. Grid cells along the sides of the channels represent transition zones.

The second step in the analysis involved mathematically combining the contaminants in the newly deposited HDP material with contaminants in the existing surface sediments to predict contaminant concentrations in future post-HDP surface sediments. This analysis was performed using the top six inches of the sediment bed to represent surface sediments; which is the thickness of the surface slices of the NBSA RI/FS Phase I cores (Figure 4-5). The information required for this step included the depth of the deposited dredged material (described above), contaminant concentrations in the dredged material, and contaminant concentrations in existing surface sediments.

Sediment chemical data collected in Newark Bay were used to estimate concentrations in dredged material and in surface sediments. The chemical data included historical measurements performed by a variety of agencies (most of which was reported in the Remedial Investigation Workplan for the Newark Bay Study Area); sediment cores collected by the USACE for the purpose of characterizing dredged material for evaluating disposal options; and cores collected in October – December, 2005 as part of the NBSA RI/FS Phase 1 sampling. Together, these data include the best available sediment data for Newark Bay and adjacent tidal straights, and thus are considered sufficient for the purposes of assessing the potential impacts on the NBSA RI/FS by the HDP. These data include multiple sampling locations within each geomorphic area and geographical region within the Bay (Tierra Solutions 2004 and 2006). Further, data are available from the sediment surface and at depth, in each of these areas. Thus, concentrations of chemicals within each dredge area and potential impact area are characterized by representative distributions. To the extent that there are areas with concentrations of chemicals in sediments that fall outside of the distributions characterized by the existing data, these areas would be limited in spatial extent (between existing data points).

To estimate contaminant concentrations in the dredged material, the depth-integrated concentration of each contaminant was calculated for each core (Appendix 2). Thiessen polygons[10] were then created to provide estimates for the entire area to be dredged. Using TCDD as an example, Thiessen polygons of the depth-integrated concentrations are presented in the left-hand panel of Figure 4-6. In this figure, concentration was indicated with color intensity. For presentation, the data were grouped into five color intensities with cutoff values between colors based upon the distribution of the data. Cutoffs were set equal to approximately the 25th, 50th, 75th and 90th percentiles of the data. The percentiles characterize the statistical spread in the chemistry data; they do not represent significance in effects or impacts. Although the figures group data to allow a clear visualization of the data and its distribution through the NBSA, actual chemical values were used in the analysis. The actual data are provided in Appendix 2.

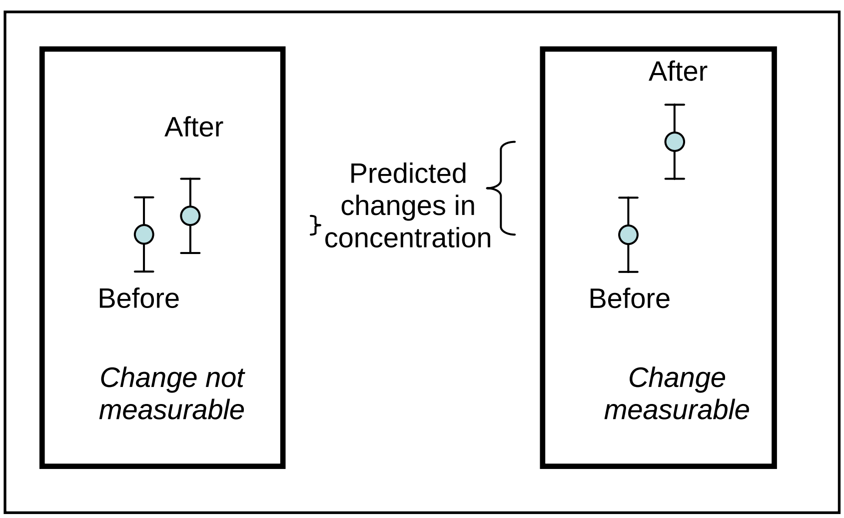
[10] Thiessen polygons are a set of adjacent polygons that cover the entire area, one polygon for each data point. All locations within a given polygon are closer to the data point within the polygon than to any other data point.

To estimate contaminant concentrations in existing surface sediments, Thiessen polygons were created using the surface sediment data. Surface sediment chemistry was determined from core samples collected from the top six inches of the sediment bed. This includes all surface samples of the NBSA RI/FS Phase I data, as well as historical data. The surface sediment concentrations are presented in Thiessen polygons of all areas not to be dredged in the right-hand panel of Figure 4-6. The analysis was performed for the following chemicals of concern; 2, 3, 7, 8-TCDD, total PCBs, total DDT (pp-DDT, pp-DDE, and pp-DDD), benzo (a) pyrene (BAP), mercury, and chromium.

4.3.2.2 Assessment of Significance

Anticipated changes in chemical concentration are significant only if they can be measured. Perspective on the significance of the projected effects of the HDP can be provided by comparing the computed changes in concentration with the uncertainty in the surface sediment concentrations. For example, if one could collect one core before and one core after dredging in exactly the same place, and if the difference between them was too small to be measured because of data uncertainty, then by definition there would be no measurable impact on the RI/FS.

To visualize an example, in the diagram below, pairs of points representing average concentrations measured before and after dredging are presented, along with error bars representing data uncertainty. In the panel on the left, the predicted change in concentration is less than the precision of the data; pre- and post-dredging data would not be noticeable. In the figure on the right, the difference would be noticeable.



The NBSA RI/FS Phase 1 dataset provides a series of field duplicates which can be used to estimate uncertainty. These were prepared in the field by mixing a double portion of a sample and placing equal aliquots of the homogenate in two sets of glassware for laboratory analysis[11]. After eliminating pairs of non-detects, between 13 and 20 pairs of duplicates remained in the analysis for the six chemicals. The data for the duplicates are presented in Table 4-2.

To compare the estimated data precision with the computed changes in concentration, a value termed the relative percent difference (RPD) was used[12]. First, the relative percent difference of each of the duplicate pairs for each chemical was calculated: this equals the difference between the duplicates, divided by their average. The measure of uncertainty used here was the upper 95th percentile of the mean of these duplicate RPD values: projected changes less than this were considered indistinguishable. This value is called the "uncertainty threshold" (UT) and was calculated using Land's method for lognormal populations (Gilbert 1987, Land 1972).

Next, the RPD associated with the projected change in contaminant concentration was calculated for each model grid cell and was compared to the UT; this equals the difference between the existing surface sediment concentration and the predicted post-HDP surface sediment concentration, divided by the existing value. Model cells with RPD values greater than the UT were identified as having projected changes greater than the uncertainty in the data. These cells were mapped, and the significance of these changes is discussed below and in Appendix 2, taking into account the actual contaminant concentrations, as well as the magnitude of the projected change in concentration.

The data for the duplicates and their associated UT values are presented in Appendix 2 and Table 4-2. The distributions of the RPD values are presented graphically in Figure 4-7.

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[11] Twenty pairs of duplicate samples were collected by Tierra. Duplicate pairs in which both samples were non-detect were not included in the analysis. Duplicate pairs in which one sample was below the limit of detection were included, and the non-detect value was set equal to one-half the detection limit.

[12] The RPD is a common measure of precision. Note that the RPD is used in the NBSA Phase 1 data program to assess the analytical precision of the data (Tierra Solutions 2004, Section 5.2.2.1).

Table 4-2: Calculation of the UT of RPDdup

	Count	Mean RPD	Standard Deviation of RPD	Median RPD	Maximum RPD	UT
2,3,7,8 TCDD	17	29%	28%	22%	100%	41%
Total PCBs	20	39%	61%	13%	200%	60%
DDT	13	19%	23%	10%	75%	30%
Benzo(a)pyrene	17	20%	19%	12%	55%	28%
Mercury	20	22%	30%	11%	140%	31%
Chromium	20	10%	7%	9%	25%	13%

Notes[(1)] Values used to calculate the UT using Land's method (Gilbert 1987, Land 1972)

4.3.2.3 Presentation and Results of Sediment Chemistry Analysis

Results of the sediment chemistry assessment are presented in several ways in order to provide both a quantitative evaluation of projected effects of the HDP and their significance, as well as a more qualitative presentation that shows the geographic pattern of changes and how changes are distributed among the different geomorphic areas of the Bay. The detailed analysis and results are presented in Appendix 2. Predicted contaminant concentrations are summarized in Figures 4-8 through 4-13. For each chemical, the first figure (Figures 4-8a through 4-13a) presents concentrations in surface sediments prior to dredging (left-hand panel) and predicted post-dredging concentrations (right-hand panel) for each model grid cell. The pre-dredging values in the left-hand panel of the Thiessen polygon figure for TCDD (Figure 4-8) are the same as in Figure 4-6, except that in Figure 4-8 values are presented on the model grid instead of the polygon grid.

In the second figure for each chemical (Figures, 4-8b through 4-13b), the difference between pre- and post-dredging concentrations is presented for each model grid cell (pre-dredging minus post-dredging; thus, a positive value indicates an increase in concentration) and a negative value is a decrease in concentration. Similar to the concentration figures, values are color-coded for presentation; purple represents the maximum increase in concentration and brown represents the maximum decrease in concentration[13].

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13 Differences in color intensity indicate the extent of change expected; for each chemical, the groups are approximately equal to one-half and one-tenth of the 25th percentile of the entire data set. The same concentration ranges were used in all figures for each chemical. Note that the groups were selected for presentation only; they are not based upon risk.

In the third figure for each chemical (Figures 4-8c through 4-13c), there are three separate panels. The left-hand panel illustrates the actual difference between current and projected concentrations after construction of the HDP for each model grid cell. The data are presented as the quantitative relationship between pre- and post-dredging concentrations on a grid cell-by-grid cell basis in the form of a crossplot. The pre-dredging (current) concentration of each contaminant is plotted on the horizontal axis and the predicted post-HDP concentration is plotted on the vertical axis. The 1:1 line is drawn to indicate where the predicted data and actual data would be if there were no change in concentration. Thus, points on the line show no change, points below the line represent a decrease in concentration following HDP; points above the line represent model grid cells in which post-HDP concentrations are projected to be higher than existing conditions. The dashed lines represent the uncertainty threshold (UT). Symbols that lie outside of the bounds of the dashed lines represent model grid cells which are predicted to change in concentration more than the UT; these are indicated in pink.

The middle panel presents an expanded version of the lower values of the left panel. The right-hand panel provides a map of Newark Bay in which the pink cells in the left and middle panels are indicated. This presentation shows were contaminant concentrations are expected to change by more than the uncertainty in the data.

4.3.2.4 Results: Chemical Effects of the HDP on Sediment Chemistry in NBSA Channels

The channel bed is an environment that is disturbed on an ongoing basis, containing sediments that are physically mixed due to tides, storms, periodic dredging and daily ship traffic. The channels planned for deepening have been dredged previously to depths below the layer deposited during the industrial period (Table 2-1). Thus, much of the silt in the channel has been deposited since the last dredging event; the HDP will remove these silts as well as underlying pre-industrial sediments. Following the HDP, the residual sediments in the channel will be a mixture of these materials as well as newly deposited silt that will quickly cover the bottom.

These processes will lead to post-HDP contaminant levels that are similar to current conditions. Consequently, chemical changes in HDP channel sediments were not analyzed. Changes within channels not lying within the NBSA were predicted, however. These results are discussed below.

4.3.2.5 Results: Chemical Effects of the HDP on Sediment Chemistry on Flats, Transition Zones and Channels

Concentrations of TCDD exhibited little change throughout the NBSA (Figures 4-8a and b). Only two cells out of a total of 2,380[14] (0.08%) cells changed color groups (Figure 4-8a). Most of the changes in concentration occurred in the northern portion of the navigational channel, and in southern Newark Bay alongside the channel. These areas coincided with cells of greatest deposition (Figure 4-8b). All computed changes in concentration that were great enough to appear in Figure 4-8b were decreases in concentration.

In the quantitative evaluation, only 10 cells out of 2380 (0.4%) had predicted changes that were greater than the uncertainty of the data (Figure 4-8c and Table 4-3). All but one of these cells was located at the northern end of the HDP; these were located within a polygon which contained a sample with a very low TCDD concentration. All of the predicted changes that were greater than the uncertainty in the data were increases in concentration (Figure 4-8c). These concentrations were predicted to remain below 5 ng/kg after the HDP is complete, considerably less than the overall median TCDD concentration in the bay, which was approximately 50 ng/kg. Thus, nearly all of the predicted differences throughout Newark Bay were within the precision of the data, and changes greater than the precision of the data were small absolute changes at low concentrations.

Changes in sediment concentrations of other contaminants are visualized in figures like those discussed for TCDD and discussed in Appendix 2. Results are summarized in Table 4-3.

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[14] 2,380 model sediment cells lie within the surface sediment polygons.

Table 4-3: Summary of Results: Number of Model Grid Cells Changing By Specific Amounts

Contaminant	2,3,7,8-TCDD ng/kg	Total PCBs mg/kg	Total DDT mg/kg	BAP Mg/kg	Mercury mg/kg	Chromium mg/kg
Number of Grid Cells changed more than UT	10	12	25	36	10	3
Percent of Grid Cells changed more than UT	0.42%	0.50%	1.05%	1.51%	0.42%	0.13%

For all contaminants there were few predicted changes in chemical concentrations in the NBSA that were greater than the uncertainty threshold. These tended to be located within or adjacent to the navigational channel at the northern tip of the HDP (TCDD and PCBs) and along the Arthur Kill (DDT, Hg). For BAP, the changes that were greater than the UT were all associated with one data value in the Kill Van Kull. For TCDD, PCBs, BAP and mercury, changes greater than the precision of the data occurred only in locations where the data indicated very low surface sediment concentrations, and the predicted changes in concentration were relatively small. A few model cells with midrange DDT and chromium concentrations changed to an extent greater than the precision of the data. Thus, for nearly all of Newark Bay, predicted changes in concentration lay within the precision of the data. This lack of widespread effects was due to the fact that contaminant levels in the channels were generally similar to levels in the surface sediments. This similarity also explains the observation that changes greater than the precision of the data were generally increases and generally occurred in areas with relatively low surface sediment concentrations. Consequently, chemical concentrations in samples collected after the HDP are, with a few exceptions, not likely to be distinguishable from concentrations in samples collected prior. It is not probable that deposition due to the HDP will affect USEPA’s ability to interpret sediment samples from Newark Bay and would have no bearing on remedial decisions that may affect these areas.

4.3.2.6 Results: Chemical Effects of Uncovering Areas of Elevated Concentrations (AEC, hot spots) on Sediment Chemistry

This evaluation was designed to assess the effects of encountering unknown AECs (hot spots) in the transitional zone as the channel is widened during the HDP and previously undisturbed sediments removed.

The transition zones comprise approximately 15% of the volume of dredged material, based upon estimates available for dredge contract area S-NB-1 (total dredge volume = 580,000 CY; slopes = 90,000 CY). To estimate the impact on the overall concentration of contaminant in the dredged material, it was assumed that one entire edge of the dredged area (approximately equal to ½ of the total slope volume, or 7.5% of the dredged material) was contaminated at the elevated concentration.

Elevated concentrations were estimated using the NBSA RI/FS Phase I samples. In the absence of data adjacent to the channels that could be used to represent AECs, and acknowledging the limitations of the available data, the "elevated concentration" was set equal to the 90th percentile of all data collected south of the northern tip of the HDP. This analysis is designed to be conservative, as the data used to compute the 90th percentile included all NBSA Phase I data as well as historical data collected within approximately half of Newark Bay and at any depth including previously dredged core locations.

The results of the transitional zone analysis are presented in Figures 4-14 through 4-19, which are structured the same as Figures 4-8a through 4-13c, and Table 4-4. All details of the analysis, data and supporting presentations are provided in Appendix 2.

For TCDD, effects on surface concentrations were similar to the HDP evaluation discussed above. Twenty-six model grid cells had predicted changes that were greater than the uncertainty in the data, compared with 10 cells in the HDP evaluation (Figure 4-14). As in the HDP evaluation, most of these were located at the northern tip of the HDP. Changes were observed in a small number of model grid cells in the Kill Van Kull. As in the HDP-only case, all of the changes that were greater than the uncertainty in the data were increases in concentration, and occurred in areas with low current TCDD concentrations (Figure 4-8c, left and middle panels). Furthermore, in all areas showing potentially noticeable increases in concentration, concentrations were predicted to remain below 10 ng/kg after the HDP is complete.

Changes in sediment concentrations of other contaminants are visualized in figures like those discussed for TCDD and discussed in Appendix 2. Results are summarized in Table 4-4. Few predicted changes in concentration were greater than the uncertainty threshold (ranging from

0.08 to 1.60% of the model domain), similar to the HDP evaluation. The spatial distribution was generally similar to the HDP evaluation, although more increases in concentration were observed than in the HDP evaluation, as was expected. Thus, chemical concentrations in samples collected after the HDP are not likely to be distinguishable from concentrations in samples collected prior. It is not probable that deposition due to the HDP will affect USEPA's ability to interpret sediment samples from Newark Bay and would have no bearing on remedial decisions that may affect these areas.

Table 4-4: Comparison of Concentration Changes Computed by the Model with Data Precision as Measured with the NBSA RI/FS Phase I Data Field Duplicates

	2,3,7,8 TCDD	Total PCBs	DDTs	Benzo(a)pyrene	Mercury	Chromium
Percent of grid cells projected to change in concentration more than the uncertainty threshold						
AEC Analysis	1.09%	1.13%	0.92%	1.60%	0.50%	0.08%

(1) Relative percent difference, unitless

4.3.2.7 Results: Chemical Effects on Sediment Chemistry at Proposed NBSA RI/FS Phase II Locations

USEPA and Tierra Solutions are currently developing a Phase II sediment sampling program for the RI/FS. In the Draft Phase II work plan, Tierra Solutions identified a total of eighteen (18) sediment sampling locations (Figure 4-20). Eleven (11) of these were previously sampled during Phase I activities and the Phase II cores will be collected within 50 feet of their associated Phase I locations. Two (2) additional cores represent new sampling locations within selected Industrial Waterfront Areas. The Five (5) remaining proposed Phase II cores are located outside of the limits of the NBSA and were not considered further for chemical evaluation. Additionally, USACE proposed the collection of samples from 15 other locations within the NBSA (Figure 4-20).

The chemical evaluation for the proposed NBSA RI/FS Phase II samples was conducted using the same methods as the HDP chemical evaluation. The changes computed to occur within each of these model grid cells are listed in Appendix 2. Out of 168 comparisons (6 chemicals X 28 sites), two values were computed to change from existing concentrations by more than the precision for the Phase II data; one value for mercury and one for DDT. The changes for both chemicals were predicted to occur along the shoreline of the Arthur Kill (USACEP2-14) (Figure 4-20). These were the result of low existing concentrations, as measured in the closest core (39_PRP-99-01). The mercury concentration changed from 0.016 to 0.026 mg/kg; both of these values are considerably lower than the median concentration in surface sediments (approximately 2.0 mg/kg). The DDT concentration changed from 0.001 to 0.003 mg/kg; both of these values are considerably lower than the median concentration in surface sediments (0.05 mg/kg). The concentrations changed by a relatively small amount in absolute terms, but because the estimated existing concentrations are low, the change exceeds the precision of the data. Thus, overall, predicted changes in surface sediment chemical concentrations are anticipated to be minimal. This analysis can be repeated for future revised sampling plans for the NBSA to help EPA locate sampling sites.

For the AEC evaluation, out of 168 comparisons (6 chemicals at 28 sites), two values were computed to change from existing concentrations by more than the precision of the data. These were the same chemicals at the same location as the HDP evaluation. The significant changes were also the result of low existing chemical concentrations, relative to the overall distribution. Thus, overall, predicted changes in surface sediment chemical concentrations are anticipated to be minimal.

4.3.2.8 Sediment Chemical Analysis Summary

The analysis presented above showed that after the HDP is completed, projected chemical concentrations in Newark Bay sediments are not likely to be distinguishable from current sediment concentrations, with few exceptions (Table 4-5).. In general, those few changes that are greater than the uncertainty in the data are likely to be only slightly greater. Variation in the data is sufficient to obscure potential changes in contaminant concentrations. Therefore, it is not probable that deposition due to the HDP will affect USEPA's ability to interpret sediment samples in Newark Bay. Potential impacts may be further avoided and mitigated through coordination of sampling and dredging between the USEPA and the USACE.

Table 4-5. Comparison of Concentration Changes Computed by the Model with Data Precision Measured with the NBSA RI/FS Phase I dataset Field Duplicates for HDP and AEC Analysis

	2,3,7,8 TCDD	Total PCBs	DDTs	Benzo(a)pyrene	Mercury	Chromium
Percent of grid cells projected to change in concentration more than the uncertainty threshold						
Post HDP	0.42%	0.50%	1.053%	1.51%	0.428%	0.13%
AEC Analysis	1.09%	1.13%	0.92%	1.60%	0.50%	0.08%

[(1)] Relative percent difference, unitless

Overall, few predicted changes in concentration were greater than the uncertainty threshold. This was true of the HDP evaluation and the AEC evaluation.

Flats: For all chemicals, in the HDP evaluation and in the AEC analysis, very few cells lying in the flats exhibited changes greater than the precision of the data. This is due to limited deposition and to the general similarity between contaminant concentrations in dredged material and in surface sediments on the flats.

Navigation Channel: Changes in contaminant concentrations in surface sediments were assessed in the channels that lie outside of the HDP; these extend from the Bergen Point area into Kill Van Kull and in the channels in northern Newark Bay, including Port Newark Channel. Predicted changes in concentration that were greater than the precision of the data were found within the navigational channel at the northern tip of the HDP (TCDD and PCBs). For BAP, the changes that were greater than the precision of the data were all associated with one data value in the Kill Van Kull.

Results were generally similar for the AEC analysis, with the following exceptions. For TCDD, changes that were greater than the precision of the data were also found in the Kill Van Kull. For DDT, a few cells in the channel in northern Newark Bay exceeded the precision of the data.

Transition zones: The transition zones were represented by the model cells adjacent to the channel. Predicted changes in concentration due to the HDP that were greater than the precision of the data tended to be found adjacent to the navigational channel at the northern tip of the HDP (TCDD and PCBs) and along the Arthur Kill (DDT, Hg). The few cells that showed changes in chromium levels greater than the precision of the data were located along the Port Elizabeth Channel. Results were generally similar in the AEC analysis.

5 CUMULATIVE IMPACTS

This section addresses the following deficiency identified in the March, 2006, O&O: *"The Corps failed to assess the cumulative impact of maintenance dredging on the RI/FS"* (page 60).

A cumulative impact is defined in 40 C.F.R. §15508.7 as:

> *The impact on the environment which results from the incremental impact of the action when added to other past, present and reasonable foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.*

This section provides both a qualitative and a quantitative analysis of the cumulative effect that the USACE's HDP, other dredging including maintenance, and Permits Program for the Clean Water Act Section 404 and Section 10 of the Rivers and Harbors Act of 1899 may have on the RI/FS for the NBSA which addresses one of the identified deficiencies by the Court.

5.1 Qualitative Evaluation: HDP in the Context of Sediment Dynamics in Newark Bay

To understand the incremental impact of the HDP, it is critical to have some understanding of sediment sources, resuspension and deposition in the bay. Large quantities of sediments enter the bay on an ongoing basis from the Passaic and Hackensack Rivers, from wastewater treatment plants and combined sewer overflows, and from the Arthur Kill and Kill Van Kull. Sediments are continually being resuspended due to tides and storms, as well as ship and barge traffic. In addition, dredging of the channels and berths has been performed on an ongoing basis for more than 100 years. As shown in Table 2-1, Newark Bay has been deepened many times in the past, and sediments that deposit in the channels have been removed repeatedly to maintain channel depth as part of ongoing O&M programs. Until recently, these dredging events were conducted without the benefits of closed environmental buckets and other Best Management Practices (BMPs) to reduce resuspension. Thus, qualitatively, the HDP is being conducted in the context of a disturbed environment exhibiting the movement of considerable amounts of sediment on an ongoing basis.

Comparing the volume of sediment that typically deposits in Newark Bay with the volume likely to be resuspended by dredging provides perspective on the contribution of both natural processes and anthropogenic actions on suspended solids.

The geochemical evaluation for the Lower Passaic River developed a mass balance for solids and contaminants in Newark Bay. This can be found on the website ourpassaic.org, under the title Geochemical Evaluation Step 2. The analysis followed the framework developed by Lowe et al (2005) and was updated by MPI to account for data collected for the Passaic River RI/FS. The same information is used here to compare the volume of suspended solids deposited in Newark Bay on an annual basis with the volume anticipated to be resuspended due to the HDP.

The total amount of solids typically accumulating in Newark Bay annually was estimated to be approximately 343,000 CY/yr (Lowe et al 2005). This was based on the long-term average rate at which sediments are removed from the channels of Newark Bay during maintenance dredging by USACE and PANYNJ. As detailed in Table 5-1, the total includes solids from various sources including the Passaic and Hackensack rivers and anthropogenic inputs from combined sewer overflows (CSO) and waste water treatment plants (WWTP).

The sediments released by dredging the HDP are estimated to be about 11,000CY/yr, similar to the volume attributable to CSOs and WWTPs. If all of the resuspended sediments deposit in Newark Bay, then the sediments raised by dredging the entire HDP represent about 3% of the annual net deposition that has occurred historically.

Thus the amount of suspended solids and deposition attributable to the HDP is small compared to the total solids flux and deposition that normally occurs annually in Newark Bay. Notably, extensive mixing of suspended solids occurs during tidal cycles each day as the loads from the tributaries and the Kills transit the Bay. This mixing is most thorough in the middle and southern end of the Bay, where the majority of the dredging will occur. As a result, potential changes in the chemical composition of surface samples that are predicted to be attributable to dredging are likely to be overwhelmed and masked by the chemistry attributable to normal solids flux, mixing and deposition in the Bay. That is, the incremental impact of the HDP is limited.

Table 5-1. Estimates of Solids Transported into Newark Bay. (from MPI 2006, Table 4-7)

Source	Solids (CY/YR)
Passaic	36,000
Hackensack	6,500
CSO/WWTP	10,500
Kill Van Kull & Arthur Kill	290,000
Total Net Transport	**343,000**

5.2 Approach to the Quantitative Analysis

The quantitative assessment is performed using the same methodology as was used to assess the impact of the HDP on contaminant concentrations in surface sediments; the analysis is extended to include additional dredging anticipated to occur over the next several years for other dredging, including maintenance, and other purposes.

To estimate the impacts associated with the HDP, other deepening projects, and maintenance dredging projects, the MIKE3 PA model was run using the same parameters used in the HDP assessment. This cumulative assessment included the material associated with the HDP, 117,000 CY of dredged material associated with deepening an area near S-AK-3 (Figure 4-3) to deepen the Arthur Kill to 43 ft, as well as estimated maintenance dredging volumes (see Appendix 1). The release points in the HDP assessment were expanded to include releases in the Port Newark Channels as this is where maintenance dredging occurs. The combined deposition attributed to the HDP and to the maintenance dredging was analyzed for its impact on chemical concentrations in the surface sediments throughout the Bay using the same methodology as used to assess the effects of the HDP alone (Appendix 2).

5.3 Permitted and Pending Projects

Projects located in the NBSA have been authorized by permits issued under the USACE's Permits Program for the Clean Water Act Section 404 and Section 10 of the Rivers and Harbors Act of 1899. Some of these applicants have already completed some dredging; others have not begun or scheduled the work (Figures 5-1 and 5-2). Table 5-2 summarizes the type of work and status of the permits identified. Other than the Port Authority and USACE, the permitted and pending work typically represents maintenance around pier areas and includes dredging, pier rehabilitation, and pier maintenance, rehabilitation of wave breaks, bridge abutment rehabilitation, and wharf reinforcements. The cumulative assessment includes all projects concurrent with the HDP[15]. For the Purposes of this EA, in October 2006 each applicant or applicant's agent for the project was contacted by telephone to inquire to the status of the work proposed in the permit. Specifically, they were asked if the work would occur in the next 5 years. The result of that inquiry is shown in table 5-2 in the last 4 columns of that table labeled, "Percentage work completed", "estimated date work to be performed", "estimated volume to be dredged" and "will dredging occur within 5 years".

Additional and updated information regarding specific permit actions is available on the Corps' web page at http://www.nan.usace.army.mil/business/buslinks/regulat/permit.htm. Relevant environmental documents and the Statement of Findings or Record of Decision containing these evaluations are also available from the USACE.

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15 The 175,700 CY project by OENJ Cherokee Corp was inadvertently not included in the cumulative assessment which utilized 900,000 CY (Table 5-5) rather than 1,075,700 CY. We do not believe that this omission changes the conclusions of the modeling and chemical analyses preformed for the cumulative assessment. The majority of this permit work is planned to be performed over two thousand feet from the nearest remaining HDP construction. The EA clearly demonstrates that projects included in the modeling of the cumulative assessment exhibit deposition plumes that are restricted spatially to the areas near the channels (Figure 5-3 and Appendix 1 Figure 38). Therefore, the 5-fold smaller volume, to be resuspended along the shore and at a distance from the channel, is unlikely to interact with the deposition plume from the HDP. To evaluate this quantitatively, an alternative calculation was performed to evaluate the potential contribution from this additional volume of material projected to be dredged.

This chemical evaluation used the same method and parameter values as used in the HDP and cumulative assessments presented in the EA. The total mass of resuspended material was estimated to equal 3% of 175,700 cy, or 5,300 cy. At a bulk density of 1,500 kg/m^3, this equates to 6,045,000 kg of material. The area of the flats in this portion of Newark Bay is approximately equal to 2,000,000 m^2. A preliminary estimate of the amount of material deposited is therefore 3.0 kg/m^2. As in the EA, the depth of deposition was calculated by dividing mass of deposited material by the dry bulk density of surface sediments (750 kg/m^3). This results in a depth of deposition equal to 4 mm. Finally, as demonstrated with the particle tracking model, it is likely that a large majority of the material will deposit relatively close to the dredge site, which is at a distance from the HDP channels. This means that deposition farther away from the project (i.e., in the vicinity of the HDP channels) is likely to be considerably less than 4 mm. This is unlikely to interact significantly with the dredging modeled in the cumulative assessment.

Table 5-2: Issued Permits and Pending Applications in Newark Bay Study Area, As 0f 1 Oct 2006

Permittee/ Project Name	Permit Number	Work Authorized	Permit Expiration/ Extension Date	Percentage of Work Completed	Estimated Date Work to be Performed	Estimated Volume to be Dredged	Dredging Within 5 Years?
Caschem Division of Rutherford Chemicals	2004-00720	Repair bulkhead and build two new 36-inch dolphins	18-Sep-2007	0%	Not scheduled	No dredging authorized	No dredging
City of Bayonne	2003-01276	Dredging/wetland enhancement	15-Jul-2007	100%	Dredging completed	None	No dredging
Texaco Downstream Properties, Inc.	2003-01034	Pier replacement and shoreline stabilization	11-Apr-2008	70%	Jun-06	No dredging authorized	No dredging
Port Authority of NY&NJ	2002-00711-2	Dredging at Berths 76 & 78 in Port Elizabeth	11-Aug-2007 and 11-Aug-2014	100% of initial cycle	Jul-06	8,400 CY maintenance	Maintenance dredging likely
Port Authority of NY&NJ	2002-00711	Dredging at Port Newark/Elizabeth	16-Oct-2005 and 16-Oct-2012	80% (Deepening of Berths 82, 84, 86 and 94 to -45' MLW not done)	Ju1-06	60,500 CY maintenance	Maintenance dredging likely
Port Authority of NY&NJ	2001-01023	Bayonne Bridge abutment rehabilitation	9-Nov-2006	Cofferdam dredging complete in NJ. 350 CY in NY to be done.	Jan-07	350 CY	Dredging likely
Port Authority of NY&NJ	2006-00057	Maintenance and new work dredging, Howland Hook Terminal	9-Nov-2008	100% of initial cycle	Dredging completed	10,000 CY maintenance 40,000 CY of rock	Maintenance dredging likely
Darling International	1999-13370	Dredging with upland placement	28-June-2010	20%	Permittee does not have it scheduled	18,000 CY	Unlikely
Amerada Hess Corp.	1999-11040	Dredging with upland placement	31-Aug-2010	0%	Permittee does not have it scheduled	20,500 CY	Unlikely

Permittee/ Project Name	Permit Number	Work Authorized	Permit Expiration/ Extension Date	Percentage of Work Completed	Estimated Date Work to be Performed	Estimated Volume to be Dredged	Dredging Within 5 Years?
Motiva Enterprises, LLC	1999-03620	Dredging with upland placement	1-Nov-2010	0%	Permittee does not have it scheduled	37,550 CY	Unlikely
Port Authority of NY&NJ	1997-02031	Wharf reinforcement and fender maintenance at Port Newark/Elizabeth	25-Mar-2007	Ongoing	Performed as needed for long term maintenance	No dredging authorized	No dredging
Port Authority of NY&NJ	1995-04370	Newark Bay Confined Disposal Facility (Sub aqueous Pit)	20-May-2000 extended to 19-May-2007	NBCDF (Site 1S) complete, remaining disposal capacity undefined	Port Authority of NY&NJ reports no additional disposal projects	None for NBCDF (Site 1S)	No dredging
City of Elizabeth, NJ	2005-00868	Marina bulkhead and wave break repair	12-Oct-2007	0%	Permittee does not have it scheduled	No dredging authorized	No dredging
OENJ Cherokee Corp.	1997-07040	Dredging and bulkhead for new marina and ferry terminal	26-Apr-2003/ Extended to 26-Apr-2009	0%	Permittee does not have it scheduled	175,700 CY	Dredging likely

5.4 Cumulative Assessment

The combined projects within the HDP are the largest planned dredging projects by volume in the NBSA and are the primary focus of this EA. In addition, maintenance dredging is necessary to remove the sediments that accumulate in channels from natural and anthropogenic sources. Removing the dredged material allows commercial navigation to use the channels and ports economically and safely. Dredging accumulated materials from channel bottoms to maintain designated channel depths has been standard practice in the Newark Bay Federal Channels and Arthur Kill Federal Channel for decades. Although no recent maintenance dredging has occurred in the Kill Van Kull Federal Channel while it has been undergoing successive deepening contracts since 1999, it too will be maintained in the future, as needed.

Maintenance dredging in Federal channels and the Port Authority berths is conducted on an as-needed basis and is influenced by the availability of funding and the likelihood of navigational dredging. There is no “regular” maintenance dredging and no long-term plan for future maintenance dredging. Some channels and berths have not been dredged in more than 20 years; some have been dredged every 3 or 4 years. Thus, annual averages were used to estimate the volume of maintenance dredging that might normally occur from February 2006 to February 2012, a five year period that coincides with the remaining contracts in the NBSA (S-AK-3, refer to Table 3-1: Predicted Start and Completion Dates of HDP Contracts). However, these estimated volumes, given the HDP construction, are believed to be conservative (higher than the likely maintenance dredging volumes) because, in the past, the USACE has not performed maintenance dredging on areas that will be deepened in the near future, and, thus, is not likely to perform if any, maintenance dredging of areas of the HDP that will be deepened in the next 5 years.

The cumulative assessment specifically focuses on the period of time when it is possible that both the HDP and maintenance dredging will take place in order to evaluate the deposition pattern that is predicted to occur during this time.

5.4.1 USACE Maintenance Dredging

USACE recently awarded a contract for maintenance dredging in the Port Newark and Port Newark Pierhead Channels. Dredging began in December, 2006 and was completed in February 2007. The plans and specifications for the Water Quality Certificate for the project were predicated on dredging 170,000 CY in the base contract with options of up to 383,695 CY. The contract as awarded allows for only 250,000 CY in its base contract and options, thus, only 250,000 CY was actually dredged in 2006 and 2007. This was the only maintenance dredging presently planned for the NBSA during the construction of the HDP. It is unlikely that maintenance dredging will be conducted in HDP areas because sediments which have accumulated in the existing channels will be removed during the deepening. These sediments are included in the assessment of HDP impacts. The northern Newark Bay channel has not been dredged in many years. However, to assure that the cumulative analysis is conservative, the maintenance volumes for the past 20 years were evaluated and used to represent USACE's possible maintenance dredging.

In its 2006 EA for Maintenance Dredging in Port Newark Channel, the USACE provided 10 years of data on the volumes of maintenance dredged material removed from Newark Bay and noted that in that time period dredging volumes averaged between 100,000 to 200,000 CY every three years. A further file search by the USACE indicated that no maintenance dredging had occurred between 1987 and 1997. In 1987, 337,739 CY were removed (Table 5-3). Thus, over the past 20 years a total of 1,299,528 CY have been removed[16]. Using this longer historical record, the estimated annual volume of maintenance dredging conducted by USACE is 64,976 CY. This is less than estimated annual volume of maintenance dredging based on historic records from 1953 through 1985, a period of 33 years which was 211,469 CY (Lowe et al 2005). However the analysis appropriately uses the most current data and clearly differentiates possible future maintenance dredging during the construction of the HDP from materials removed during

[16] There has been a considerable amount of deepening in the Federal channels in Newark Bay over the past 17 years. For this reason, the O&M estimates based on O&M dredging during most of these years are generally lower than normal or expected based on establish sedimentation rates. During that 17-year period, the O&M sediment was removed concurrently with deepening material.

the deepening process, which are accounted for in the HDP impact assessment. In the cumulative assessment, the estimated annual volume of, maintenance dredging, 65,000 CY was distributed through the Federal navigation channels in the HDP dredge contract areas and in the footprint of the recent dredging contract in the Port Newark Channels for each of 5 years (325,000 CY total).

Table 5-3[17]. Twenty Year Maintenance Dredging History of Newark Bay (USACE 2006B)

YEAR	AREA OF WORK	SIZE OF CONTRACT (VOLUME CY)
2006-2007	Newark Bay, Maintenance with Upland Beneficial Placement	250,000
2002	Small piece of Main channel and piece of the Port Newark Branch Channel	68,510
2001	Port Elizabeth Pierhead Channel	22,350
1998	Elizabeth Channel	415,895
1997	South Elizabeth and Port Elizabeth Pierhead Channels	205,034
1987	Port Newark and Elizabeth Channels	337,739
	Total = **20 year average**	**1,299,528** 64,979

5.4.2 Port Authority Maintenance Dredging

The Port Authority of New York and New Jersey (PANYNJ) provided 10 years of dredging history in the NBSA (Table 5-4). As noted on the table, the volumes of dredged material reported are likely to be higher than those removed from Newark Bay because some of the sediments may have come from Port Jersey. In addition, some of the total volume is associated with berth deepening which would not be repeated, thus the totals are greater than the volume attributable to maintenance alone. Based upon the dredging history an average of 24,520 CY per year was removed from Port Newark Channel. This volume was distributed to the Port Newark Reach for each of 5 years. The 16,214CY per year removed from Howland Hook was distributed in the S-AK-3 contract area (Refer to Figure 4-3) for each of 5 years. Additionally,

[17] Tables 5-3 and 5-4 are historic summaries of actual dredging that has occurred within the NBSA. This actual dredging data was used to predict an annual estimate of future dredging over the life of the HDP.

94,545 CY per year could not be allocated to specific areas; thus, the volume was distributed equally in the S-NB-2A, S-NB-1C, S-E-1A and B areas. The total PANYNJ volume, 122,179 CY, is similar to a previous estimate, 131,303 CY (Lowe et al 2005).

Table 5-4. PANYNJ Maintenance/Deepening Contracts within the NBSA (Last 10 Years)

Award Date	Area	Contract # & Title	Non-HARS/ Upland (CY)	NBCDF (CY)
Apr-98	Howland Hook	**HH-971.125**- Howland Hook Marine Terminal - Maintenance Dredging & Material Disposition		79,422
Sep-00	Howland Hook	**HH-234.876**- Howland Hook Marine Terminal - Maintenance Dredging	70,000	
Oct-02	Howland Hook	**HH-234.920**- Howland Hook Marine Terminal - Maintenance Dredging & Material Disposition		2,565
Aug-03	Howland Hook	**HH-334.016**- Howland Hook Marine Terminal - Wharf Extension Berth Deepening	10,155	
		Subtotals	**80,155**	**81,987**
		Howland Hook Total		**162,142**
		Howland Hook Ten Year Avg.		**16,214**
May-96	New Jersey Marine Terminals	**MFP-204**- Port Newark Reach A - Maintenance Dredging and Material Disposition	100,000	
Mar-97	New Jersey Marine Terminals	**MFP-207A**- Port Newark/Elizabeth, Port Authority Marine Terminal/Port Jersey Channel - Maintenance Dredging	272,459	
Mar-99	New Jersey Marine Terminals	**PN-984.900**- Port Newark Reach A - Maintenance Dredging and Material Disposition		145,203
Oct-99	New Jersey Marine Terminals	**MFP-994.901** Multi-Facility New Jersey Marine Terminals - Maintenance Dredging		52,088
Apr-00	New Jersey Marine Terminals	**MFP-994.990** Multi-Facility New Jersey Marine Terminals - Maintenance Dredging	191,846	16,848
April-02	New Jersey Marine Terminals	**PN-234.898**- Port Newark Container Terminal Berth deepening 50 ft.	31,059	
Oct-02	New Jersey Marine Terminals	**MFP-994.901Z** New Jersey Marine Terminals-Multi-Facility Maintenance Dredging & Berth Deepening	116,689	41,546
Nov-04	New Jersey Marine Terminals	**MFP-944.901** New Jersey Marine Terminals-Multi-Facility Maintenance Dredging & Berth Deepening	91,916	
		Subtotals	**803,969**	**255,685**
		New Jersey Marine Terminals Total		**1,059,654**
		New Jersey Marine Terminals Ten Year Avg.		**105,965**

Note: As 12/ 31/2006
The ten year average accounted for dredging activities from 1996 to 2006 and does not include the following two dredge contracts that were conducted in late 2006. 1) July -06 New Jersey Marine Terminals **MFP-944.901** New Jersey Marine Terminals-Multi-Facility Maintenance Dredging & Berth Deepening 35,851 cy and 2) July-06 Howland Hook **HH-934.553**- Howland Hook Marine Terminal – Berth Deepening 45 ft. 14,072 cy

5.4.3 Cumulative Modeling Assessment Results

The MIKE3 PA module was used to estimate the deposition due to the combination of the HDP and other dredging, including maintenance. The total volumes are presented in Table 5-5. The total volume of dredged material used in the cumulative assessment is 2,887,139 CY; with 1,834,200 CY attributable to the HDP material to be removed with the environmental clamshell dredge and 1,052,939 CY attributable to other possible dredging with the environmental clamshell dredge in the NBSA during the course of constructing the HDP. Table 5-5 shows the allocation of dredged material through out Newark Bay which was used in the cumulative assessment. The heading "Other USACE" dredging is maintenance dredging for federal channels. This Table takes the annual estimate of dredging from Tables 5-3 and 5-4 to establish an annualized estimate of future federal maintenance dredging and multiplies this annualized average by 5 years for the life of the HDP for a total of future predicted maintenance dredging. Other PANYNJ dredging was estimated annually from Table 5-4. The volumes of the predicted maintenance dredging were then allocated to the HDP model sub areas in a weighted fashion to represent past dredging areas as described in the Sections and Tables above.

Figure 5-3 presents the cumulative deposition predicted by the combined effects of the HDP and other dredging including maintenance. The deposited thickness is higher in the areas where both the HDP and other dredging are predicted to have relatively high sedimentation, namely the Elizabeth Channel where it intersects the Port Newark Pierhead Channel. In general, the contribution of other dredging including maintenance to resuspended sediment depth is less than half that of the HDP.

Table 5-5. Total Five-Year Cumulative Dredge Volumes (CY) by Dredge Area

Dredge Area	Area (yd2)	Other USACE Dredging	Other PANYNJ Dredging	Total Other Dredge Volumes	Total HDP Dredge Volumes	Cumulative Dredge Volume
O&MBasicShoalArea1	91,684	130,000		130,000	0.00	130,000
O&MOptionShoal3456	178,581	55,276		55,276	0.00	55,276
O&MOptionShoal2	54,270	6,690	72,283	78,972	0.00	78,972
O&MOptionShoal1A	37,779	3,034	50,317	53,351	0.00	53,351
S-AK-1	321,506			0.00	120,600	120,600
S-AK-2	400,838			0.00	59,100	59,100
S-AK-3	354,185	117,000	81,070	198,070	21,000	219,070
S-E-1(A)	544,356	65,000	114,035	179,035	414,289	593,324
S-E-1(B)	298,296		61,091	61,091	215,111	276,202
S-NB-1(A)	284,313	30,000		30,000	143,164	173,164
S-NB-1(B)	383,928			0.00	219,622	219,622
S-NB-1(C)	647,677	20,250	134,399	154,649	214,514	369,163
S-NB-2(A)	471,760	14,750	97,745	112495	129,138	24,1633
S-NB-2(B)	148,509			0.00	200,594	200,594
S-NB-2(C)	385,651			0.00	97,068	97,068
				1,052,939	1,834,200	2,887,139

Notes
1 The area of Option Shoal Area 3456 used in the model (Figure 18) represents areas where dredging has recently been performed. Future dredging will cover the entire Port Newark Branch Channel, which includes Area 3456, as well as the smaller area extending inland from Area 3456 to the entrance to the Port Newark Inland Channel (the pierhead). Dredge volumes are accurate current estimates of future dredging volumes. The approximation of the footprint area is unlikely to materially affect model results.
2 The area of Option Shoal Area 1A and 2 used in the model (Figure 18) represents areas where dredging has recently been performed. Future dredging will cover the entire inland Port Newark Channel. Dredge volumes are accurate current estimates of future dredging volumes. The approximation of the footprint area is unlikely to materially affect model results.
3
The 117,000 cy of material to be dredged from the area of S-AK-3 represents work performed to deepen the channel. All other entries labeled "Other USACE" and "Other PANYNJ" represent O&M.

<u>Summary of deposition in geomorphic areas</u>:

Flats: Mean deposition on the Newark Bay flats was 0.9 mm (0.04 inch) with variability between 0.0mm and 49.4mm (1.9 inches). The vast majority of the flats had less than 2 mm (0.08 inch). The greatest deposition occurred at the flats south of the South Elizabeth Channel. This is an area of low current velocities and where channel widening is occurring.

Navigation Channels: The maximum predicted sedimentation depth in the channels is 127mm (5.3 inches) near the corner formed by the Pierhead Channel and Elizabeth Channel. Mean deposition on the channel bottoms was 13.1mm (0.5 inch) with variability between 0.0mm and 127.5mm (5 inches). Maximum sedimentation outside the channel areas is 14mm (0.6 inch) over the Newark Bay CDF. At the northern reach of the Arthur Kill, there are small areas where the predicted deposition is higher than the mean.

Transition Zones: Mean deposition in the transition zones, between channels and flats, was 9.1mm (0.36 inch) with variability between 0.0mm and 70.1mm (2.8 inches). The vast majority of the transition zones had less than 8mm (0.3 inches). There were sections of the transition zones in the northern reach of the Arthur Kill where predicted deposition was higher than the mean (Figure 5-3).

5.4.4 Cumulative Chemical Sediment Assessment Results

Thiessen polygons representing dredged material concentrations, maps depicting chemical deposition, and graphs of all predicted changes in concentration of surface sediments are included in Appendix 2 and are structured the same as figures discussed previously (Figures 5-2 to 5-7).

Table 5-6 summarizes the number of grid cells predicted to have changes in surface concentration after the HDP and other dredging that would be great enough to exceed the limitations of precision in the data.

Table 5-6: Cumulative Assessment Summary of Results: Number of Model Grid Cells Changing by Specific Contaminant

Contaminant	2,3,7,8-TCDD ng/kg	Total PCBs mg/kg	Total DDT mg/kg	BAP mg/kg	Mercury mg/kg	Chromium mg/kg
Number of Grid Cells changed more than UT	13	17	29	37	11	6
Percent of Grid Cells changed more than UT	0.52%	0.68%	1.15%	1.47%	0.44%	0.24%

Qualitative results for TCDD are shown in Figures 5-10a to 5-10c. Thirteen model grid cells (0.52%) had predicted changes that were greater than the uncertainty in the data, compared with 10 cells (0.42%) in the HDP evaluation. As in the HDP evaluation, most of these were located at the northern tip of the HDP (Figure 5-10c). Three cells were located in southern Newark Bay and in Kill Van Kull. All but one of these potentially noticeable changes were increases in concentration, and all of the increases occurred in areas with very low current TCDD concentrations (Figure 5-10c, left and middle panels). The concentrations that increased were predicted to remain below 10 ng/kg after the HDP is complete. One cell was predicted to decrease slightly more than the UT.

Changes in sediment concentrations of other contaminants are visualized in figures like those discussed for TCDD and discussed in Appendix 2.

In the cumulative assessment, changes were also observed in or adjacent to the port channels and in or adjacent to the transitional zones. Also, more decreases in concentration were predicted than in the HDP evaluation. Overall, though, throughout the bay, those few changes that were greater than the uncertainty in the data were often only slightly greater.

Dredging the HDP in combination with other dredging projects was not predicted to cause areas with new concentrations of AECs. The results of the analysis presented here for proposed Phase 2 sediment sampling locations are provided in Appendix 2. Out of 168 comparisons (6 chemicals X 28 sites), two values were computed to change from existing concentrations by more than the precision of the data. These were the same chemicals (mercury and DDT) and the same location as for the HDP and AEC evaluation (USACEP2-14) along the shoreline in the Arthur Kill. Concentrations changed to a greater degree than in the HDP-only and AEC evaluations (for mercury from 0.016 to 0.058 mg/kg, and for DDT from 0.001 to 0.01 mg/kg. For comparison, all values remained considerably less than the overall medians of the data (approximately 2.0 mg Hg/kg and 0.05 mg DDT/kg). Thus, the predicted concentration increases are still relatively small. Overall, predicted changes in surface sediment chemical concentrations are anticipated to be minimal.

The cumulative analysis is conservative in that a portion of the additional dredging is to be performed irrespective of the HDP, and thus predicted changes in contaminant levels in surface sediments represent, in part, the continuation of an ongoing process. In conclusion, for nearly all of Newark Bay, predicted changes in concentration were generally less than or similar to the precision of the data. Consequently, chemical concentrations in samples collected after the HDP are likely to be indistinguishable, in general, from chemical concentrations in samples collected prior. It is improbable that deposition due to the HDP and other dredging will affect USEPA's ability to interpret chemical concentrations in sediment samples in Newark Bay.

Summary of chemical analysis in geomorphic areas:

Overall, few predicted changes in concentration were greater than the uncertainty threshold.

Flats: In the cumulative assessment, very few cells lying in the flats exhibited changes greater than the precision of the data, for all chemicals. This is due to limited deposition and to the general similarity between contaminant concentrations in dredged material and in surface sediments on the flats.

Navigation Channels: Changes in contaminant concentrations in surface sediments were assessed in the channel extending from the Bergen Point area into Kill Van Kull and in the channels in northern Newark Bay, including Port Newark Channel. These are areas that lie outside of the HDP. Predicted changes in concentration that were greater than the precision of the data were found within the navigational channel at the northern tip of the HDP. For BAP, the changes that were greater than the precision of the data were all associated with one data value in the Kill Van Kull.

Transition Zones: The transition zones were represented by the model cells lying adjacent to the channel. Predicted changes in concentration due that were greater than the precision of the data tended to be found adjacent to the navigational channel at the northern tip of the HDP and along the Arthur Kill. Results were generally similar in the AEC analysis.

5.5 Future Dredging

Beyond five years, following the anticipated construction of the deepened channels within Newark Bay, the deepened channels and berths will begin to accumulate sufficient sediments to warrant their removal on a regular basis. Volumes of sediment to be removed are expected to be slightly greater than have been removed from the 45 ft channels in the past (USACE 2004d). By the time this construction is complete and maintenance of the channels is required, the RI/FS is expected to be complete (Letter from Mr. Pavlou to Col. Polo Appendix 5)

6 MITIGATION: BEST MANAGEMENT PRACTICES (BMPS), WATER QUALITY CERTIFICATION (WQC) AND MONITORING

This Section addresses the following deficiency identified in the March 2006 O&O:

"The Corps' mitigation measures do not provide substantial assurance that possible impacts will be minimized" (page 60)

Best Management Practices (BMPs) are procedures that minimize the potential for adverse environmental and physical impacts from construction activities, such as dredging and dredged material management operations. BMPs for the proposed project are required by the state-issued WQC conditions for the purpose of protecting the biological resources of the Bay. The following is a discussion of the mitigation, BMPs, monitoring and WQC permit conditions that are being employed within the NBSA during HDP dredging. These practices will also minimize and mitigate HDP impacts to the RI/FS.

6.1 Mitigation

In accordance with the Council on Environmental Quality (CEQ) Regulations for Implementing NEPA (40 C.F.R. § 1500-1508), and with paragraph 7-35 a. of USACE ER 1105-2-100 (USACE 1990, 1997), the planning of USACE-lead and other Federal projects must ensure that project-caused adverse environmental impacts to fish and wildlife resources have been avoided or minimized to the extent practicable and that any remaining, unavoidable impacts are compensated to the extent justified.

USACE regulations stipulate that the Recommended Plan must contain sufficient mitigation measures to ensure that it will have no more than negligible net adverse impacts, including the impacts of the mitigation measures themselves. The USACE regulations also state that "full credit shall be given to the beneficial aspects of an alternative plan, or project, before consideration is given to adding separable mitigation features."

An important element of the NEPA process is the requirement that an agency discuss methods for mitigating potential adverse consequences of a proposed project (USDC-SDNY 2006). Section 1508.20 of the CEQ Regulations for Implementing NEPA defines Mitigation to include:

(a) Avoiding the impact altogether by not taking a certain action or parts of an action.

(b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation.

(c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.

(d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.

(e) Compensating for the impact by replacing or providing substitute resources or environments.

A number of mitigation concepts are presented in ER 1105-2-100. Two of the mitigation techniques applicable to the Recommended Plan include Avoidance and Minimization. Coordination with the USEPA and sequencing of the HDP contracts (i.e. timing alternatives) are currently being conducted as a form of adaptive management and mitigation to avoid potential impacts to the RI/FS.

Avoidance techniques associated with dredging operations typically include the use of environmental windows based on either temporal or spatial constraints. Minimization techniques generally involve design modifications to reduce or minimize a project's impacts (i.e., BMPs).

6.2 AVOIDANCE of EFFECTS

Currently, effects are being avoided through sequential construction of S-NB-1 side-slopes. As defined in the plans and specifications for the upcoming Newark Bay Dredging (S-NB-1) Contract, dated January 2007, scheduled construction on the first contract in NBSA will proceed as a Base Contract award with several options to be exercised. Deepening a portion of the center channel prism bottom will occur first; other areas, including channel prism side-slopes with greater probability of undisturbed historical sediments, will be constructed sometime after the base contract is awarded. These plans and specifications reflect a revision which allow for the postponement, to the extent possible as it relates to navigational safety, of work in the outer slope area to allow the greatest opportunities for regulatory review by NJDEP and USEPA, as well as data collection opportunities by Tierra Solutions, Inc. as part of the USEPA NBSA RI/FS (Refer to 3.2.2 the Proposed Action).

6.3 Best Management Practices (BMPs)

The following BMPs are applicable to the dredging operations of the preferred alternative in the NBSA. Some of these BMPs are also included as a requirement in the NJDEP Water Quality Certification (WQC) (see section 6.4); however USACE employs additional BMPs in their dredging specifications that are not contained as conditions in the WQC that are protective of the environment. Examples are provisions for the Endangered Species Act and Clean Air mitigation specifications that are not contained with the states WQC as BMPs.

- A Closed (i.e. sealed) Environmental (clamshell) bucket will be used to minimize lose sediment suspension at the dredging site for fine grained unconsolidated (silty) sediments. This type of bucket reduces the amount of sediment that falls back into the water while it is being raised out of the water.

- Dredging practices: The following practices are applicable in areas of fine grained unconsolidated sediments and ensure that large amounts of sediment are not released into the water column within the NBSA. These practices will reduce the amount of free water in the dredge material, will avoid overfilling the bucket, and minimize the number of dredge bucket cycles needed to complete the dredge contract :

  - Maximizing the depth of penetration taken by the dredge bucket, thereby reducing the number of bites needed to dredge the contract area. The dredge will be operated as to control the rate of descent and to maximize the depth of penetration cut without overfilling the closed environmental (clamshell) bucket thereby reducing the amount of sediment that falls back into the water as it is being raised.

  - Reducing the hoist speed so that the closed environmental (clamshell) bucket is raised through the water at a rate of 2 feet per second or less.

  - Washing the gunwales of the dredge scow will be avoided, except to the extent necessary to ensure the safety of workers so as to minimize reintroduction of sediment into the water column.

- The closed environmental (clamshell) bucket will be equipped with sensors to ensure complete closure of the bucket before lifting through the water column to minimize loss of sediment.
- Dredged material will be placed deliberately and in a controlled manner in the barge in order to avoid spillage of dredged material overboard, thereby reducing the amount of suspended sediments.

- "No Barge Overflow": The elimination of barge overflow reduces the creation and dispersal of suspended sediments when dredging fine grain sediments.

- Barge/Scow Type: The type of barge used would depend on the placement option selected. It is anticipated that barges or scows would be of solid hull construction or would be sealed thereby reducing the chance that sediment will be released into the water column during dredging, to prevent "leakage" of sediments back to the water column.

- Dredging Inspector: On board inspectors will be assigned to dredging operations to monitor and document compliance with permits and conditions described below at a minimum of twice per week.

- Webcam Visual Inspection : Webcam visual inspection, per contract specifications, are conducted 24 hours per day, every day, to monitor the entire bucket cycle from the bucket's descent into the water column to the bucket's ascent from the water column, breaking the surface to the loading to the scow, regardless of the type of dredged material (HARS and non-HARS).

- Dredging Windows: Dredging windows are established to protect migration, over wintering, and spawning habitats of fish, birds and other fauna from temporal conflicts with dredging operations. To protect early life stages of winter flounder, dredge windows have been imposed: Dredging of soft, fine-grained material is prohibited from February 1 through May 31 in Acceptance Areas A1, A2, B1 and B2 (east side of Newark Bay channel) in any given year. Dredging of all other material within Acceptance Areas A1, A2, B1 and B2 is prohibited from March 31 through May 31 in any given year. Thus, any RI/FS sampling during this time period and within the dredge window contract areas is not affected by HDP construction activities during this time.

- Decanting Operations: The NJDEP WQCs require that barges can not be decanted before 24 hours of settlement within the scow. This minimizes the amount of resuspension of solids during decanting procedures.

6.4 Required Water Quality Certificate Compliance

In September 2006, NJDEP issued a WQC for the Newark Bay 1 contract. In order to minimize and reduce impacts to the environment from dredging fine grain sediments, dredging in Newark Bay will be conducted using the BMPs required as Water Quality Certificate conditions and identified in Table 6-1. Separate state issued WQCs will be required for subsequent deepening contracts and are expected to contain the same or similar conditions. The BMPs required for navigational deepening in WQC conditions 2 through 13 are also required during maintenance dredging of the existing channels and are expected to be required by the states during future maintenance dredging of the deepened channels. Other possible new BMPs, if determined to provide added protection or address new concerns, may be added to these WQC as deemed appropriate by NJDEP or NYSDEC (in NY waters).

Table 6-1: Water Quality Certificate Conditions for the S-NB-1 Contract

Water Quality Certification Conditions for the S-NB-1 Contract		
# 1	To protect the early life stages of winter flounder the following timing restrictions have been imposed:	
	A.	Dredging of soft, fine-grained material is prohibited from February 1 through May 31 in Acceptance Areas A1, A2, B1 and B2 (east side of Newark Bay channel) in any given year.
	B.	Dredging of all other material within Acceptance Areas A1, A2, B1 and B2 is prohibited from March 31 through May 31 in any given year.
# 2	Dredging of soft, fine-grained material shall be accomplished using a closed clamshell environmental bucket.	
# 3	The dredge shall be operated so as to control the rate of descent of the bucket so as to maximize the vertical cut of the clamshell bucket while NOT penetrating the sediment beyond the vertical dimension of the open bucket (i.e. overfilling the bucket). This will reduce the amount of free water in the dredged material, will avoid overfilling the bucket, and minimize the number of dredge bucket cycles needed to complete the dredging contract.	
	A.	The dredging contractor shall use appropriate software and sensors on the dredging equipment to ensure consistent compliance with this condition during the entire dredging operation.
	B.	The NY District Quality Representative shall monitor the operation of the software and sensors during the inspections required by Condition #15 of this authorization. Any malfunction of the software and sensors on the dredge at any time shall be immediately reported to the NY District Contracting Officers' Representative by the dredging contractor and shall be immediately repaired to working order.
# 4	The closed clamshell environmental bucket shall be equipped with sensors to ensure complete closure of the bucket before lifting the bucket. Said sensors shall be operational during the entire dredging operation.	
# 5	Where a closed clamshell environmental bucket is required, it shall be lifted slowly through the water, at a rate of 2 feet per second or less.	
# 6	Dredged material shall be placed deliberately in the barge in order to prevent spillage of material overboard.	
# 7	A "No barge overflow" applies to this dredging contract. NOTE: This conditions only applies to soft, fine-grained material	

Water Quality Certification Conditions for the S-NB-1 Contract		
# 8	All barges or scows used to transport sediment shall be of solid hull construction or be sealed with concrete.	
# 9	The gunwales of the dredge scows shall NOT be rinsed or hosed during dredging except to the extent necessary to ensure the safety of workers maneuvering on the dredge scow.	
# 10	All decant water holding scows shall be water tight and of solid hull construction.	
# 11	Decant water from this project may only be discharged within the Newark Bay in close proximity to the dredging contract area. Discharge to another receiving waterbody requires prior approval from the Department, and may require a New Jersey Discharge Pollutant Elimination System/Discharge to Surface Water (NJDPES/DSW) permit.	
# 12	All decant water shall be held in the decant holding scow a minimum of 24 hours after the last addition of water to the decant holding scow. Said water contained in the decant holding scow may only be discharged after this mandatory 24 hour retention time.	
	A.	Should the contractor wish to reduce the required holding time, the contractor shall demonstrate that the reduced holding time is sufficient to meet a total suspended solids (TSS) background value of 30 mg/L.
	B.	This TSS action level is consistent with the ambient TSS results presented in the NY District study entitled "NY & NJ Harbor Deepening Project - Total Suspended Solids (TSS) Monitoring Interim Report" (January 2006).
	C.	The total suspended solids shall be determined through gravimetric analysis. No discharge shall be permitted from the decant holding scow until the results of the gravimetric analysis have confirmed that the 30 mg/L background level has been achieved.
	D.	No additional water shall be added to the decant holding scow between the time of sample acquisition and discharge.
	E.	Upon successful demonstration that the reduced holding time is sufficient to meet the TSS background level of 30 mg/L, the monitoring of TSS may be suspended and the demonstrated settling time shall replace the 24 hour minimum. A successful demonstration of the reduced holding time efficiency shall be determined once three consecutive TSS analyses have confirmed that the 30 mg/L action level has been achieved by the reduced holding time.
	F.	Should the contractor wish to demonstrate this reduced holding time, all records including time of last addition of decant water into the scow, time of TSS sampling and the results of TSS sampling shall be submitted to the NJDEP as soon as they become available, together with a request for a reduced holding time.
# 13	During pumping of the decant water from the holding scow, great care shall be taken to avoid resuspending or pumping sediment which has settled in the decant holding scow.	
# 14	The dredging contractor shall complete and submit the attached Dewatering Form to the NY District Contracting Officers' Representative on a weekly basis as part of the Quality Control Report provided to the NY District.	
	A.	Said Dewatering Form shall be certified by a NY District Quality Assurance Representative that they have witnessed the dewatering process during the preceding week.
	B.	The NY District shall submit the completed Dewatering Form with appropriate certifications by FAX to the Office of Dredging & Sediment Technology for the proceeding week.
# 15	The NY District shall perform inspections of the dredging contract a minimum of twice per week using the attached WQC Field Inspector form.	
	A.	The NY District shall submit the completed inspection forms to the NJDEP on at least a weekly basis.
# 16	Reporting Requirements: At the completion of this contract, the NY District shall submit the following information to the Department. This information shall be submitted with six months of contract completion.	
	A.	Start and finish date of contract
	B.	Post-dredge hydrographic survey
	C.	Completed "Notice of Completion of Work" attached

6.5 MONITORING MITIGATION (BMP) PERFORMANCE

USACE has developed the Total Suspended Solids (TSS) monitoring program to evaluate the efficacy of mitigation measures and best management practices. This monitoring program is designed to assure that these measures mitigate the effects of the HDP on RI/FS. Results of the monitoring program conducted to date are summarized in Appendix 3. Results of monitoring events will be provided to the Agencies for review.

Since the June 2005 Draft EA, additional USACE-NYD coordination with USACE's Engineering Research and Design Center (ERDC) has prompted revisions to the TSS/Turbidity sampling program that has greatly intensified and expanded USACE's data collection efforts and goals. TSS sampling during dredging operations was conducted in Newark Bay, and the Arthur Kill, focusing upon channel reaches with predominantly fine (clay and/or silt) sediments where the probability of dispersion of hydrophobic contaminants would be greatest.

The HDP TSS program was designed with the intent to determine/define: 1) ambient turbidity and TSS concentrations in the study area during selected periods; 2) spatial structure and temporal dynamics (extent and duration) of suspended sediment plumes associated with activities within the New York and New Jersey Harbor; 3) relationships between gravimetric, optical, and acoustic measurements of turbidity and TSS in the project area; and 4) estimate the amount of sediment released into the water column for use in modeling applications. This program was created as part of the overall HDP aquatic sampling program.

The HDP TSS program methods are provided in Appendix 3. Future monitoring events would consist of the same sampling procedures, i.e. Fixed OBS stations, current surveys, mobile ADCP surveys, water sampling and sediment grabs from scows. The TSS program is envisioned to continue throughout the life of the contracts in the NBSA. This is for only dredging that will require the use of a closed clamshell environmental bucket. The HDP TSS monitoring program is scheduled to be conducted at least twice during each contract in the NBSA. Monitoring events will be chosen based on the type of material that is being dredged and the location of the dredging (i.e. sideslopes or main channel).

Within the context of this EA, the Total Suspended Solids (TSS) monitoring program will also be used to evaluate the efficacy of mitigation measures and best management practices of the HDP. As part of the adaptive management program, results of the monitoring program conducted to date are summarized in Appendix 3 of the DEA. Results of future monitoring events will be provided to the Agencies for review. Upon their review of the data, USACE will coordinate any additional BMPs, as required and if necessary for future contracts.

7 COORDINATION

This Section addresses the following deficiency identified in the March 2006 O&O:

"*The Corps' mitigation measures do not provide substantial assurance that possible impacts will be minimized"* (page 60)

7.1 History and Models of Coordination

On July 24, 1996, the U.S. Department of Transportation (DOT), the USACE and the USEPA entered a Memorandum of Agreement (MOA) to advance the shared goals of protecting the region's environment while ensuring the economic strength and competitiveness of the Port of New York and New Jersey (MOA, 1996). This innovative agreement marked the designation of the HARS, but more importantly it created a framework in which the USEPA and the USACE agreed to work together to address both the environmental and economic needs of the Harbor into the 21st Century.

Other joint agency coordination teams and efforts include:

- The Regional Dredging Team: The New York Harbor Dredging Task Force was revamped in late 2005 and renamed the New York/New Jersey Regional Dredging Team (RDT). There are a number of RDTs throughout the country, which is part of a larger National Dredging Team (NDT) Initiative sponsored by USEPA. The NY/NJ Harbor RDT meets once a month since it's first meeting in January 2006. USACE-NYD and USEPA are the co-chairs and the group consists of members from eight other federal, state and local agencies, (including the PANYNJ, NJDEP, New Jersey Department of Transportation [NJDOT], NYSDEC, NYS Department of State [NYSDOS] and the New York City Department of Environmental Protection [NYCDEP]). The RDT updates, discusses and attempts to actively resolve, problematic issues associated with dredging and disposal in the Harbor, particularly focusing on federal deepening and maintenance dredging project volumes and schedules, and upland placement site development and capacity. The Team also gets monthly reports on the status of the Public Processing Facility (PPF) and updates to the Dredged Material Management Plan (DMMP). Since the team includes regulatory decision-makers from the Corps, USEPA and the States, recommendations on specific current and future federal and private projects are discussed and determinations on a course of action are often made. These meetings also afford the opportunity for agency representatives to evaluate different policy issues associated with dredging the Harbor, with specific recommendations forwarded to the Senior Partnering Meeting for further action.

- The Regional Sediment Management Task Force (RSM): The RSM is chaired by the USACE –NYD and meets monthly since it's formation in February 2006. RSM members include USEPA, NY/NJ Baykeeper Organization, NYSDEC, NJDEP, NJDOT, PANYNJ, The Hudson River Foundation, and Clean Ocean Action. The group was formed to create a Comprehensive Plan for managing sediments from the NY/NJ Harbor as a resource, with the overall goal of having sediments support and sustain both a healthy ecosystem and a robust regional economy. The Comprehensive Plan will focus on evaluating three primary elements: Sediment Quality, Sediment Quantity and Dredging. The Sediment Quality evaluation will focus on addressing issues concerning newly introduced sediments and historic contamination; Sediment Quantity will consider the relationship of sediment quantity to estuarine ecological processes and channel sedimentation; and Dredging will address navigational dredging and dredged material management. The Plan will be part of a report that will include a series of recommended actions for each element that will lead to a management strategy for all Harbor sediments. The report is scheduled for completion by early 2007, and will be given to the Harbor Estuary Program Policy Committee for their review and implementation.

- The Regional Air Team: A comprehensive Harbor Air Mitigation Plan (HAMP) was developed in 2004 to address impacts of the HDP to the air quality in the region. The HAMP examined a number of strategies for achieving conformity and recommended a combination of options that meet Clean Air Act (CAA) requirements in a cost effective and environmentally acceptable manner. A Regional Air Team, comprised of the USACE, Port Authority, USEPA, NYCDOT and State air quality offices, has been coordinating since 2000 to first develop and then assist with the continual updates to the HAMP and assure its technical feasibility and regulatory compliance with the CAA.

These groups have been formed to address interagency and stakeholder concerns and potentially over lapping programs. USACE and USEPA coordination for the RI/FS will build off these existing and successful models.

This traditional commitment of cooperation is further exemplified by an MOU signed between the USACE and USEPA in July 2002 for environmental remediation and restoration of degraded urban rivers and related resources (MOU, 2002). The Lower Passaic River (LPR) was one of eight pilot projects prioritized in the original MOU, affording the two agencies an opportunity to coordinate their efforts for the purpose of achieving more efficient and effective cleanup, revitalization, and restoration of the Lower Passaic River. This agreement and its subsequent renewal (MOU, 2005) created a mechanism for cooperation and coordination, and expressed the intent of the signatory agencies to work together in resolving conflicts using consensus building and collaborative decision-making to find common ground and to identify practical solutions (MOU, 2005).

The foundation for USACE and USEPA coordination within LPR and Newark Bay began with the initiation of the Lower Passaic River Environmental Restoration Feasibility Study. The purpose of this joint environmental restoration study was to develop a comprehensive plan for the LPR basin. The LPR was designated as part of the Diamond Alkali Superfund Site, which is the subject of an USEPA RI/FS pursuant to CERCLA. In recognition of the coincidental study areas and the related roles and responsibilities of the USEPA, USACE and NJDOT the agencies combined the USEPA Superfund RI/FS and the Corps environmental feasibility study into one comprehensive and cooperative study – the Lower Passaic River Restoration project (LPRRP).

The coordination process and procedures for the LPRRP and the HDP differ because the LPRRP is a cooperative project between the agencies in the study phase. In comparison, the HDP and RI/FS are two separate projects that are in different stages and are being conducted at the same location. The coordination between the USEPA and USACE for the LPRRP project further illustrates the history of coordination efforts between the two agencies.

7.2 Special Coordination as a Mitigation Measure for the HDP

Avoidance and minimization of project impacts to the RI/FS are integral components of the preferred action instead of post-project compensatory mitigation. To avoid and minimize potential impacts to the NBSA RI/FS, a NBSA Comprehensive Coordination Plan with the USEPA has been developed (Appendix 5). The NBSA Comprehensive Coordination Plan ensures that potential impacts on the RI/FS associated with the HDP are identified, avoided, and minimized to the fullest extent practicable. Avoidance and minimization of project impacts to the RI/FS will also be accomplished through the application of a variety of BMPs as previously discussed in Section 6.

The NBSA Comprehensive Coordination Plan is an outgrowth of the long-standing and on-going institutional cooperation (Section 7.1) that the USACE has developed with both state and Federal agencies since the USACE began the current harbor deepening efforts in the mid 1980's. The NBSA Comprehensive Coordination Plan as outlined is more than a "business as usual" approach and includes a team of senior level managers and technical experts from both the USEPA and the USACE-NYD, as well as representatives from the PANYNJ, the U.S. Fish &

Wildlife Service (USFWS), NOAA's National Marine Fisheries Service (NMFS), as well as representatives from the state regulatory agencies of New York (NYSDEC) and New Jersey (NJDEP).

The coordination team meets on a monthly basis to update each other on current and future activities and to resolve any potential scheduling and/or sampling conflicts between the two programs. The coordination team is supported on an as needed basis by additional agency scientists and engineers as well as consulting experts to address the project specific details of both the RI/FS and HDP.

7.2.1 Technical, Institutional and Problem Resolution Components of the NBSA Coordination Team

As a result of this ongoing relationship, and as outlined in the NBSA coordination teams' charter, a Project Coordination Team has been established in which the USACE has been kept informed of the USEPA's progress on the NBSA and the USACE has shared with USEPA all pertinent and relevant information on the HDP's construction schedule, sediment sampling data, and other geophysical data. The team is co-chaired by the USEPA (Region 2) and the USACE (NY District). A complete listing of the current team members is in Appendix 5. Agency contractors or other technical experts are participants on a case by case basis.

The coordination team will remain active for the duration of the HDP and any associated maintenance projects during the completion of the RI/FS. The team meets monthly, typically the second Tuesday of each month, to update each other on current and future activities, identify current or upcoming document review requirements, review documents, and resolve any outstanding issues. A draft agenda is circulated to team members for review and input approximately one week prior to the scheduled meeting date. Additional meetings may be scheduled based on the needs of a given agency or individual team members, who may also be invited to attend other relevant meetings, such as USACE meetings with dredging contractors. Draft minutes of the meetings are prepared and distributed to the team for review, comment, and concurrence prior to finalization. To document success and demonstrate good faith effort, all minutes and memoranda for record are signed, disseminated to the appropriate agencies, and routed to upper management (Appendix 5).

USACE and USEPA successfully coordinated during Phase I of the RI/FS (January 23 Letter from Mr. Pavlou to Col. Tortora, Appendix 5). Meetings conducted prior to the release of USEPA's Phase I RIWP resulted in the revisions to the RIWP based on data and information provided by USACE. These included: 1) historical dredging areas and volumes; 2) database of sediment, water, and biota sample results from HDP aquatic biological program; and 3) existing USACE datasets within the NBSA pertaining to barge removal, habitat surveys and confined disposal facility (CDF) construction. This exchange of information helped USEPA choose sampling stations that met the goals of the RI/FS and ensured that dredging activities would not impact the RI/FS. During the 2006 coordination meetings, USACE and USEPA discussed Phase I results, Port Newark O&M dredging activities and the Phase II RIWP (Appendix 5). The Draft Phase II RIWP was provided to USACE for review and comments regarding Phase II sampling locations and dredging activities.

Throughout the coordination of the HDP and RI/FS, USACE will continue to provide USEPA with maps providing updated and historical bathymetry, information on current and future dredging activities within the NBSA, sediment data from future dredge material cores and biological data in and adjacent to NBSA. USACE and USEPA have been coordinating on the location of Phase II sediment sampling locations. Based on USACE 2007 historical sediment report, additional Phase II sampling locations were identified with USEPA.

Coordination between the USACE and the USEPA will ensure that the programs are conducted in a manner consistent with both the best available science and appropriate management practices. Acting in a cooperative fashion to assist each other in furthering the goals of the coordination plan, the team has implemented a tiered dispute resolution plan. Highlights of this plan are as follows:

- The team will attempt to resolve the dispute at the team level within seven days.
- If the team cannot resolve the dispute, then the issue will be raised to the involved agency management staff, whom then has seven days to resolve the dispute.
- If the immediate management staff cannot resolve the issue, then it is raised to the NY/NJ Harbor Senior Partners, a group composed of the senior representatives of each agency. The Senior Partners will endeavor to resolve the dispute within 30 days, convening a special meeting if necessary.

8 SUMMARY AND CONCLUSIONS

This Environmental Assessment (EA) evaluated the potential impacts of the New York and New Jersey Harbor Deepening Project (HDP) on the U.S. Environmental Protection Agency's (USEPA) Remedial Investigation and Feasibility Study (RI/FS) being conducted in the Newark Bay Study Area (NBSA).

This Draft EA, in addition to meeting its' NEPA obligation, specifically addresses the four areas of deficiencies identified in the March, 2006, O&O, all other impacts having been, properly addressed as concurred by the Court:

1) **"(The EA) *It failed to take a hard look at the effect of resuspension on contaminant concentrations in the surface level sediments for two reasons: 1) it failed to assess resuspension rates for different geomorphic areas and arbitrarily relied on the used of averaging over each contract area; and 2) it did not identify and consider hot spots* (page 60)[18]" For technical evaluations see Section 4 of this EA.**

Deposition of Resuspended Sediments within Each Geomorphic Area

A numerical modeling framework was implemented to track the deposition of sediment resuspended by dredging activity in Newark Bay. The model used the MIKE3 particle tracking model (PA) to predict the transport and deposition of sediments released by environmental (closed) clamshell dredges. The model was calibrated and validated using recent field collected data to reproduce the measured TSS concentrations around dredges operating in Newark Bay in June-July 2006.

Flats: Over the life of the HDP, the predicted deposition over the majority of the flats is 0.8mm (0.03 inch). The flats represent more than 75% of the surface area of the NBSA, thus the overall potential impact from the HDP to the RI/FS is trivial and generally below detection.

Navigation Channels: The model simulation predicts the majority of resuspended sediment due to the HDP deposits within the channel limits in the immediate vicinity of the dredge areas.

[18] Page number references refer to pages in the U.S. District Court, Southern District of New York, Opinion and Order of March 8, 2006.

Transition Zones: The mean sedimentation predicted by the model is 7.7 mm (0.3 inches) but not more than 60 mm(2.3 inches) is generally found immediately adjacent to the channel boundaries (i.e. transition zones) and the nearby shoals (between South Elizabeth Channel and Arthur Kill, and over the Newark Bay CDF). The transition zone (generally at the junction of the channel slopes and the flats) also receives more redeposition. However, these areas represent less than 2% of the total area modeled.

Sediment Chemistry Analysis within Each Geomorphic Area

The model simulations demonstrate that the majority of resuspended sediment deposits in the immediate vicinity of the dredge, with smaller amounts deposited in areas outside of the dredge contract areas and in the shallows of the bay. The model-simulated /predicted sedimentation depths were used to assess impact to the chemical analysis of the RI/FS.

The primary mechanism by which dredged material may affect the RI/FS is by changing the concentrations of contaminants within the surface layer of sediments. Measuring contaminant concentrations in surface sediments is a typical and an important component of any contaminated sediment evaluation. The NBSA Phase 1 program included sampling of surface sediments, and future phases are likely to include additional sampling of surface sediments. The analysis was performed for 2, 3, 7, 8-TCDD, total PCBs, total DDT (pp-DDT, pp-DDE, and pp-DDD), benzo (a) pyrene, mercury, and chromium.

Flats: For all chemicals, in the HDP evaluation and in the AEC analysis, very few cells lying in the flats exhibited changes greater than the precision of the data. This is due to limited deposition and to the general similarity between contaminant concentrations in dredged material and in surface sediments on the flats.

Navigation Channels: Changes in contaminant concentrations in surface sediments were assessed in the channels that lie outside of the HDP; these extend from the Bergen Point area into Kill Van Kull and in the channels in northern Newark Bay, including Port Newark Channel. Predicted changes in concentration that were greater than the precision of the data were found within the navigational channel at the northern tip of the HDP (TCDD and PCBs). For BAP, the changes that were greater than the precision of the data were all associated with one data value in the Kill Van Kull.

Results were generally similar for the AEC analysis, with the following exceptions. For TCDD, changes that were greater than the precision of the data were also found in the Kill Van Kull. For DDT, a few cells in the channel in northern Newark Bay exceeded the precision of the data.

Transition Zones: The transition zones were represented by the model cells adjacent to the channel. Predicted changes in concentration due to the HDP that were greater than the precision of the data tended to be found adjacent to the navigational channel at the northern tip of the HDP (TCDD and PCBs) and along the Arthur Kill (DDT, Hg). The few cells that showed changes in chromium levels greater than the precision of the data were located along the Port Elizabeth Channel. Results were generally similar in the AEC analysis.

Overall, the HDP dredging has a very low likelihood at causing adverse impacts to ongoing and proposed sampling and chemical analyses for the RI/FS (Table 4-5). In general, changes in surface sediment concentrations were zero. Results for the transitional zone and unexpected or unknown Areas of Elevated Concentration (AEC), aka "Hot Spots", analysis are provided in Section 4 and Appendix 2. The USEPA RI/FS will further elucidate the presence of AEC's ("Hot Spot"), if any, via their CERCLA studies and efforts. The Corps assessment has determined that out of 168 comparisons (6 chemicals X 28 sites), two values were computed to change from existing concentrations by more than the precision for the NBSA RI/FS Phase 2 data; one value for mercury and one for DDT. The changes for both chemicals were predicted to occur along the shoreline of the Arthur Kill. Overall, predicted changes in surface sediment chemical concentrations are anticipated to be minimal. However, if future schedules or sampling plans change, potential impacts may be further avoided and mitigated through coordination of sampling and dredging between the USEPA and the USACE.

2) ***"The Corps failed to assess the cumulative impact of maintenance dredging on the RI/FS* (Page 60)". For Technical evaluations see Chapter 5 of this EA ;**

To estimate the impacts associated with the HDP in conjunction with other deepening and/or maintenance projects, the MIKE3 PA model was run using the same parameters used in the HDP assessment. This cumulative assessment included the volume of material associated with the

HDP and 117,000 CY of dredged material associated with deepening an area near S-AK-3 (Figure 4-3) to deepen the Arthur Kill to 45 ft as well as estimated other dredging volumes, which include maintenance dredging (see Appendix 1). The release points in the HDP assessment were expanded to include releases in the Port Newark Channels as this is where other dredging occurs. The combined deposition attributed to the HDP and to other dredging was analyzed for its impact on chemical concentrations in the surface sediments throughout the Bay (Appendix 2).

Cumulative Deposition of Resuspended Sediments within Each Geomorphic Area

Flats: Mean deposition on the Newark Bay flats was 0.9 mm (0.04 inch) with variability between 0.0mm and 49.4mm (1.9 inches). The greatest deposition occurred at the flats south of the South Elizabeth Channel. This is an area of low current velocities and where channel widening is occurring.

Navigation Channels: The maximum predicted sedimentation depth in the channels is 127 mm (4.9 inches) near the corner formed by the Pierhead Channel and Elizabeth Channel. Mean deposition on the channel bottoms was 13.1mm (0.5 inch) with variability between 0.0mm and 127.5mm (5 inches). Maximum sedimentation outside the channel areas is 14mm (0.6 inch) over the Newark Bay CDF. At the northern reach of the Arthur Kill, there are small areas where the predicted deposition is higher than the mean.

Transition Zones: Mean deposition in the transition zones, between channels and flats, was 9.1mm (0.36 inch) with variability between 0.0mm and 70.1mm (2.8 inches). The vast majority of the transition zones had less than 8mm (0.3 inches). There were sections of the transition zones in the northern reach of the Arthur Kill where predicted deposition was higher than the mean (Figure 5-3).

Overall, deposition is predictably more extensive in the cumulative assessment than in the HDP-only case. Deposition is heaviest within the Port Newark areas, as expected, due to proximity to the source of the material, as well as the depositional nature of this navigational channel. The highest sediment accumulation is observed in the Port Newark channel where it intersects with Newark Bay, which is primarily due to the hydrodynamics of the system (i.e. reduced current velocities).

In the cumulative assessment, changes were also observed in or adjacent to the port channels and in or adjacent to the transitional zones. Overall, though, throughout the bay, those few changes that were greater than the uncertainty in the data were often only slightly greater.

Cumulative Sediment Chemistry Analysis within Each Geomorphic Area

Flats: In the cumulative assessment, very few cells lying in the flats exhibited changes greater than the precision of the data, for all chemicals. This is due to limited deposition and to the general similarity between contaminant concentrations in dredged material and in surface sediments on the flats.

Navigation Channels: Changes in contaminant concentrations in surface sediments were assessed in the channel extending from the Bergen Point area into Kill Van Kull and in the channels in northern Newark Bay, including Port Newark Channel. These are areas that lie outside of the HDP. Predicted changes in concentration that were greater than the precision of the data were found within the navigational channel at the northern tip of the HDP. For BAP, the changes that were greater than the precision of the data were all associated with one data value in the Kill Van Kull.

Transition Zones: The transition zones were represented by the model cells lying adjacent to the channel. Predicted changes in concentration due that were greater than the precision of the data tended to be found adjacent to the navigational channel at the northern tip of the HDP and along the Arthur Kill. Results were generally similar in the AEC analysis.

Overall, for nearly all of Newark Bay, predicted changes in concentration were generally less than or similar to the precision of the data. Consequently, chemical concentrations in samples collected after the HDP are likely to be indistinguishable, in general, from chemical concentrations in samples collected prior. These changes are not significant. Deposition due to the HDP and other dredging is unlikely to affect EPA's ability to collect and interpret chemical concentrations in sediment samples from the flats.

3) "*The EA lacked a proper alternatives analysis* (page 60)" For Screening Criteria and technical evaluations see Chapter 3 in this EA

This EA assesses the impact that the HDP may have on the RI/FS in the NBSA. The primary objective of the alternatives analysis is to consider approaches to dredging in the NBSA that may avoid or minimize potential impacts on the RI/FS. In addition to the No Action alternative, the alternatives considered to avoid and minimize impacts on the RI/FS are: 1) the proposed action, 2) timing/sequencing alternative for constructing the HDP in the NBSA, and 3) remedial dredging. Each of these alternatives is described in Section 3.1.

As discussed in the Alternatives Evaluation (Section 3.2.2), the Proposed Action is technically feasible and avoids issues associated with some of the other alternatives, such as; side slope failure incurred by phased implementation of channel deepening and channel widening; economic impacts of project construction incurred due to prolonged schedule delays; economic impacts to the shipping industry incurred due to prolonged schedule delays and environmental impacts incurred due to increased ship traffic. The selected alternative will not adversely affect the outcome of the RI/FS sampling and analysis activities.

4) "*The Corps' mitigation measures do not provide substantial assurance that possible impacts will be minimized* (page 60)" This issue is addressed in Sections 6 and 7 of this EA.

Avoidance and minimization of project impacts to the NBSA RI/FS are integral components of the preferred action instead of post-project compensatory mitigation. USACE will avoid impacts to the RI/FS by sequential dredging of the side-slopes for S-NB-1. In addition, a mitigation program based on BMPs will be monitored through the use of dredge inspectors. USACE has also developed a TSS monitoring program to evaluate the efficacy of its mitigation measures. All monitoring results are shared and coordinated with NJDEP, NYSDEC and USEPA.

Best Management Practices (BMPs) are procedures that minimize the potential for adverse environmental and physical impacts from construction activities, such as dredging and dredged material management operations. BMPs for the proposed project are required by the state issued WQC conditions. The dredge practices (i.e. closed environmental clamshell bucket and hoist speeds) being used for constructing the HDP in the NBSA reduce the amount of free water in the dredge material, avoid overfilling the bucket and minimize the number of dredge bucket cycles needed to complete the dredge contract. These practices will minimize HDP impacts to the RI/FS.

To address concerns regarding coordination of HDP construction activities with projects in the study phase (i.e. RI/FS) while not affecting port operations critical to the national economy and security, in addition to the avoidance and minimization measures already employed (i.e. deferment of side slope construction in S-NB- 1 contract, additional BMPs in WQC and TSS monitoring), USACE in cooperation with the USEPA developed a joint comprehensive coordination plan to minimize the potential conflicts between USACE Harbor dredging operations and the EPA's NBSA RI/FS process. The purpose of this plan is to ensure that potential impacts on the USEPA's RI/FS, in the NBSA are identified, avoided, and minimized (mitigated) to the fullest extent possible.

The coordination team will remain active for the duration of the NBSA RI/FS. The team meets monthly to update each other on current and future activities, identify current or upcoming document review requirements, review documents, and resolve any outstanding issues.

USACE and USEPA successfully coordinated during Phase I of the RI/FS. Meetings conducted prior to the release of USEPA's Phase I RIWP resulted in the revisions to the RIWP based on data and information provided by USACE. These included: 1) historical dredging areas and volumes; 2) database of sediment, water, and biota sample results from HDP aquatic biological program; and 3) existing USACE datasets within the NBSA pertaining to barge removal, habitat surveys and confined disposal facility (CDF) construction. This exchange of information helped USEPA choose sampling stations that met the goals of the RI/FS and ensured that dredging activities would not impact the RI/FS. During the 2006 coordination meetings, USACE and USEPA discussed Phase I results, Port Newark O&M dredging activities and the Phase II RIWP (Appendix 5). The Phase II RIWP was provided to USACE for review and comments regarding Phase II sampling locations and dredging activities. Based upon recent past successful interagency coordination, it is reasonable to expect the same levels of cooperation during future coordination and expect the same successful outcomes.

This EA in conjunction with the prior documentation completed under the requirements of NEPA (Section 1.3.) evaluates the effects of the HDP. The focus herein is upon the deficiencies identified in the Court's March O&O. This EA evaluated the issue of dredging-induced sediment resuspension and determined that the HDP would not likely alter surface sediment chemical concentrations such that the outcome of sampling results associated with the RI/FS would be adversely altered. In addition, this EA assessed the potential for cumulative impact of maintenance (Federal and non-Federal) dredging on the RI/FS, with findings similar to the HDP-only evaluation. Alternatives to the HDP Proposed Action were evaluated against project objectives and constraints with the result that the Proposed Action was identified as the Preferred Alternative. Mitigation measures, including BMPs, as well as the tailored NBSA coordination plan, were delineated in this EA to provide assurance that impacts will be minimized to the maximum extent practicable.

The Proposed Action meets the primary HDP goal of providing safe navigation and does so without significant effects on the RI/FS.

9 GLOSSARY

Term	Definition/Explanation
Administrative Order on Consent (AOC)	Generically, an Administrative Order on Consent is an enforceable legal agreement signed by USEPA and an individual, business, or other entity through which the violator agrees to pay for correction of violations, take the required corrective or cleanup actions, or refrain from an activity. In this EA, the AOC of interest is the February 13, 2004 agreement between USEPA and Occidental Chemical Corporation for Tierra Solutions Inc., to conduct a RI/FS of the Newark Bay Study Area. The USEPA maintains oversight of the work in the Newark Bay Study Area.
Authorized Depth	The depth to which the channels within the HDP will be dredged. In main shipping channels, the Authorized Depth for the HDP is 50 feet except for areas of rock or hard bottoms where the depth is 2 feet deeper than maintained depth (i.e., 52 feet).
Bathymetry	Topographical (surface) configuration of submerged lands.
Benthic	An environment or habitat related to the bottom of a stream or body of water.
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)	Commonly known as Superfund, this law, enacted by Congress on December 11, 1980, created the Superfund program. Specifically, CERCLA (1) established prohibitions and requirements concerning closed and abandoned hazardous waste sites, (2) provided for liability of persons responsible for releases of hazardous waste at these sites, and (3) established a trust fund to provide for cleanup when no responsible party could be identified.
Draft	The maximum depth of a vessel in the water.
Dredging Residual	Sediments that either remain after dredging below the dredge line, or have been spread to locations outside of the dredge area as a result of the dredging. Sources of dredging residual include failure of cut slopes, sediment dredged but not captured, settling of resuspended sediments and material disturbed by ship propellers (prop wash).
Endangered Species	Any species that is in danger of extinction throughout all or a significant portion of its range, and published in the Federal Register in accordance with the Federal Endangered Species Act. Note: States may also designate Threatened Species based on state legislation.
Environmental Assessment (EA)	A preliminary, written, environmental analysis required by the National Environmental Policy Act (NEPA;) to determine whether a federal activity such as building airports or highways would significantly affect the environment; projects may require preparation of a more detailed Environmental Impact Statement.

Term	Definition/Explanation
Environmental Impact Statement (EIS)	A document required of federal agencies by the NEPA for major projects or legislative proposals significantly affecting the environment. A tool for decision making, it describes the positive and negative effects of the undertaking and cites alternative actions.
Estuary	A semi-enclosed body of water that has a free connection with the open sea and within which seawater (from the ocean) is diluted measurably with freshwater that is derived from land drainage. Brackish estuarine waters are decreasingly salty in the upstream direction and vice versa. The ocean tides are projected upstream to the fall lines.
Excavated Depth	This is the target, or minimum, depth of initial construction dredging. To provide added safety clearance, this depth is 2 ft deeper than maintained depth in areas of rock and hard bottom.
Feasibility Study	The development and analysis of the potential cleanup alternatives for a site on the state and/or federal registry. The feasibility study usually recommends selection of a cost-effective alternative. The feasibility study usually starts as soon as the remedial investigation is underway; together, they are commonly referred to as the "RI/FS."
Finding of No Significant Impact (FONSI)	A document prepared by a federal agency showing why a proposed action would not have a significant impact on the environment and thus would not require preparation of an Environmental Impact Statement. A FONSI is based on the results of an environmental assessment prepared to document compliance with (NEPA).
Flats or Flats Areas	Shallow areas of the Newark Bay Study Area or Harbor Deepening Project Area.
Harbor	Short for "New York and New Jersey Harbor"; this refers to the waterways in the analysis. However, it may be used interchangeably with the Port.
Hot Spot	Areas with contaminant concentrations that exceed risk based values or benchmarks established to estimate potential for human health and/or ecological risk.
Maintained Depth	The depth of a channel maintained by operation and maintenance dredging.
National Environmental Policy Act (NEPA)	A federal law of the United States passed in 1970 which requires federal agencies to evaluate the impact of their actions on the natural and human environments, weigh the costs and benefits of alternative actions, and consider measures to mitigate environmental impacts. Compliance with NEPA can be achieved through the preparation of an Environmental Assessment (EA), and, subsequently, the preparation of a Finding of No Significant Impact, if the EA concludes that there will be no significant impact on the environment. However, if the EA concludes that the action

Term	Definition/Explanation
	would have a significant impact on the environment, an Environmental Impact Statement (EIS) is required.
Overdredge Depth	There are two types of overdepth dredging: Allowable and non-pay. Allowable is the maximum additional depth of a channel beyond the required depth and/or width allowed by permit to account for dredging equipment inaccuracy. In order to assure that the excavated depth is achieved, dredging typically extends beyond the required depth. For the HDP, this additional depth is routinely permitted to vary up to an additional 1.5 feet past the required depth. Non-pay is dredging beyond the permitted and allowable prism.
Port	Short for "The Port of New York and New Jersey", this refers to the land-side facilities, operations, etc. in the analysis. However, it may be used interchangeably with the Harbor.
Post-Panamax Vessel	Refers to a vessel too large to navigate the Panama Canal. The beam width is greater than 113 ft (34.5 m).
Remedial Investigation (RI)	An in-depth study designed to gather data needed to determine the nature and extent of contamination at a potential Superfund site or State hazardous waste site; establish site cleanup criteria; identify preliminary alternatives for remedial action; and support technical and cost analyses of alternatives. The remedial investigation can be done with the feasibility study. Together they are usually referred to as the "RI/FS."
Resuspension	The remixing of sediment particles and pollutants back into the water by storms, currents, organisms, and human activities, such as dredging.
Salinity	The relative proportion of salt in a solution, such as water.
Sediment Deposition or Erosion	Sediment addition (deposition) or removal (erosion) from an area by some transporting agent, such as wind or water.
Sediments	The organic and inorganic particulate materials, including gravel, sand, silt and clay, comprising the bottom substrate of a waterbody.
Shoaling	Deposition of sediments result in reduced bottom depth
Superfund Amendments and Reauthorization Act (SARA)	This legislation, passed on October 17, 1986, amended the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). SARA reflected EPA's experience in administering the complex Superfund program during its first six years and made several important changes and additions to the program. Fore more detail on SARA refer to the following link: http://www.epa.gov/superfund/action/law/sara.htm
Superfund	The program operated under the legislative authority of CERCLA and SARA that funds and carries out USEPA solid waste emergency and long-

Term	Definition/Explanation
	term removal and remedial activities. These activities include establishing the National Priorities List, investigating sites for inclusion on the list, determining their priority, and conducting and/or supervising cleanup and other remedial actions.
Suspended Sediments	Soil particles that remain suspended in water due to the upward forces of turbulence and currents, and/or colloidal suspension.
Thiessen Polygon	Thiessen polygons are drawn so that the boundary lines for each polygon are of equal distance between two adjacent points.
Threatened Species	Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Species considered Threatened on the Federal level are listed in the Federal Register, in accordance with the Federal Endangered Species Act. Note: States may also designate Threatened Species based on state legislation.
Turbidity	A measure of water clarity resulting from the presence of suspended matter; an optical property of water influenced by particulate and dissolved constituents of a volume of water
Water Quality Certificate	A Water Quality Certificate (WQC) is required under Section 401 of the Clean Water Act. Section 401 Water Quality Certification programs are administered by State agencies (e.g., NJDEP, NYSDEC), in cooperation with the federal permit program. Any applicant for a federal license or permit (or state permit where the state has assumed jurisdiction for the federal program) who seeks to conduct an activity that may result in any discharge into the navigable waters, including wetlands and watercourses, must obtain a WQC. The WQC confirms that the discharge is consistent with the federal Clean Water Act and the state’s water quality standards. The WQC can stipulate conditions, such as mitigation measures and/or monitoring, which must be conducted by the applicant. Unlike disposal of dredged material in the waters of the United States, dredging by itself is considered a deminimis discharge under the CWA and is not regulated under the State WQ Program.

10 REFERENCES

Bernick, Andrew. 2005. New York City Audubon's Harbor Herons Project: 2005 Interim Nesting Survey.

Bohlen, W.F., Cundy, D.F., Tramontano, J.M. (1978), "Suspended Material Distributions in the Wake of Estuarine Channel Dredging Operations," Estuarine and Coastal Marine Science, 9, pp. 699-711.

Bohlen, W. F. 1980. A Comparison between Dredge Induced Sediment Resuspension and that Produced by Natural Storm Events. In Proceedings of the Seventeenth Coastal Engineering Conference. ASCE, New York. 1980. p. 1700-1707.

Diaz, R. 2005. Estimation of the Biologically Active Zone, Newark Bay, New Jersey. Report for USEPA Phase I Remedial Investigation Activities.

Hayes, D., Wu, P. (2001). "Simple Approach to TSS Source Strength Estimates," WEDA Proceedings, WEDA XXI, Houston, June 15 -27

Gilbert, R.O. 1987. Statistical Methods for Environmental Pollution Monitoring. Wiley.

Land, C.E. 1972. An evaluation of approximate confidence interval estimation methods for lognormal means. Technometrics 14:145-158.

Lowe.S, K. Abood, J. KO and T. Wakeman. 2005. A Sediment Budget Analysis of Newark Bay. Journal of Marine Science and Environment. No. C3 p. 37-44.

National Research Council. 1997. Contaminated Sediments in Ports and Waterways. National Research Council. National Academy of Press, Washington D.C.

_____. 2006. "A Risk-Management Strategy for PCB-Contaminated Sediments," Committee on Remediation of PCB-Contaminated Sediments, Board on Environmental Studies and Toxicology, Division on Life and Earth Studies, National Academy Press, Washington, DC.

National Oceanic and Atmospheric Administration (NOAA). 2005 (online). Query Manager and MARPLOT Tutorial. Website address: http://response.restoration.noaa.gov/cpr/qm/qmmptutorial.html

New Jersey Department of Environmental Protection (NJDEP). October 1997. Technical Manual - The Management and Regulation of Dredging Activities and Dredged Material in New Jersey's Tidal Waters.

New York State Department of Environmental Conservation (NYSDEC). June 2003. Contaminant Assessment and Reduction Project: NY/NJ Sediment Report 1998 – 2001. Prepared by the Division of Water.

Schoellhamer, D.H. 1996. Anthropogenic Sediment Resuspension Mechanisms in a Shallow Microtidal Estuary. Estuarine, Coastal and Shelf Sciences Vol. 43, p.553-548.

Schoellhamer, D. H. 2002. Comparison of the Basin-scale Effect of Dredging Operations and Natural Estuarine Processes on Suspended Sediment Concentration. Estuaries Vol. 25, No. 3, p. 488-495.

Tierra Solutions. 2004. Inventory and Overview Report of Historical Data. In Newark Bay Study Area, Remedial Investigation Work Plan, Sediment Sampling and Source Identification Program. Newark Bay, New Jersey.

United States Congress, House of Representatives. Conference Report on the Energy and Water Appropriations Act of 2002, 107th Congress, 1st Session, 2002. House Report 107-258.

United States Environmental Protection Agency (USEPA). 1993. USEPA 2, 3, 7, 8-TCDD Surficial Sediment Analysis. Database obtained from NOAA Query Manager, February 2005.

_____. 1999. Guide to Preparing Superfund Proposed Plans, Records of Decision, and other Remedy; Selection Decision Documents.

_____. 2005. Contaminated Sediment Remediation Guidance for Hazardous Waste Sites, United States Environmental Protection Agency EPA-540-R-05-012, Office of Solid Waste and Emergency Response OSWER 9355.0-85.

______. 2005c (online). Regional Environmental Monitoring and Assessment Program (REMAP). REMAP 1998-99 NY/NJ Harbor Data Sets. Website address: http://www.epa.gov/emap/remap/html/two/data/nynj9899.html

_____. 2005c (online). Regional Environmental Monitoring and Assessment Program (REMAP). REMAP 1993-94 NY/NJ Harbor Data Sets. Website address: http://www.epa.gov/emap/remap/html/two/data/nynj.html

United States Army Corps of Engineers (USACE). 1999. New York and New Jersey Harbor Navigation Study Feasibility Report and Final Environmental Impact Statement. Prepared by the New York District.

_____.1999b Dredged Material Management Plan for the Port of New York and New Jersey: Implementation Report, Programmatic Environmental Impact Statement, and Technical Appendix. U.S. Army Corps of Engineers, New York District, New York, NY.

_____. 2004 New York and New Jersey Harbor Navigation Program. Aquatic Biological Survey Report 2005.

_____. 2004b. Limited Reevaluation Report and Environmental Assessment on Consolidated

Implementation of the New York and New Jersey Harbor deepening Project. New York District.

_____. 2005 New York and New Jersey Harbor Navigation Program. Aquatic Biological Survey Report 2006.

_____. 2006a. Avian Monitoring Observations, Shooters Island

_____. 2006b. Assessment of Suspended Sediment Plumes Associated with Navigation Dredging the Arthur Kill waterway, New Jersey.

_____. 2007. Geomorphologic/Geophysical Characterization of the Nature and Dynamics of Sedimentation and Sediment transport in Newark Bay focusing on the Effects related to the Continued and Future Federal Navigation Channel Deepening and Maintenance.

United States District Court-Southern District of New York (USDC-SDNY). 2005. Opinion and Order of August 5, 2005 (Shira A. Scheindlin, U.S.D.J.). 05 Civ.762 (SAS).

_____. 2006. Opinion and Order of March 8, 2006 (Shira A. Scheindlin, U.S.D.J.). 05 Civ.762 (SAS).

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Ms. Gallo has been with the U.S. Army Corps of Engineers- New York District for 10 years. She is responsible for providing leadership to and management of environmental technical teams assigned to the New York District's Civil Works Planning and Construction Program, which includes: planning and construction of multi-purpose dams and reservoirs, flood control facilities, shore and hurricane protection improvements, habitat restorations, navigation projects and operation of waterways under USACE jurisdiction. Ms. Gallo is also responsible for ensuring USACE actions are in compliance with Federal environmental laws such as the National Environmental Policy Act, the Clean Water Act, the Clean Air Act, the Endangered Species Act, the US Fish and Wildlife Coordination Act, the Magnuson-Stevens Fishery Conservation and Management Act and Essential Fish Habitat Amendment and the Migratory Bird Act as well as state and local environmental laws and regulations. In addition she is also provides technical support to the USACE -NYD Office of Counsel, as required.

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Mr. Pinzon has 10 years of professional experience in the environmental field. He is responsible for the design, preparation, and coordination of environmental impact/restoration studies and National Environmental Policy Act (NEPA) documents for the USACE's NY & NJ Harbor Program. He has worked on a number of field study efforts in the Harbor (Total Suspended Solids Monitoring, Aquatic Biological Sampling, and Essential Fish Habitat Restoration). Mr. Pinzon also serves as a Point of Contact for environmental issues in the Harbor between the Corps and agencies such as the New Jersey Department of Environmental Protection (NJDEP), NYSDEC, National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS).

Prior to working for the Corps, Mr. Pinzon conducted fisheries studies and prepared technical and administrative reviews for environmental permit applications under the State Environmental Quality Review Act (SEQRA), Article 15 Protection of Waters and Article 25 Tidal Wetland Land Use Regulations of the New York State Environmental Conservation Law (ECL) for the New York State Department of Environmental Conservation (NYSDEC).

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While with the USACE, Dr. Engler was a frequent participant testifying in Congressional and Office of Management and Budget hearings on environmental issues dealing with dredging and disposal and contaminated sediments. In addition, he has been a Technical Consultant to the USACE's Office, Chief of Engineers on environmental regulatory criteria and guidelines and has served as an expert witness in controversial environmental litigation and hearings. Dr. Engler has also served as an interagency liaison for the USACE on all scientific and technical issues regarding dredged and fill material disposal testing and evaluative guidelines, criteria, and regulations.

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Dr. Glaser has over 20 years of experience in the analysis of environmental contamination. His work has focused on computer modeling, fate and transport and bioaccumulation of contaminants in the environment, ecological risk assessment, and habitat restoration. His efforts have included the development of quantitative approaches that involve mechanistic modeling, as well as statistical analysis. Dr. Glaser's efforts have included studies of uncertainty in risk assessment and the development of approaches for analyzing the uncertainty associated with simulation models. Some of Dr. Glaser's recent work has included the statistical evaluation of time trends for contaminants in the environment, geostatistical analysis to support remedial design for contaminated sediments, the design of field sampling programs, the evaluation of habitat restoration efforts, as well as multivariate approaches to chemical fingerprinting.

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Dr. Metzger, has over 30 years of professional experience. She is a former principal of Lawler, Matusky & Skelly Engineers LLP, (now HDR LMS). She managed studies and prepared analyses that were included in many environmental impact statements (EISs) developed under the National Environmental Policy act (NEPA), the New York State Quality Review Act (SEQRA) and the City Environmental Quality Act (CEQRA). She has conducted numerous environmental assessments and documentation studies for public and private sector clients throughout New York Harbor dealing with waterfront facilities, and their associated transportation infrastructure. New York Harbor studies under her direction include port planning, dredging and disposal permits; waterfront development; mitigation and habitat restoration plans, Coastal Zone Management (CZM) compliance; Uniform Land Use Review Procedure (ULURP); bioassay, bioaccumulation studies, and biological field surveys; as well as impact assessment of shading, and pier and piling construction. Dr. Metzger has published in the subject areas of functional assessments for urban area wetlands and management of contaminated sediments.

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Mr. Smith has over 10 years of professional experience in the coastal/ocean engineering field. He has provided project management, numerical modeling, physical modeling, data collection, planning, analysis, inspection, and design services for a variety of coastal, ocean, and port projects located throughout the United States and overseas. He is well versed in the application of various hydrodynamic, wave, sedimentary, and water quality numerical models and has performed numerous modeling studies to evaluate environmental impacts, structural design loads, design optimization, and long-term morphological effects. He has simulated navigability and safe mooring practices for port facilities using time-domain vessel simulation software. In addition, Mr. Smith has co-authored several articles in books and scientific journals on offshore moorings and coastal and hydraulic modeling.

Mr. Smith contributed both to the New York and New Jersey Harbor Navigation Study Feasibility Report and Final Environmental Impact Statement and the New York Harbor Deepening Consolidation Environmental Assessment and Environmental Impact Statement, including developing high-resolution, three-dimensional models of Hudson River Estuary, New York Harbor, Long Island Sound, and New York Bight to evaluate impacts of the harbor deepening project and consolidation of a number of channel-dredging contracts within New York Harbor into a single-phase project.

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Ms. Zappala works with the Natural Resource Management and Permitting Group for HDR LMS and has worked on numerous USACE navigation improvement projects and other private and public sector sponsored waterfront and marine-related projects. As a project manager, she has led the preparation of field sampling work plans, environmental reviews and impact statements for waterfront development and navigational projects in New York Harbor, including evaluation of project impacts and the development of aquatic habitat enhancement/restoration plans.

Ms. Zappala is project manager and developed a work plan and coordinated field sampling efforts for the Total Suspended Solids Monitoring and annual aquatic biological sampling program to assess potential impacts of navigation channel improvements for the NY/NJ Harbor Deepening Project (USACE). Ms. Zappala also assisted in the sampling design and collection of macroinvertebrates and sediments used to understand the fate and transport of contaminants discharged into the New York/New Jersey Harbor Estuary as part of the Contaminant Assessment and Reduction Project.

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Mr. Habel has 27 years experience with the Corps of Engineers in marine resource studies and project management for design and construction of navigation and coastal protection projects. Mr. Habel has been the chief of the New England District's Navigation Planning Section from 1985 to 1990 and from 2001 to present.

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Dr. Fredette manages the New England District's Disposal Area Monitoring System (DAMOS), a multidisciplinary marine survey program for site management and evaluating environmental impact from activities associated with dredging and sediment disposal projects. Dr. Fredette also serves as an expert on contaminated sediment management approaches providing advice to USEPA and other agencies on projects such as New Bedford Harbor (MA), Palos Verdes Shelf (CA), Pine Street Barge Canal (VT), Housatonic River/Silver Lake (MA), St. Louis River/Duluth Tar Site (MN), and the Port of Santos (Brazil). He also has been a team member on major civil works dredging projects including Boston, New Haven, Providence, and Portland Harbors. Dr. Fredette is one of the US delegates to the Scientific Group of the international London Dumping Convention (LC) and has conducted training on the LC on five continents. He has also participated in many USEPA/USACE national advisory committees. He has over 23 years of experience with 20 in New England and three at the USACE Waterways Experiment Station in Vicksburg, MS.

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Mr. Mackay has over 30 years of professional experience in the environmental field working for private, state and federal entities and currently serves as Chief of the Environmental Resources Section at the New England District where he manages, supervises and reviews the work of a multi-disciplinary staff responsible for the preparation of environmental impact studies, NEPA documents, ecological risk assessments, Marine Protection, Research and Sanctuaries Act (MPRSA) and Clean Water Act Section 404 determinations. He has written numerous environmental assessments, provides technical input during EA/EIS preparation for major dredging projects (Providence River) and manages ecological and water quality monitoring programs for navigation dredging projects including the New Bedford Harbor Superfund project.

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Mr. Morin is a Project Manager for the U.S. Army Corps of Engineers, New England District and has been with them for 17 years. He is currently with the Environmental Project Management Division and is responsible for executing investigations and cleanups for Superfund Sites throughout New England. His experience with hazardous waste and Superfund cleanups includes: design and construction of groundwater extraction and treatment systems, design and construction of solid waste and RCRA landfills and caps, planning and execution of comprehensive contaminated groundwater studies, excavation and disposal of contaminated soils and sediments, dredging and dewatering of contaminated sediments, water treatment, and wetland restoration. He has also served as a Construction Manager for several projects including construction of a hazardous waste landfill and completion of a significant soil removal action. In addition, he served as an On-Scene Coordinator for several New England communities for

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Ms. Rogers serves as a technical lead in the preparation of NEPA documents; Marine Protection, Research and Sanctuaries Act (MPRSA) and Clean Water Act Section 404 compliance; and other applicable environmental compliance for civil works projects. She has prepared numerous Environmental Assessments and prepared and provided technical review of Environmental Impact Statements for Corps water resources development projects including maintenance and improvement dredging projects, shoreline protection projects and environmental restoration projects for 20 years. Major relevant projects include the Boston Harbor Navigation Improvement Project, the Boston Harbor Inner Harbor Maintenance Dredging Project, and the Rhode Island Region Long-Term Dredged Material Disposal Site Evaluation Project.