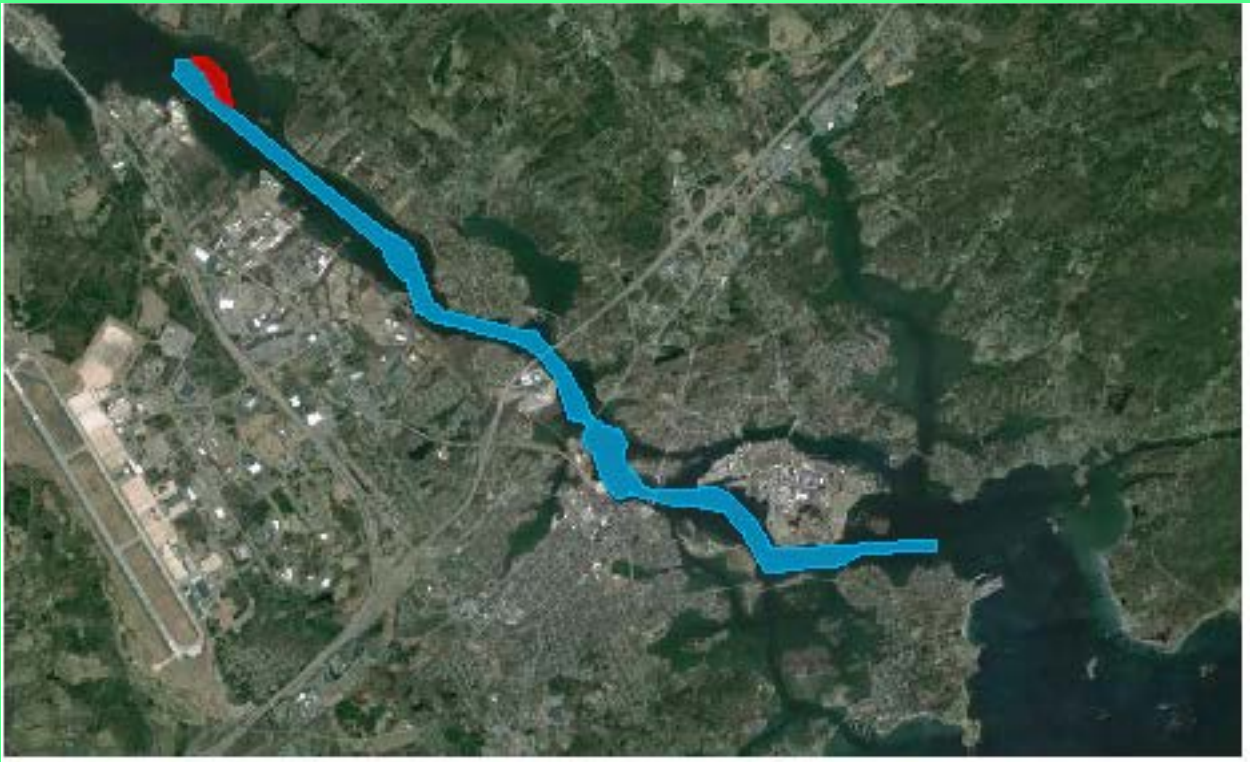
Draft Feasibility Report and
Draft Environmental Assessment
for Navigation Improvement Project

Portsmouth Harbor and Piscataqua River

New Hampshire & Maine



US ARMY CORPS
OF ENGINEERS
New England District

NH PORT
AUTHORITY

March 2014

Portsmouth Harbor and Piscataqua River
New Hampshire & Maine
Navigation Improvement Project

Draft Feasibility Report
& Draft Environmental Assessment
Including
Finding of No Significant Impact
Section 404(b)(1) Evaluation

March 2014

Portsmouth Harbor & Piscataqua River
New Hampshire and Maine
Navigation Improvement Project

Executive Summary

The purpose of the study is determine whether navigation improvements to the existing Federal navigation project at Portsmouth Harbor and Piscataqua River are warranted and in the Federal interest. The existing width of the upper turning basin is too narrow for efficient and safe handling of existing and future commerce. This report presents the results of studies concerning the feasibility of providing a wider turning basin to serve the terminals situated in the upper reach of the Piscataqua River. The report consists of this executive summary, a draft Feasibility Report, a draft Environmental Assessment (EA) and supporting appendices.

This study of Portsmouth Harbor and Piscataqua River, New Hampshire and Maine, was directed by Section 436 of the Water Resources Development Act of 2000 (P.L. 106-541) which states:

> *"The Secretary shall conduct a study to determine the feasibility of modifying the project for navigation, Portsmouth Harbor and Piscataqua River, Maine and New Hampshire, authorized by section 101 of the River and Harbor Act of 1962 (76 Stat. 1173) and modified by section 202(a) of the Water Resources Development Act of 1986 (100 Stat. 4095), to increase the authorized width of turning basins in the Piscataqua River to 1,000 feet."*

Section 216 of the Flood Control Act of 1970 also provides the Corps general authority to review completed civil works projects.

> *"The Secretary of the Army, acting through the Chief of Engineers, is authorized to review the operation of projects the construction of which has been completed and which were constructed by the Corps of Engineers in the interest of navigation, flood control, water supply, and related purposes, when found advisable due to the significantly changed physical or economic conditions, and to report thereon to Congress with recommendations on the advisability of modifying the structures or their operation, and for improving the quality of the environment in the overall public interest".*

The study area is located within the 1st Congressional District of New Hampshire and the 1st Congressional District of Maine. In addition, sites considered for nearshore placement of dredged material for beach nourishment are located in the 6th Congressional District of Massachusetts.

The State of New Hampshire, Pease Development Authority, Division of Ports and Harbors is the non-Federal sponsor for the feasibility study and improvement project.

The Piscataqua River forms a portion of the state boundary between Maine and New Hampshire. Portsmouth Harbor, located at the mouth of the river, is about 45 miles northeast of Boston Harbor, Massachusetts, and 37 miles southwest of Portland Harbor, Maine.

The existing Federal Navigation Project for Portsmouth Harbor and Piscataqua River consists of a 6.2 mile long navigation channel that is 35-feet deep at mean lower low water, a minimum of 400 feet wide, and extends from deep water at the river's mouth at New Castle, New Hampshire/ Kittery, Maine to the head of deep-draft navigation at Newington, New Hampshire/Eliot, Maine. The project also includes widening at several bends and bridge approaches by removal of ledge at; Henderson Point, Gangway Rock, Badgers Island, the U.S. Route 1 Bypass Bridge (Sarah Long Bridge), and Boiling Rock. Revised channel widths in these areas vary from 500 to 1,000 feet between the two vertical lift bridges. There are two turning basins, a 950-foot wide 35-foot deep basin upstream of Boiling Rock (river mile 5.1) and an 800-foot wide, 35-foot deep basin at the head of the project. The project also includes a stone breakwater connecting Goat Island and Great Island (New Castle), and shallow-draft back channels connecting the harbor with Little Harbor and Sagamore Creek.

Portsmouth Harbor is the only deep draft harbor located in the state of New Hampshire. The navigation project is ice-free year round, supports a wide variety of commercial and recreational activities along the Piscataqua River, with commercial terminals located primarily on the south bank of the river in Portsmouth and Newington, New Hampshire. A U.S. Naval Shipyard primarily engaged in servicing submarines is located in Kittery in the lower harbor. Commodities received at the port include petroleum and petroleum products, and bulk and specialty cargos. Principal shipments received at the two upper terminals include road salt, cement, gypsum, kerosene, liquid asphalt, fuel oil and liquid propane gas.

Alternative improvement plans analyzed and compared during the feasibility study included no action, widening the existing turning basin from 800 feet to widths of 1020, 1120 or 1200 feet, and relocating the turning basin to either an upstream or downstream location. The tentatively recommended navigation improvement plan identified in the report is widening the existing turning basin to 1200 feet at the authorized depth of -35 feet mean lower low water. Approximately 728,100 cubic yards of mostly sand and gravel (glacial till), and about 25,300 cubic yards of rock would be removed to widen the existing turning basin to 1200 feet.

Development of the tentatively recommended plan was based on identification of the plan with the highest net annual benefits which is the National Economic Development (NED) plan, in this case widening the existing turning basin to a width of 1200 feet. The NED Plan includes the Federal Base Plan for ocean placement of the dredged material and rock at the Isles of Shoals North site (IOS-N), identified by the Corps and US EPA as a likely selectable

site, and is the plan selected for implementation. The costs and benefits of the recommended plan are shown in Table ES-1, using the Fiscal Year 2014 interest rate of 3 ½ percent.

Four coastal communities; Wells, Maine and Salisbury, Newburyport and Newbury, Massachusetts, have expressed a desire to acquire and beneficially use the sandy dredged material. These municipalities are willing to fund the additional cost over and above the Federal Base Plan cost, to transport the material to more distant sites for placement in nearshore bars along eroding beaches in those communities. The report presents estimates of the additional costs allocated to placement at these alternative beneficial use sites. Securing the necessary approvals and permits to receive the sand will be the responsibility of those communicates during the project's design phase. This beneficial use plan would be implemented contingent on those communities' receipt of those approvals, execution of contributed funds agreements, and provision of funds to cover the additional cost. To the extent that any of those communities are unable to secure those approvals the Federal base plan will be implemented.

Although beneficial uses for rock were discussed with the States and municipalities, no firm plans were developed and the current plan includes placement of the rock at the IOS-N site. Coordination will continue with State and local officials during the project's design phase, and it is likely that a beneficial use for the rock will be identified prior to construction. The Town of Kittery, Maine, is pursuing design and regulatory approval for construction of a stone berm to act as a wave break for their small craft anchorage at Pepperell Cove at the mouth of Portsmouth Harbor. Similar to the plans for beneficially use of the sand, should the Town successfully complete its efforts and provide funds to cover any excess cost for placement of the material at this site over the cost of the Base Plan, then the rock from the turning basin expansion could be made available to the Town.

The tentatively recommended plan is supported by the non-Federal Sponsor, the New Hampshire Pease Development Authority. The plan accomplishes the objectives of reducing safety hazards and grounding damages, decreasing turning costs, and reducing waterborne transportation costs for carriers and shippers utilizing the two upper Piscataqua River terminals identified as beneficiaries of the project.

Cost sharing of the tentatively recommended plan is based on sharing the costs of the Federal base plan between the Federal government and the non-Federal Sponsor. If any of the beneficial use proposals are ultimately implemented, then all costs exceeding the Base Plan cost will be allocated to those purposes and borne by the communities requesting alternative placement of dredged material or rock. The estimated project first cost for the Federal base plan is $20,367,000 (October 2013 price level). That cost escalated to the programmed budget year (Fiscal Year 2015) is $20,774,000. Costs escalated to the assumed fully funded mid-point of construction of February 2016) would be $21,295,000. The Federal share would

be 75 percent and the non-Federal sponsor's up-front share would be 25 percent. The non-Federal sponsor would also be responsible for an additional 10 percent of the project cost after construction to be paid over a period not to exceed 30 years.

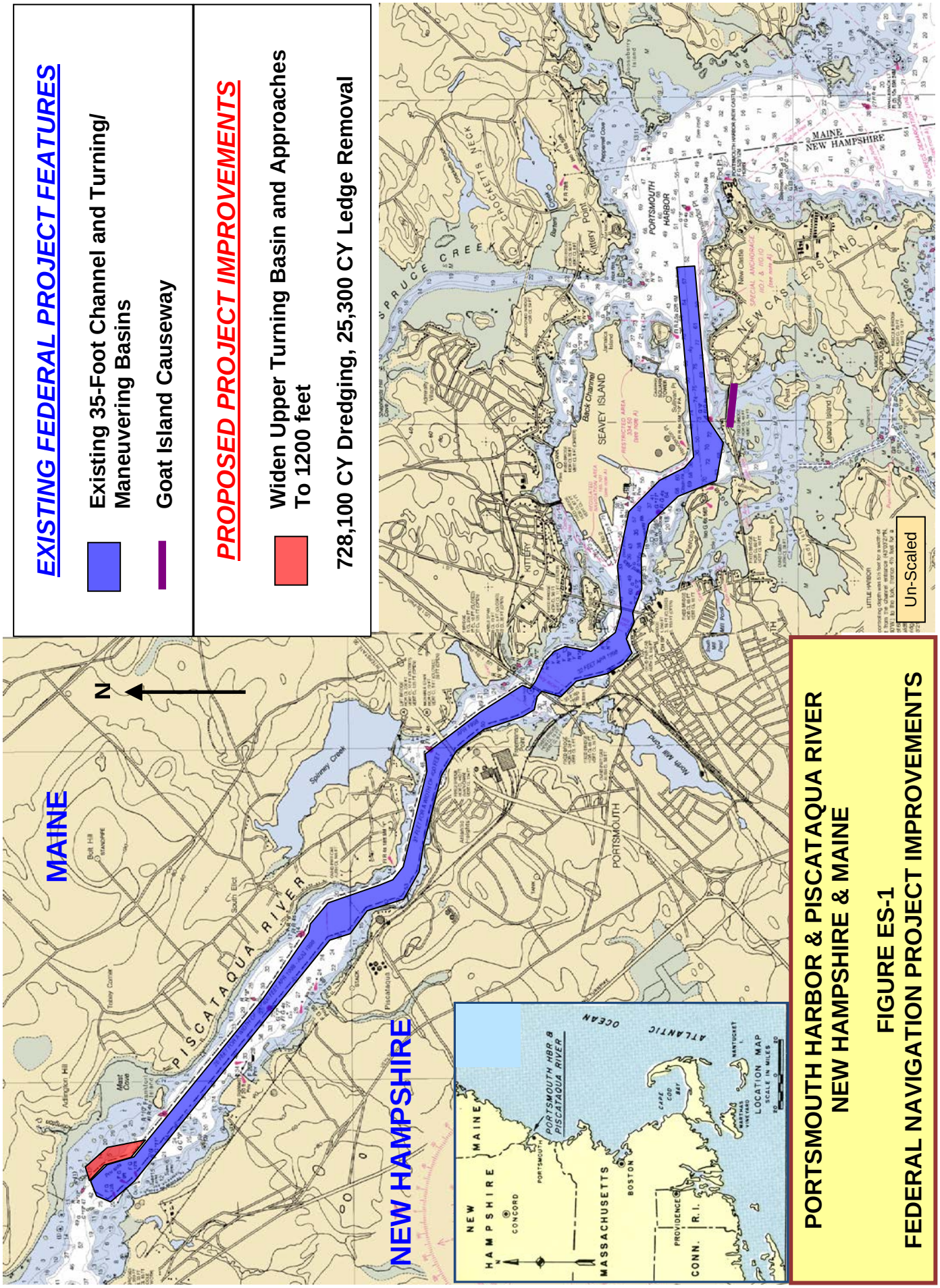
The estimated cost of the alternative beneficial use plan including placement of the sandy material nearshore off beaches in the four interested communities is $23,373,000 (escalated to the February 2016 mid-point of construction). This results in a fully funded cost differential of $2,078,000 that will be shared between the four communities requesting nearshore placement for beach nourishment based on volume received and additional distance hauled.

TABLE ES-1 Costs and Benefits of the Recommended Plan 1200-Foot Wide Turning Basin	
First Cost of Improvement – Federal Base Plan – October 2013 Price Level	
General Navigation Feature Improvements	$15,309,000
Contingencies	$3,234,000
Planning, Engineering and Design	$997,000
Construction Management	$827,000
Lands, Easements, ROWs	None
Total First Cost	$20,367,000
Investment Cost with IDC (5 months)	$20,478,000
Annual Costs of Federal Base Plan – 50-Year Project Life – 3-1/2% Interest Rate	
Interest and Amortization	$873,000
Increased Annual Maintenance Dredging	$203,700
Total Annual Cost	$1,076,700
Annual Benefit	$3,285,500
Benefit/Cost Ratio	3.1
Net Annual Benefit	$2,208,800
Annual Costs of Federal Base Plan – 7% Interest Rate	
Total Annual Cost	$1,637,200
Benefit/Cost Ratio	2.01
Net Annual Benefit	$1,648,300

TABLE ES-1 (Continued) Costs and Benefits of the Recommended Plan 1200-Foot Wide Turning Basin		
Federal Base Plan – October 2014 Budget Year Level Cost		
General Navigation Feature Improvements		$15,588,000
Contingencies		$3,293,000
Planning, Engineering and Design		$1,033,000
Construction Management		$857,000
Lands, Easements, ROWs		None
Total Program/Budget Year (FY2015) Cost		$20,774,000
Federal Base Plan – Fully Funded Cost (February 2016)		
General Navigation Feature Improvements		$15,962,000
Contingencies		$3,371,000
Planning, Engineering and Design		$1,059,000
Construction Management		$902,000
Lands, Easements, ROWs		None
Total Fully Funded Cost		$21,295,000
Cost Sharing – Fully Funded Cost - GNF		
Federal Up-Front Share (75%)		$15,962,000
PED Phase		$794,000
Construction Phase		$15,177,000
Non-Federal Up-Front Share (25%)		$5,324,000
PED Phase		$265,000
Construction Phase		$5,059,000
Non-Federal Post-Construction Additional Share (10%)		$2,130,000
Additional Non-Federal Cost for Alternative Nearshore Placement of Sand Fully Funded (FY 2016) Price Level		
Placement Site	Cubic Yards	Total Cost
Wells, Maine	364,100	$1,065,000
Salisbury, Massachusetts	90,900	$247,000
Newburyport, Massachusetts	36,400	$102,000
Newbury, Massachusetts	236,700	$664,000
Total	728,100	$2,078,000

The expected annual economic benefit of the proposed navigation improvements is about$3,285,500. The annualized cost of the tentatively selected plan, expressed in average annual equivalent terms, includes the estimated costs of project design, construction, management, interest during construction, contingencies, and the cost of deepening berths by the non-Federal sponsor and is estimated at $1,076,700. With expected average annual benefits of $2,208,800 the benefit/ cost ratio for the selected plan is about 3.1 to 1.

The recommendations contained in the draft FS/EA reflect the information available at this time and current policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a National Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding. However, prior to transmittal to the Congress, the non-Federal sponsor, New Hampshire Pease Development Authority, Division of Ports and Harbors and other parties would be advised of any modifications and would be afforded an opportunity for further comment.


EXISTING FEDERAL PROJECT FEATURES
Existing 35-Foot Channel and Turning/ Maneuvering Basins
Goat Island Causeway
PROPOSED PROJECT IMPROVEMENTS
Widen Upper Turning Basin and Approaches To 1200 feet
728,100 CY Dredging, 25,300 CY Ledge Removal
MAINE
NEW HAMPSHIRE
N
PISCATAQUA RIVER
PORTSMOUTH
SEAVEY ISLAND
NEW CASTLE ISLAND
SPRUCE CREEK
CROCKETTS NECK
Un-Scaled
LOCATION MAP
PORTSMOUTH HBR & PISCATAQUA RIVER
ATLANTIC OCEAN
MASSACHUSETTS
BOSTON
PROVIDENCE
CONCORD
PORTSMOUTH
PORTSMOUTH HARBOR & PISCATAQUA RIVER
NEW HAMPSHIRE & MAINE
FIGURE ES-1
FEDERAL NAVIGATION PROJECT IMPROVEMENTS

PORTSMOUTH HARBOR AND PISCATAQUA RIVER
NAVIGATION IMPROVEMENT PROJECT
NEW HAMPSHIRE AND MAINE

FEASIBILITY REPORT

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Acronyms Used in this Document

Acronym	Meaning
ATR	Agency Technical Review
CADS	Cape Arundel Disposal Site
CY	Cubic Yards
DEP	Department of Environmental Protection (NH or MA)
DMR	Maine Department of Marine Resources
DOD	Department of Defense
DRED	NH Department of Resources and Economic Development
DWT	Dead Weight Tons (Ship's Displacement)
EFH	Essential Fisheries Habitat
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FNP	Federal Navigation Project
GNF	General Navigation Features (Federal Project Features)
IEPR	Independent External Peer Review
IOS-H	Isles of Shoals Historic Disposal Site
IOS-N	Isles of Shoals North Ocean Placement Site
MBDS	Massachusetts Bay Disposal Site
ME DEP	Maine Department of Environmental Protection
MGS	Maine Geological Survey
MHW	Mean High Water
MLLW	Mean Lower Low Water
MLW	Mean Low Water
MPRSA	Marine Protection Research and Sanctuaries Act
NED	National Economic Development
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
O&M	Operations and Maintenance
OMRR&R	Operation, Maintenance, Repair, Replacement and Rehabilitation
OSE	Other Social Effects
PDA	Pease Development Authority
PDS	Portland Disposal Site
SBIT	Saco Bay Implementation Team
TPCS	Total Project Cost Summary
TSP	Tentatively Selected Plan
USACE	U. S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WHG	Woods Hole Group
WRDA	Water Resources Development Act

PORTSMOUTH HARBOR AND PISCATAQUA RIVER
NAVIGATION IMPROVEMENT PROJECT
FEASIBILITY REPORT

1.0 INTRODUCTION

1.1 Study Authority

This study of Portsmouth Harbor and Piscataqua River, New Hampshire and Maine, was directed by Section 436 of the Water Resources Development Act of 2000 (P.L. 106-541) which states:

> *"The Secretary shall conduct a study to determine the feasibility of modifying the project for navigation, Portsmouth Harbor and Piscataqua River, Maine and New Hampshire, authorized by section 101 of the River and Harbor Act of 1962 (76 Stat. 1173) and modified by section 202(a) of the Water Resources Development Act of 1986 (100 Stat. 4095), to increase the authorized width of turning basins in the Piscataqua River to 1,000 feet."*

The study was initiated at the request of the State of New Hampshire, Pease Development Authority, Division of Ports and Harbors, the study sponsor, using funds from the Fiscal Year 2004 Energy and Water Development Appropriations Bill.

Section 216 of the Flood Control Act of 1970 also provides the Corps general authority to review completed civil works projects.

> *"The Secretary of the Army, acting through the Chief of Engineers, is authorized to review the operation of projects the construction of which has been completed and which were constructed by the Corps of Engineers in the interest of navigation, flood control, water supply, and related purposes, when found advisable due to the significantly changed physical or economic conditions, and to report thereon to Congress with recommendations on the advisability of modifying the structures or their operation, and for improving the quality of the environment in the overall public interest".*

The study area is located within the 1st Congressional District of New Hampshire and the 1st Congressional District of Maine. In addition, sites considered for nearshore placement of dredged material for beach nourishment are located in the 6th Congressional District of Massachusetts.

1.2 Purpose and Scope

The study purpose is to evaluate the feasibility of modifying the existing Portsmouth Harbor and Piscataqua River Federal navigation project to provide a wider turning basin for vessels that off load their cargos at the upper two terminals on the Piscataqua River. The existing width of 800 feet is too narrow for efficient and safe handling of existing and future commerce. An additional purpose was to establish the level of support, willingness and capability of the non-Federal sponsors to participate in recommended improvements.

1.3 Study Area

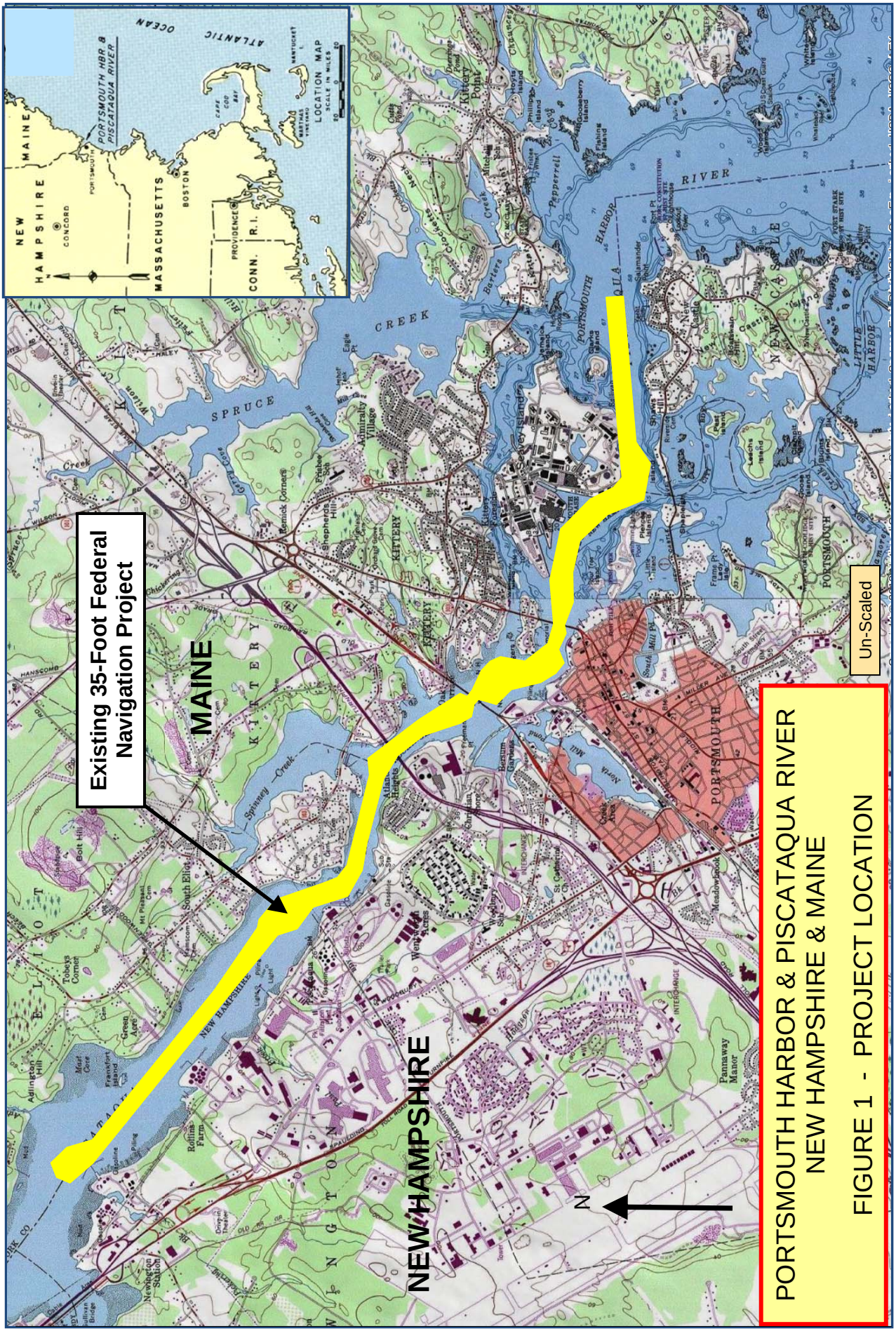
The Piscataqua River, which has a drainage area of about 1495 square miles, forms a portion of the interstate boundary between Maine and New Hampshire. Portsmouth Harbor, located at the mouth of the river as shown in Figure 1, is situated about 45 miles northeast of Boston, Massachusetts and 37 miles southwest of Portland, Maine. The existing Federal navigation project includes a 35-foot deep channel, 400-feet wide, extending from deep water in Portsmouth Harbor (river mile 2.6) upstream to just north of Sprague Energy's River Road terminal in Newington, New Hampshire (river mile 8.8).

The focus of this feasibility study is widening the turning basin at the upstream end of the Federal channel near Newington, New Hampshire and Eliot, Maine. This turning basin is 800-feet wide and 35-feet deep at mean lower low water. Two active terminals, Sea-3/Sprague Avery Lane and Sprague River Road utilize the turning basin. A third terminal, owned by the Department of Defense (DOD), for supplying fuel to the former Pease Air Force Base, is currently not in use.

1.4 Existing Federal Navigation Project

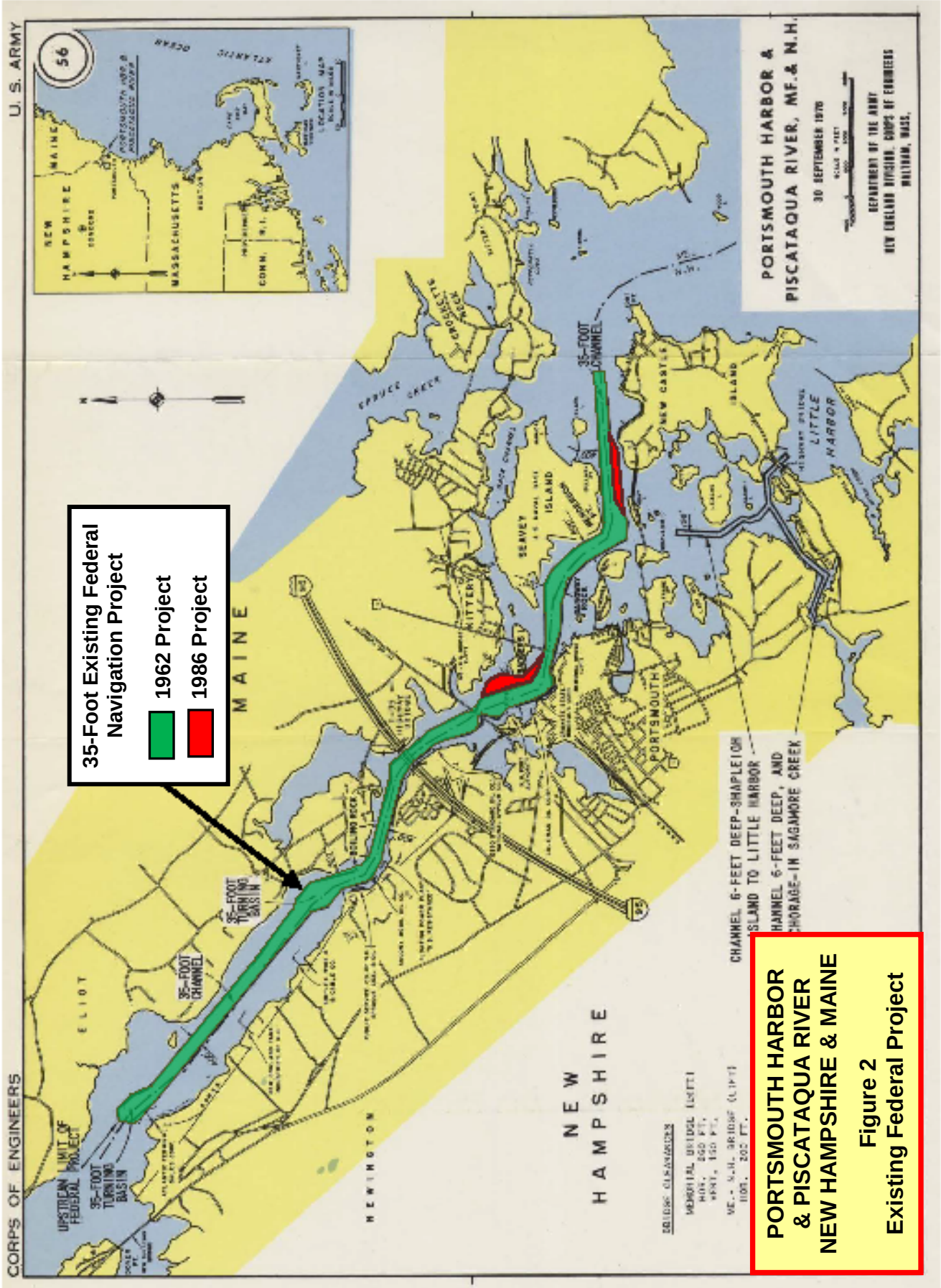
As previously stated, the Portsmouth Harbor and Piscataqua River Federal navigation project consists of a 6.2 mile long navigation channel that is 35-feet deep at mean lower low water (MLLW), generally 400 feet wide, and extends from deep water in Portsmouth, New Hampshire to the head of navigation in Newington, New Hampshire. The project, shown in Figure 2, also includes widening at several bends by removal of ledge at; Henderson Point, Gangway Rock, Badgers Island, the U.S. Route 1 Bypass Bridge (Sarah Long Bridge), and Boiling Rock. Revised channel widths in these areas vary from 500 to 1,000 feet between the two vertical lift bridges. There are two turning basins, a 950-foot wide 35-foot deep basin upstream of Boiling Rock (river mile 5.1) and an 800-foot wide, 35-foot deep basin at the head of the project.

The project also includes the 6-foot deep Back Channels project located about one mile south of the outer end of the main ship channel. This channel extends 0.4 mile from the head of Little Harbor at 100 feet wide, through the Route 1B drawbridge to deep water at the junction of two 75-foot wide branch channels. One branch channel extends 0.7 mile to deep water between Shapleigh and Goat Islands to connect through a fixed bridge with Portsmouth Harbor, and the other extends 0.9 mile up Sagamore Creek to a 3 acre anchorage area along the upper end of the channel near the Route 1A Bridge in Rye, New Hampshire.



PORTSMOUTH HARBOR & PISCATAQUA RIVER
NEW HAMPSHIRE & MAINE

FIGURE 1 - PROJECT LOCATION


35-Foot Existing Federal Navigation Project
1962 Project
1986 Project
PORTSMOUTH HARBOR & PISCATAQUA RIVER, ME. & N.H.
30 SEPTEMBER 1976
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.
CORPS OF ENGINEERS
U. S. ARMY
MAINE
NEW HAMPSHIRE
ELIOT
NEWINGTON
PORTSMOUTH
KITTERY
SEAVEY ISLAND
NEW CASTLE ISLAND
LITTLE HARBOR
SPRUCE CREEK
35-FOOT CHANNEL
35-FOOT TURNING BASIN
UPSTREAM LIMIT OF FEDERAL PROJECT
CHANNEL 6-FEET DEEP-SHAPLEIGH ISLAND TO LITTLE HARBOR
CHANNEL 6-FEET DEEP, AND ANCHORAGE-IN SAGAMORE CREEK
BRIDGE CLEARANCES
MEMORIAL BRIDGE (LIFT)
HGT. 200 FT.
WIDT. 150 FT.
NE.-N.H. BRIDGE (LIFT)
HGT. 200 FT.
PORTSMOUTH HARBOR & PISCATAQUA RIVER NEW HAMPSHIRE & MAINE
Figure 2
Existing Federal Project

1.4.1 Construction History of the Navigation Project

Federal involvement in navigation improvements at Portsmouth Harbor and along the Piscataqua River began in 1879 with initiation of construction of a breakwater between Goat Island and Great Island, which now serves as a causeway carrying Route 1B to connect New Castle Island to the mainland. This work was followed by removal of ledge at Badgers Island and Gangway Rock between 1881 and 1891. In 1956, additional ledge was removed to a depth of 35 feet at Boiling Rock, Gangway Rock and the southwest point of Badgers Island to remove channel restriction and improve navigation in these areas.

The next improvements were authorized by the River and Harbor Act of 1962, and were constructed between 1964 and 1966. These improvements deepened and widened the natural and previously improved areas of the channel to provide a depth of -35 feet MLW with a minimum width of 400 feet , extending about6.2 miles from deep water north of New Castle Island to a turning basin located below the entrance to Great Bay. Also included was widening the channel to various widths in bends and bridge approaches, and construction of turning basins upstream from Boiling Rock and at the head of navigation. This project was designed to accommodate bulk carriers of about 35,000 dead weight tons (DWT) with a draft of 35 feet transiting with tidal assistance.

The Water Resources Development Act of 1986 made additional modifications consisting of widening the channel to the south along the Goat Island Causeway to 550 feet, to the north along Badgers Island by an additional 100 feet, and providing additional 600 to 1000-foot wide emergency maneuvering area between Badgers Island and the Route 1 (Sarah Long) bridge. These improvements were constructed in 1989 to 1992 and were designed to permit bulk carriers in the 40,000 to 45,000 DWT class to access terminals below Interstate 95. The upstream reaches of the project were also investigated leading up to the 1986 modifications, specifically widening of the upper turning basin. At that time however initial investigations indicated that widening of the upper turning basin would encounter substantial ledge carrying a high cost for removal. Improvements to the upper basin were determined to be not economically justified at that time as a result.

Bulk carriers in the 45,000 DWT class are now calling on terminals upstream of I-95. These shifts to larger vessels upstream led to the request to re-examine turning basin improvements for the upper project area. A complete listing of project authorizations and work history is included in Appendix B.

1.4.2 Navigation Uses of the Federal Navigation Project

Portsmouth Harbor is the only deep draft harbor located in the state of New Hampshire. The navigation project supports a wide variety of commercial and recreational activities along the Piscataqua River. Commercial terminals are located primarily on the south bank of the river

in Portsmouth and Newington, New Hampshire. The U.S. Naval Shipyard is situated on Seavey's Island along the north bank of the river in Kittery, Maine, and mainly supports the Atlantic submarine fleet.

The fleet currently calling on the upper Piscataqua River in Portsmouth Harbor ranges is length from 420 feet to 747 feet, with most vessels in the 20,000 to 50,000 DWT range. There are currently over 100 vessel visits a year with many shipments originating in the Mediterranean, Northern Europe and the Caribbean.

1.5 Feasibility Study Process

The Corps planning and evaluation for water resource projects is based on the "Economic and Environmental Principles & Guidelines (P&G) for Water and Related Land Resources Implementation Studies" approved in 1983. The P&G was implemented under the authority of the Water Resources Planning Act of 1965. In accordance with the P&G the Federal objective of a water resource project is to contribute to the national economic development consistent with protecting the nation's environment. The P&G are the drivers for the Corps planning process. The Corps regulation that describes the process is the Planning Guidance Notebook; Engineering Regulation 1105-2-100 dated April 22, 2000 and subsequent revisions.

The Corps planning process follows a six step iterative process as described in the Planning Guidance Notebook and includes the following steps:

1. Specification of water and related land resources, problems, and opportunities
2. Inventory, forecast, and analysis of existing and future conditions
3. Formulation of alternative plans
4. Evaluation of the effects of the alternative plans
5. Comparison of alternative plans
6. Selection of a recommended plan

The process considers the four criteria of completeness, effectiveness, efficiency, and acceptability in the screening of alternative plans. Completeness is the extent to which the plan accounts for all necessary investment or actions. For example plans that rely on activity by others to be successful may not be complete if the activity to be completed by others is unlikely to occur. Effectiveness is the degree to which an alternative plan contributes to the attainment of the planning objective. An efficient plan is the extent to which an alternative plan is most cost-effective means of attaining the objective. Acceptability measures the workability of a plan and compatibility with existing laws, regulations, and public policy.

During the feasibility study alternatives are formulated and evaluated to determine which alternative reasonably maximizes the net economic benefit consistent with protection of the environment. The economic benefits calculated for this study are National Economic Development (NED) benefits. NED benefits are contributions to national economic

development that increase the value of the national output of goods and services. For deep-draft navigation projects, the most common type of NED benefit is transportation cost savings, typically waterborne transportation cost savings. The NED benefits are estimated by comparing the transportation costs without the project to the transportation costs with the project. Any decrease in total transportation costs resulting from the project equal the benefits of the project. The project costs are then subtracted from the benefits to determine the net benefits. The alternative that maximizes the net benefits, consistent with protection of the environment is the Corps identified NED plan.

Projects may deviate from the NED plan if requested by the non-Federal sponsor and approved by Assistant Secretary of the Army for Civil Works. For example a non-Federal sponsor may not be able to afford or otherwise support the NED Plan. Plans requested by the non-Federal sponsor that deviate from the NED plan are identified as the Locally Preferred Plan (LPP).

The Corps feasibility study process also contains an Environmental Assessment. The Environmental Assessment (EA) is prepared in compliance with the requirements of National Environmental Policy Act (NEPA). NEPA requirements are outlined in the Council on Environmental Quality (CEQ) Regulations (40 CFR 1500-1508) and the U.S. Army Corps of Engineers Regulation 200-2-2, “Procedures for Implementing NEPA". The EA is designed to serve as a concise public document that briefly provides sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact; and to aid the Corps of Engineers in compliance with the NEPA, when an environmental impact statement is not necessary. The EA includes a brief discussion of the need for the project, the environmental impacts of the proposed action and alternatives, and a listing of agencies and persons consulted.

1.6 Environmental Operating Principles

The Corps has reaffirmed its commitment to the environment in a set of "Environmental Operating Principles". These principles foster unity of purpose on environmental issues and reflect a positive tone and direction for dialogue on environmental matters. By implementing these principles within the framework of Corps regulations, the Corps continues its efforts to evaluate the effects of its projects on the environment and to seek better ways of achieving environmentally sustainable solutions in partnership with stakeholders.

The seven “Environmental Operating Principles” are as follows:

1. Foster sustainability as a way of life throughout the organization.
2. Proactively consider environmental consequences of all Corps activities and act accordingly.
3. Create mutually supporting economic and environmentally sustainable solutions.

4. Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the Corps, which may impact human and natural environments.
5. Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs.
6. Leverage scientific, economic and social knowledge to understand the environmental context and effects of Corps actions in a collaborative manner.
7. Employ an open, transparent process that respects views of individuals and groups interested in Corps activities.

1.7 USACE Campaign Plan

The U.S. Army Corps of Engineers (Corps) Campaign Plan guides Corps policy decisions on how we organize, train, and equip our personnel; how we plan, prioritize, and allocate resources; and how we respond to emerging requirements and challenges. Implementation of the goals and objectives from this Campaign Plan will lead to actual change in the Corps organization moving the Corps from "good to great."

The Corps strategic plan effort towards improvement began in August 2006 with the "12 Actions for Change" and has evolved to four goals and associated objectives. Although the effort originally developed with a focus on missions that seek to manage risk associated with flooding and storm damage, the Campaign Plan Goals and Objectives are applied to all aspects of the Corps service to the nation including its navigation mission. USACE Campaign Plan Goals and Objectives are derived, in part, from the Commander's Intent, the Army Campaign Plan, and Office of Management and Budget guidance. The two goals and associated objectives related to the feasibility study are:

Goal 2: Deliver enduring and essential water resource solutions through collaboration with partners and stakeholders.

> **Objective 2a:** Deliver integrated, sustainable, water resources solutions.
> **Objective 2b:** Implement collaborative approaches to effectively solve water resource problems.
>
> Addressing Objective 2a and 2b. The study considers the harbor as a physical and economic system with general navigation features, local service facilities, port facilities, and shippers and consideration of the environmental. The recommended plan will consider the likelihood and potential for gain in economic benefits related to the project improvements. The public is involved through the NEPA review process.

Goal 4: Build and cultivate a competent, disciplined, and resilient team equipped to deliver high quality solutions.

Objective 4b: Communicate strategically and transparently.

Addressing Objective 4b. The study provides opportunities for agency technical review and involvement of the Corps established Center of Expertise, and technical and policy expertise available though the vertical chain of command at the New England District, North Atlantic Division, and Corps Headquarters, Washington D.C., Office of Water Policy Review.

2.0 PLANNING SETTING AND PROBLEM IDENTIFICATION

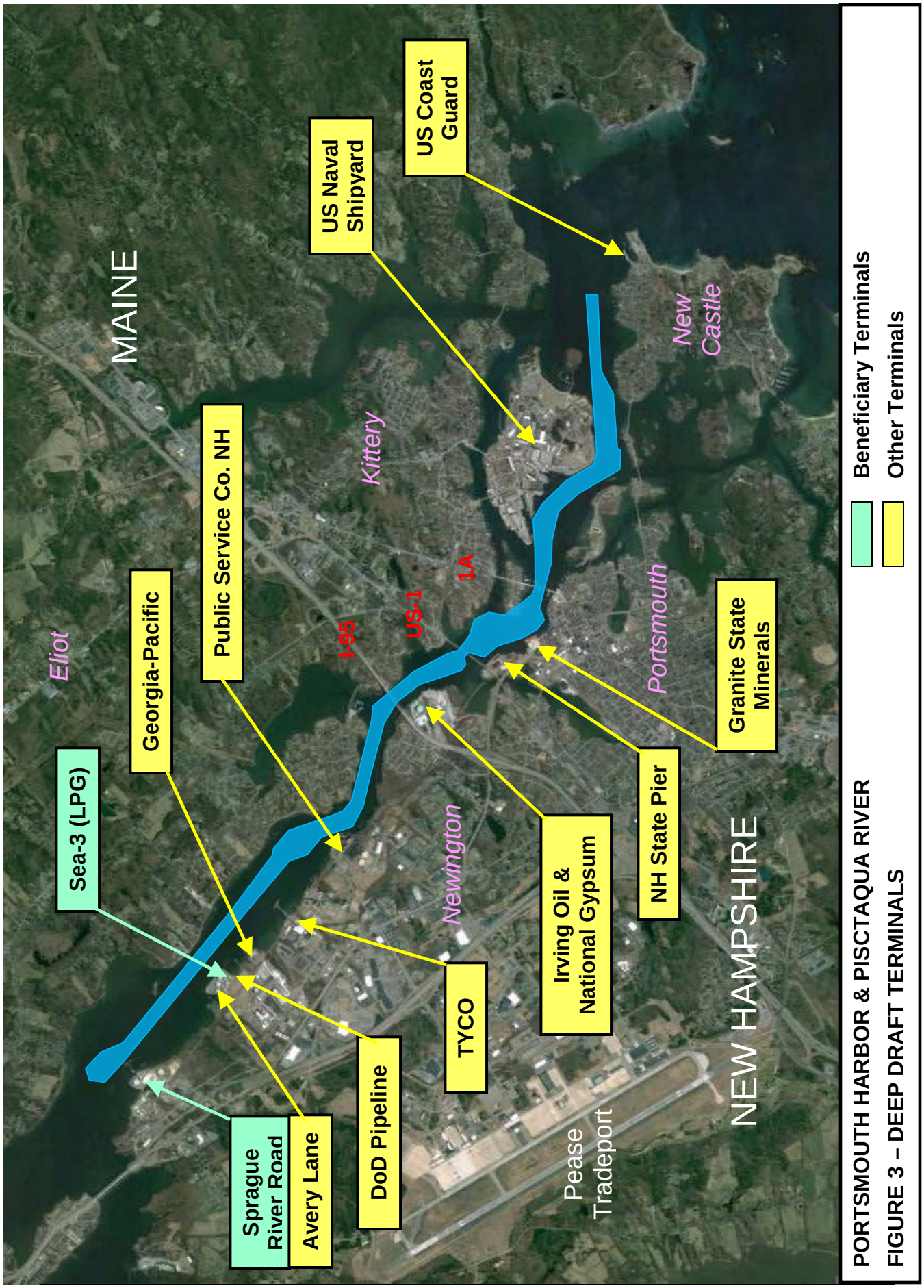
2.1 General Setting and Navigation Problems

The Portsmouth Harbor and Piscataqua River Federal Navigation Project is located along the lower reaches of the Piscataqua River estuary and extend from river mile 2.6 to river mile 8.8. The Harbor is New Hampshire's only deep water port. It is also ice-free, year round which allows navigation throughout the year. The Piscataqua River extends for about 13 miles and forms a portion of the border between New Hampshire and Maine. Communities bordering deep draft reaches of the river include Newcastle, Portsmouth and Newington in New Hampshire and Kittery and Eliot in Maine.

There are seven major terminals along the Piscataqua River on the New Hampshire side of the River in Portsmouth and Newington. Table 1 is a listing of these terminals, in order from downstream to upstream, and the major cargos that are handled at each one. The Market Street Terminal, owned and operated by the New Hampshire Pease Development Authority (PDA), Division of Ports and Harbors, is the only public access, general cargo terminal on the river. The locations of the port's terminals are shown in Figure 3.

TABLE 1
Marine Terminals along the Piscataqua River

Terminal	Cargos Handled
Granite State Minerals	Road Salt
New Hampshire State Pier (Market Street Terminal)	Bulk cargo (scrap metal, road salt, gypsum), and general, project and container cargo
National Gypsum /Irving Oil	Gypsum and fossil fuels (kerosene and oil)
Public Service of New Hampshire	Fossil fuels (coal and oil)
Tyco Wire and Cable	Specialty cargo (cable)
Sprague Avery Lane/Sea-3 Newington	Liquid asphalt, oil and propane
Sprague River Road	Bulk cargo (road salt, cement, gypsum), liquid cargo (tallow) and fossil fuels (kerosene)



PORTSMOUTH HARBOR & PISCTAQUA RIVER
FIGURE 3 – DEEP DRAFT TERMINALS

As shown in the table below, Portsmouth Harbor terminals ship and receive a variety of commodities. The types of commodities have remained relatively unchanged with petroleum fuels and construction materials predominating. Growth from 2010 to 2011 was about 2.8%. In 2011 these goods were carried in 121 vessels, of which half (61) had arrival drafts greater than the 32 feet that can be carried at all tides with 10 percent underkeel clearance in the 35-foot channel.

TABLE 2
Commodities Shipped – Thousands of Tons

Commodity	2010	2011
Coal	313	309
Liquid Petroleum Fuels	1200	1,183
LPG	316	198
Asphalt	57	26
Gypsum	491	529
Scrap Metal and Slag	131	214
Salt and Minerals	446	555
All Other Commodities	9	33
Total All Commodities	2,964	3,047

Currents along the Piscataqua River are among the highest of commercial harbors in the northeast United States with currents reaching speeds of up to 5 knots. In addition to these currents, the principle factors that limit the size of ships that can safely navigate the harbor are the alignment and size of the bridge opening at the Sarah Long Bridge, and the undersized turning basin at the head of navigation. The alignment of the span at the Sarah Long Bridge is being addressed with the replacement of the bridge. Construction of a new bridge is scheduled to begin in the fall of 2014. With completion of this new bridge, the undersized turning basin at the upstream end of the navigation project will remain as the major factor limiting the size of ships that can safely use the two upper terminals on the Piscataqua River. Fast currents will continue to be addressed by limiting ship transits and turns to slack or near slack water periods.

2.2 Topography and Geology

2.2.1 Physiography

The project area is in the New England physiographic province of southeastern Maine and New Hampshire. The Piscataqua River estuary is located in the Seaboard Lowland section. The Seaboard Lowland section rises uniformly from sea level to an elevation of about 300 to 400 feet with occasional hills rising above this elevation. Relief is generally low with rivers flowing southeasterly to the Atlantic Ocean.

2.2.2 Marine Geology and Geophysics

Bedrock beneath the Piscataqua River consists of the Elliot Formation (SOe – Generally thin-bedded gray calcareous and ankeritic quartz-biotite-chlorite phyllite and metasiltstone; and dark gray biotite-chlorite-muscovite phyllite). The Elliot Formation strikes northeast and dips steeply southeast (70 degrees). Compositional layering in the metamorphic rock of the Elliot Formation has been documented in the area of the General Sullivan Fault. A diabase dike outcrops on the south bank of the Piscataqua River and strikes northeast with a near vertical dip.

A seismic reflection survey was conducted as part of a Marine Geophysical Investigation (See Attachment to Appendix F), but, as reported in the final report, it was unable to differentiate between acoustic basement composed of bedrock and acoustic basement composed of glacial till. To characterize material in the area of the proposed turning basin widening, a total of 8 borings and three probes were advanced in this area. Soil samples were taken at 5 foot intervals while advancing the borings and the probes were conducted to determine depth to bedrock. During conduct of the borings, bedrock was encountered at elevation -30 feet mean lower low water (MLLW) at boring B-6. The rock core recovered from this boring appears to be gray phyllite. No other borings, all of which were advanced to at least -40 feet MLLW, encountered bedrock. Geophysics, boring, and probe results were used to estimate the depth and extent of bedrock in the study area.

2.3 Soils and Sediment Characterization

Along the Piscataqua River, surficial geologic material consists of marine regressive deposits generally composed of sand, gravel and silt, and drumlinoid deposits of surficial materials that strike northwest-southeast.

To characterize soils in the area of potential turning basin widening, ten representative samples of the soils that were collected when the borings were advanced were tested for grain size. These results, which are summarized in Table 3, are shown in Appendix F.

As analysis of soils at boring B-5 showed a high percentage of silt, additional analysis of surface sediments in this area were conducted to complete the Suitability Determination for

disposal of dredged material. Bottom grab samples were collected in a 75 foot grid pattern around the location of boring B-5. A total of 22 grab samples were attempted. Samples could not be obtained at six of these locations after 5 attempts. This was attributed to hard rocky bottom conditions. Table 4 shows the results of grain size analysis of these samples. All of these samples, except for two, had a very low percentage of silt. Based on this analysis, the material was found suitable for ocean disposal.

TABLE 3
Grain Size Analysis of Boring Soil Samples

Boring Number and Sample Identification	% cobble	% gravel	% sand	% silt & clay
B-1 (J-5)	-	1.5	89.9	8.6
B-2 (J-3)	-	1.0	90.4	8.6
B-4 (J-3)	-	1.7	83.8	14.5
B-5 (J-1)	-	0.0	5.7	94.3
B-5 (J-3)	-	13.4	45.1	41.5
B-7 (J-1)	-	0.03	89.1	10.6
B-7 (J-2)	-	2.5	84.2	13.3
B-7 (J-3)	-	16.2	76.5	7.3
B-8 (J-1)	-	13.5	76.5	10.0
B-8 (J-2)	-	19.4	74.9	5.7

TABLE 4 Grain Size Analysis of Surface Grab Samples				
Sample Number	Depth of Water	% gravel	% sand	% silt & clay
1	20	No sample		
2	18.5	No sample		
3	17.7	78.0	20.7	1.3
4	10	No sample		
5	19	45.9	53.3	0.8
6	19	1.1	67.6	31.3
7	17.4	14.1	76.9	8.7
8	18.9	No sample		
9	20.1	57.0	42.1	0.9
10	15.7	41.0	58.1	0.9
11	16.4	-	92.9	7.1
12	18.5	67.0	31.0	2.0
13	16.3	No sample		
14	14.6	11.8	85.4	2.8
15	16.6	82.1	16.9	1.0
16	17.9	0.8	90.2	9.0
17	12.5	5.7	83.4	10.9
18	15	36.7	61.5	1.7
19	7	60.9	33.5	5.6
20	10	No sample		
21	6.4	3.1	78.4	18.5
22	8	5.5	87.0	7.5

2.4 Water Resources

2.4.1 Piscataqua River

The Piscataqua River is a 13 mile long tidal estuary formed by the confluence of the Cocheco and Salmon Falls Rivers. The watershed covers an area of about 1,495 square miles and includes the additional watersheds of the Great Works River and fiver rivers that flow into Great Bay. The rivers that enter Great Bay include the Bellamy, Oyster, Lamprey, Squamscott, and Winnicut. Great Bay is a large tidally dominated estuary that occupies over 6,000 acres (more than 9 square miles). The lower river forms one of finest harbors in the Northeast despite having currents rated among the highest in North America.

2.4.2 Marine Water Quality

The water quality in the Piscataqua River is generally good as New Hampshire and Maine have an agreement to maintain acceptable water quality in the river by regulating their effluent discharges into the river. The river is designated by the state of New Hampshire as a Class B stream segment and by the state of Maine as a Class SB. New Hampshire Class B waters are acceptable for bathing and other recreational purposes. Maine Class SB waters are suitable for water contact recreation, fishing, shellfish harvesting and propagation, and are valuable fish and wildlife habitat.

2.5 Estuarine Biology

New Hampshire's estuaries are composed of a variety of habitats. They serve as nursery areas for commercially important fish and shellfish species as well as sustaining runs of numerous anadromous and diadromous species. The primary producers include a diverse community of benthic organisms, seaweeds and eelgrass.

2.6 Estuarine Vegetation

The majority of the salt marsh in the Great Bay Estuary can be found in the lower portions of the Piscataqua River near Portsmouth Harbor and Little Harbor. A salt marsh fringe is located along the edges of Mast Cove, which is located along the Maine side of the river near the turning basin. Seaweeds mapped in Mast Cove are iris moss, tufted red weed and knotted wrack.

Eelgrass is an essential habitat for the Great Bay Estuary because it is the basis of an estuarine food chain that supports many of the recreationally, commercially and ecologically important species in the estuary and beyond. Despite its ecological importance, there has been a continuing loss of eelgrass biomass in the estuary, and virtually all of the eelgrass in Little Bay and the Piscataqua River has died. Despite the slight increase of eelgrass distribution in the Great Bay Estuary in 2008, there was continued loss of percent cover and biomass in Great Bay and in Portsmouth Harbor in 2007-2008. In 2008, eelgrass was found only in the Great Bay itself and in Portsmouth Harbor. Overall, the estuary has lost 66% of its eelgrass biomass since 1996.

A lack of eelgrass sighted in the proposed turning basin project area was confirmed by staff from the U.S. Army Corps of Engineers (USACE), New England District. Dr. Fred Short of the University of New Hampshire accompanied the staff of USACE during this site visit. An underwater camera was towed along several transects within the proposed expansion of the turning basin to locate eelgrass on October 14, 2008. The results of the field trip indicated that no eelgrass exists in the proposed navigation improvement area, only seaweed.

Another eelgrass survey was conducted when it was reported by Dr. Short at a NH Dredged Material Task Force Meeting on October 21, 2009 that eelgrass had returned to the proposed project area. Another video survey was successfully carried out on November 5, 2009 by USACE personnel in the vicinity of the proposed project area. Depths in the area surveyed ranged from five to 24 feet at the time of survey (intertidal to 19 feet adjusted to MLLW). Again, no eelgrass was observed in the survey area. The bottom type consisted of sand with cobble, gravel and shell, with several areas of dense kelp beds. A record of the field trip, video survey log, and screen captures from each of the video survey stations can be found in Appendix L.

2.7 Benthic Invertebrates

Benthic invertebrates include epibenthos such as motile bottom dwelling taxa (e.g. snails, crabs and lobsters) and sessile taxa that attach to hard substrates (e.g. oysters, barnacles) as well as infaunal benthos that burrow in the sediments. Environmental conditions that are important in influencing invertebrate occurrence include water depth, substratum, temperature, and salinity. Substratum type is also a major determinant of species composition.

Community composition is determined to a great extent by sediment grain size. Although species dominance can vary spatially and temporally, generally speaking the dominant taxa in the Great Bay Estuary are the polychaetes, the amphipod, and the bivalves. Abundance, number of taxa and species diversity generally increase with decreasing distance from the open coast, indicating that fewer species are tolerant of the seasonal temperature extremes and daily tidal salinity changes.

To determine the potential impact to the benthic community from the proposed project, six benthic samples were collected with a Van Veen (1/25 m^2) grab from the proposed turning basin on September 11, 2007 and passed through a 0.5 mm sieve. A visual inspection of the grab samples determined that the substrate is composed of coarse sand and gravel. Amphipod species comprised three of the four dominant species making up 79% of the total individuals in the area. The results of the benthic survey are typical of coarse grained benthic community in that the Amphipod species typically make slender tubes for shelter. The fourth species was an unidentified Oligochaete.

2.8 Shellfish

The Great Bay Estuary supports populations of eastern oyster, flat oysters, softshell clams, blue mussels, razor clams, and sea scallops. A benthic survey conducted at the proposed turning basin widening site resulted in the collection of softshell clams at two of the six stations sampled and blue mussels at all six stations sampled.

Other common or important crustaceans in the estuary system are American lobster, horseshoe crabs, green crabs, and rock crab. The river is fished by local lobstermen and lobster concentrations are highest near the mouth of the estuary.

2.9 Finfish

The Great Bay Estuary supports 52 species of resident and migratory fish (Nelson, 1981). Estuarine species include year round residents such as tomcod, mummichogs and silversides; seasonal migrants such as bluefish and striped bass; and anadromous fish such as the river herrings, shad and lampreys. Fishways constructed on the Cocheco, Exeter, Oyster, Winnicut and Lamprey Rivers in the Great Bay Estuary have enabled populations of several anadromous species to rebound. However, some species such as the Atlantic salmon, and the common and shortnose sturgeons (for which there is no reliable historic record of occurrence) and shad have not successfully been reestablished, despite stocking efforts for Atlantic salmon and shad. Commercially and recreationally important species include, smelt, winter flounder, smooth flounder, and striped bass.

This area also serves as habitat for a number of diadromous fishes species, including blueback herring, alewife, American shad, rainbow smelt, striped bass, and American eel. These species are present in the Piscataqua River and in the vicinity of the Portsmouth Harbor during spawning migrations.

Smelt, followed by alewives and blueback herring, were the most abundant anadromous fish captured during the Newington Generating Station Study. Smelt enter Great Bay estuary in late fall and winter and move up and down river channels with the tides. In spring, after ice-out, spawning occurs in the tributaries. Adults then return to more saline water and eventually leave the estuary.

Alewives move into the bay and freshwater tributaries to spawn from late April or early May through June; blueback spawn at or just above tidewater during this period. Striped bass are in the estuary from late June through September.

2.10 Wildlife Resources

Although Portsmouth Harbor is surrounded by a combination of industrial, commercial, and recreational land uses, area wetlands provide habitats for reptiles, amphibians and mammals. Harbor seals can be found throughout the Great Bay Estuary, but they and the harbor porpoises are more frequent in the lower portions of the estuary. Harbor seals can be found from November through April, with most sightings during March and April. They were sighted most often in Little Bay, with infrequent sightings in Great Bay and the Piscataqua River.

Whales have been observed outside Portsmouth Harbor, in the Gulf of Maine, during their migration. Most common species include humpback whales, right whales, finback whales, and minke whales.

Great Bay is part of the Atlantic flyway and an important migratory stopover as well as wintering area for many waterfowl and wading birds. As a result, there are both substantial seasonal and year round populations of waterfowl throughout the Great Bay area. Common species include cormorants, Canada geese, bald eagles, sea gulls, terns, ducks, herons, snowy egrets, common loons and a large variety of perching birds.

2.11 Threatened and Endangered Species

Based on correspondence from the National Marine Fisheries Service (letters dated September 2, 2011, November 15, 2013, and February 3, 2014) the following Federally listed threatened or endangered species may occur in the project area: for fish species, the endangered shortnose sturgeon and Atlantic salmon, and the threatened Gulf of Maine (GOM) Distinct Population Segment (DPS) of Atlantic sturgeon; for sea turtles, the endangered leatherback, Kemp's ridley and green, and the threatened loggerhead; listed whale species include the endangered North Atlantic right whale, humpback whale, fin whale, and sei whale.

2.12 Essential Fish Habitat

The 1996 amendments to the Magnusson-Stevens Fishery Conservation Management Act strengthen the ability of the National Marine Fisheries Service and the New England Fishery Management Council to protect and conserve the habitat of marine, estuarine, and anadromous finfish, mollusks, and crustaceans. This habitat is termed "essential fish habitat", and is broadly defined to include "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Managed species listed for the 10' x 10' square of latitude and longitude which includes Piscataqua River are: Atlantic salmon, Atlantic cod, haddock, pollock, whiting, red hake, white hake, winter flounder, yellowtail flounder, windowpane flounder, American plaice, Atlantic halibut, Atlantic sea scallop, Atlantic sea herring, bluefish, Atlantic mackerel, and bluefin tuna. See Appendix P for a list of the EFH managed species and their life history.

2.13 Special Reserves/Places

New Hampshire coastline is supported by several Federal, State, and local initiatives to protect and enhance its coastal and estuarine environment. The Great Bay, located upstream of the project area, was designated in 1989 as a National Estuarine Research Reserve. The National Estuarine Research Reserve System is a network of 27 areas representing different biogeographic regions of the United States that are protected for long-term research, water-quality monitoring, education and coastal stewardship. The reserve system is a partnership program between the National Oceanic and Atmospheric Administration and the coastal

states. NOAA provides funding, national guidance and technical assistance. Each reserve is managed on a daily basis by a lead State agency or university, with input from local partners. In the case of Great Bay, it is managed by the New Hampshire Department of Fish and Game.

The Pisqataqua River is also a component of the Piscataqua Region Estuaries Partnership (PREP), a U.S. Environmental Protection Agency National Estuary Program. The National Estuary Program is a joint local/State/Federal program established under the Clean Water Act with the goal of protecting and enhancing nationally significant estuarine resources.

2.14 Air Quality

Ambient air quality is protected by Federal and State regulations. The U.S. Environmental Protection Agency (EPA) has developed National Ambient Air Quality Standards (NAAQS) for certain air pollutants, with the NAAQS setting concentration limits that determine the attainment status for each criteria pollutant. The six criteria air pollutants are carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur dioxide.
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As the area of proposed dredging in the Piscataqua River in Maine and New Hampshire, and areas of potential disposal of material off of Wells Beach in Maine, and off the beaches located in Salisbury, Newburyport, and Newbury, Massachusetts are in attainment for 2008 Ground-level Ozone Standards, 2006 24-Hour Particulate Matter Standards, 2010 Nitrogen Dioxide Standards, 2010 Sulfur Dioxide Standards, and 2008 Lead Standards, no General Conformity Analysis is required.

2.15 Cultural Resources

As one of the major estuaries on the New England coast, the Piscataqua River provided a reliable source of aquatic resources for both aboriginal inhabitants and early settlers. With increased settlement, the economy shifted toward long distance shipping, and the river became one of the most important ports in New England. The majority of this early activity occurred at or below the city of Portsmouth which is downriver from the study area. Commercial activity in the upper portion of the estuary occurred primarily during the later part of the last century. Archaeological studies in the study area, presented in Appendix I, indicate that no prehistoric or historic resources are located in the project areas.

2.16 Socioeconomics

Population and other statistics for the five communities adjacent to the Federal navigation project are shown on Table 5. Major sources of employment include professional, scientific and management services, educational and health care services, transportation and warehousing, service occupations, and manufacturing.

TABLE 5 Community Statistics			
Community	**Population ***	**Median Household Income ****	**Unemployment Rate****
Portsmouth, NH	21,233	$64,459	4.8
Newington, NH	753	$81,458	0.5
New Castle, NH	968	$103,462	4.7
Kittery, ME	9,490	$47,571	4.3
Eliot, ME	6,204	$76,620	4.5
* U.S. Census Bureau 2010 ** U.S. Census Bureau, 2007-2011 American Community Survey			

Population Trends			
	2010 Census	2012 Estimate	2013 Estimate
State of New Hampshire – Population	1,316,469	1,321,617	1,323,459
% Change Since 2010		0.4 %	0.5 %
Rockingham County - Population	295,223	297,820	NA
% Change Since 2010		0.7 %	
City of Portsmouth - Population	21,233	21,379	NA
% Change Since 2010		0.9 %	
Source: US Census Bureau			

3.0 PLAN FORMULATION

3.1 Summary of Navigation Inefficiencies and Safety Problem

Vessels utilizing the upper turning basin off-load their cargo at the two active terminals in the upper reach of the deep draft project. A third terminal and berth in the area that is owned by the U.S. Department of Defense is currently not in use. Fuel lines from the government terminal lead to the former Pease Air Force Base. Although Sprague owns both active terminals, they share the upstream terminal (River Road) with other users and share the downstream terminal (Avery Lane) under an easement granted to Sea-3. Sea-3 has also made capital improvements to this terminal and their easement, and an associated dock agreement, allows them road and pipeline access to off-load at the terminal. Sea-3 is an importer of liquefied natural gas (LPG) that is temporarily stored at their tank farm landward on the terminal.

Currently, terminal operators and harbor pilots report that the existing width of the turning basin is inadequate for existing and future vessel traffic. To compensate for the inadequate width, larger vessels are turned near low slack water, when the currents are the lowest, and only during daylight hours. In addition, vessels are turned using three tugs vs. the two that would normally be required. Even with these precautions, there have been five groundings in the last 30 years. The most costly incident occurred in 1985 when the vessel grounding caused damage to the propeller, propeller shaft and stern tube. Vessel damage, towing charges, penalties and vessel service loss were estimated to be $8,000,000 at that time. The loss in today's prices is estimated at $15,600,000. Another incident resulted in an estimated $250,000 in damage to the bulbous bow of the ship. No damage was reported for the other three groundings. Without widening the turning basin, the commercial potential of the upper portion of the navigation channel will not be realized as shippers have no incentive to use larger ships as the potential for damage would exceed the reduction in transportation cost. The possibility of groundings and continued inefficient turning operations for existing vessel traffic will also persist.

Waterborne Commerce Statistics report about 121 vessel arrivals and departures from Portsmouth Harbor in 2011, of which about half were vessels drawing greater than the 32 feet that can be carried through the 35-foot channel at all tidal stages given a 10% (3-foot) underkeel clearance requirement. Of the total number of calls, about 78 ships call on the terminals in the upper river reaches that rely on the upper turning basin for access. The breakdown of these calls by vessel length is shown below.

TABLE 6
Upriver Vessel Calls by Vessel Length Class
For Existing Condition with 800-Foot Basin Width

Vessel Length (LOA)	Number of Vessels – 2011 Data		
	Domestic	Foreign	Total
<=500 Feet	28	22	50
501-599 Feet	0	9	9
600-699 Feet	0	12	12
700-800 Feet	0	7	7
Total Ships	28	50	78

3.2 Problems and Opportunities

3.2.1 Problems

As stated previously, the current 800-foot wide turning basin is inadequate for existing and future vessel traffic. Due to this restriction, ships are turned during high or low water slack periods when currents are the lowest, and only during daylight hours. In addition, due to inadequate bank clearance, three rather than two tugs are used to keep the vessel in position during the turn. Even with these precautions, there have been accidental groundings at the turning basin. These restrictions increase the cost of turning vessels and impose a limit on the size of vessels that can use the upper reaches of the project.

Specifics regarding how vessels are turned are shown below:

- All turns take approximately 10 minutes.
- For a turn at low slack, they start the maneuver 30 minutes before low slack (30 minutes of ebb remaining). Currents at this time are about 1 knot.
- For a turn at high slack, they start the maneuver 50 minutes before high slack (50 minutes of flood remaining). Currents at this time are 1-1.5 knots.
- For a portion of each maneuvering time the current continues to act on the vessel and its assisting tugs
- The remainder of the transit, either inbound or outbound, must also be accomplished during a specified period to avoid problems in the remaining channel reaches, channel bends, and the two drawspan openings.

3.2.2 Opportunities

Opportunities are positive conditions that may result from management measures. There is an opportunity to improve efficiency and safety for deep draft commercial cargo carriers using the upper project reaches by implementing a variety of management measures. Providing a wider turning basin would increase the safety and efficiency of turning ships and reduce the potential for grounding damage. A wider turning basin would also encourage shippers to use larger vessels thereby reducing transportation costs.

3.4 Planning Objectives

The Federal objective of water and related land resources planning is to contribute to national economic development consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders and other Federal planning requirements. In support of the National Objective, it is within both the Federal and Corps interest to participate in studies to improve commercial navigation. The objective for this study of Portsmouth Harbor is to develop the most cost effective plan to improve navigation related issues consistent with the Federal objectives. Since the upper turning basin is inefficient considering the size of vessels that use or could use the terminals in this section of

navigation channel, the primary goal of the study is to provide a wider turning basin to accommodate these vessels.

Specific planning objectives are:

1. Decrease the inefficiencies associated with navigation in the upper project reaches, including turning vessels at the upper turning basin, during the period of analysis.
2. Reduce safety hazards and grounding damages for vessels using the upper project reaches, including those caused by the current inadequate turning basin width, during the period of analysis.
3. Decrease transportation costs to enable shippers to use larger vessels in the upper project reaches during the period of analysis.

3.5 Planning Constraints

Planning constraints are restrictions that limit the planning process and the available scope of solutions to the identified problems, or that limit consideration of opportunities. Alternative plans should be formulated in a manner that meets the planning objectives while avoiding the planning constraints. Planning constraints may be physical (bridges, landmasses, utilities), institutional (legal or legislative), economic, environmental, or cultural resources. The following constraint was considered during the plan formulation and evaluation process.

- The focus of the improvement project is to provide an appropriately sized turning basin to accommodate vessels that use, and are projected to use, the commercial cargo terminals on the upper deep draft reach of the Piscataqua River.

- The Portsmouth Pilots have identified the maximum size vessel that could access the upper river reaches as being no more than 800 feet in length. This restriction is due to the width and alignment of the navigation openings two of the downstream bridges, the channel width, and the bends in the channel in those bridge approaches. While the downstream-most bridge (Route 1A) was recently replaced (2013), and the middle bridge (Route 1) is scheduled for replacement in 2015-16, significant changes in navigation alignment were not made and are not planned. Further, as the channel through the lower reaches is largely rock-bound, the cost of downstream modifications to the channel and its bends through extensive drilling and blasting, and further changes to the bridges to permit vessels larger than 800 feet in length to access the river, would be extraordinarily high. Therefore, analysis of vessel usage of the upper reaches beyond the 800-foot maximum identified by the pilots was not carried into detailed planning.

3.6 Measures to Improve Shipping Efficiency and Safety

A range of management measures were initially identified and considered as the basis for formulating alternative plans to provide safe and efficient turning of vessels at the upstream limit of the Federal navigation project.

Three highway bridges cross the deep-draft channel, of which one is a combined highway/railway bridge. The uppermost is the Interstate 95 Bridge, a high-level crossing with piers located along each shore, poses no restriction on current or projected navigation. The middle bridge is the US Route 1 Sarah Long Bridge. Replacement of this combined highway/railway bridge is nearing completion and its replacement is scheduled to be completed in 2016. Replacement of the downstream-most bridge, the Route 1A Memorial Bridge, was completed in July 2013. The replacement of the two drawspans will permit the waterway to safely carry large bulk cargo vessels of up to 800 feet in length.

The very specific needs of improving the efficiency and safety of vessels utilizing the upstream terminals limits the range of alternatives that can be considered. Non-structural measures such as reducing the size of vessels visiting these terminals would not be acceptable to terminal operators as their ultimate goal is to increase vessel size to reduce transportation costs. The current trend toward larger vessels has increased the average length of vessels visiting these terminals. In addition, as severe tidal currents limit navigation maneuvers to slack or near slack periods, there were no opportunities to more effectively use the tide or adjust operating conditions to address the issue of turning basin width. Accordingly, no viable non-structural measures were identified for this investigation.

Structural navigation improvement measures focused on meeting all planning objectives by providing an effective and efficient turning basin near the head of navigation along the Piscataqua River. Plan formulation included consideration of measures to provide an adequately sized turning basin and options for disposal or beneficial use of dredged material.

3.7 Subsurface Investigations

To assess the feasibility of widening the existing turning basin, subsurface investigation were conducted to characterize the material that would be excavated. In September 2007, eight test borings and 3 probes were taken in the area of proposed widening. A plan showing the location of these explorations is included in Appendix F, Geotechnical Investigations.

Investigations included a geophysical survey of the area of potential turning basin widening. The geophysical study included a side scan sonar survey to identify course materials and man-made items on the bottom, a magnetic intensity survey to identify ferrous items on or below the bottom, and a sub-bottom profile survey to identify the presence of coarse glacial till and bedrock. Results of this work are presented in a report entitled, “Marine Geophysical

Investigations Navigation Channel Improvement Project Piscataqua River Portsmouth, New Hampshire" dated 17 September 2008, that is included as an attachment in Appendix F.

Data collected from borings, probes and sub-bottom profiling was used to assess dredging practicability. Analysis showed that the material is primarily coarse sand and gravel, with two areas of bedrock generally deeper than -30 feet MLLW. The glacial till is very dense and is expected to contain cobbles and some boulders. Based on the nature of the material to be dredged, a barge mounted mechanical dredging plant would be required for improvement dredging at the site.

3.8 Navigation Features

Based on EM 1110-2-1613, Chapter 9, Section 9-2.c.(1), a turning radius of 1.5 times the length of the design vessel being considered was used to size the turning diameter. This factor is based on current velocities greater than 0.5 but less than 1.5 knots. The selection of the turning radius factor of 1.5 considered the Portsmouth Pilots input and currents at the time ships are turned during windows limited to slack tide periods. Due to the limited nature of the improvements under consideration and the slack tide limitation on vessel turning, a ship simulation study was not conducted during the feasibility study.

Based on the size of ships that currently use the two upstream terminals and the design vessel for the navigation project, three turning basin widths were developed for evaluation. Since the majority (about 90 percent) of ships that use these terminals are less than 680 feet in length, a basin width of 1,020 feet was the smallest to be evaluated. The next basin width to be analyzed was 1,120 feet. This is based on a 747 foot long vessel which represents over 99 percent of vessel trips over the last 5 years. The widest basin width to be evaluated is 1,200 feet, which is based on the design vessel length of 800 feet. Considering the channel configuration, width and depth, the harbor pilots consider this to be the maximum sized vessel that could navigate the river and reach the upper turning basin and terminals, and the replaced draw spans will improve the safety of transiting vessels of that size.

3.9 Dredged Material Disposal Suitability Determination

The suitability of dredged material for ocean disposal was evaluated based on testing of ten representative samples from the September 2007 borings and supplemental testing of 16 surface samples in collected in June 2009. Suitability determinations for both rounds of testing are included in Appendix K. Material was found to be suitable for disposal at a Section 103 ocean disposal site without further testing, or; as proposed, as sub-tidal nearshore feeder bar placement for eroding beaches in nearby communities.

3.10 Dredged Material Management Measures

3.10.1 Upland Disposal

There are several options for upland disposal of dredged material. In 2005, the Corps completed a study that indentified approximately 100 potential upland disposal sites for dredged material from Federal navigation projects in New Hampshire. All sites were within a 15 mile haul distance from one of the eight Federal navigation projects located in the State. Although property owners were not contacted, this study demonstrated that it was likely that upland sites were available depending on the nature of the material to be dredged. As initial testing of the dredged material indicates that it would be acceptable as construction fill, the cost to dispose of the material at one of the closest sites in Newington was developed. This cost included unloading the scow at the State terminal on Market Street, trucking it to the site, and grading the material at the disposal site. As the cost per cubic yard for upland disposal exceeded $30.00, which is about twice the cost of ocean disposal, this measure was eliminated from further consideration.

3.10.2 Ocean Placement

There are three regional dredged material placement sites that could be used for dredged material, all of which are subject to Section 103 of the Marine Protection, Research, and Sanctuaries Act, also known as the Ocean Dumping Act. Two are located off the coast of Maine, the Portland Disposal Site (PDS), located directly east of Cape Elizabeth, and the Cape Arundel Disposal Site (CADS), located just southeast of Kennebunkport, Maine The other site, the Massachusetts Bay Disposal Site (MBDS), located 20 miles east of Boston Harbor, Massachusetts.

The PDS was designated by the U.S. Environmental Protection Agency (EPA) as a dredged material disposal site on October 16, 1987 However, the material from the turning basin was not tested for suitability for disposal at the PDS because it is located about 58 miles by sea from the dredging site. This distance is too far to be considered a practicable disposal location; therefore this site was dropped from further consideration.

The CADS site was considered for disposal when the Expedited Reconnaissance Report was completed in August 2004. However future use of this site was affected by a 1992 amendment to the Marine Protection Research and Sanctuaries Act (MPRSA - the Ocean Dumping Act). That amendment established a time limit on the availability of Corps selected sites for disposal activity in waters seaward of the territorial sea baseline. The provision allowed a selected site to be used for two non-consecutive five-year periods; beginning with the first disposal activity after the effective date of the provision, which was October 31st, 1992. The second five-year period began with the first disposal act commencing after completion of the first five-year period. Use of the dredged material disposal site, however, could be extended for long-term use if the site was designated by EPA. Thus, the Corps can

select disposal sites only for short-term limited use; whereas, Congress authorized EPA to undertake long-term site designations subject to ongoing monitoring requirements to ensure that the sites remain environmentally sound. However, no funding was provided to support the EPA studies needed to designate the CADS as a long-term dredged material disposal site. As a result, CADS no longer remained available for dredged material disposal after January 2010. As of the time the internal drafts of this report were prepared, this situation resulted in this site being eliminated from further consideration.

The Consolidated Appropriations Act for Fiscal Year 2014 (PL 113-76, January 17, 2014) contained language as cited below that re-opened the Cape Arundel Disposal Site for a limited period with certain conditions.

> *Section 113. The Cape Arundel Disposal Site in the State of Maine selected by the Department of the Army as an alternative dredged material disposal site under section 103(b) of the Marine Protection Research and Sanctuaries Act of 1972, shall remain open for 5 years after enactment of this Act, until the remaining disposal capacity of the site has been utilized, or until completion of an Environmental Impact Statement to support final designation of an Ocean Dredged Material Disposal Site for southern Maine under section 102(c) of the Marine Protection Research and Sanctuaries Act of 1972, whichever first occurs, provided that the site conditions remain suitable for such purpose and that the site may not be used for disposal of more than 80,000 cubic yards from any single dredging project.*

With the per-project limitation of 80,000 the site would be of only limited use for the Portsmouth Harbor project. It may be possible that the rock volume to be removed from any turning basin expansion could be accommodate under these restrictions, but the ordinary material dredging volumes would far exceed that limit under even the smallest incremental alternatives.

The MBDS was officially designated by the U.S. Environmental Protection Agency (EPA) as a dredged material disposal site on 1993. However, the material from the turning basin was not tested for suitability for disposal at the MBDS because it is located about 58 miles by sea from the dredging site. This distance is too far to be considered a practicable disposal location; therefore this site was dropped from further consideration.

Inasmuch as the distance to available ocean disposal sites eliminates them as acceptable disposal sites due to cost, the feasibility of re-opening the historically used Isle of Shoals (IOS-H) disposal site located just east of the Isle of Shoals in State waters was considered. However, based on coordination with resource agencies (primarily NMFS), it was determined that since this site is a prime area for various marine species and is today an important fishing ground, NMFS would not consider the IOS-H site as a disposal site. Since designating a new ocean disposal site within a reasonable haul distance from the proposed project would result in significant cost saving to the project a meeting was held with NMFS and EPA representatives following Corps/EPA investigations of potential ocean placement sites in the

Portsmouth vicinity. EPA had encouraged locating any new ocean placement site outside State waters and entirely within Federal waters. Based on those investigations, a potential candidate site was located north of the Isles of Shoals, which was assessed as being less biologically productive and had little evidence of recent fisheries activity.

The investigation of an alternative ocean placement site determined that an area with the appropriate characteristics is located about five (5) miles northeast of the IOS-H disposal site. This site, designated as Isles of Shoals North (IOS-N), has a depth of about 300 feet and is a relatively flat plain nearly surrounded by higher elevations. Figure 4 shows the location of the previously used IOS-H site, and the IOS-N site. Data was then collected from this site to determine if it would be "likely selectable" under the MPRSA criteria for dredged material disposal site selection. Side-scan sonar data was collected in July 2010 by the U.S. EPA OSV "BOLD" for both the existing IOS site and the IOS-N site during July 2010. Benthic and grain size data was collected separately by the Corps from the IOS-N site in November 2010.

The side-scan data show that the substrate at the IOS-N site is smooth, uniform and composed of fine-grained material, while the IOS-H site contains ridges and other deposits of hard material (rock, ledge and/or boulders). The side-scan data also indicated that fish trawl marks noted at the IOS-N site during the survey are historic (oxidized), indicating that the site is not actively fished. Only a few trap lines were evident at IOS-N site, whereas the IOS-H site was being actively fished for lobster, with numerous trap lines visible. The benthic report for IOS-N summarizes the site as "the study area is physically homogeneous and inhabited by a limited benthic invertebrate community. Richness, at the species and higher taxonomic levels, and density are low relative to both more inshore and more offshore habitats." Grain size data confirmed that the site is fine-grained as seven of the nine samples contained more than 95% fines and the remaining two samples contained more than 79% fines. Data collected during this analysis is included in Appendix M.

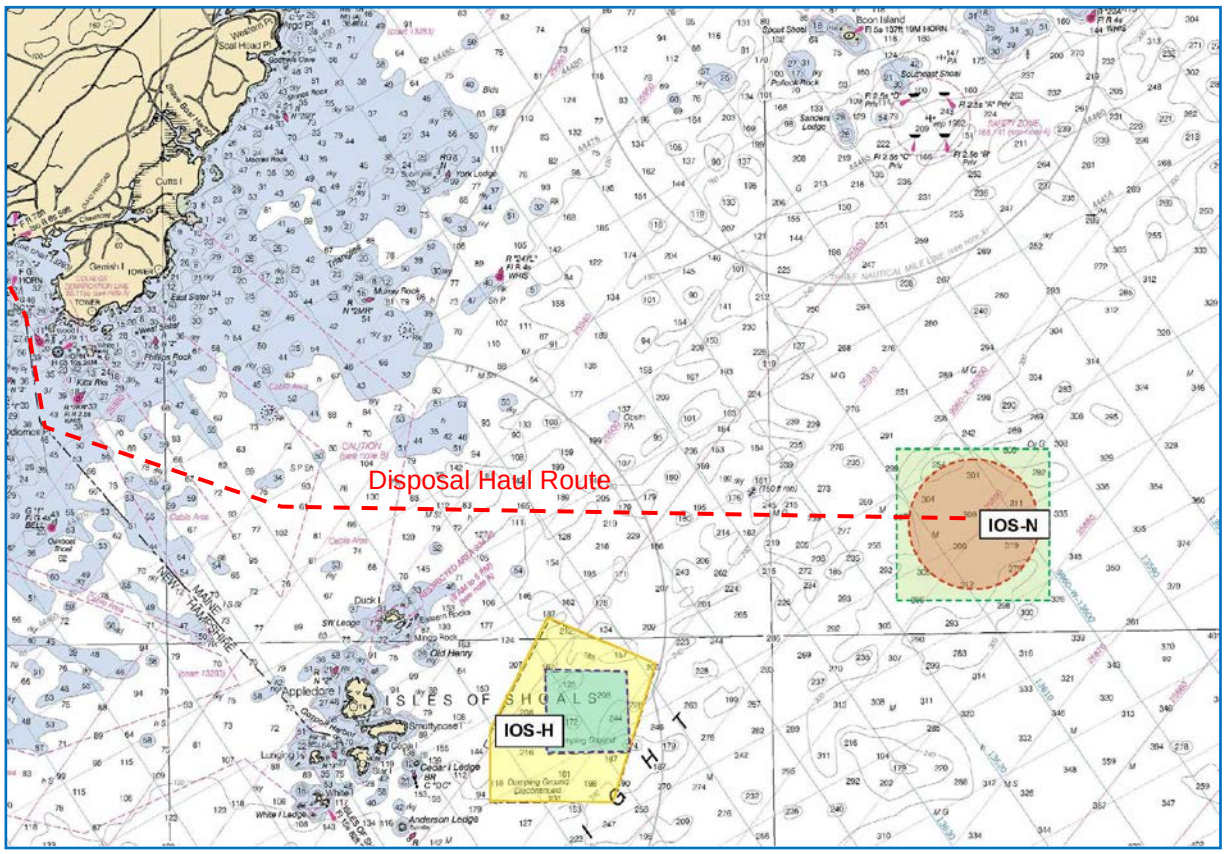

Figure 4. Isle of Shoals Ocean Placement Sites

As these results indicate that IOS-N is "likely selectable" under MPRSA criteria for one-time use for placement of dredged material from the turning basin widening, letters were forwarded to EPA and NMFS requesting their concurrence. By letter dated 7 September 2011, EPA concurred "that this site is "likely selectable" for one-time use for placement of dredged material from the Piscataqua River FNP turning basin." NMFS determined that the proposed alternative site "(IOS-N) may be a more favorable selection for minimizing impacts to living marine resources than the historic IOS-H site", but that additional consultation would be required under the Magnuson-Stevens Fisheries Conservation Management Act (MSA), and the Endangered Species Act (ESA) should a site selection be made. By letter of February 3, 2014 NMFS determined that use of the IOS-N site was not likely to affect listed species. Based on these responses, and cost estimates showing that use of the IOS-N site results in the lowest project costs, this site was identified as the Federal base plan.

3.10.3 Beneficial Use, Beach Nourishment

One of the most common forms of beneficial use is beach nourishment by placing suitable sandy dredged materials on beaches or at nearshore areas where wave action will slowly move the material onshore. Review of the material proposed to be dredged shows that it is predominantly sand with some gravel. The material is coarser than the sand on the beaches

needing nourishment making direct placement potentially unacceptable. Another factor to consider is that the material to be dredged is compact and must be mechanically dredged. Direct placement on beaches needing fill would therefore require double handling of the material making this option cost prohibitive. However, nearshore placement is much more cost effective as the material does not need to be re-handled and has been approved for ocean disposal. Wave action on the nearshore placement would also sort the dredged material resulting in finer materials being washed ashore. Therefore, beach nourishment by way of nearshore placement was retained as a suitable disposal alternative.

As beneficial use of dredged material is viewed favorably by State and Federal agencies, coordination was initiated to identify candidate beaches in New Hampshire and Maine. The preliminary criterion for this search was that these beaches be located within the same haul distance as the most likely Federal base plan (disposal at IOS-N), a distance of 20 miles. For beaches further than 20 miles, the non-Federal entity requesting the sand would be required to fund the difference in cost between the Federal base plan and transporting sand to their location. The closest beach needing sand is Wallis Sands Beach in Rye, New Hampshire. This beach is managed by the New Hampshire Department of Resources and Economic Development (DRED). Dredged material from Little Harbor, situated between New Castle and Rye, has been placed off shore from the beach. DRED was contacted regarding current needs, but were concerned because material previously placed nearshore may have migrated south resulting in the blockage of a coastal inlet.

To determine beach nourishment needs in Maine, the Maine Geological Survey (MGS) was contacted. This State agency monitors numerous beaches along the coast and has identified those with erosion problems. Using our initial criterion, MGS identified Long Sands Beach in York Maine as a prime candidate. Erosion has been a long term problem and the beach is within 20 miles of the dredging site. Since this beach appeared to be a good candidate for beneficial use, the Maine Department of Environmental Protection (DEP), and Department of Marine Resources (DMR) were contacted. DMR's primary concern was that the disposal site not be located in an area where the bottom is rocky or has boulders and cobbles. These areas are considered prime lobster habitat. The potential for impacts to submerged aquatic vegetation, primarily eelgrass, was also considered. Based on these concerns, a site at the northern end on the beach was selected for further study. To determine site suitability and potential impacts to the benthic community, five sediment grab samples were collected in the nearshore placement area. Grain size analysis of these samples determined that all samples were fine sands. The benthic community analysis determined that the number of species identified is typical for a small benthic survey of a sandy nearshore environment on the Maine coast.

As studies at Long Sands Beach progressed, we were in contact with the Maine Lobstermen's Association and the town of York. To discuss the nearshore disposal option and gather information from the Lobstermen's Association, a meeting was scheduled for the evening of 5

January 2010 in York, Maine. Town officials were also expected to attend. Upon arrival for the meeting Corps and State officials (MGS, DEP and DMR) were advised that the meeting room had changed. Based on a local news report, roughly 50 people had arrived for the meeting. The background of the study and why Long Sands was selected as a potential candidate for nearshore placement were explained, and the meeting was opened for questions and comments. There was definite vocal opposition to the plan. Those present were concerned about the characteristics of the sand. Although testing is not required based on the grain size analysis and the high velocity environment of the Piscataqua River, and ocean disposal had been approved based on coordination with resource agencies, the public was concerned whether the material was clean enough for disposal. There was also concern regarding impacts to surfing opportunities and the color of the sand, brown rather than the white sand found on their beach. The dispersal of disposed sediments over hard bottom areas was a potential issue as well. Although the reasoning behind selecting this area was based on the history of landward migration and lowering of the beach, those present didn't seem to see the need for potential beach quality sand at their beach. Subsequent discussions with the Chairman of the York Board of Selectmen on February 16, 2010 determined that based on this opposition, the Town was not in a position to support nearshore placement in York.

Opposition to nearshore placement in York and similar concerns expressed regarding placement off shore from Wallis Sands Beach and at other beaches in New Hampshire, resulted in a reanalysis of nearshore placement options. Initially, sites within a 20 haul distance were considered because there would be no local cost share as cost to deliver sand to these sites would be the same or less expensive than the base plan. If sand was transported further than this, the community receiving the sand would have to pay the difference in cost between the base plan and the cost to bring it to their location. Since this cost would be relatively minor when compared with the cost of receiving sand by other means, a new search was initiated to identify other potential sites. To gauge the level of interest in receiving the dredged material a meeting was held on May 21, 2010 in Portsmouth, New Hampshire. Representatives from three states, Maine, New Hampshire and Massachusetts, were invited along with representatives from communities with documented beach erosion problems. Approximately 25 people from the three state region attended the meeting. To give attendees an approximation of the cost to receive this material, the following cost comparison table (Table 7) was distributed at the meeting.

The town of Wells, Maine and the Commonwealth of Massachusetts expressed an interest in receiving dredged material for beach nourishment. The Massachusetts sites included the Merrimack River Inlet/Plum Island area and Winthrop. Dredged material has previously been deposited along the coasts of Wells and Plum Island.

TABLE 7 PORTSMOUTH HARBOR - TURNING BASIN WIDENING STUDY Cost Comparison of Sand Placement Alternatives			
Placement Site	Haul Distance (Miles)	Cost/CY	Cost Increase Above Federal Base Plan
Open Water Placement			
Wallis Sands Beach, North Rye, NH - Nearshore	14	No Local Interest	
Isles of Shoals North – Ocean Placement – Base Plan	20	$19.75	NA
Long Sands Beach, York, ME - Nearshore		No Local Interest	
Salisbury Beach MA - Nearshore	24	NA	$2.60
Plum Island Beaches in Newbury & Newburyport, MA - Nearshore	26	NA	$2.69
Wells Beach, Wells, ME - Nearshore	32	NA	$2.81
Camp Ellis Beach, Saco, ME – On Beach	52	NA	$10.00
Winthrop Beach, Winthrop, MA – Nearshore	58	NA	$11.70
Portland Disposal Site, Maine – Ocean Placement	58	NA	$11.70
Upland Placement			
Gosling Road, Newington, NH – 220,000 CY Only		NA	$13.80
Note: Costs are comparison of Base Plan costs with alternative placement plans costs based on total project first cost for design and construction in FY2014 price levels and distributed by CY.			

Additional coordination concerning interest in receiving dredged material was also conducted in July 2012. Letters were sent to each State and to the following communities: Rye in New Hampshire; Wells, Ogunquit and Kittery in Maine; and Salisbury, Newburyport, Newbury and Winthrop in Massachusetts. The communities of Wells, Maine, and Salisbury, Newburyport and Newbury, Massachusetts responded that they would be interested in receiving dredged material and would be willing to fund the incremental amount above the Federal base plan.

Discussions between State representatives determined that the dredged material would be distributed on a 50/50 basis between Maine and Massachusetts should all of the interested parties ultimately secure the necessary permits and approvals prior to completion of the project's Design Phase. In addition, based on a Merrimack River Beach Alliance agreement between the communities of Salisbury, Newburyport and Newbury, the Massachusetts, 25 percent of the Massachusetts material would go to Salisbury, with the remainder going to Plum Island (Newburyport and Newbury).

4.0 ALTERNATIVES

4.1 Future Without Project Condition

The future without project condition, or the no-action alternative, is the condition expected to occur in the project area in the future should no-action be taken by the Federal government to provide a wider turning basin at the upstream limit of navigation on the Piscataqua River. The future without-project condition is compared to the with project condition to identify project benefits and environmental effects of the alternatives. The base year of the analysis is 2015 and a 50 year period of analysis is used.

Changes in the fleet utilizing Portsmouth Harbor resulted in previous project improvements and modifications. Improvements authorized in 1962 and completed in 1966, which included extending the channel to its current limits, widening the channel at several locations, and constructing of turning basins upstream from Boiling Rock and at the head of navigation, were designed to permit the use of vessels of 35,000 DWT (deadweight tonnage) with a draft of 35 feet. As the fleet changed and more ships in the 40,000 – 45,000 DWT class used the harbor, several sections of the channel were widened to allow safe navigation of the channel. These improvements were authorized in 1986 and completed in 1992. These improvements resulted in further changes in the fleet and more frequent use of larger vessels in the upstream reach of the project. Between 2008 and 2012, an average of 12 vessels with a deadweight tonnage of 45,000 or greater visited the upper two terminals. These changes to larger vessels lead to the need for upstream turning basin improvements.

In the future without project condition it is assumed that the two beneficiary terminals at the upstream end of the navigation channel will continue to operate and that cargo volumes will be similar to current levels (See Table 2 and Appendix C - Economics). Total annual transportations costs for the existing condition for cargo shipped by the existing upper harbor fleet are as follows (in $1000s). As the commodities shipped are primarily petroleum fuels and items like asphalt and gypsum which are tied to roadway and housing construction, these number are expected to grow at a low rate similar to the rate of population growth, with variation according to the severity of any given winter.

At Sea Cost	In Port Cost	Tidal Delay Cost	Total Cost
$5,470.7	$928.1	$0.1	$6,398.9

Sprague Energy owns both the Sprague River Road terminal, which it operates, and the Avery Lane Terminal. Sea-3 has an easement to access and operate the Avery Lane Terminal for its propane pipeline which connects its gas tanks on Sea-3 property with the dock. That easement was originally granted to Sea-3's predecessor, Dorchester Enterprises, and grants a right of way to the terminal as well as over the terminal itself. That easement itself does not have a stated termination date but is instead tied to the terms and conditions of a Dock Agreement which memorializes the two companies (Sprague and Sea-3) shared

responsibilities for dock maintenance and operation. The Dock Agreement's termination date is 2079, beyond the 50-year project life, but may be terminated sooner upon the expiration of the useful life of the dock or if any occurrence or event requires a capital improvement of $500,000.00 or more. However, Sea-3 has an Option to Purchase the dock if either of those events come to pass. Sea-3's Option to Purchase is also triggered by Sprague attempting to sell or lease the dock to another entity or if 51% of the Sprague's stock is transferred. The grantee in the easement (Sea-3) has an ownership interest in the property to the extent the Dock Agreement remains in effect.

The future without a navigation improvement project assumes that the existing channel and turning basin would be maintained at the authorized dimensions (i.e. depth of -35 feet MLLW, channel width of 400 feet and turning basin width of 800 feet). The upper portion of the Federal project was originally completed in 1966 and there has been no need for maintenance dredging in the upper reaches adjacent to these terminals. No changes in maintenance requirements are expected without the project. Based on condition surveys obtained in 2007, only a small amount of shoaling (less than 1,400 cubic yards in areas shallower than -35 feet MLLW) has accumulated in the turning basin. This minimal amount of shoaling does not impact vessel operations in this area. Maintenance dredging of the Simplex Shoal area, situated about 3,000 feet downstream, is conducted fairly regularly. The last maintenance dredging in this area was completed in early 2013.

Without an improvement project, inefficient turning operations and safety hazards would continue. Shippers would also continue to be limited in the size of vessel they can use to call on the port, leaving them unable to achieve the economies of scale of larger vessels. Many shippers, particularly of bulk commodities, prefer to use larger vessels that have lower overall costs per ton, particularly for trips over long distances (from South America or Europe). Without a project, the degree to which commodities can be shipped on the most cost-effective vessels would be limited by the undersized turning basin width.

In the future without project condition it is likely that natural resources in the study area will continue to be present as described in the existing conditions section of this report.

4.2 Alternative Plans

Navigation improvement measures and dredged material disposal measures discussed above were combined to form alternative plans. All alternatives, except the no-action alternative, include a wider turning basin at the upstream end of the Federal navigation channel. Dredged material disposal options include nearshore placement for beach nourishment and ocean disposal.

4.3 Development of Alternatives

Development of alternatives was an iterative process. The first item evaluated was the feasibility of widening the existing turning basin, or relocating the turning basin to an adjacent area where it would be able to serve the two upper terminals. Bathymetric surveys of the area were obtained and alternative turning basins were laid out using the maximum turning basin width of 1,200 feet. Alternative 1 consists of widening the existing turning basin, Alternative 2 is a southeast relocation, and Alternative 3 is an upstream relocation. Figure 5 shows the location of the existing turning basin and the two alternative turning basin locations.

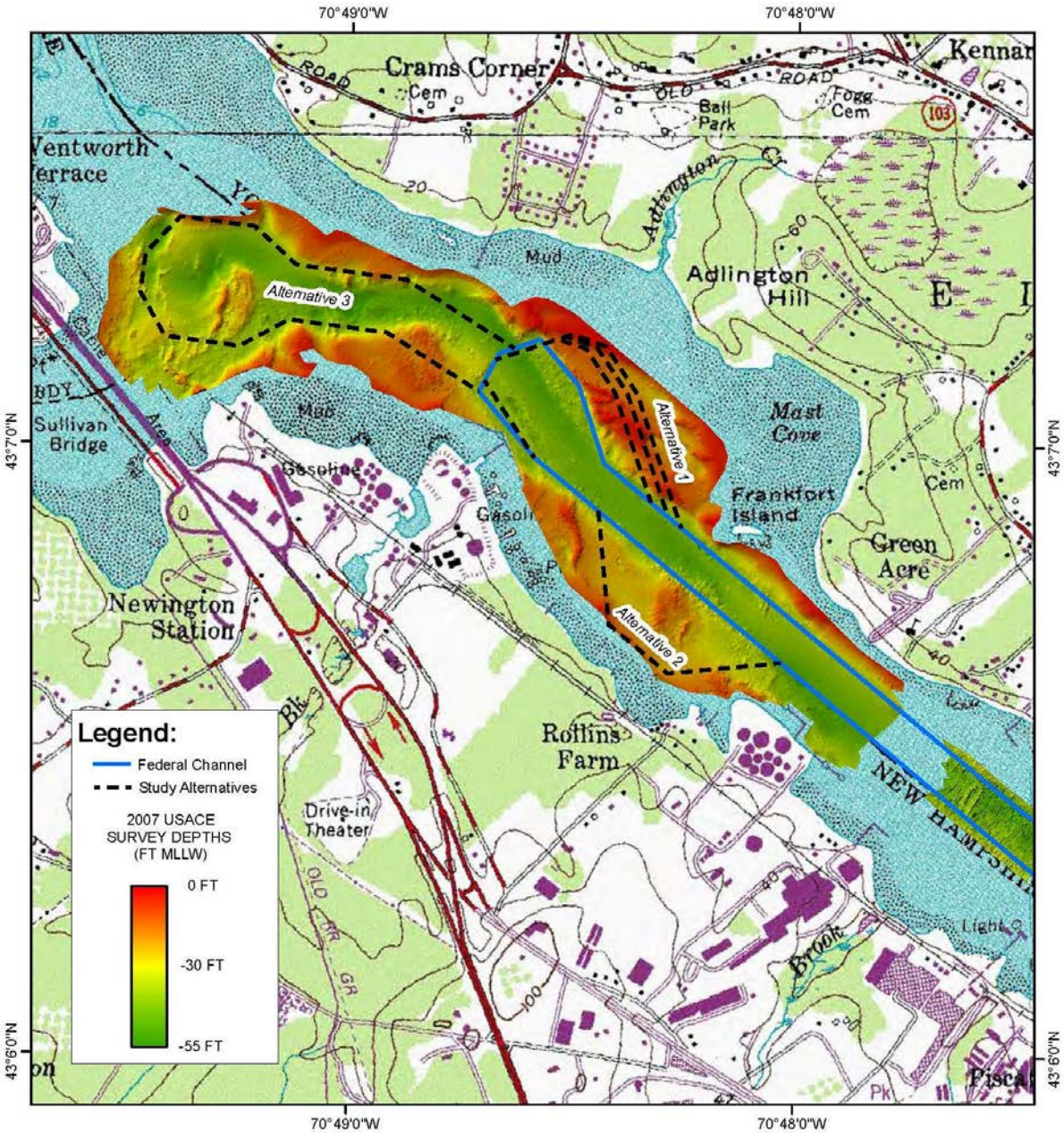

Figure 5. Turning Basin Alternatives

4.4 Description and Evaluation of Alternatives

No Action: Continued Maintenance of the Existing Turning Basin Width

Under this alternative the existing project dimensions would be maintained by maintenance dredging when required. Vessels would be limited in size to lengths no greater than those presently calling on the upper river terminals. At least three tugs would be required for turning maneuvers. The risk of vessel grounding would remain and vessels would continue to be limited to slack-water movement in times that would facilitate transit in daylight hours. .

Alternative 1: Widen Existing Turning Basin

Widening the existing turning basin to allow efficient and safe turning of ships was selected for further study. It is currently 800 feet wide and widening it would cause the least disruption in the area. Widening the existing turning basin to a maximum width of 1200 feet would result in the smallest dredging footprint of the alternatives considered. There are no critical environmental or cultural resources present in the proposed expansion area, and the extent of bedrock is limited. It is also favored by the Portsmouth pilots as the Sprague River Road Terminal, which handles about two thirds of the river traffic in this section of the river, is adjacent to the turning basin. This allows the pilots to turn the ship off the terminal taking advantage of the short slack tide windows to turn the ship. Potential widening widths, discussed in Section 3.8, Navigation Improvements, will be evaluated in detail to select the most cost effective plan.

Alternative 2: Relocate Turning Basin to Southeast

Relocating the turning basin southeasterly to a point between the Sprague and Sea-3 terminals was considered. This area, located on the New Hampshire side of the channel, would be easily accessible from both terminals. Evaluation of a 1200 wide turning basin, which would encompass the 400-foot wide channel, would require the excavation of over 640,000 cubic yards of material. However, based on past borings along the river, bedrock is extensive and located at shallow depths in this area. As drilling, blasting and removing this rock to an elevation of -39 feet MLLW would be extremely expensive, the alternative was not recommended for further study.

Alternative 3: Relocate Turning Basin to Upstream Location

This alternative would cause a major revision of how ships from the Sprague River Road and Sprague Avery Lane/Sea-3 terminal are turned. The turning basin would be located about 3400 feet further upstream and would require extension of the main ship channel. The Portsmouth Pilots evaluated this upstream turning basin and based on their comments and the additional reasons listed below, this upstream site was not recommended for further study or consideration.

- The additional distance to reach the turning basin upstream would mean the pilots would have less time and flexibility to turn the ships during slack tides.

- The new turning basin would be located where the currents exit Great Bay into Piscataqua River. These additional currents would increase the amount of time the pilots would need to maneuver the ships to counter these currents; thereby lessening their already short slack tide window for turning large vessels in the river. Additional tugs may be needed for these maneuvers.
- Significant small craft traffic between the bay and the river would interfere with the use of the area as a turning basin for large ships. The Hilton State Park at Dover Point in New Hampshire has a large boat ramp located adjacent to the proposed upstream turning basin. This State park experiences a significant amount of recreational usage, further contributing to the small craft congestion in this area, and a potential safety hazard.
- Multiple turns in the proposed extension of the navigation channel to take full advantage of naturally deep water would not be possible due to the river currents and the large size of the ships using the river. Therefore, some removal of the submerged banks in the river would be necessary. This along with the presence of a large ledge in the center of the proposed upstream turning basin site would contribute to a higher upstream turning basin development cost than just expanding the existing turning basin.
- The upstream turning basin site also contains a plotted shipwreck that may be a cultural resource of concern. This would require additional study and documentation to determine compliance with applicable laws and regulations.

4.5 Results of Initial Alternative Screening

Evaluation of the alternatives presented in the previous section resulted in the selection of Alternative 1, Widen the Existing Turning Basin, as the only viable alternative. To determine the most cost effective basin width, three basin widths were evaluated. These basin widths were developed based on classes of ships that currently use the upper terminals, and the largest vessel that could safely navigate the Piscataqua River and access the upper terminals

TABLE 8
Alternatives Recommended for Further Study Based on Initial Screening

Alternative	Description
No Action	Continued Maintenance of Existing Project Dimensions
1A	Widen Existing Upper Turning Basin to 1020 feet
1B	Widen Existing Upper Turning Basin to 1120 feet
1C	Widen Existing Upper Turning Basin to 1200 feet

The turning basin widening plans will be evaluated based on dredged material placement at the IOS-N site which is considered to be the Federal base plan. Costs for placement at the four nearshore disposal sites that were developed during plan formulation would then

developed to determine local cost requirements for the additional haul distance. One site is located in Wells, Maine and the other three are situated in Salisbury, Newburyport and Newbury, Massachusetts.

The plans were formulated in consideration of the Corps formulation criteria of completeness, effectiveness, efficiency and acceptability. The three plans are similar and meet these criteria as described below.

Completeness. The plans are complete as they include all necessary investments to widen the existing turning basin.

Effectiveness. The plans are effective as they all contribute to varying degrees to the planning objectives to decrease transportation costs, and reduce safety hazards and inefficiencies associated with turning vessels at the existing turning basin.

Efficiency. The plans are cost-effective means of attaining these objectives. Initial screening considered various dredge material disposal measures including upland disposal and open water disposal at nearshore placement sites or at a disposal site northeast of the Isle of Shoals. Open water disposal is less expensive then upland disposal.

Acceptability. The alternative plans are workable from a construction point of view and can be implemented in compliance with existing laws regulations, and public policy.

4.6 Quantity Estimates for Alternative Plans

Dredge quantities were developed for each turning basin width and include quantities for both ordinary material (sand and gravel) and bedrock. The design depth of the expanded turning basin would remain at the design depth of -35 feet Mean Lower Low Water (MLLW). In areas of bedrock, the required depth is increased two feet to -37 feet MLLW. In addition, overdepth allowances for dredging is two feet is all areas. A minor amount of maintenance dredging would be required to restore the turning basin to its authorized depth of -35 feet MLLW. Although this material would be dredged at the same time as the improvements, quantities shown in Table 8 do not include this maintenance quantity of 7,800 cubic yards (CY) including overdepth. Quantities for the No Action alternative are not shown on Table 9 as long term maintenance has not been required along this section of river.

The assumed bedrock surface that was used to develop quantity estimates for rock removal was based on boring and probe results, and a seismic study conducted at the site. Of the 8 borings and 3 probes that were taken, bedrock was encountered at only one location at a depth less than the dredging depth of -37 feet MLLW (boring B-6 at a depth of about -30 feet MLLW). The acoustic basement reflector identified during the seismic study in this area coincides with this depth indicating that the acoustic basement is the surface of bedrock in this area. Acoustic basement and probe results were somewhat inconsistent in other areas indicating that the acoustic basement could be either bedrock or glacial till. As boring and

probe coverage was somewhat limited, the acoustic basement was assumed to be the top of bedrock in areas where geologic features indicate the potential for the presence of bedrock. Accordingly, the rock excavation quantities presented in the report are considered conservative, as material now counted as bedrock could be hard glacial till common to New England. Additional subsurface investigations will be conducted during detailed design to better define the surface of bedrock.

TABLE 9 **Dredging Quantity Estimates for Alternative Plans**		
1020-Foot Wide Turning Basin	Dredging Quantity (CY)	
	Ordinary Material	Rock
Cut to -35 Feet MLLW	340,500	8,900
Overdepth Allowance – 2 Feet	44,400	6,100
Additional Overdepth in Rock – 2 Feet		7,500
Total Improvement Quantities	384,900	22,500
1120-Foot Wide Turning Basin	Dredging Quantity (CY)	
	Ordinary Material	Rock
Cut to -35 Feet MLLW	519,800	8,900
Overdepth Allowance – 2 Feet	53,900	6,200
Additional Overdepth in Rock – 2 Feet		7,800
Total Improvement Quantities	573,700	22,900
1200-Foot Wide Turning Basin	Dredging Quantity (CY)	
	Ordinary Material	Rock
Cut to -35 Feet MLLW	661,300	9,200
Overdepth Allowance in Ordinary Material or Additional Required in Rock – 2 Feet	66,800	6,800
Additional Overdepth in Rock – 2 Feet		9,300
Total Improvement Quantities	728,100	25,300

4.7 Cost Estimates of Alternative Plans

Cost estimates for the alternative plans were developed for each plan for the base plan (disposal of all material at the new IOS-North site). Cost estimates include dredging and disposal costs, planning, engineering and design, and construction supervision and administration. Costs are presented in Table 10 below. Cost estimates are at the October 2013 price level. Costs for the No Action alternative are not shown in Table 10 as maintenance dredging of this section of the Piscataqua River has not been required since the project was completed in 1966. No Action project costs are therefore estimated to be $0 relative to the existing maintained project. Costs were also developed and included in Table 8

for a “beneficial use” plan that would place the dredged sandy material in nearshore areas off beaches in Maine and Massachusetts where local communities have expressed a desire to receive that material and pay for the additional transportation cost for hauling that material a longer distance.

Construction Costs. Construction cost estimates were developed using the Corps of Engineers Dredge Estimating Program (CEDEP) for dredging of ordinary material and blasted rock. Costs for drilling and blasting the bedrock were developed using a separate estimating program. CEDEP estimates include costs for mobilization and demobilization, construction plant (dredge, scows, tugs), cost of fuel, labor, insurance, materials, overhead, bond and profit. CEDEP inputs include consideration of the type of material to be dredged, efficiency of dredging operation, and haul distance. The drilling and blasting program includes costs for mobilization and demobilization, and all other costs associated drilling and blasting the rock.

Planning, Engineering and Design (PED) Phase Costs. Cost estimates include design phase project management, planning and engineering, additional agency coordination, preparation of plans and specifications, costs for reviews, and pre-construction contracting activities.

Construction Management Costs (Including Supervision and Administration and Engineering During Construction). Cost estimates include project management, contract administration, construction supervision and inspection, engineering during construction (EDC) and pre-dredge and after-dredge surveys and monitoring.

Real Estate Costs. No real estate interests are required for the Federal project. The area to be dredged and the open water placement areas required for construction are below the ordinary high watermark of the navigable watercourse. Therefore, navigational servitude applies and would be invoked for the project. Berth access for survey and work boats and tugs would be provided at the State’s Market Street Terminal by the New Hampshire Pease Development Authority, Division of Ports and Harbors. As the berths and piers are subject to navigation servitude no credit would be due the non-Federal sponsor for this use.

Interest During Construction. The estimated cost of the project is increased for interest during construction (IDC) to account for the lost opportunity cost of construction funds over the period of construction, yielding the total investment cost. IDC is included for economic analysis purposes only and is not included in total project costs for budgeting or cost-sharing purposes. IDC was calculated based on the Office of Budget and Management (OMB) rate for Federal water projects for FY14 of 3-1/2 percent.

Aids to Navigation. No new aids to navigation are planned for the alternatives. There are five markers in the area, G “9” (Fl G 4s), R “10” (Fl R 4s), and G “11” (Fl G 2.5s) mark the Federal channel downstream from the turning basin, and R “12” (N), and G “13” (C) mark the natural channel upstream from the Federal project. The navigation aids are maintained by the United States Coast Guard (USCG).

TABLE 10 Cost Estimates for Alternative Plans				
Alternative 1A – 1020-Foot Wide Turning Bain				
With Ocean Placement at the Isles of Shoals North Site				
	Work Time Months	Cubic Yards	Unit Cost	Cost
Mobilization/Demobilization				
Dredging Plant – Ordinary Material		Lump Sum		$608,000
Drill and Blast Plant			LS	567,000
Dredging Plant – Rock Removal			LS	16,000
Total Mob/Demob				$1,191,000
Dredging and Disposal Ordinary Material	1.7	384,900	$14.86	$5,720,000
Drill and Blast Ledge Rock	1.1	22,500	$92.57	2,083,000
Dredge Blasted Rock	0.2	22,500	$32.80	738,000
Subtotal Contract Cost				$9,732,000
Contingencies		21.12%		2,056,000
Subtotal with Contingency				$11,788,000
Planning, Engineering and Design				957,000
Construction Management				729,000
Total First Cost		407,400		$13,5474,000
With Nearshore Bar Placement of Sand at Wells Beach and Merrimack River Beaches				
Mobilization/Demobilization				
Dredging Plant – Ordinary Material		Lump Sum		$720,000
Drill and Blast Plant			LS	567,000
Dredging Plant – Rock Removal			LS	16,000
Total Mob/Demob				$1,303,000
Dredging and Disposal Ordinary Material				
50% Nearshore Placement at Wells Beach	0.9	192,500	$17.45	$3,359,000
37.5% Placement at Plum Island Beaches	0.6	144,400	$16.81	2,427,000
12.5% Placement at Salisbury Beach	0.2	48,000	$16.17	776,000
Drill and Blast Ledge Rock	1.1	22,500	$92.57	2,083,000
Dredge Blasted Rock	0.2	22,500	$32.80	738,000
Subtotal Contract Cost				$10,686,000
Contingencies		21.12%		2,257,000
Subtotal with Contingency				$12,943,000
Planning, Engineering and Design				964,000
Construction Management				729,000
Total First Cost		407,400		$14,636,000

TABLE 10 (Continued) Cost Estimates for Alternative Plans				
Alternative 1A – 1120-Foot Wide Turning Bain				
With Ocean Placement at the Isles of Shoals North Site				
	Work Time Months	Cubic Yards	Unit Cost	Cost
Mobilization/Demobilization				
Dredging Plant – Ordinary Material		Lump Sum		$608,000
Drill and Blast Plant			LS	567,000
Dredging Plant – Rock Removal			LS	16,000
Total Mob/Demob				$1,191,000
Dredging and Disposal Ordinary Material	2.6	573,700	$14.81	$8,496,000
Drill and Blast Ledge Rock	1.1	22,900	$93.28	2,136,000
Dredge Blasted Rock	0.2	22,900	$34.12	781,000
Subtotal Contract Cost				$12,604,000
Contingencies		21.12%		2,662,000
Subtotal with Contingency				$15,266,000
Planning, Engineering and Design				976,000
Construction Management				778,000
Total First Cost		596,600		$17,090,000
With Nearshore Bar Placement of Sand at Wells Beach and Merrimack River Beaches				
Mobilization/Demobilization				
Dredging Plant – Ordinary Material		Lump Sum		$720,000
Drill and Blast Plant			LS	567,000
Dredging Plant – Rock Removal			LS	16,000
Total Mob/Demob				$1,303,000
Dredging and Disposal Ordinary Material				
50% Nearshore Placement at Wells Beach	1.3	286,900	$17.44	$5,004,000
37.5% Placement at Plum Island Beaches	1.0	215,100	$16.78	3,609,000
12.5% Placement at Salisbury Beach	0.3	71,700	$16.35	1,172,000
Drill and Blast Ledge Rock	1.1	22,900	$93.28	2,136,000
Dredge Blasted Rock	0.2	22,900	$34.12	781,000
Subtotal Contract Cost				$14,005,000
Contingencies		21.12%		2,958,000
Subtotal with Contingency				$16,963,000
Planning, Engineering and Design				986,000
Construction Management				778,000
Total First Cost		596,600		$18,727,000

TABLE 10 (Continued) Cost Estimates for Alternative Plans				
Alternative 1A – 1200-Foot Wide Turning Bain				
With Ocean Placement at the Isles of Shoals North Site				
	Work Time Months	Cubic Yards	Unit Cost	Cost
Mobilization/Demobilization				
Dredging Plant – Ordinary Material		Lump Sum		$608,000
Drill and Blast Plant			LS	567,000
Dredging Plant – Rock Removal			LS	16,000
Total Mob/Demob				$1,191,000
Dredging and Disposal Ordinary Material	3.2	728,100	$14.84	$10,808,000
Drill and Blast Ledge Rock	1.3	25,300	$96.52	2,442,000
Dredge Blasted Rock	0.2	25,300	$34.31	868,000
Subtotal Contract Cost				$15,309,000
Contingencies		21.12%		3,234,000
Subtotal with Contingency				$18,543,000
Planning, Engineering and Design				997,000
Construction Management				827,000
Total First Cost		753,400		$20,367,000
With Nearshore Bar Placement of Sand at Wells Beach and Merrimack River Beaches				
Mobilization/Demobilization				
Dredging Plant – Ordinary Material		Lump Sum		$720,000
Drill and Blast Plant			LS	567,000
Dredging Plant – Rock Removal			LS	16,000
Total Mob/Demob				$1,303,000
Dredging and Disposal Ordinary Material		728,100	$0.06	$41,000
50% Nearshore Placement at Wells Beach	1.6	364,100	$17.36	6,321,000
37.5% Placement at Plum Island Beaches	1.2	273,100	$16.64	4,544,000
12.5% Placement at Salisbury Beach	0.4	90,900	$16.11	1,464,000
Drill and Blast Ledge Rock	1.3	25,300	$96.52	2,442,000
Dredge Blasted Rock	0.2	25,300	$34.31	868,000
Subtotal Contract Cost				$16,983,000
Contingencies		21.12%		3,554,000
Subtotal with Contingency				$20,537,000
Planning, Engineering and Design				997,000
Construction Management				827,000
Total First Cost		753,400		$22,361,000

4.8 Annual Cost of Alternative Plans

The first cost and annual costs of each alternative with disposal at the IOS-N site (Federal base plan) are shown in the Table 11. The costs of the alternatives were prepared at October 2013 price levels. Annual costs consist of amortization of the project first cost and any increase in annual maintenance of the project attributed to the improvement. Amortizing the first costs used the 50-year period of analysis for navigation improvements and the Fiscal Year 2014 interest rate of 3-1/2%. The Office of Management and Budget conducts its own review of water resource projects using an interest rate of 7%, and those numbers are also provided below.

Maintenance dredging of the section of river where the turning basin is located has not been required since the project was completed in 1965. Maintenance of this area is currently not considered necessary on its own as the controlling depth over most of the basin is greater than the authorized depth of -35 feet. Currently there is less than 1400 cubic yards of material shallower than the design depth of -35 feet, and a total of about 7,800 cubic yards shallower than the current allowable overdepth elevation of -37 feet. The lack of shoaling in the basin and vicinity has made sedimentation studies unnecessary, thereby providing no basis for estimating future shoaling rates. A reasonable estimate of future annual maintenance dredging costs was determined to be one percent of project first costs.

TABLE 11
Annual Cost of Alternative Plans
With Placement at IOS-N Site (Federal Base Plan)

Project Investment Costs	**Turning Basin Width Alternatives**		
	1020 Feet	**1120 Feet**	**1200 Feet**
Total Project First Cost	$13,474,000	$17,020,000	$20,367,000
Interest During Construction	$39,000	$70,000	$111,000
Total Project Cost	$13,513,000	$17,090,000	$20,478,000
Annual Costs – at 3-1/2% Rate			
Amortization of Project Costs	$576,100	$728,500	$873,000
Increased Annual Maintenance Dredging	$134,700	$170,200	$203,700
Total Annual Cost	$710,800	$898,700	$1,076,700
Annual Costs – at 7% Rate			
Amortization of Project Costs	$945,900	$1,196,300	$1,433,500
Increased Annual Maintenance Dredging	$134,700	$170,200	$203,700
Total Annual Cost	$1,080,600	$1,366,500	$1,637,200

5.0 EVALUATION AND COMPARISON OF ALTERNATIVE PLANS

5.1 Economic Analysis

This economic analysis was conducted in accordance with current Corps of Engineers guidance for deep draft navigation projects. The purpose of the economic analysis is to determine the potential benefit a plan would have on the national economy. The Corps uses the National Economic Development (NED) account to analyze the economic benefits of a project. NED benefits are contributions to national economic development that increase the value of the national output of goods and services. For deep-draft navigation projects, the most common type of NED benefit is waterborne transportation cost savings. The NED benefits are estimated by comparing the transportation costs without the project to the transportation costs with the project. Any decrease in total transportation costs resulting from the project equal the benefits of the project. This study also evaluated reduction on damages as a result of grounding when turning, and the efficiencies achieved when fewer tugs are required to assist in the turn.

The economic analysis conducted for the Portsmouth Harbor turning basin study is based on detailed waterborne commerce statistics data from the Corps of Engineers Waterborne Commerce Statistics Center, as well as on information provided by the New Hampshire Pease Development Authority, Division of Ports and Harbors, the operators and users of the two terminals at the upstream end of the Federal channel, and the Portsmouth Harbor Pilots.

Benefits and project costs are compared in annual terms, and are converted to average annual equivalents using the FY 2014 Federal interest rate for water resources projects of 3-1/2 percent. The base year of the analysis is 2015 and a 50 year period of analysis (2015-2065) is used. Both the without and with project conditions are forecast over the period of analysis. A detailed explanation of the economic analysis and results including data, assumptions and methodology is provided in the Appendix C, Economic Assessment. Findings of the economics analysis are briefly summarized below. Hourly vessel operating costs as developed by the Army Corps of Engineers, Institute for Water Resources, in Economic Guidance Memorandum #11-05, Deep-Draft Vessel Operating Costs FY 2008, were used in the economic analysis.

5.1.1 Benefits Analysis

In the future without-project condition it is assumed that the two terminals at the upstream end of the navigation channel will continue to operate and that cargo volumes will be similar to current levels (See Appendix C - Economics). The future without a navigation improvement project also assumes that the existing channel and turning basin would be maintained at the authorized dimensions (depth of -35 feet MLLW, channel width of 400 feet and turning basin width of 800 feet). The upper portion of the Federal project was completed in 1966 and maintenance dredging the only area where shoaling occurs regularly, the Simplex Shoal

located about 3,000 feet downstream, is conducted approximately every ten years. The last maintenance dredging in this area was completed in early 2013. Based on condition surveys obtained in 2007, only a small amount of shoaling (less than 1,400 cubic yards shallower than -35 feet MLLW) has accumulated in the turning basin. This minimal amount of shoaling does not impact vessel operations in this area.

Three types of benefits were evaluated for this study. The first type is a reduction in the transportation costs that are associated with the economies of scale of using larger vessels and less time in port. The second type is is a reduction in damages as a result of grounding while turning, and the third type would be the efficiency achieved in the turning operation as a result of utilizing fewer tugs to assist in the turn.

In the with project condition, widening the turning basin will allow shippers to shift to larger, more cost-effective vessels, thereby achieving the lower cost per ton of larger vessels. The degree to which shippers would use larger vessels was determined based on interviews with Sea-3 and users of the Sprague terminal. Widening the turning basin from 800 feet to the proposed widths of 1020, 1120 and 1200 feet would encourage shippers to schedule relatively more of the larger ships. Transportation costs, expressed in at sea, in port and tidal delay, were developed for each widening scenario. In these with project conditions, it is projected that average size of vessels will increase based on the new width. Widening the turning basin to 1200 feet allows a new class of vessel to call on the two terminals that use this basin for turning.

The reduction in transportation cost between the without project condition and the with project condition is a project benefit. Savings were put on a per ton basis to allow for calculation of tonnage growth, but no growth was assumed in the calculation. The annual economic benefits to widening the turning basin equal the difference in waterborne transportation cost between the without project condition and the with project condition for each turning basin width analyzed.

In the without project condition the probability of grounding is about 0.00357 (5 groundings divided by 1400 trips) based 28 years of record. In the with-project condition the probability of grounding is expected to be reduced by at least 75 percent.

In the without project condition, three tugs are required to turn vessels in the upper turning basin. In the with-project condition the number of tugs can be reduced to two for all turning basin widths evaluated. The reduction in tugs costs improves the efficiency of the turn and is a project benefit.

Table 12 shows the upper river fleet distribution for the various alternative basin widths including the no action plan. Table 13 shows transportation cost savings, grounding damage reductions, reduction in turning costs and total expected annual benefits for each improvement width.

TABLE 12
Vessel Size Distribution for Alternative Plans

Vessel Length	Alternative Turning Basin Widths											
	800 Feet No Action Plan			**1020 Feet**			**1120 Feet**			**1200 Feet**		
	Domestic	Foreign	Total	Domestic	Foreign	Total	Domestic	Foreign	Total	Domestic	Foreign	Total
<=500	28	22	50	28	22	50	28	22	50	28	22	50
501-599	0	9	9	0	0	0	0	0	0	0	0	0
600-699	0	12	12	0	14	14	0	0	0	0	0	0
700-800	0	7	7	0	5	5	0	17	17	0	15	15
Total	28	50	78	28	41	69	28	39	67	28	37	65

TABLE 13 Annual Benefits to Turning Basin Widening				
Turning Basin Width	Expected Annual Benefits			
	Transportation Cost Savings	Grounding Damage Reduction	Reduction in Turning Costs	TOTAL
1020 Feet	$2,089,800	$307,900	$74,000	$2,471,700
1120 Feet	$2,277,500	$314,900	$82,000	$2,674,400
1200 Feet	$2,873,600	$321,900	$90,000	$3,285,500

5.2 Determination of NED Plan

The National Economic Development (NED) plan is that plan which reasonably maximizes net annual benefits. The net annual benefits of an improvement plan are equal its annual benefits minus its annual costs. The annual benefits, annual costs, benefit to cost ratio (BCR), and annual net benefits for each alternative were evaluated and compared using outputs calculated at the FY2014 3-1/2% interest rate. The results are shown in Table 14. Benefit-cost calculations using the 7% OMB interest rate are also shown.

TABLE 14 Benefit-Cost Summary			
Benefit-Cost Analysis at 3-1/2% Rate	**Turning Basin Width**		
	1020 Feet	**1120 Feet**	**1200 Feet**
Annual Benefits	$2,471,700	$2,674,400	$3,285,500
Annual Costs	$710,800	$898,700	$1,076,700
Annual Net Benefits	$1,760,900	$1,775,700	$2,208,800
Benefit-Cost Ratio (BCR)	3.48	2.98	3.05
Benefit-Cost Analysis at 7% Rate	**Turning Basin Width**		
	1020 Feet	**1120 Feet**	**1200 Feet**
Annual Benefits	$2,471,700	$2,674,400	$3,285,500
Annual Costs	$1,080,600	$1,366,500	$1,637,200
Annual Net Benefits	$1,391,100	$1,307,900	$1,648,300
Benefit-Cost Ratio (BCR)	2.29	1.96	2.01

The 1200-foot wide turning basin plan is the NED plan as net annual benefits are maximized at this width. Annual net benefits for the 1020 and 1120-foot width plans are nearly identical,

with the 1200-foot width plan providing more than 25 percent more annual net benefits than either of these plans. The 1200-foot plan is the best plan from an economic standpoint as it provides nearly $500,000 more in net annual benefits.

5.3 Development of Costs for the Beneficial Use Plan

The previous section indentified the NED plan based on the Federal base plan disposal site which is IOS-N. As four communities, Wells, Maine, and Salisbury, Newburyport and Newbury, Massachusetts, have expressed an interest in having dredged material placed in nearshore areas to nourish nearby beaches, the difference in cost between this Federal base plan and nearshore placement at these sites was determined. The distances from the turning basin to these sites vary which will result in differences in costs to haul the dredged material to these locations. Table 15 shows the total difference in costs between the Federal base plan and nearshore placement at the four sites. As the Newburyport and Newbury sites are off the Plum Island shoreline they were combined for this analysis. In both the Federal base plan and beneficial use plan, rock will be disposed of at the IOS-N site.

TABLE 15
Comparison of Project Costs - Federal Base Plan and Nearshore Placement

Project Costs	1200-Foot Turning Basin Width	
	Federal Base Plan	Nearshore Placement
Mobilization/Demobilization		
Dredging	$1,191,000	$1,303,000
Ordinary Material (728,100 CY)		$41,000
100% to IOS-North	$10,808,000	
50% Nearshore Placement at Wells Beach		$6,321,000
37.5% Nearshore Placement at Plum Island		$4,544,000
12.5% Placement at Salisbury Beach		$1,464,000
Rock – Drilling & Blasting and Removal	$3,310,000	$3,310,000
Subtotal	$15,309,000	$16,983,000
Contingencies	$3,234,000	$3,554,000
Subtotal	$18,543,000	$20,537,000
Planning, Engineering and Design (PED)	$997,000	$997,000
Construction Management	$827,000	$827,000
Total Project First Cost	$20,367,000	$22,361,000
Interest During Construction	$111,000	$122,000
Total Project Investment Cost	$20,478,000	$22,483,000
Difference in Total Project First Cost	$1,994,000	

As shown in Table 16, the total difference in Total Project First Cost between the Federal base plan and nearshore placement is $1,994,000. This difference in total costs was distributed to the four communities requesting placement in nearshore areas based on the difference in the distance to these alternative placement sites and the percentage of material going to each site. Table 16 shows the cost apportionment plus other specifics regarding costs for nearshore placement by community. Whether any or all of the identified receiving communities ultimately receive sand from the project will depend on their ability to secure necessary permits and approvals and provide the difference in cost for that placement over the cost of the Federal base plan for ocean placement. These cost were developed using the proportional costs for nearshore placement from Table 10 applied to the difference in total project first cost from Table 15. This ensures that both sand volumes placed and haul distance to each site are both factored into the distribution.

TABLE 16
Non-Federal Costs for Nearshore Placement by Community

Beach Placement Site	Distance to Site	Cubic Yards Placed	Cost Apportionment	Approximate Cost Per CY
Wells, Maine	31	364,100	$1,022,000	$2.81
Salisbury, Mass.	26	90,900	$237,000	$2.61
Newburyport, MA	28	36,400	$98,000	$2.69
Newbury, Mass.	28	236,700	$637,000	$2.69
TOTAL		728,100	$1,994,000	

5.4 Regional Economic Development and Other Social Effects Benefits

The widened turning basin would also have positive regional economic effects (RED benefits). The transportation costs savings of the NED benefit analysis would be seen in lower costs of bringing products to manufacturers and consumers in New Hampshire and Maine. LPG costs with the widening project could be somewhat lower as compared to the without project condition. Lower costs of transporting products such as gypsum to manufacturing businesses could make these businesses more efficient and more cost-competitive relative to businesses in other regions. This could increase local business activity which in turn could increase employment.

Although no growth in use of these terminals was projected, widening the turning basin could promote increased use of these upstream terminals by importers and exporters. This could result in increased employment in the region and at the harbor itself, as increased shipments

require additional dock workers, truckers, and other workers. These types of positive effects would be RED benefits to turning basin widening.

In the Other Social Effects (OSE) category, the most significant benefit from channel widening would be the improved safety and efficiency of turning vessels at this basin. Costs associated with turning vessels would be reduced, and safety, particularly for LPG tankers would be improved. This would help ensure reliable and efficient deliveries of LPG and other products and raw materials to the region. Increased turning basin width would allow shipments to be brought on larger, more cost-effective vessels. The improved safety and efficiency of critical energy shipments would improve the energy security of the region.

Placement of dredged material in nearshore areas to nourish nearby beaches in four communities, one in Maine and three in Massachusetts, will have a beneficial effect on local economies. As all communities have substantial tourist industries that rely heavily on healthy beaches, wider stable beaches should attract additional visitors as well as protect structures situated along the shoreline.

5.5 Environmental Impacts

Information on environmental impacts of dredging and impacts of disposal or beneficial use of dredged material is presented in the following sections.

5.5.1 Dredging Impacts

Dredging of about 730,000 cubic yards of coarse sand and gravel from the turning basin in the Piscataqua River would be performed by a mechanical dredge. The potential impacts of dredging on water quality and biological resources in the area are addressed below.

Water Quality: The area of the proposed improvement is classified by the state of New Hampshire as Class B and by Maine as Class SB. New Hampshire Class B Waters are designated by the State as being acceptable for bathing and other recreational uses. Maine Class SB waters are suitable for water contact recreation, fishing, shellfish harvesting and propagation, and are valuable fish and wildlife habitat. The area of proposed improvement is a high-energy environment with strong tidal currents sometimes exceeding 5 knots. The majority of the material to be dredged (i.e “parent material”) consists of coarse sand and gravel. Sand and gravel are not known for being a carrier of contaminants; therefore no release contaminants into the water column during dredging operations are expected. Excavation (and the loading of attendant scows) of the parent material from the Piscataqua River will likely suspend some sediment into the water column; however, given the nature of the material to be dredged, any increases in turbidity should be short term. The strong currents of the Piscataqua River may carry the turbidity plume beyond the immediate vicinity of the dredging area, but because of the minor amount (and nature) of material likely to be

suspended, the impact of any turbidity plume should be minimal There should be no degradation of Class B or Class SB waters as a result of the dredging operations.

Effects on Marine Organisms: Potential impacts of dredging to marine organisms is restricted to physical effects, as dredging operations are not likely to have any effect on water column chemistry. Some benthic organisms inhabiting the dredging area would be destroyed during the dredging process. The benthic invertebrates inhabiting the channel area are mostly opportunistic species with life history characteristics adapted to frequent disturbances. Dredging to widen the turning basin is therefore not likely to alter benthic community structure. Recolonization following dredging should take place within a few months. Any temporary loss of fish foraging area would be extremely localized and short-lived.

There are no significant shellfish resources in the dredging area. Softshell clams along the intertidal banks of the Piscataqua River would not be threatened by dredging operations as any increases in turbidity levels would be short-lived and extremely localized. More motile forms (e.g. lobsters and crabs) would avoid the work area and should not be seriously affected by dredging. Turbidity generated by the dredging may drive lobsters away from the area for a short time. Adult lobsters and crabs in the area would survive short-term increases in turbidity. Lobster larvae are likely to be abundant from May through July. Softshell clams spawn in the area from June through August. Restricting the dredging and disposal operations to the November through March window will also minimize impacts to lobsters and shellfish.

Dredging can be conducted without significant impacts to anadromous fisheries. The timing of the dredging operation avoids spring runs of anadromous fish (alewife, April - June; American shad, May - June; blueback herring, May - June; smelts, April - June) and the fall salmonid runs (October - November). Striped bass spawn in the estuary in June and early July. Restricting dredging and disposal to between November and March would avoid any impacts to striped bass spawning. Overall, the impacts to finfish are expected to be minimal. Turbidity impacts would be extremely short-lived and localized, and fish should be able to avoid the work area.

Any marine mammals that could be in this portion of the river would also avoid the area of activity and not be affected.

Impacts of Blasting: The Approximate 25,300 cubic yards of rock may require blasting to remove it from the expanded turning basin. Potential aquatic impacts associated with blasting include noise, thermal energy release, increased turbidity, damage to structures, and effects on aquatic life, all of which are expected to be minor and temporary in nature due to the precautions to minimize the shock wave. These impacts would be generated as a result of vibrations, explosion-induced surface water waves, or air overpressure.

Any impacts to aquatic populations would be localized and temporary, with the most pronounced effect on aquatic species in the immediate vicinity. The effect of blasting on hard-bodied invertebrates would tend to be small except in the immediate vicinity of the blast. Damage to hard-bodied invertebrates near the blast site might include cracked or broken shells and carapaces. Soft-bodied invertebrates in the immediate vicinity would be killed, while populations of those in outlying areas would sustain less damage. Long term impacts are not expected.

The extent of damage to fish populations depends primarily on the proximity to the blast and the presence or absence of a swim bladder. Fish with swim bladders (e.g., Atlantic herring) will be unable to adjust to the abrupt change in pressure propagated by the blast. If they are within a zone of influence, fish with swim bladders may be injured or killed. Fish without swim bladders (e.g., winter flounder) are less likely to be injured, and would likely sustain injuries only if they are in the immediate vicinity of the blast. Blasting may displace resident fishes, although this impact is expected to be temporary. Blasting impacts will be avoided or minimized by the methods discussed below:

- Use of a fish detecting and startle system to avoid blasting when fish are present or transiting through the area, including placing the fish startle system on a separate boat;
- Require the use of sonar and the presence of a fisheries and marine mammal observer;
- Prohibiting blasting during the passage of schools of fish, or in the presence of marine mammals, unless human safety was a concern;
- Using inserted delays of a fraction of a second per blast drill hole, and;
- Placing material on top of the borehole (stemming) to deaden the shock wave reaching the water column.

5.5.2 Impacts of Disposal

Water Quality: The material from the expanded turning basin is composed of coarse grained material (sand and gravel). This area has not been dredged before so the material has little anthropogenic influences (contamination). Dredged material released from a barge would descend through the water column as a dense fluid-like mass and a small percentage may be lost to the water column. Because the dredged material is coarse grained almost all of the material would be expected to be deposited as a feeder berm for the nearby beaches with little turbidity.

Sediment Quality: Disposal would not significantly change the present character of the nearshore disposal sites. The dredged sediments are clean, coarse sand and gravel that is considered to be free of contaminants. The grain size distribution of shoal material is generally compatible with the sediments at the disposal area, except for the Wells nearshore disposal site which has finer grained material. However, the coarser grained material should assist in providing a stable beach for a longer period of time.

Sediment Movement: Low mounds of dredged material are created when placed in a nearshore environment for the purposes of beach nourishment. This type of placement is considered a "feeder berm", allowing beach nourishment to occur naturally by migration of sand to these nearshore areas. Since tidal currents and wave action would redistribute the material over the course of several seasons or years, no long-term changes in bathymetry would occur. The average height of material would be several feet above the seafloor and placed at the 12-foot MLLW contour and seaward in the nearshore placement sites to maximize movement of the material towards shore. Approximately 364,100 cy of dredged material would be disposed in waters off the coast of Wells, Maine, with the remaining 364,000 cy divided between the three Massachusetts communities as follows: Salisbury – 90,900 cy, Newburyport – 36,400 cy, and Newbury – 236,700 cy. Material would be placed to provide the greatest amount of material to be carried by currents and longshore transport onto the nearby beaches for nourishment.

Effects on Marine Organisms and Wildlife: The major physical effects of disposal on aquatic populations are turbidity and direct burial. Turbidity impacts would be minimal, short lived and localized and not likely to significantly impact the biota. The impact on shellfish in the immediate vicinity of the site would be minimal. Gradual erosion at the disposal site could result in minor periodic turbidity increases in the immediate area. The temporary mounds formed by the discharge may bury or injure individuals in the disposal area. Mobile species would most likely avoid the area. Any lobsters inhabiting the area would be buried during disposal events. Once disposal operations begin and the area is disrupted, lobsters would likely move from the area. Material has been previously disposed at the Wells, Salisbury, Newburyport, and Newbury nearshore disposal sites.

Limiting work to between mid-October through mid-April would minimize impacts to lobsters and the impact on local populations should not be significant. There would be little release of sediment contaminants into the water column; therefore no chemical impacts on the disposal site biota are anticipated.

5.5.3 Threatened and Endangered Species

Federally Listed Species: While listed whales and sea turtles occur seasonally off the coast of New Hampshire, the occurrence of any of these species in Portsmouth Harbor is extremely unlikely (NMFS letter dated March 27, 2008). Since the bulk of the dredging and disposal activities are planned to occur during the late fall and winter months (November – March), it is unlikely that listed sea turtles species would be in the area during the construction activities. Therefore, the proposed dredging and disposal operations are not expected to adversely affect listed species of sea turtles. Listed whales would not be expected to occur at shallow nearshore placement sites or along the transit routes to these sites (NMFS letters dated

November 15, 2013 and February 3, 2014). Whales could be present at the IOS-N site. The contractor will be required to contact the Right Whale Advisory prior to transit, and a threatened and endangered species monitor will be present for transport of material to the IOS-N site to avoid potential ship strikes. Vessels will not be allowed to travel greater than 10 knots.

As stated in NMFS' letter dated September 2, 2011, seaward migrating juvenile Gulf of Maine (GOM) DPS Atlantic salmon (listed as Federally endangered) have been recorded by acoustic telemetry moving southward toward the vicinity of the proposed Isles of Shoals Disposal area (IOS-N). Atlantic salmon have been detected in the vicinity of GoMOOS Buoy E01, however they have not been detected in the Buoy closest to the IOS-N, B01 since its deployment in 2005 (which is located approximately 10 miles south from E01). Therefore it is unlikely that this species would be in the vicinity of the Isles of Shoals disposal area during the time of disposal operations. In addition, once out-migrating Atlantic salmon smolts have transitioned to saltwater, growth is rapid, and the post-smolts have been reported to move close to the surface in small schools and loose aggregations (Dutil, J. D., and J. M. Coutu. 1988 and early marine life of Atlantic salmon, *Salmo salar*, post-smolts in the northern Gulf of St. Lawrence (Fishery Bulletin 86: 197-212)). Therefore, given the fact that this species has not been detected in the area of the disposal area, as well its migratory behavior being close to the surface where it could avoid any vessel in the area, it is unlikely that the disposal of dredged material at the Isle of Shoals will adversely affect the Gulf of Maine DPS of Atlantic salmon.

The proposed dredging and blasting activities at the Piscataqua River turning basin are planned to be conducted during the late fall/early winter and late winter/early spring, during the months of mid-October through mid-April. Shortnose sturgeons are not known to spawn in the Piscataqua River, so there would no impacts on early life stages in the dredged area. Information that you provided in your letter indicated that shortnose sturgeon were detected in the Piscataqua River during the spring and fall. Therefore it is not likely that shortnose sturgeon will be in the proposed dredging and blasting area during the bulk of the dredging and blasting activities. In addition, based upon the information noted above concerning overwintering, it is not likely that the actual dredging area would be an overwintering site for shortnose sturgeon. Also, due to the time of year that the construction will occur, it does not appear that shortnose sturgeon would be foraging in that area during the time of construction. However it is possible that shortnose sturgeon migrating to and from the Great Bay estuary during the early spring and late fall could encounter the construction activities and be affected by them. However, given the fact that shortnose sturgeon are less likely to be in the dredging area during the time of active dredging and the lower risk of contact with a mechanical dredge, the likelihood of a lethal interaction between a sturgeon and the dredge in the Piscataqua River during the active time of dredging would appear to be low.

As noted in NMFS' November 15, 2013 letter, shortnose sturgeons that were detected in the Piscataqua River were believed to be migrating between the Kennebec and Merrimack Rivers. Since all of these near shore disposal areas as well as the Isle of Shoals Disposal Area are located between the Kennebec River and the Merrimack River, any shortnose sturgeon migrating between these two areas could potentially be affected by the disposal activities at these sites. Effects of the disposal of the coarse grained sand and gravel dredged from the Piscataqua River include the direct burial of benthic organisms at the disposal site, as well as the burial or direct contact of any fish species that may be foraging along the bottom with the material as it descends through the water column. Therefore any shortnose sturgeon in the immediate path of the descending dredge plume could be directly affected by the material as it descends from the scow. Also if these sites were used for foraging, then food items could be buried.

Studies conducted on sub-adult white sturgeon in the lower Columbia River in Washington at dredged material disposal areas have shown that "the rates of movement, depths used, and diel movement patterns of the white sturgeon showed little change over all periods" (i.e. of disposal activities) "suggesting that natural behaviors were not altered during and immediately after hopper dredge disposal operations" (Parsley et al. 2011). It is assumed that shortnose sturgeon would similarly be un-affected, being a similar species. In addition, most of the migratory activity of shortnose sturgeon appears to be during the spring and fall, and since most of the dredging activity is planned to occur during November through March, the likelihood of sturgeon being in these areas at the time of dredging is reduced.

Rock removed from the site is planned to be disposed at the Isle of Shoals disposal area. As noted in the letter from NMFS above, although acoustic receivers (GoMOOS buoy E01) in the vicinity of the Isle of Shoals have detected tagged Atlantic salmon and Atlantic sturgeon, no shortnose sturgeon were detected in the receiver closest to the Isle of Shoals disposal area (GoMOOS Buoy B01). Although the letter mentions that migrating shortnose sturgeon could be in the area of the proposed disposal site, the closest buoy to that site has not detected any shortnose sturgeon or Atlantic salmon. In addition, since shortnose sturgeon have been detected migrating between river systems in the spring and fall, it is not likely that they will be in the vicinity of the disposal areas during the bulk of the construction period between mid-October through mid-April. Therefore based upon the time of year of the shortnose sturgeon migrations reducing the likelihood of their being the any of the disposal areas during the time of disposal, and the fact that shortnose sturgeon were not detected at the Isles of Shoals buoy, as well as the information that shows other sturgeon species to be unaffected by disposal material, it would appear that the disposal of the Piscataqua River dredged material at the proposed near shore and Isles of Shoals disposal sites would not be likely to adversely affect shortnose sturgeon.

Like shortnose sturgeon, the available information on the presence of Atlantic sturgeon in the Piscataqua River is extremely limited and is based only on the detection of Atlantic sturgeon

by acoustic receivers in Great Bay. An Atlantic sturgeon tagged and released in the Merrimack River was detected by telemetry receivers in the Great Bay as recently as June 2012. The best available information indicates that suitable habitat for Atlantic sturgeon spawning and rearing does not occur in the lower Piscataqua River because of relatively high salinities. If suitable forage was present, it would be expected that occasional subadult Atlantic sturgeon could be present in the River while foraging between the spring and fall. Because of the lack of spawning and rearing habitat, the action area should only be considered a migratory corridor for both sturgeon species; but, since Atlantic sturgeon do not overwinter in their natal streams they may occur in the action area regardless of season or time of year.

As noted in NMFS's November 15, 2013 letter, Atlantic sturgeon are not believed to spawn in the Piscataqua River, and due to the lack of spawning and rearing habitat, the action area should only be considered a migratory corridor for both sturgeon species. However the letter also notes that due to the fact that Atlantic sturgeons do not overwinter in their natal streams, they may occur in the action area regardless of season or time of year. As noted in the information presented above, Atlantic sturgeon overwintering areas include nearshore areas off the Atlantic coast from the Gulf of Maine south to Cape Lookout North Carolina. Also in the Hudson River, overwintering areas include deep holes. In addition, Adult sturgeon are generally found in areas of little or no current throughout much of their lives, specifically when they are living in the lower parts of rivers, in estuaries or in the ocean.

Since the dredging area of the Piscataqua River is located in an area of high velocity currents, it would not likely be an overwintering area for Atlantic sturgeon. In addition, based upon the above information, it would appear that most of the overwintering areas for adults and late juvenile Atlantic sturgeon would be in nearshore areas off the coast. Since the dredging will occur from mid-October through mid-April, during the times that Atlantic sturgeon would already be at these overwintering areas, it is not likely that an overwintering Atlantic sturgeon would be in the area of active dredging. However, since Atlantic sturgeon migrations occur during the spring and fall, it is possible that during the late fall or early spring that Atlantic sturgeon moving through the area to or from the Great Bay Estuary could be affected by the dredging activities.

NMFS's letter also notes that if suitable forage was present in the dredging area of the Piscataqua River, then occasional sub-adult Atlantic sturgeon could be present in the area while foraging between the spring and fall. Since Atlantic sturgeon juveniles are known to feed on a variety of freshwater, estuarine and marine organisms, it is likely that these food items would be present in either Great Bay, or the tidal flats in the vicinity of the proposed dredging area. However, as noted in that letter, this would be likely between the spring and the fall. In addition, the most recent Atlantic sturgeon detection from Great Bay occurred during June of 2012. Since most of the dredging will occur in the late fall through the early spring, the chances of an Atlantic sturgeon being in the area and being affected by the

dredging operations would be assumed to be minimal. However, it is possible that a late fall or early spring migrant through the river could come in contact with the dredging activities.

NMFS's November 15, 2013 letter notes that the use of explosives has the potential to result in injury or mortality of fish. Shortnose and Atlantic sturgeon within 500 feet of a detonation resulting in peak pressures of 120 psi and average pressure of 70 psi, would be exposed to noise and pressure levels that could cause adverse effects (see Moser 1999; Teleki and Chamberlain 1978; and Wiley *et al.* 1981). Based on studies completed by Moser (1999), peak pressure levels at, or below, 75.6 psi, and peak impulse levels at or below 18.4 psi-msec, will cause no injury or mortality to species of sturgeon, including Atlantic and shortnose sturgeon. The letter recommended that the project be designed to observe the above mentioned thresholds, and suggested that the following mitigation techniques be used to facilitate the reduction of sound pressure:

1. Stemming and decking of individual charges;
2. Staggered detonation of charges in a sequential blasting circuit; and
3. Blasting during periods of slack tide and within a confined bubble curtain.

These, plus the following actions to minimize potential blasting impacts to marine mammals and fish (i.e. shortnose sturgeon), will be employed to the maximum practicable extent during construction of the project.

- Use of a fish detecting and startle system to avoid blasting when fish are present or transiting through the area, including placing the fish startle system on a separate boat;
- Require the use of sonar and the presence of a fisheries and marine mammal observer;
- Prohibiting blasting during the passage of schools of fish, or in the presence of marine mammals, unless human safety was a concern;
- Using inserted delays of a fraction of a second per blast drill hole, and;
- Placing material on top of the borehole (stemming) to deaden the shock wave reaching the water column.

Blasting safety radii for marine mammals, sea turtles and Atlantic sturgeon were calculated for the Boston Harbor Deep Draft Dredging project. These calculations were based upon peak pressure levels of less than 23 psi, which would avoid level B harassment of turtles and marine mammals, and would be more than protective of Atlantic and shortnose sturgeon (which as noted above is 75.6 psi). Using Coles equation (1948) modified for confined blasting (Hempen et al, 2007) safety radii were calculated based upon the total weight of the charges for blast. These same equations will be used to calculate safety radii for the Piscataqua River blasting. Since they are based upon the lower peak pressure of 23 psi which protects sea turtles and marine mammals, it is expected that they would be more than protective of shortnose sturgeon (See letter to John Bullard, NOAA Fisheries from ACOE dated November 7, 2012 for further discussion, and also NMFS response of February 3, 2014).

Based on these calculations and analysis of effects on listed species and the low probability of whales, sea turtles and Atlantic and sturgeon occurring in the project area during the time of active blasting, we believe that the blasting in the Piscataqua River would not likely adversely affect listed species, particularly sturgeon.

No impacts to the Federally listed Piping Plover or the proposed listing of the Red Knot is expected. Piping plover nest on beaches and they forage in intertidal areas, away from the proposed nearshore placement sites.

State Listed Species

Maine: As the State listed species for the State of Maine are the same as the Federally listed species, any potential impacts described above for the Federal species would be relevant to Maine's State listed species.

New Hampshire: Comments from New Hampshire on state listed species will be included when received.

Massachusetts: The proposed nearshore placement of about 365,000 cubic yards of dredged material in the vicinity of Newbury, Newburyport and Salisbury will occur within the foraging habitat of the Least Tern and Common Tern, and is in close proximity to breeding habitat for Piping Plover. Both tern species are State-listed as "Special Concern" and the Piping Plover is State-listed as "Threatened". The Piping Plover is also Federally protected as "Threatened" pursuant to the U.S. Endangered Species Act (ESA, 50 CFR 17.11).

Based on the information provided, the Natural Heritage & Endangered Species Program of the Massachusetts Division of Fisheries & Wildlife does not anticipate impacts to State-listed species associated with the nearshore placement of about 365,000 cy of dredged material (email dated October 2, 2013).

5.5.4 Essential Fish Habitat

Dredge Area

The only EFH managed species listed for the Great Bay and the Piscataqua River are: transiting Atlantic salmon (juveniles, adults), Atlantic cod (eggs, larvae), haddock (eggs, larvae), pollock (eggs, larvae, juveniles), red hake (juveniles, adults), white hake (eggs, juveniles, adults), winter flounder (eggs, larvae, juveniles, adults, spawning adults), yellowtail flounder (eggs, larvae), windowpane flounder (eggs, larvae, juveniles, adults, spawning adults), Atlantic halibut (eggs, larvae, juveniles, adults, spawning adults), Atlantic sea scallop (juveniles, adults), Atlantic sea herring (larvae, juveniles), bluefish (juveniles, adults), and Atlantic mackerel (eggs, larvae, juveniles).

Short-term and temporary impacts to EFH species from dredging and blasting are expected based on the following reasons. The Piscataqua River is very wide, with swift currents. The reach of river where dredging to expand the turning basin would occur is over 2,000 feet in width. As the material to be dredged is composed of mostly sand and gravel, the majority of the material is expected to settle within a 1,000 feet of the dredging. Dredging activities are not expected to impede the passage of fish migrating up and down the Piscataqua River due to the substantial width of the river and the coarse material being removed from the turning basin. Some entrainment of eggs and larvae could occur from dredging. This is likely to affect spawning winter flounder, windowpane flounder and Atlantic halibut. Ongoing dredging activities may deter these species from spawning in locations in and adjacent to these activities. However, the amount of entrainment should be minimal as dredging would occur in a limited area. Restricting the dredging operations to between September through April will further minimize any impacts to fisheries.

Blasting activities will kill or injury finfish species with air bladders closest to the blast more severely. Demersal species such as flounder would not be expected to be as impacted as greatly from the shock wave from blasting. Mitigation techniques to reduce these blasting impacts were discussed above.

The benthic community in the Piscataqua River is dominated by opportunistic species that are capable of rapid recolonization. Long-term impact to the benthic community is not expected as recolonization would be expected to begin when dredging has been completed. No significant and long-term impact to these EFH species is expected from deepening the turning basin.

Isles of Shoals-North Site (Federal Base Plan)

EFH managed species listed for the IOS-N site based on depth and substrate type are: Atlantic cod (eggs), pollock (eggs, larvae, juveniles, adults), whiting (eggs, larvae, juveniles, adults), red hake (eggs, larvae), white hake (eggs, larvae, juveniles, adults), redfish (larvae, juveniles, adults), winter flounder (juveniles), American plaice (larvae, juveniles, adults), ocean pout (adults), Atlantic halibut (eggs, larvae, spawning adults), Atlantic sea scallop (eggs, larvae, juveniles), Atlantic sea herring (juveniles, adults), monkfish (eggs, larvae, juveniles, adults), bluefish (juveniles, adults), long-finned squid (juveniles, adults), short-finned squid (juveniles, adults), Atlantic butterfish (eggs, larvae, juveniles, adults), Atlantic mackerel (larvae, juveniles, adults), summer flounder (adults), scup (juveniles, adults), ocean quahog (juveniles, adults), spiny dogfish (juveniles, adults), bluefin tuna (juveniles, adults).

Eggs and larvae of these species are mostly found in the surface and pelagic waters of the placement site. Any eggs and larvae at the placement site would be entrained in the dredged material as it is released from the scow and destroyed. Eggs and larvae on the bottom of the sea floor would also be destroyed from burial during placement. Disposal during the cooler

months of the year could impact Atlantic cod eggs, pollock eggs and larvae, American plaice eggs and larvae, Atlantic halibut eggs and larvae, monkfish eggs and larvae, and Atlantic mackerel larvae. It is possible that juveniles and adults would be able to escape impacts from placement. Also, the temporary and limited impact of disposal on these species is not expected to have a significant impact.

The material proposed for placement is composed of coarse-grained material. The current bathymetry and sediment type is homogenous and fine-grained. Disposal mounds of coarser grained material and rock could provide a benefit to EFH species by providing some physical diversity to the site which may attract additional EFH species.

Nearshore Placement Site – Wells

Managed species for the Wells nearshore disposal site are: Atlantic cod (adult), whiting (adult), white hake (juvenile, adult), winter flounder (eggs, larvae, juveniles, adults, spawning adults), yellowtail flounder (larvae, adults), windowpane flounder (eggs, larvae, juveniles, adults, spawning adult), American plaice (juveniles, adults), Atlantic halibut (eggs, larvae, juveniles, adults), Atlantic sea scallop (eggs, larvae, juveniles, adults), Atlantic sea herring (larvae, juveniles, adults), bluefish (juveniles, adults), and bluefin tuna (adults).

The only managed species listed above which would be expected to inhabit the Wells nearshore placement site based on the available depths and marine conditions at the placement area as well as the seawater (> 25 ppt) include: white hake (juveniles and adults), winter flounder (juveniles, adults, and spawning adults), windowpane flounder (eggs, larvae, juveniles, adults, and spawning adults), Atlantic halibut (eggs, larvae, and spawning adults), and bluefish (juveniles and adults). The potential impact to these species is discussed in the following paragraphs.

White Hake: The nearshore placement sites are at their lower limit of their preferred depth; consequently the number of individuals at the placement location would be expected to be small. Any potential impacts from nearshore placement would not be expected to be large or meaningful. The time of year restrictions would not generally coincide with the presence of white hake in the project area. Considering the overall project area in comparison to the Gulf of Maine, potential impacts to this EFH species from interim dredging within Wells Harbor would be considered irrelevant.

Winter Flounder: The material to be disposed is coarse grained sand and gravel so turbidity impacts would again be expected to be minimal and of a short duration. Winter flounder spawning, eggs and larvae could be minimally affected as placement could occur during a portion of the spawning period. Any adult fish in nearshore placement site would be expected to move away from the disruption. Benthic resources would be expected to recolonize the area quickly. Fish could swim to other areas to avoid the disturbance and for foraging while the area recolonizes.

Windowpane Flounder: The coarse nature of the sediment would further minimize turbidity impacts at the nearshore placement sites. Therefore, impacts from turbidity are expected to the localized and temporary. The nearshore placement would occur sometime between mid-October through mid-April. This would further avoid or minimize potential adverse impacts to windowpane flounder. Peak observations of windowpane flounder eggs and larvae are May and October in the middle Atlantic and July through August on Georges Bank. If adults are in the project area, they would be expected to move away from areas of disturbance. Benthic resources would be expected to recolonize the area quickly. Fish could swim to other areas with better forage species while the area recovers.

Atlantic Halibut: Atlantic halibut would not be expected to be found in large numbers in the project area as they are generally located in deeper marine areas. Spawning occurs between late fall and early spring, with peaks in November and December. Spawning could coincide with the placement at the nearshore placement site. This potential temporary impact from placement would be considered insignificant as the project area is not generally associated with this species and nearshore placement will only have a temporary and localized turbidity impact.

Bluefish: Bluefish juveniles and adults are found in pelagic waters generally from June through October. It is unlikely that large numbers of bluefish would be found off of Wells Beach. If present, these fish would be expected to avoid the nearshore placement activities. The temporary and limited impact from nearshore placement is not expected to have any significant impact on the bluefish population in the Gulf of Maine.

Nearshore Placement Sites – Salisbury, Newburyport, and Newbury

Managed species for the Salisbury, Newburyport and Newbury nearshore disposal areas are Atlantic cod (eggs, larvae), pollock (juveniles), red hake (eggs, larvae, juveniles), winter flounder (eggs, larvae, juveniles, adults), windowpane flounder (eggs, juveniles, adults), Atlantic sea scallop (eggs, larvae), Atlantic mackerel (eggs, juveniles, adults), surf clam (juveniles, adults), and bluefin tuna (juveniles, adults).

Atlantic Cod: Some entrainment of eggs and larvae could occur from disposal at the nearshore disposal sites. However, the area of disposal is small compared to the remaining area of Massachusetts Bay.

Pollock: The coarse nature of the material would minimize turbidity impacts to this species. Juveniles would be expected to move from the area of disturbance. Any potential impacts would be expected to be minimal and short-term.

Red Hake: Some entrainment of eggs and larvae could occur from disposal at the nearshore disposal sites. However, the area of disposal is small compared to the remaining area of Massachusetts Bay. Juveniles would be expected to move from the area of disturbance.

White Hake: The nearshore disposal site is at their lower limit of their preferred depth; consequently the number of individuals at the disposal location would be expected to be small. Any potential impacts from nearshore disposal would not be expected to be large or meaningful. The time of year restrictions would not generally coincide with the presence of white hake in the project area. Considering the overall project area in comparison to the Gulf of Maine, potential impacts to this EFH species from interim dredging within Wells Harbor would be considered irrelevant.

Winter Flounder: Disposal of the material is sandy so turbidity impacts would be expected to be minimal. Winter flounder spawning, eggs and larvae could be minimally affected as disposal could occur during some of the spawning period. Any adult fish in nearshore disposal site would be expected to move away from the disruption. Benthic resources would be expected to recolonize the area quickly. Fish could swim to other areas with better forage species while the area recovers.

Windowpane Flounder: The coarse nature of the sediment would minimize turbidity impacts at the nearshore disposal sites. Therefore, impacts from turbidity are expected to the localized and temporary. The nearshore disposal would occur sometime between mid-October through mid-April. This would further avoid or minimize potential adverse impacts to windowpane flounder. Peak observations of windowpane flounder eggs and larvae are May and October in the middle Atlantic and July through August on Georges Bank. If adults are in the project area, they would be expected to move away from areas of disturbance. Benthic resources would be expected to recolonize the area quickly. Fish could swim to other areas with better forage species while the area recovers.

Atlantic Sea Scallop: Atlantic sea scallop eggs and larvae could be buried at the site from disposal. However, the nearshore disposal would occur sometime between September through April avoiding the peak occurrences. Impacts are expected to be minimal and temporary.

Atlantic Mackerel: Atlantic mackerel would not be expected to be found in large numbers in the project area as they are generally located in pelagic waters. Some entrainment could occur during disposal, but this would not be considered significant as the project area is small compared to the Massachusetts Bay. Nearshore disposal will only have a temporary and localized turbidity impact.

Surf Clams: All of the Massachusetts nearshore disposal sites contained juvenile surf clams. Some of these clams may be able to ascend burial by thin layers of dredged material disposal. The coarse nature of the sediment would further minimize turbidity impacts at the nearshore

disposal site. Therefore, impacts from turbidity are expected to the localized and temporary. The dredging project would occur sometime between mid-October through mid-April. This would further avoid or minimize potential adverse impacts to surf clams. Commercial fishermen may be allowed to remove any clams prior to burial.

Bluefish: Bluefish juveniles and adults are found in pelagic waters generally from June through October. It is unlikely that large numbers of bluefish would be found off during the window of disposal. If present, these fish would be expected to avoid the nearshore disposal activities. The temporary and limited impact from nearshore disposal is not expected to have any significant impact on bluefish population in the Gulf of Maine.

5.6 Cultural Resources

A marine archaeological survey of the proposed project area was completed in 2008 (Robinson and Gardner, 2008). The survey consisted of archival research and field investigation using differential GPS, side-scan sonar, a marine magnetometer, and sub-bottom profiler to acquire 100 percent coverage within the project area along a series of parallel surveyed track lines spaced 50 feet apart.

Systematic, multidisciplinary archival research, remote sensing archaeological field survey, and geotechnical data analysis of the Piscataqua River navigation improvement project area documented no targets with potential to be National Register–eligible post-contact archaeological deposits and no areas of buried paleosols with archaeological sensitivity for potentially containing pre-contact period archaeological deposits. Based on the results of this study, no additional archaeological investigations within the project area are recommended.

No historic properties will be affected during the proposed placement of dredged material at the nearshore areas. These areas are in a highly active environment within the littoral zone. It is anticipated that sand placed at these locations will eventually wash landward to nourish the adjacent beaches. Any historic properties within these areas would have already been damaged or destroyed due to water and wave action.

This proposed project was coordinated with the Maine State Historic Preservation Officer (SHPO), the New Hampshire SHPO, the Massachusetts SHPO, the Massachusetts Board of Underwater Archaeological Resources, the Penobscot Nation Tribal Historic Preservation Officer (THPO), the Wampanoag Tribe of Gay Head (Aquinnah) THPO, and the Passamaquoddy THPO. The MA SHPO concurred on November 12, 2013 with the determination that the proposed navigation improvement project will have no effect on historic properties in Massachusetts. The remaining agencies and tribes are expected to concur with the determination that the proposed navigation improvement project will have no effect on historic properties.

5.7 Plan Selection

Identification of the tentatively recommended plan was based on the results Corps planning guidance that specifies that the plan that reasonably maximizes net economic benefits consistent with protecting the Nations environment is the selected plan. In this case, widening the existing turning basin to a width of 1200 feet and disposing of dredged material at the IOS-N ocean disposal site was the NED plan and is the Federal base plan that would be selected for implementation. However, as four coastal communities have indicated that they desire that the dredged material be placed in nearshore areas to nourish nearby beaches, and are willing to fund the cost differential between the NED plan and nearshore placement, this beneficial use plan is selected as the tentatively recommended plan. The environmental impacts discussion summarized in this report and additional information provided in the attached EA demonstrates that the alternative can be implemented in a manner that is consistent with protecting the Nations environment. The tentatively recommended plan, widening the existing turning basin to 1200 feet with placement of dredged material at four locations to nourish area beaches is supported by the non-Federal sponsor.

6.0 DESCRIPTION OF TENTATIVELY RECOMMENDED PLAN

6.1 Plan Components

6.1.1 General Navigation Features

The navigation improvement project at the Portsmouth Harbor and Piscataqua River Federal navigation project would widen the upper turning basin from a width of 800 feet to a width of 1200 feet at the authorized depth of -35 feet MLLW (see Figure 6). Realignment of the basin limits, in part to allow for a wider non-Federal berth for larger ships at the upper terminal, would result in eliminating two small wedge shaped sections of the existing turning basin. One would provide for a 125-foot wide berth at the Sprague Terminal, and the other to straighten the upstream boundary of the widened turning basin.

Approximately 728,100 cubic yards of sand and gravel, and about 25,300 cubic yards of rock would be removed. Under the Federal Base Plan for disposal, and of the material (sand and gravel and rock) would be placed at the Isles of Shoals North ocean placement site. The EPA in their letter of September 7, 2011 concluded that this site was likely selectable based on physical and ecological surveys conducted by the Corps and EPA. A site selection document would need to be prepared and processed during the design phase to allow placement at this site.

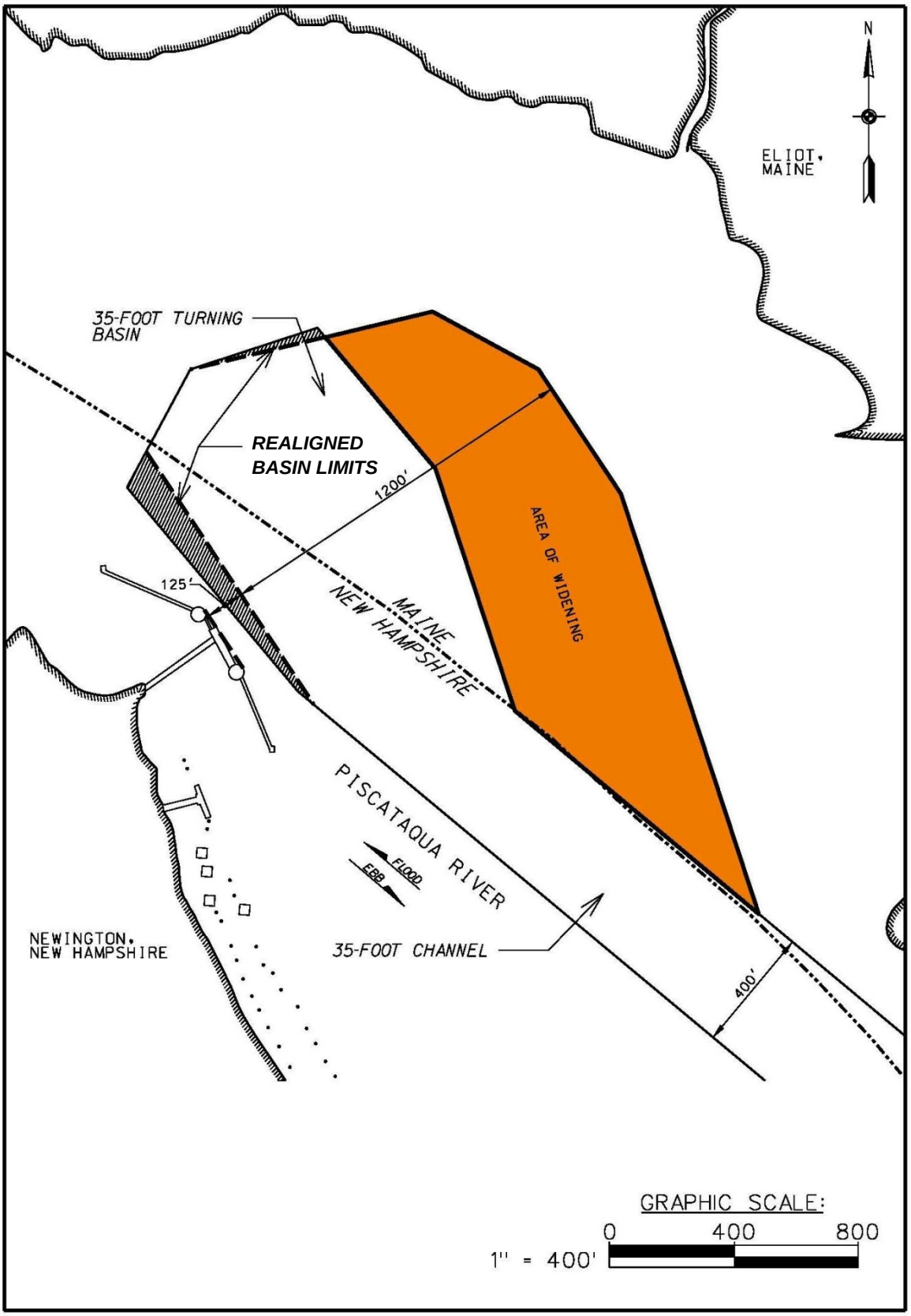

Figure 6. Recommended Turning Basin Widening Plan

Consideration of beneficial use alternatives for both the sandy material and the rock have been ongoing throughout the study and would continue during design. Under current proposals by non-Federal interests other than the project Sponsor, the sand and gravel would be disposed of at four nearshore sites off of beaches in the communities of Wells, Maine, and Salisbury, Newburyport and Newbury, Massachusetts. The location of these sites in relation to the project site is shown on Figure 7. The haul distances from the improvement area to these nearshore placement sites is 31 miles for Wells, 26 miles for Salisbury, and 28 miles for Newburyport and Newbury.

The rock to be removed is a phyllite that will most likely require blasting. Although beneficial uses for this rock were discussed, no firm plans were developed and the current plan includes disposal at the IOS-N disposal site. However, during detailed design, coordination will continue and it is likely that a beneficial use will be identified.
The tentatively recommended improvement project accomplishes the objectives of decreasing transportation costs, reducing safety hazards and grounding losses, and decreasing inefficiencies associated with turning vessels at the upper turning basin.

6.1.2 Design and Construction Considerations

A mechanical dredge (bucket or clamshell) would be used to remove sand and gravel and rock. A drill barge would be utilized to drill then rock for subsequent blasting. It is anticipated that all sands and gravels would be excavated prior to rock removal. The dredges would remove the material from the bottom and place the material in split-hull scows for transport to the nearshore placement sites. Due to the fast currents on the river, scow transit would be limited during the ebb tide. This would require the positioning of at least one extra scow at the dredge site. The contractor is also expected to employ smaller harbor tugs to help position the equipment, work boat for crew and supply transfer, and a survey boat. It is anticipated that the dredging and blasting operation would take about 5 months to complete. No scow overflow would be allowed to minimize any turbidity impacts.

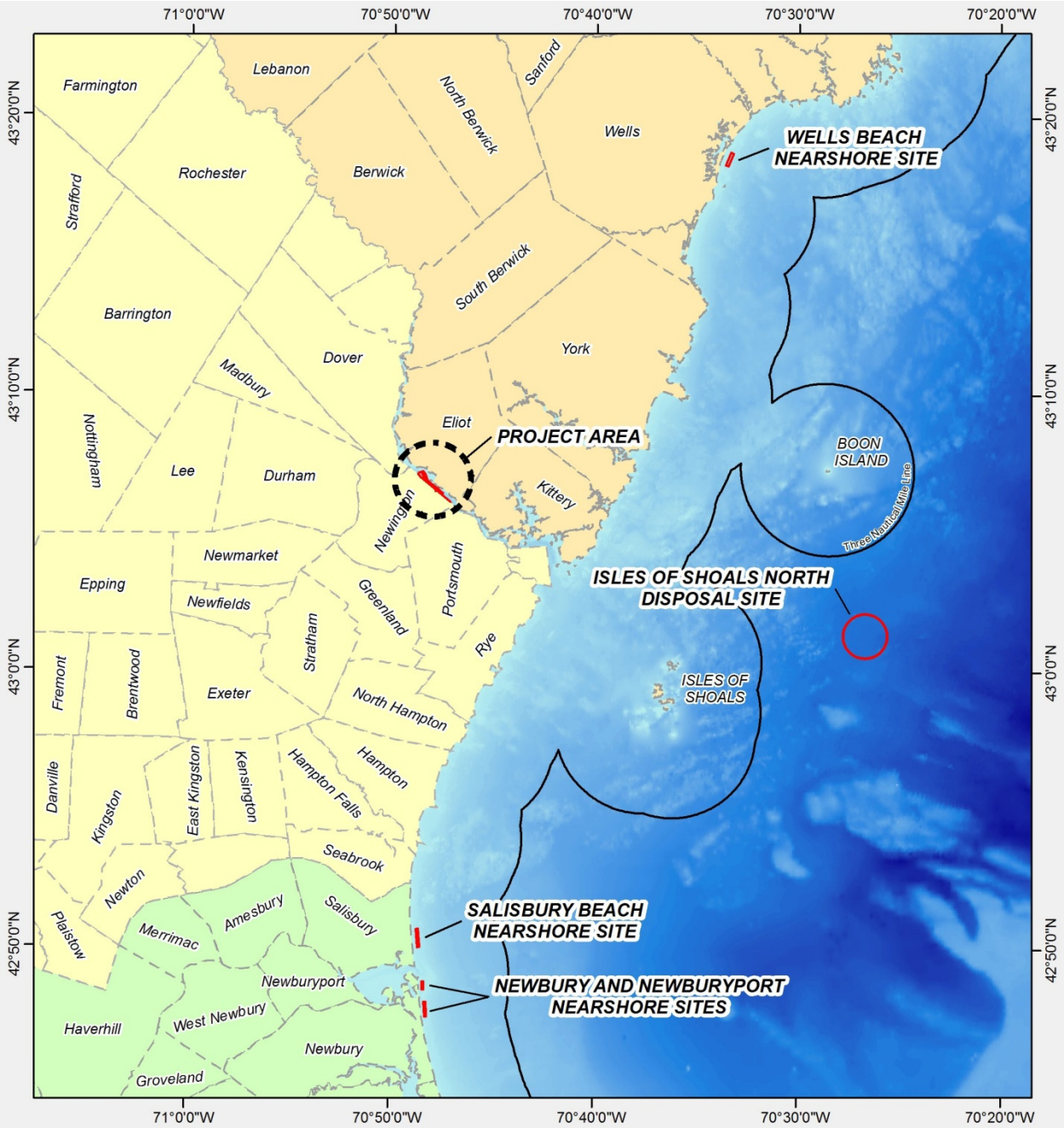

Figure 7. Nearshore Placement Sites and Location of IOS-N

6.2 Economics of the Federal Base Plan

This section summarizes the economics of the Federal base plan which includes all Federally cost shared costs. Costs of the recommended plan, or beneficial use plan, include additional disposal costs due to the longer distance to the disposal site. This cost will be presented in the next section.

TABLE 17 1200-Foot Basin - Federal Base Plan - Project Cost and Benefits		
First Cost of Improvement	GNF Improvements	$15,309,000
	Contingency	$3,234,000
	Subtotal	$18,545,000
	Planning, Engineering and Design	$997,000
	Construction Management	$827,000
	Lands, Easements, ROWs	None
	New Aids to Navigation	None
Project Cost	Total	$20,367,000
	Investment Cost with IDC (5 months)	$20,478,000
Annual Cost/Benefit	Interest and Amortization (3-1/2%)	$873,000
	Increased Annual Maintenance Dredging	$203,700
	Total Annual Cost	$1,076,700
	Annual Benefit	$3,285,500
	Benefit/Cost Ratio	3.05
	Net Annual Benefit	$2,208,800
Cost and benefits were analyzed at the October 2013 price level used in the study, a 50-year period of analysis, and 3-1/2 percent discount rate		

The expected average annual benefits in transportation costs savings, grounding damages avoided, and reduction in turning costs (at 3-1/2% interest rate) for the Federal base plan are estimated at $3,285,500. The economic cost of the tentatively selected plan consists of several project cost components and includes all of the opportunity costs expressed in average annual equivalent terms. The economic costs include: expenditure for project design, construction, related construction management and administration costs, interest during construction, and a risk based contingency established for the project. The annualized economic cost for the Federal base plan (at 3-1/2 interest rate) is $1,076,700. With expected average annual benefits of $3,285,500 the benefit to cost ratio for the Federal base plan is 3.1 to 1 (See Table 17). The annual net benefits are $2,208,800.

6.3 Project Cost Breakdown

a. Project First Cost (Program Year).

This section has divided costs that will be shared between the non-Federal Sponsor and the Federal Government from costs that will be 100 percent non-Federal, but not be funded by the non-Federal Sponsor. The four communities requesting nearshore placement will share in

funding these costs. These costs and their allocation between communities will be discussed under other non-Federal costs.

The cost for the general navigation features (GNF) of the improvement project include the construction contract costs, cost of pre-construction planning, engineering and design, construction management, and contingency. There are no lands, easements, rights-of-way and relocations required for project implementation. A risk based contingency was estimated for the project using the abbreviated cost schedule risk analysis procedures developed by the Corps of Engineers, Center of Cost Expertise. The cost schedule risk analysis, the MII cost estimate (based on dredging costs developed with the Corps of Engineers Dredge Estimating Program), and the "Total Project Cost Summary" spreadsheet (TPCS) for the base plan are included in Appendix E.

For the purpose of calculating the first cost (program year), the estimated cost of the improvement project $20,367,000 (October 2013 price level) is brought to the effective price level date of October 2014 for the Federal budget year 2015 providing a project first cost of $20,774,000 (See Table 18 and TPCS in Appendix E).

TABLE 18
Escalation of Federal Base Plan GNF Project Costs to Budget Year

GNF contract costs	$15,588,000
Lands, Easements, ROWs	None
Planning, Engineering and Design	$1,033,000
Construction Management	$857,000
Contingency	$3,293,000
Total	$20,774,000

Note: October 2013 price levels brought to effective price level date of October 2014, Federal budget year FY 2015.

b. Fully-Funded Project Cost. The fully funded GNF improvement project cost estimate is $21,295,000. This number is based on the GNF improvement project cost (October 2013 price level) escalated to the estimated mid-point of design or construction, as applicable. The calculation is displayed in the TPCS included in the Cost Appendix (E).

Construction is expected to take about five months to complete and assuming a construction start in November 2015, the mid-point of construction used in the TPCS for calculation purposes was February 2016. The fully funded cost estimate would be used in the Project

Partnership Agreement to implement the project, in accordance with the cost sharing provisions of Section 101 of WRDA 1986, as amended, the costs for the GNF improvements (widening the turning basin from 800 to 1200 feet) would be shared at the rate of 75 percent by the Government and 25 percent by the non-Federal sponsor (See Table 19).

c. Additional 10 Percent Payment. In addition to the non-Federal sponsor's estimated share of the total fully-funded cost of the GNF improvement project, pursuant to Section 101(a)(2) of WRDA 1986, as amended, the non-Federal sponsor must pay an additional 10 percent of the cost of the GNF of the project in cash over a period not to exceed 30 years, with interest.

Table 19
Estimated GNF Improvement Project – Funds Allocation Table

Federal/Non-Federal Cost for General Navigation Features of Improvement Project
Portsmouth Harbor & Piscataqua River, NH and ME
Federal Base Plan for Ocean Placement of Dredged Materials
Fully Funded Cost Estimate ($000)[1]

GNF Improvement Cost	Total Cost	Non-Federal Cash		Federal Cash	
Year 1 - PED	$1,059	$265	25%	$794	75%
Year 2 - Construction	$20,236	$5,059	25%	$15,177	75%
Total	$21,295	$5,324		$15,971	
Year 2 - Non-Federal cash (Post Construction Reimbusement[2])		$2,130	10%	NA	
Total with Reimbursement		$7,454		NA	

Notes:
1. All costs in this table are based on October 2013 price levels escalated to the assumed mid-point of the period of design or construction, as applicable.
2. Post construction, the non-Federal sponsor must pay an additional 10% of the cost of the general navigation features of the improvement project in cash over a period not to exceed 30 years, with interest. Information provided above assumes full payment of 10% in Year 2.

d. Other Non-Federal Costs. The difference in costs between the Federal base plan and recommended plan are considered other non-federal costs. To develop these costs, total costs for the recommended plan were also developed and are presented in the cost appendix. The total cost for this plan, escalated to the February 2016 mid-point of construction is $23,373,000. At this fully funded price level, this results in a cost differential of $2,078,000

that will be shared between the four communities requesting nearshore placement for beach nourishment. Table 20 presents the cost allocation between communities.

TABLE 20 Cost Allocation for Nearshore Placement by Community Escalated to Fully Funded Cost				
Beach Placement Site	Distribution by Project First Cost (FY2014 Prices) from Table 16		Distribution of Fully Funded Cost (FY2016) from Table 19	
	Cost Apportionment	Approximate Cost Per CY	Cost Apportionment	Approximate Cost Per CY
Wells, Maine	$1,022,000	$2.81	$1,065,000	$2.93
Salisbury, Mass.	$237,000	$2.61	$247,000	$2.72
Newburyport, MA	$98,000	$2.69	$102,000	$2.80
Newbury, Mass.	$637,000	$2.69	$664,000	$2.81
TOTAL	$1,994,000		$2,078,000	

e. Real Estate Costs. All work will be in areas seaward of mean high water and will entail work by waterborne plant. There will be no lands, easements or rights of way required for the project. There are no utility relocations required for the project.

f. Aids to Navigation. There are no additional costs for aids to navigation as coordination with the US Coast Guard concluded that no new aids are required. Relocating and resetting existing aids to facilitate construction would be required for maintenance dredging even if no improvement dredging was planned.

6.4 Environmental Mitigation

As described in Section 5.5, environmental impacts, and in the EA, the tentatively recommended plan would have only temporary environmental impacts. Measures to minimize effects of the proposed action include measures to minimize turbidity and effects of proposed blasting, and seasonal restrictions on dredging. Dredging and disposal would occur between November and March to protect migrating Atlantic salmon and other natural resources in Penobscot Bay and no overflow from the scows during dredging would be allowed to minimize any turbidity impacts.

6.5 Real Estate and Utilities

No lands, easements, rights-of way are required for improvement project implementation. No utility relocations are required for project implementation. The area to be dredged and the open water disposal area required for construction are below the ordinary high watermark of

the navigable watercourse. Therefore, navigational servitude applies and would be invoked for the project. Berth access for survey and work boats and tugs would be provided at the State's Market Street Terminal by the New Hampshire Pease Development Authority, Division of Ports and Harbors. As the berths and piers are subject to navigation servitude no credit would be due the non-Federal sponsor for this use. Alternatively the contractor could elect to use a different site on which to base their bid.

6.6 Operation and Maintenance

The existing Portsmouth Harbor and Piscataqua River project was completed in 1966 and maintenance dredging has only been required at upper 35-foot channel portion of the project (the Simplex Shoal area). Dredging has been required approximately every 10 years with dredging volumes varying from 7,900 to 39,100 cubic yards. The improvement of the existing channel is not expected to significantly increase shoaling or maintenance frequency in this upper portion of the navigation channel although the widened turning basin may experience some additional shoaling.

Future maintenance of the improved Federal project is expected to be minimal. Hydrographic surveys of the area would be conducted by the Corps Survey Boat about every 10 years to monitor the depths at the project. When maintenance dredging is required to reestablish the authorized channel depth it is anticipated that the instream disposal site recently used to dispose of sediment from the Simplex Shoal area will be used.

6.7 Sea Level Change

The approach was to address the potential impact of sea level rise on a navigation project at the Portsmouth Harbor and Piscataqua River Federal Navigation Project by considering sea level change (SLC) calculated for the area and apply this information qualitatively to assess the risk to future project performance. In general the types of navigation components that may be affected by sea level rise are jetties and breakwaters affected by increase wave heights, infrastructure at the port, clearance under bridge crossings, and shoaling related to changes in inlet configurations. The existing Federal Navigation Project includes a breakwater and three bridge crossings. The entrance to the harbor is naturally deep so changes in shoaling related to inlet configuration changes are not a concern. There is infrastructure at the port, piers and land side terminal facilities and depending on the magnitude of SLC there may be a potential impact to these facilities. There is the potential for SLC to provide a potential benefit to the future depth of water at the navigation project.

<u>Sea Level Change Projection</u>

As described in the Sea Level Change (SLC) EC 1165-2-212, USACE is required to use three projected SLC curves for a project area. These curves are; the historic rate of SLC at the project area, an intermediate SLC curve (modified NRC Curve I), and a high SLC curve

(modified NRC Curve III). Formulation of the NRC curves from a defined starting date, and for localized subsidence was also provided in the EC which allows for SLC to be calculated for specific project time frames and for specific geographic areas. This is critical since SLC along the coast varies due to local subsidence, uplift, water body movement, etc. Using Equation 11-1 below, which is equation 3 from the EC, Figure 8 was developed for Portland, ME. Portland, ME was used since it is only 37 miles north along the Maine coast, and has available historic SLC information from NOAA. Figure 9 shows the long term sea level trend for Portland, ME.

Equation (11-1) $E(t2) – E(t1) = 0.0017(t2 – t1) + b(t22 – t12)$ where	
	t1 = is the time between the project's construction date and 1986
	t2 = is the time between a future date at which one wants an estimate for sea-level rise and 1986.
	b = 2.36E-5 for modified NRC Curve I b = 1.005E-4 for modified NRC Curve III
*Equation 11-1 is adjusted to include the historic global mean sea-level change rate	

As can be seen in Figure 7, the historical rate would result in a rise of 0.3 feet (91mm) over 50 years. The level of change increases for the intermediate and higher curves specified for use in the EC. As shown in Figure 7, for the intermediate curve, the increase in sea level after 50 years is 1.5 feet. For the high curve in Figure 7, the increase over 50 years is 2.2 feet.

Sea Level Change Discussion

The historic level of SLC would result in a change about 0.3 feet over 50 years. The mean range of tide at Portsmouth is about 7.8 feet. The existing facilities have been designed and are operated to deal with this fluctuation. It is very unlikely that the historic level of SLC would impact the use of pier or port facilities. The intermediate and high rates of SLC for this area of coast are 1.5 feet and 2.2 feet, respectively over 50 years and there is some likelihood that this level of sea level rise may require modification of the terminal facilities by private operators and at the State's Market Street Terminal by the non-Federal sponsor at some point in the future, such as increasing pier deck elevations. There is also a potential benefit to the project in the form of the additional depth of water in the channel, basin and berths that an increase in sea level would bring. This additional depth of water may decrease the need for project maintenance dredging. Based on the above analysis, it does appear that the tentatively selected plan (1200 foot wide turning basin) would accommodate the range of SLC scenarios and the risk to project performance is low.

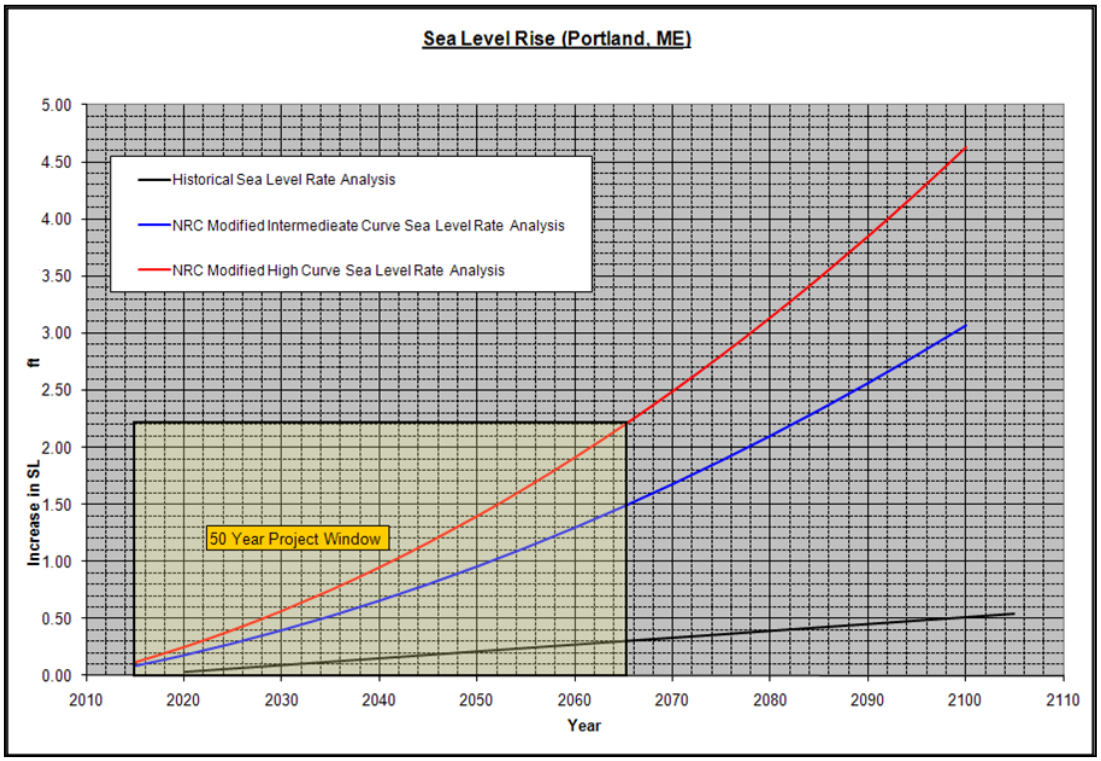

Figure 8. Sea Level Curves Based Upon USACE EC-1165-2-212, Portland, ME

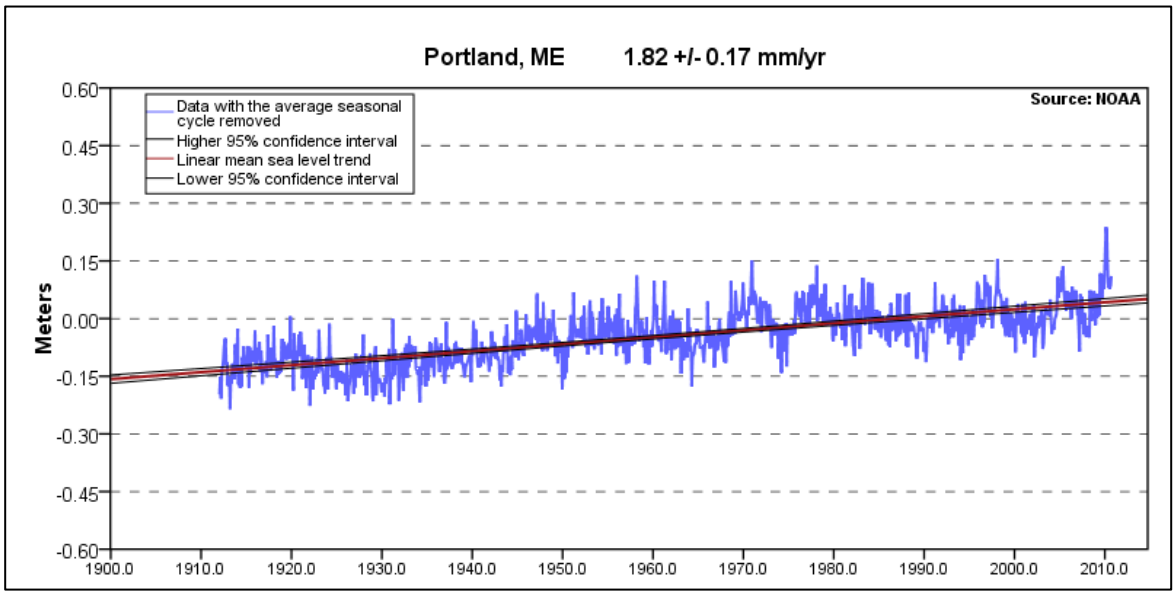

Figure 9. Historical Sea Level Change Trend for Portland, ME – Provided by NOAA.

6.8 Institutional Requirements

In order to implement the navigation improvement project the U.S. Congress would both authorize the project and once authorized provide Federal funds for the navigation improvement project. The New Hampshire Pease Development Authority, Division of Ports and Harbors would seek funding for the non-Federal share of the project costs. Project implementation would require both parties to enter into two Corps Project Partnership Agreements, one for the design phase and one for the construction phase.

6.9 Status of Legal Review

The draft report and EA will be reviewed by Office of Counsel, New England District prior to public release. The District and Division Legal Counsel would also review the Project Partnership Agreements for the project. It is anticipated that the Corps "model" Project Partnership Agreements would be used for design and construction.

6.10 Agency Technical Review Documentation

Agency technical review (ATR) will be completed for the Corps internal agency formulation briefing (AFB) submittal in accordance with the review plan for the study dated January 2008, as updated December 2012. The Planning Center of Expertise for Deep Draft Navigation will be involved in the ATR process. The Corps Cost Engineering Mandatory Center of Expertise will review and certify the recommended project costs prior to the Civil Works Review Board.

6.11 Compliance with NEPA, Key Statutes and Regulations

The following paragraphs summarize the relationship of the navigation improvement project to the some of the more pertinent statutes and regulations. The EA includes additional information on project compliance with additional applicable statutes and regulations.

A Draft Environmental Assessment (EA) has been prepared for the proposed project and documents compliance with NEPA and other environmental laws, regulations, and policies. Following public review of the Draft EA it anticipated that the outcome would be a Finding of No Significant Impact.

Water Quality. Section 401 Water Quality Certificate under the Clean Water Act of 1977 (P.L. 95-217), as amended, is applicable to the navigation project. The Corps submits a request for a State Water Quality Certification for project construction.

Section 404(b)(1) of the Clean Water Act requires evaluation of the effects associated with the discharge of material in the water of the United States. A 404(b)(1) evaluation has been prepared for the navigation project and is included in pages CWA-1 to CWA-6.

Coastal Zone Management. Coastal Zone Management Act of 1982, as amended, 16 U.S.C. 1451 et seq is applicable to the navigation project and is handled by the Maine Coastal Program Office, and Massachusetts EOEEA – Coastal Zone Management. The Corps submits and obtains Coastal Zone Consistency Determination for the navigation project.

Cultural Resources. Pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470 et seq. effects on historic, architectural and archaeological resources are to be evaluated. A marine geophysical investigation and marine archaeological surveys were completed in the study area. The project has been coordinated with the Maine State Historic Preservation Officer.

Biological Resources.

Laws include:

- Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661 et seq.
- Magnuson-Stevens Act, as amended, 16 U.S.C. 1801 et seq.
- Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq.

A USFWS Final Coordination Act Report (FCAR) has been requested from USFWS. Coordination with the National Marine Fisheries Service has determined that the preparation of an Essential Fish Habitat (EFH) Assessment is required and this is included in the EA and has been provided to NMFS for review. The Corps has developed its determination regarding endangered species in the EA and this has been provided to NMFS and the USF&WS for their review.

6.12 Agency Coordination

Federal, State and local agencies and port interests were invited to an initial coordinated site visit in Portsmouth on May 13, 2008. The purpose of the invitation was to inform the agencies of the project and study scope, and to solicit comments, concerns, and information from the appropriate resources. The study has been discussed at the New England District's quarterly dredging task force meetings with local, state and Federal agencies, and at the regular state dredging team meetings for each of the three states. Coordination with agencies assisted in identifying biological resources to include in the draft Environmental Assessment prepared for the study. A summary of public and agency coordination for this study is included in Appendix A. A list of the agencies, municipalities and other interests coordinated with during the study is provided in Table 21.

TABLE 21 Federal, State and Local Coordination		
Federal Agencies	**State Agencies**	**Local Agencies**
U.S. Environmental Protection Agency (EPA)	Maine Dept of Environmental Protection	Town of Ogunquit, ME
National Marine Fisheries Service	Maine Department of Conservation - Coastal Program	Town of Eliot, ME
U.S. Fish and Wildlife Service	Maine Dept of Marine Resources	Town of Wells, ME
United States Coast Guard	Maine Dept of Inland Fisheries and Wildlife	Town of Kittery, ME
	New Hampshire Dept of Environmental Services	Town of Rye, NH
Academia	New Hampshire Fish and Game Dept	Town of Salisbury, MA
University of New Hampshire	New Hampshire Natural Heritage Bureau	City of Newburyport, MA
	New Hampshire Dept of Resources and Economic Development	Town of Newbury, MA
	New Hampshire Div of Parks and Recreation	Town of Winthrop, MA
	Massachusetts Dept of Conservation and Recreation	Town of York, ME
	Massachusetts EOEEA- Coastal Zone Management	Town of Ogunquit, ME

6.13 Public Review and Comment

A public notice on the availability of the Draft Feasibility Report and Draft Environmental Assessment will be issued and e-mailed to interested and appropriate stakeholders including agencies, organizations, and individuals after these documents are approved for public release. The issuance of a Draft Feasibility Report and Draft Environmental Assessment will initiate a 30-day public review period. Coastal Zone Management Consistency Determination concurrence will be requested from the states of New Hampshire and Maine concurrent with the public review period for the Federal Base Plan action. As disposal under the Base Plan is seaward of the territorial sea, state Water Quality Certification is not required.

6.14 Status of Sponsor Support

The New Hampshire Pease Development Authority (NHPDA), Division of Ports and Harbors is the non-Federal sponsor for improvement project. NHPDA fully supports the proposed improvement project and views the proposed improvement project to be crucial to the Harbor's existing and future operation.

The non-Federal sponsor understands its responsibilities under the future Project Partnership Agreements required to design and implement the project. The non-Federal sponsor understands that they will need to sign and submit a non-Federal Sponsor's Self-Certification of Financial Capability. This will be signed by the chief financial officer or an equivalent official of the non-Federal sponsor and would be provided no more than 90 days prior to the date that the final decision document is submitted to the Corps Division and Headquarters vertical team for review.

7.0 RECOMMENDATION

As the District Engineer I have considered the environmental, social, and economic effects, the engineering and technical elements, and the comments received from other resource agencies and the public during the Portsmouth Harbor and Piscataqua River Feasibility Study and Environmental Assessment.

Based upon the sum of this information, I am recommending that widening the existing turning basin to 1200 feet be authorized, with realignment of the basin as included in the recommended plan, and with such modifications as in the discretion of the Chief of Engineers may be advisable, as it reasonably maximizes net benefits and is consistent with protecting the Nation's environment.

This recommendation is subject to the non-Federal sponsor agreeing to comply with all applicable Federal laws and policies, including that the non-Federal sponsor must agree with the following requirements prior to project implementation.

a. Provide 10 percent of the total cost of construction of the GNFs attributable to dredging to a depth not in excess of 20 feet; plus 25 percent of the total cost of construction of the GNFs attributable to dredging to a depth in excess of 20 feet but not in excess of 45 feet as further specified below:

(1) Provide 25 percent of design costs allocated by the Government to commercial navigation in accordance with the terms of a design agreement entered into prior to commencement of design work for the project;

(2) Provide, during the first year of construction, any additional funds necessary to pay the full non-Federal share of design costs allocated by the Government to commercial navigation;

(3) Provide, during construction, any additional funds necessary to make its total contribution for commercial navigation equal to 10 percent of the total cost of construction of the GNFs attributable to dredging to a depth not in excess of 20 feet; plus 25 percent of the total cost of construction of the GNFs attributable to dredging to a depth in excess of 20 feet but not in excess of 45 feet; plus 50 percent of the total cost of construction of the GNFs attributable to dredging to a depth in excess of 45 feet.

b. Provide all lands, easements, and rights-of way (LER), including those necessary for the borrowing of material and the disposal of dredged or excavated material, and perform or assure the performance of all relocations, including utility relocations, all as determined by the Federal Government to be necessary for the construction or operation and maintenance of the GNFs;

c. Pay with interest, over a period not to exceed 30 years following completion of the period of construction of the GNFs, an additional amount equal to 10 percent of the total cost of construction of the GNFs less the amount of credit afforded by the Government for the value of the LER and relocations, including utility relocations, provided by the Sponsor for the GNFs. If the amount of credit afforded by the Government for the value of LER, and relocations, including utility relocations, provided by the Sponsor equals or exceeds 10 percent of the total cost of construction of the GNFs, the Sponsor shall not be required to make any contribution under this paragraph, nor shall it be entitled to any refund for the value of LER and relocations, including utility relocations, in excess of 10 percent of the total cost of construction of the GNFs;

d. Provide, operate, and maintain, at no cost to the Government, the local service facilities in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government;

e. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the Sponsor owns or controls for access to the project for the purpose of completing, inspecting, operating and maintaining the GNFs;

f. Hold and save the United States free from all damages arising from the construction or operation and maintenance of the project, any betterments, and the local service facilities, except for damages due to the fault or negligence of the United States or its contractors;

g. Keep, and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of

the accounting for which such books, records, documents, and other evidence are required, to the extent and in such detail as will properly reflect total cost of the project, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and local governments at 32 CFR, Section 33.20;

i. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601–9675, that may exist in, on, or under LER that the Federal government determines to be necessary for the construction or operation and maintenance of the GNFs. However, for lands, easements, or rights-of-way that the Government determines to be subject to the navigation servitude, only the Government shall perform such investigations unless the Federal Government provides the Sponsor with prior specific written direction, in which case the Sponsor shall perform such investigations in accordance with such written direction;

j. Assume complete financial responsibility, as between the Federal Government and the Sponsor, for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under LER that the Federal Government determines to be necessary for the construction or operation and maintenance of the project;

k. To the maximum extent practicable, perform its obligations in a manner that will not cause liability to arise under CERCLA;

l. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, (42 U.S.C. 1962d-5b) and Section 101(e) of the WRDA 86, Public Law 99-662, as amended, (33 U.S.C. 2211(e)) which provide that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the Sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;

m. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended, (42 U.S.C. 4601-4655) and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way necessary for construction, operation, and maintenance of the project including those necessary for relocations, the borrowing of material, or the disposal of dredged or excavated material; and inform all affected persons of applicable benefits, policies, and procedures in connection with said act;

n. Comply with all applicable Federal and State laws and regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto; Army

Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (revising, codifying and enacting without substantive change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 et seq.), and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c);

o. Provide the non-Federal share of that portion of the costs of mitigation and data recovery activities associated with historic preservation, that are in excess of 1 percent of the total amount authorized to be appropriated for the project; and

p. Not use funds from other Federal programs, including any non-Federal contribution required as a matching share therefore, to meet any of the Sponsor's obligations for the project unless the Federal agency providing the Federal portion of such funds verifies in writing that such funds are authorized to be used to carry out the project.

The recommendations contained herein reflect the information available at this time and current policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a National Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding. However, prior to transmittal to the Congress, the non-Federal sponsor, the State of New Hampshire, Pease Development Authority, Division of Ports and Harbors, and other parties would be advised of any modifications and would be afforded an opportunity for further comment.

_____	_____
Date	Charles P. Samaris Colonel, Corps of Engineers District Engineer

PORTSMOUTH HARBOR AND PISCATAQUA RIVER NAVIGATION IMPROVEMENT PROJECT NEW HAMPSHIRE AND MAINE

DRAFT

ENVIRONMENTAL ASSESSMENT

&

FINDING OF NO SIGNIFICANT IMPACT (FONSI)

Evaluation Branch
U.S. Army Corps of Engineers, New England District
Concord, MA

March 2014

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DRAFT ENVIRONMENTAL ASSESSMENT

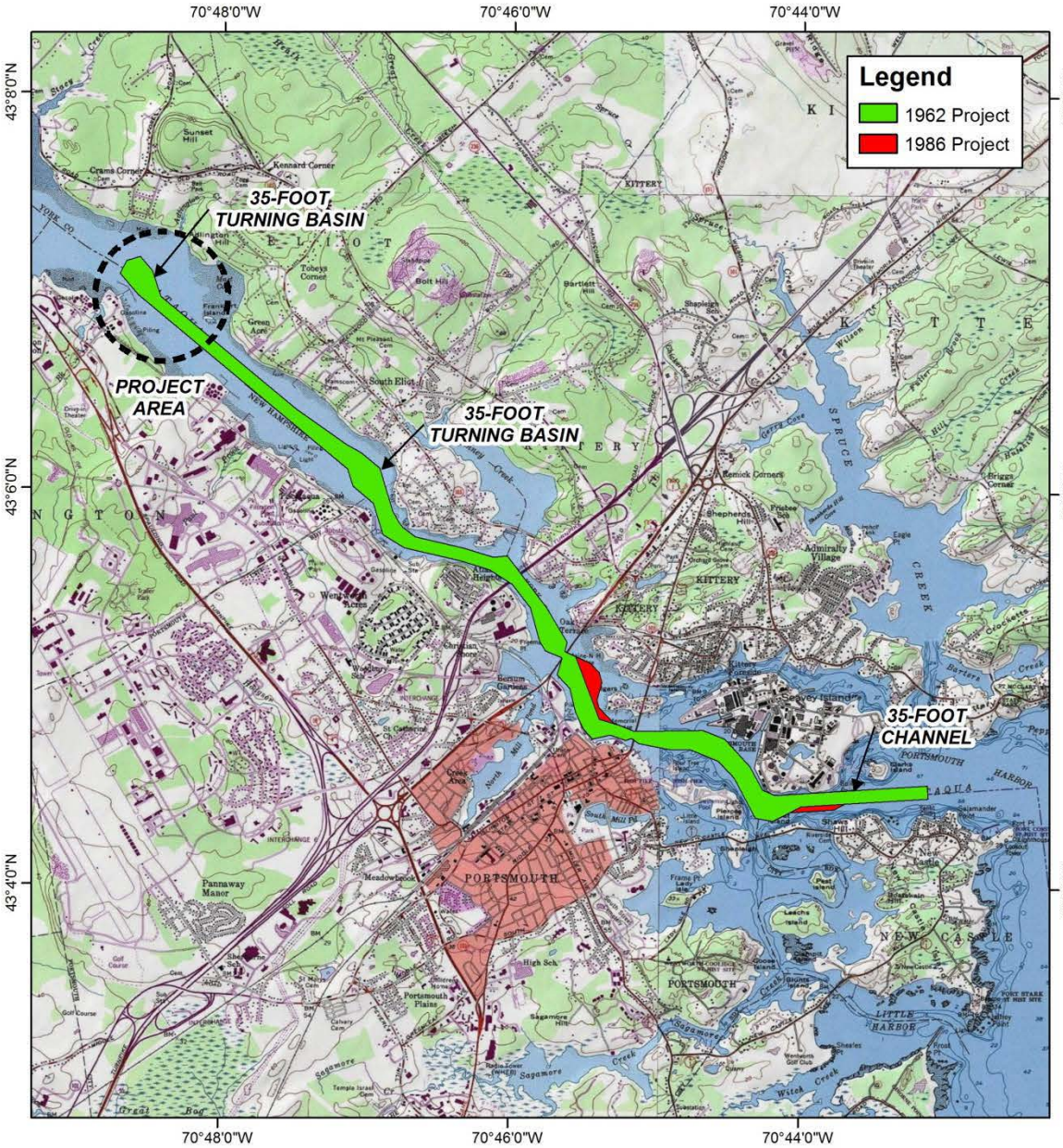
I. INTRODUCTION AND PROJECT HISTORY

The U.S. Army Corps of Engineers (USACE), New England District, has prepared this Environmental Assessment as part of the planning and development of navigation improvements in compliance with the National Environmental Policy Act (NEPA) of 1969. The NEPA process is intended to promote better decisions based on an understanding of environmental consequences, and to take actions that protect, restore, and enhance the environment. Other environmental considerations applicable to the placement of dredged material include the requirements of the Clean Water Act Section 401 and Section 404 (b)(1) Evaluation, and/or the Marine Protection, Research, and Sanctuaries Act as well as other applicable environmental laws and regulations.

The Piscataqua River forms the lower boundary between the States of Maine and New Hampshire. Portsmouth Harbor, located at the mouth of the Piscataqua River, is about 45 miles northeast of Boston, Massachusetts and 37 miles southwest of Portland Harbor, Maine. The original Federal navigation project in Portsmouth Harbor and Piscataqua River was authorized in 1879 and modified by the River and Harbor Act of 1890, 1954, and 1962, by the Chief of Engineers in December 1965 under the Continuing Authority of Section 107 of the 1960 River and Harbor Act, as amended, and by the Water Resources Development Act of 1986. The existing Federal navigation project provides for a 35-foot deep mean lower low water (MLLW), 400-foot wide, navigation channel extending from deep water in Portsmouth Harbor (river mile 2.6) to a point about 1,700 feet upstream of the Sprague Energy wharf in Newington, NH (river mile 8.8). A 950-foot wide turning basin located above Boiling Rock (river mile 6.5), an 800-foot wide turning basin located at the upstream limit of the project, and a stone breakwater between Goat Island and Great Island (New Castle), comprise the remaining navigation features of the project. Both turning basins are 35 feet deep MLLW. The 1986 modifications, completed in 1992, widened the lower channel reaches opposite Seavey Island and expanded the area between the two vertical lift bridges to allow larger ships to access the river reaches and terminals located downstream of the bridges. See Figure EA-1.

Other completed Federal navigation projects for Portsmouth Harbor and the Piscataqua River include the shallow draft Portsmouth Back Channels connecting the harbor with Little Harbor and Sagamore Creek authorized in 1965, and a project to remove obstructions from the river bed above Great Bay up to Berwick authorized in 1832, an area now called the Salmon Falls River.

This navigation improvement study focuses on improvements to the upper reaches of the project for the benefit of deep-draft commercial traffic calling on terminals located above the bridges in areas not covered by the 1986 project modifications. Specifically this project addresses the inadequacy of the existing 800-foot wide, 35-foot deep MLLW turning basin located at the head/upstream limit of the 35-foot deep Federal navigation channel. Two deep-draft terminals



US Army Corps of Engineers
New England District

FIGURE EA-1
PROJECT LOCATION AND EXISTING FEDERAL PROJECT

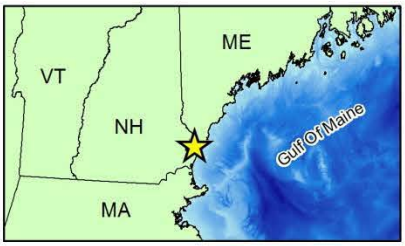
0 2,500 5,000 7,500 10,000 Feet

0 0.5 1 1.5 Miles

1:50,000

USGS TOPOGRAPHIC QUADS

GCS NAD 1983



that are located on the New Hampshire shore, and rely on the upper turning basin, are the Sprague Energy River Road Terminal, and a joint use terminal the Sprague Energy/Sea-3 Avery Lane Terminal. A third terminal, owned by the U.S. Department of Defense (DOD) and originally constructed as a fuel terminal for the former Pease Air Force base, is currently inactive.

II. STUDY AUTHORITY

This study of Portsmouth Harbor and Piscataqua River was directed by Section 436 of the WRDA of 2000 in the following language:

> *"The Secretary shall conduct a study to determine the feasibility of modifying the project for navigation, Portsmouth Harbor and Piscataqua River, Maine and New Hampshire, authorized by Section 101 of the River and Harbor Act of 1962 (76 Stat. 1173) and modified by Section 202(a) of the Water Resources Development Act of 1986 (100 Stat. 4095), to increase the authorized width of turning basins in the Piscataqua River to 1,000 feet."*

Section 216 of the Flood Control Act of 1970 also provides the USACE general authority to review completed civil works projects.

> *"The Secretary of the Army, acting through the Chief of Engineers, is authorized to review the operation of projects the construction of which has been completed and which were constructed by the Corps of Engineers in the interest of navigation, flood control, water supply, and related purposes, when found advisable due to the significantly changed physical or economic conditions, and to report thereon to Congress with recommendations on the advisability of modifying the structures or their operation, and for improving the quality of the environment in the overall public interest".*

This study was initiated at the request of the non-Federal sponsor; the State of New Hampshire, Pease Development Authority, Division of Ports and Harbors. Funds to initiate the study were added to the Fiscal Year 2004 Energy and Water Development Appropriations Bill. The reconnaissance report was approved by the USACE, North Atlantic Division on October 21, 2004.

III. PURPOSE AND NEED FOR THE PROJECT

The Piscataqua River is known for its strong tidal currents and tight turns that make navigation through this area difficult. Vessels use the upper turning basin to access the commercial terminals on the New Hampshire side of the river above the I-95 Bridge. The existing width of the upper turning basin is too narrow for efficient and safe turning and maneuvering of the larger vessels calling on two of those terminals, which constrains existing and future commerce.

Current USACE navigation design policy dictates that a turning basin should be equal to 1.5 times the length of the largest ship (design ship) utilizing the turning basin. Currently, vessels that utilize the two upper berths can be divided into two categories; those less than 680 feet in

length, and those more than 680 feet long up to a maximum of 747 feet long. This means that the turning basin should have a minimum width of 1,020 feet or 1,120 feet, respectively, to safely turn these vessels. Instead, ships unloading at the two upper berths have a turning basin which is only 800 feet wide. Terminal operators also plan to bring in ships up to 800 feet long. The two downstream drawspans (Routes 1 and 1A) are being rebuilt to handle ships of that size, and the lower river channel was modified in 1986 to handle such vessels in the reaches below the bridges.

As a result of the narrow upper turning basin, ships calling on the upper river terminals have been damaged from groundings. To compensate for the narrow turning basin, the harbor pilots will only turn ships when currents are slower during the high slack or low slack tidal periods, and during daylight hours. Turning during these times within the tidal cycle also coincide with the best time to transit the river based on the current speeds.

These conditions put a severe constraint on the available time to transit the river and unload goods. Additional costs associated with these delays include the cost to remain at the berth until the tide is right, and the cost of additional tugs to turn and maneuver the ships up and down the river. Also, shippers may use shorter ships to unload goods so that they can use the current turning basin. This means there is an additional cost for extra ships to transport the same amount of goods.

The purpose of this study is to identify the Federal navigation improvement plan for Portsmouth Harbor and the Piscataqua River which is economically justified based on maximizing national economic development, is environmentally acceptable based on minimizing environmental impacts, and which considers regional economic development and other social effects. The study also assesses the non-Federal Sponsor's interest and capability to participate in sharing the construction costs of the project.

IV. ALTERNATIVES

In addition to the navigation improvement alternatives, a no action alternative is discussed so that a comparison to the various navigation improvement alternatives can be made. Various dredging methods and placement alternatives are also considered. Placement alternatives include open water placement, nearshore placement, upland placement and riverine placement.

A. No Action Alternative

With the no action alternative, the turning basin would not be expanded at the upstream end of the Federal navigation channel. Vessels and pilots would continue to operate as at present, and would continue to experience unsafe and inefficient navigation and transfer of goods, as described in the preceding section. This could create a situation where the ships may experience damage from groundings, and since a large percentage of commerce is liquid petroleum (fuel oils, LPG and asphalt), a major grounding with hull breach could cause serious environmental damage in the estuary. However, with the no action alternative, the temporary environmental

impacts to marine organisms and permanent alteration of the river bottom that result from dredging would not occur.

B. Alternative Dredging Methods

Typical dredging methods and plants include a hydraulic dredge, a hopper dredge, and a mechanical dredge. The dredging method selected for a particular project is determined by the placement site selected for disposal and the type of material to be dredged. A hydraulic pipeline dredge was eliminated from further consideration in part because hydraulic dredges are extremely inefficient in areas that consist of hard packed glacial deposits such as this, and due to the lack of a nearby suitable upland or alongshore placement site (see below). A hopper dredge was also eliminated from further consideration because they are best suited for removal of loose material and the majority of material to be dredged is hard packed glacial sands and gravels.

A mechanical dredge excavates the sediments with a bucket-type apparatus and deposits them into a scow for transport to a placement site. Dredged material may be released through an opening in the bottom of the scow into open water or transported for offloading to an upland placement site. Based on conditions at the placement site, only a mechanical dredge in combination with scows for transport of material would be suitable for work in the Piscataqua River. Given the semi-consolidated nature of the sandy, gravelly glacial till to be removed a large heavy toothed bucket, either crane mounted or excavator, would be required.

Bedrock is expected to be encountered during the deepening of the turning basin. Blasting may be required if a sharp-toothed mechanical dredge cannot remove the rock. If blasting is required, a mechanical dredge would then remove the rock material and deposit the material into a scow.

C. Navigation Improvement Alternatives

The development of the turning basin alternatives was an iterative process. The first alternative evaluated was the feasibility of widening the existing turning basin, or relocating the turning basin to an adjacent area where it would be able to serve the two upper terminals. Bathymetric surveys of the area were obtained and alternative turning basins were laid out using the maximum turning basin width of 1,200 feet. Alternative 1 consists of widening the existing turning basin, Alternative 2 is a southeast relocation, and Alternative 3 is an upstream relocation. Figure EA-2 shows the location of the existing and the two optional turning basin locations.

1. Widening the Existing Turning Basin

Widening the existing 800 foot wide turning basin to allow for the efficient and safe turning of ships was selected for further study. The three expansion alternatives proposed for the existing turning basin include:

- the two design alternatives discussed above in the purpose and need section;
    - the 1,020 wide alternative to accommodate ships less than 680 feet long,
    - and the 1,120 wide alternative for those ships more than 680 feet long up to a maximum of 747 feet long; as well as

- a third design alternative of a 1,200 wide turning basin based on an 800-foot long ship. An 800-foot long ship is the largest ship that can safely navigate the river and access the upper terminals.

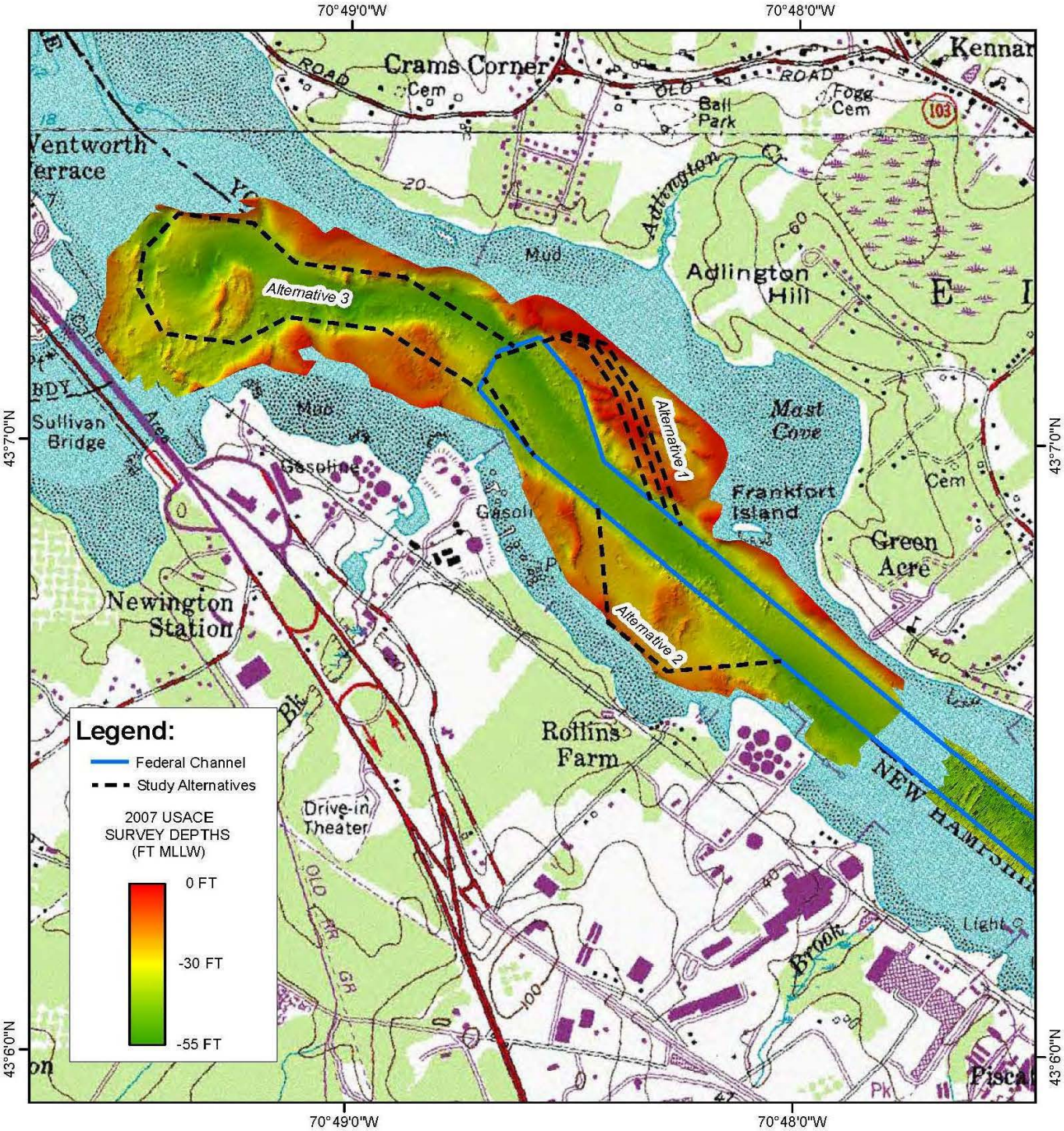


FIGURE EA-2. Location of the Turning Basin Alternatives

All of the dredging and rock removal required for each of these alternative widths for the existing basin would occur in State of Maine waters. Table EA-1 below compares the various existing turning basin alternatives.

TABLE EA-1. COMPARISON OF EXISTING TURNING BASIN ALTERNATIVES-			
Alternatives	**Dredged Material (cy)**	**Rock (cy)**	**Acres**
1,020 feet wide	384,900	22,500	11.3
1,120 feet wide	573,700	22,900	16.2
1,200 feet wide	728,100	25,300	20.4

The 1,200-foot wide turning basin alternative was selected as the most cost effective plan. Compared to relocating the turning basin, the impacts to the sub-bottom habitat would be fewer and the amount of bedrock to be removed would be smaller if the turning basin was widened to 1,200 feet instead. In addition, there are no critical environmental or cultural resources present. Enlarging the existing turning basin is also favored by the Portsmouth Pilots over relocating the turning basin. The Sprague River Road Terminal, which handles about two thirds of the river traffic in this section of the river, is located adjacent to the existing turning basin. This means that the pilots can turn a ship next to the terminal. The advantage of this alternative is that the pilots can take full advantage of the short amount of time available during slack tide to turn the ship around.

2. Relocate the Turning Basin to the Southeast

Relocating the turning basin southeasterly to a point between the Sprague River Road and Sea-3 terminals was also considered. This area, located on the New Hampshire side of the Piscataqua River, would be easily accessible from both terminals. Evaluation of a turning basin 1,200 feet wide and 35-deep MLLW, which would encompass the 400-foot wide navigation channel, would require the excavation of over 640,000 cubic yards of material. However, based on past borings in this area, bedrock is extensive and located at shallow depths. A far greater amount of rock would need to be removed from this site compared to the other two turning basin alternatives evaluated. As drilling, blasting and removing this rock to an elevation of -39 feet MLLW (-35 feet plus 2 feet of additional required removal in hard material, plus 2 feet of allowable overdepth) would be extremely expensive, this alternative was not recommended for further study.

3. Relocate the Turning Basin to an Upstream Location

This alternative would require a major revision in how the Portsmouth Pilots maneuver and turn ships arriving or departing from the Sprague River Road and Sprague Avery Lane/Sea-3 terminals. A turning basin at this site would be located about 3,400 feet upstream of the existing turning basin and would require extension of the main ship channel to provide access. A new turning basin at this upstream site was dismissed from further consideration based on comments from the Portsmouth Pilots and for the additional reasons as listed below.

- The additional distance to reach the turning basin upstream would mean the pilots would have less time and flexibility to turn the ships during slack tides.
- The new turning basin would be located where the currents exit Great Bay into Piscataqua River. These additional currents would increase the amount of time the pilots would need to maneuver the ships to counter these currents; thereby lessening their already short slack tide window for turning large vessels in the river.
- Significant small craft traffic between the bay and the river would interfere with the use of the area as a turning basin for large ships. The Hilton State Park at Dover Point in New Hampshire has a large boat ramp located adjacent to the proposed upstream turning basin. This State park experiences a significant amount of recreational usage, further contributing to the small craft congestion in this area, and a potential safety hazard.
- Multiple turns in the proposed extension of the navigation channel to take full advantage of naturally deep water would not be possible due to the river currents and the large size of the ships using the river. Therefore, some removal of the submerged banks in the river would be necessary. This along with the presence of a large ledge in the center of the proposed upstream turning basin site would contribute to a higher upstream turning basin development cost than just expanding the existing turning basin.
- The upstream turning basin site also contains a plotted shipwreck that may be a cultural resource of concern. This would require additional study and documentation to determine compliance with applicable laws and regulations.

Based on these concerns, the upstream turning basin alternative was not recommended for further consideration.

D. Alternative Placement Options

Placement of dredged material can occur in open water, at an upland site, or in the river. The following section gives a description of the proposed placement alternatives assessed for dredged material. Rock placement is considered after the discussion of soft dredged material placement.

1. Upland Placement

The suitability of an upland site located at the end of Gosling Road in Newington, NH that is currently owned by Public Service of New Hampshire (a Northeast Utilities Company), and was previously owned by the Fuel Storage Corporation in Newington, NH, was investigated. This land is still undeveloped and does not appear to have significant natural resources.

A New Hampshire comprehensive upland dredged material placement study was completed by the USACE for the State of New Hampshire in 2005. This study identified three suitable offloading and dewatering sites in New Hampshire near the project area. In addition, several upland placement sites were also identified. However, none of the property owners were contacted for their interest in leasing or selling land for placing dredged materials during the study. The next phase of the upland placement study would have been to short-list the sites based on property owner's interest, proximity to dredging sites, the cost of land, and verification

of compliance with zoning. In addition, the upland sites were based on accommodating approximately 24,000 cy of dredged maintenance material from Piscataqua River/Portsmouth Harbor. This project would produce over 700,000 cy of material, possibly exceeding the capacity of and eliminating most if not all of the available sites listed in the study for placement of dredged material. The follow-on phases of the upland site study were never funded.

Any upland placement would significantly increase the cost of the project. Although the dredged material is used by the property owner, the Government is not compensated. With bucket and scow operations the material would need to be handled multiple times; once during the dredging, again when the material is being offloaded from the scow. In addition, a containment facility would have to be built to dewater the dredged material, which would add to the overall project cost. Further rehandling after dewatering would be required to transport the material to the final upland site, offload the material at that site, and distribute the material within that site.

Currently there are no identified viable upland placement sites available for use for dredged material. Upland placement increases the cost of the project because the material needs to be handled and transported multiple times. Since a practicable upland site could not be identified for dredged material placement, the upland placement alternative was removed from further consideration.

2. Riverine Placement

Two in-river placement sites have been used for previous placement of dredged material removed during maintenance dredging in the Simplex Shoal Reach of the existing navigation channel. The first in-river placement area is about 7,500 feet seaward of the turning basin in a section of the river where depths exceed 50 feet MLLW. This placement area was used for the last three maintenance dredging projects: in 1991 when 20,100 cy of sand and gravel were removed from the channel, in 2000 when 7,900 cy of material was removed, and in 2013 when 14,323 cy of material was removed. This placement area would likely be proposed for the next maintenance dredging cycles of the Simplex Shoal area located just downstream of the turning basin.

The second placement area is located about 10,500 feet downstream from the turning basin and just upstream from the I-95 Bridge. Water depths at the second placement site range from 53 to 58 feet MLLW. This placement area was used in the 1984 maintenance dredging operation when 43,100 cubic yards of sand and gravel were removed from the channel.

Survey data indicates that depths at the riverine placement sites have changed very little over the past fifteen years. Sediment characteristics at the two riverine placement sites are similar. Grain size analysis indicates that material to be dredged from the channel is compatible with material in these two sites. In November 2010, additional sediment grab samples were taken from the proposed dredge and placement area for the proposed maintenance dredging project (Simplex Shoal). Grain size curves from the dredging site and the proposed placement site show that the

dredged material from the Simplex Shoal is sand and gravel which is consistent with that collected in 1999. Only gravel was collected from the placement area. As the material from the proposed expansion of the turning basin is also composed of sand and gravel, this indicates that material dredged from expansion of the turning basin and the placement site would be compatible.

However, the amount of material to be dredged from the expanded turning basin exceeds the capacity of the deep areas along the Piscataqua River. In addition, placement of large volumes of material along this high velocity river would create channel instability in areas where it was placed and most likely create navigation hazards. Therefore, riverine placement was eliminated from further consideration.

3. Ocean Placement (MPRSA)

Several ocean placement sites, subject to the regulations of Section 103 of the Marine Protection, Research, and Sanctuaries Act (MPRSA), are located near the project area. They include the Isle of Shoals (IOS) placement site, the Cape Arundel Disposal Site (CADS), the Portland Disposal Site (PDS), and the Massachusetts Bay Disposal Site (MBDS). The closest previously used ocean placement site to the project area is the Isles of Shoals. See Figure EA-3.

The CADS is a regional disposal site located approximately 23 nautical miles northeast from Portsmouth Harbor. This site was closed for disposal on January 10, 2010 under the 1992 amendments to the MPRSA which limited future use of non-EPA-designated ocean sites. A disposal site designation study to keep the site open under MPRSA was never funded. Congress in the Fiscal Year 2014 Consolidated Appropriations Act re-opened the CADS for a period of five years, but limited its use to project placing no more than 80,000 cubic yards of material. This site is therefore not available for use by this navigation improvement project unless no more than 80,000 cubic yards of rock or other materials were placed there.

About 51 miles north of the mouth of Portsmouth Harbor, and approximately seven nautical miles east of Cape Elizabeth, Maine, is the PDS. This disposal site is a U.S. EPA designated dredged material disposal site and could receive material from the Piscataqua River. The MBDS is also a U.S. EPA designated dredged material disposal site and is located 44 nautical miles south-southeast of the mouth of Portsmouth Harbor. The dredged material proposed to be dredged from this project consists of clean sand and gravel. Placement at the PDS, or the MBDS would have minimal impacts on water quality and the local habitat at these ocean sites. However, the distance to the PDS or the MBDS makes disposal at these sites undesirable. Also, disposal of material at these sites would preclude taking advantage of potential beneficial use opportunities as discussed in the next two sections below.

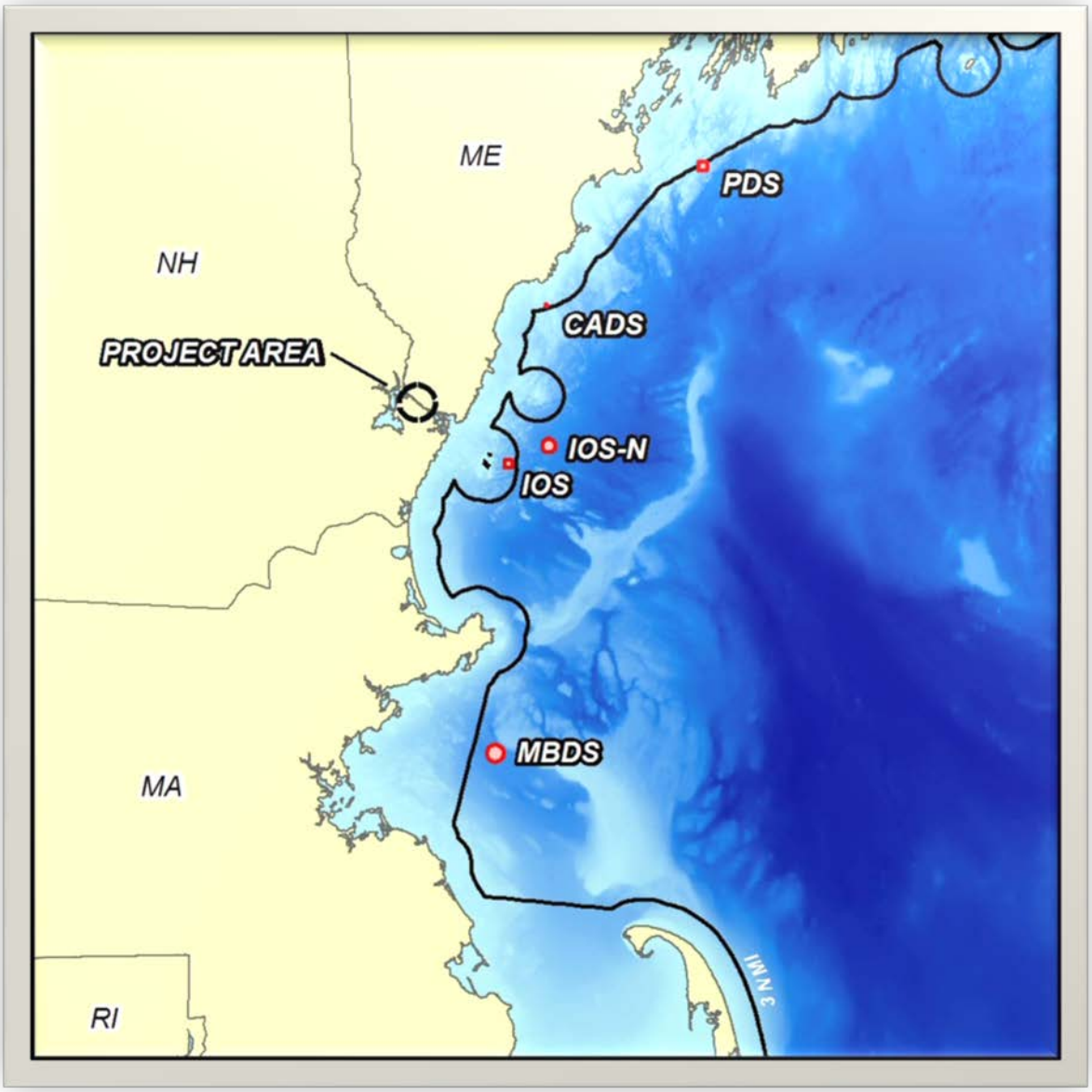


FIGURE EA-3. Approximate Location of Alternative Ocean Dredged Material Disposal Sites

The IOS placement site is an open water disposal area that has been used in the past for disposal of dredged material from Portsmouth Harbor. The disposal site is centered in open water about three nautical miles east of a cluster of islands called the Isles of Shoals. The waters surrounding the Isles of Shoals are clear, deep, and relatively pollution free. They support a rich abundance of aquatic life and commercially and recreationally important finfish and shellfish. In 1964-1965, 64,000 cy of material was disposed at this location from improvement dredging of the Portsmouth Harbor. This site was last used in June 1971 when 39,160 cubic yards (cy) of material were removed from the project area using a Government hopper dredge.

A meeting between staff from the USACE, the National Marine Fisheries Service (NMFS) and the Environmental Protection Agency (EPA) was held on April 14, 2010 to discuss the feasibility of disposal at the IOS disposal site. Concern was expressed by the agencies that the IOS site likely provides valuable fisheries habitat based on conversations with local fishermen. It was concluded that additional studies would be needed to fully assess the potential impacts from disposal of dredged material in this area.

Since it was determined that the IOS historic site may not be suitable for dredged material disposal due to fisheries concerns, adjacent areas were evaluated to identify their suitability as potential locations for disposal of dredged material. Another proposed ocean disposal site, selected for one-time use, would be needed to establish the Federal base plan as a baseline for comparison of costs for disposal. Once this Federal base plan was established, the additional cost to transport and dispose of the material at sites located at a further distance than or more costly than the base plan would be the responsibility of the local or State partner(s).

Further evaluations for another proposed ocean disposal site identified the Isle of Shoals-North (IOS-N) site as a potential site for placement of suitable material dredged from the Piscataqua River upper turning basin and a potential Federal base plan; if additional studies determined the site could be selected or designated for that use. This site is located seaward of the three nautical mile limit of the territorial sea in Federal waters, just northeast of the Isle of Shoals. See Figure EA-3. This site was identified because it is located in deep Federal waters ranging in depths between approximately 250 and 310 feet. Additional benthic and substrate studies were performed to assess the suitability of this site and determine if this site could satisfy the five general (40 CFR 228.5) and 11 specific (40 CFR 228.6) regulatory criteria for site designation under MPRSA as discussed in Section VI (Affected Environment). Subsequent correspondence from EPA dated September 7, 2011 stated that based on these additional analysis, EPA concurred that the IOS-N site is “likely selectable” as an alternative site for the Piscataqua River Navigation Improvement Project on a “one-time use” basis.

4. Nearshore/Open Water Placement (Clean Water Act)

Material disposed for fill (i.e. beach nourishment, intertidal clamflat creation, etc.) within the three mile limit of the Territorial Seas is subject to Section 404 (b) (1) Guidelines of the Clean Water Act. The USACE seeks opportunities to use dredged material in a beneficial manner

whenever practicable. Disposal of dredged material for beach nourishment at appropriate nearshore disposal sites was investigated. The New Hampshire Division of Parks and Recreation identified the beach at Wallis Sands State Park and Hampton Beach as two beaches that need sand. At a meeting held on September 15, 2009, staff from the State of New Hampshire indicated that they would prefer the material to be disposed at the north end of both disposal sites to maximize the use of the material for beneficial reuse as longshore drift is to the south. The Wallis Sands Beach nearshore site has not received dredged material from the Piscataqua River but material dredged from the Federal navigation channel in Little Harbor has been placed at the site. About 5,400 cubic yards was placed in 1994, and approximately 40,000 cubic yards was placed in 2001. Most renourishment of Hampton beach has consisted of direct placement on the beach, but in 1987 about 23,000 cubic yards of material dredged from the entrance channel at Hampton Harbor was placed at a nearshore site off the north end of Hampton Beach. Nearshore placement would be suitable for disposal of material from the Piscataqua River, since the material is clean sand and gravel. Disposal of the dredged material at the nearshore site would keep the material within the littoral zone. However, even if both New Hampshire beaches were nourished, they could not accommodate all of the material that would be removed from Portsmouth Harbor. At most, between 50,000 and 100,000 cubic yards could "fit" at each nearshore disposal site.

Although the local sponsor for this project is the New Hampshire Pease Development Authority, Division of Ports and Harbor, all of the material would be removed from Maine waters, except the maintenance material. In addition, since the large amount of material to be dredged from the turning basin could not be accommodated at the two beaches identified by the State of New Hampshire, inquires were made to find additional suitable nearshore disposal sites.

In October 2009, a suitable nearshore disposal site, located within a reasonable distance from Portsmouth Harbor (about 10 miles), was identified by the staff from the Maine Geological Survey (MGS). This nearshore site was located off of Long Sands Beach in York, Maine, which based on MGS studies, has a history of landward migration and lowering in response to sea level rise and storm events. Based on the site selection by the MGS, and favorable coordination with Maine's Department of Environmental Protection (DEP) and Department of Marine Resources (DMR), grab samples were collected on November 5, 2009 to determine the benthic community structure and grain size at the site. See the benthic and grain size results in Appendix O. Based on the grain size and benthic community results, it was determined that material dredged from the Portsmouth Harbor and Piscataqua River Navigation Improvement Project would be suitable for disposal at the Long Sands Beach nearshore disposal site.

A meeting was scheduled with the local lobstermen on January 5, 2010 in York, Maine and the USACE and State of Maine staff to obtain any comments, questions, or concerns they may have regarding disposal off of Long Sands Beach. Publicity concerning this coordination meeting resulted in a much larger group of attendees than expected (about 60 attended). USACE and

State of Maine representatives (primarily MGS, although DEP and DMR representatives were also present) explained that the long term history of landward migration and lowering of the beach indicated that this was a good candidate for nearshore placement of sandy material. The area of proposed dredging, which consists of parent materials adjacent to the channel rather than sediments in the channel, was explained. However, as the material was coming from the Piscataqua River, the public was concerned about the chemical characteristics of the sand, and whether or not the material was suitably "clean" for disposal. The criteria and testing that was done to determine the material was suitable for open ocean disposal were explained, but many desired additional testing. Sand color, white vs. light brown, and potential impacts to surfing opportunities were also discussed. Fishermen were also concerned about dispersal of material over hard bottom areas. In summary, all who spoke at the meeting were opposed to placing material off of Long Sands Beach in nearshore waters from the proposed expanded turning basin.

As no local officials spoke at the meeting, the Chairman of the York Board of Selectmen was contacted on February 16, 2010 to determine the town's position regarding nearshore placement of dredged material. Based on concerns expressed at the meeting and the general public opinion, the Chairman stated that the Town has no interest in receiving sand from the turning basin widening project. Publicity following the York meeting also resulted in the Selectmen of Rye, New Hampshire stating that their town also had no interest in having the sandy dredged material deposited off their shore.

The lack of nearby nearshore placement sites for beach nourishment purposes prompted a new search for other practicable placement alternatives, preferably in nearshore areas for beneficial use. A meeting was held May 21, 2010 in Portsmouth, NH to determine who from the three States (Maine, New Hampshire, and Massachusetts) would be interested in receiving the dredged material. Table EA-2 displays an updated cost comparison between the Federal base plan (placement at Isle of Shoals-North) and the other alternative nearshore, ocean, and upland placement sites.

The Town of Wells, Maine, located approximately 32 miles from the turning basin, and the State of Massachusetts expressed an interest in receiving dredged material for the purposes of beach nourishment. Sites considered for nearshore placement in Massachusetts included Salisbury and Plum Island (26 miles from Portsmouth Harbor) and Winthrop Beach near Boston Harbor (58 miles from Portsmouth Harbor). In addition to the meeting noted above, letters were also sent in July 2012 to the States of Maine, New Hampshire, and Massachusetts, as well as the following local communities to determine their interest in receiving dredged material for nearshore placement from the proposed project. The local communities included Wells, Ogunquit, and Kittery in Maine; Rye in New Hampshire; and Salisbury, Newbury, Newburyport, and Winthrop in Massachusetts. The communities of Wells, Maine, and Salisbury, Newbury and Newburyport in Massachusetts responded that they would be interested in receiving this material and would also be willing to fund the incremental cost above the Federal base plan.

TABLE EA-2. ALTERNATIVE DREDGED MATERIAL PLACEMENT COST COMPARISONS			
Disposal Site	**Haul Distance From Turning Basin (Miles)**	**Base Plan Cost/Cubic Yard**	**Cost Increase Above Base Plan**
Aquatic Disposal			
Wallis Sands/N. Rye, NH - Nearshore	14	No Local Interest	
Isle Of Shoals-N – Ocean: Base Plan	**20**	**$19.75**	**N/A**
Long Sands, York, ME – Nearshore	20	No Local Interest	
Salisbury, MA – Nearshore	24		$2.60
Newburyport, MA – Nearshore	25		$2.69
Newbury, MA - Nearshore	26		$2.69
Wells, ME – Nearshore	32		$2.81
Camp Ellis, ME – Nearshore	52		$10.00
Winthrop, MA – Nearshore	58		$11.70
Portland, ME Disposal Site - Ocean	58		$11.70
Upland Disposal			
Newington, NH – Gosling Road			$13.80
Note: Cost per as cost above base plan are Fiscal Year 2014 price level costs (total first costs) for project implementation design and construction.			

5. Rock Placement Alternatives

Rock could be disposed at an upland site, disposed at a nearshore site to create rock reef, used for coastal armoring, or disposed at an open water disposal site. Discussions with State and Federal resource agencies indicated that the rock could be used for upland projects. Discussions with the New Hampshire and Maine Departments of Transportation indicated an interest in the rock for their road projects. The rock could be offloaded at a shoreside location along the Piscataqua River for transport to a suitable upland storage site. Additional discussions with the States of Maine and New Hampshire regarding real estate needs would be needed if these States are still interested in the rock for upland uses.

The Town of Kittery, Maine has expressed an interest in receiving the rock generated by the project for its construction of a wave berm at the entrance to Pepperell Cove, located near the mouth of Portsmouth Harbor. The Town is presently pursuing design and permitting of that proposed plan. As with the non-Federal proposals for nearshore placement of the sandy material, any alternative placement or use of the rock requires the non-Federal proponent to secure all necessary approvals for that placement and provide any costs above the Base Plan.

Alternative locations for rock disposal are the IOS-N site and CADS. If the IOS-N site is used, a MPRSA Section 103 site selection document would need to be prepared and processed by the USACE and U.S. EPA during the project's Design Phase.

V. TENATIVELY SELECTED PLAN

The Tentatively Selected Plan would widen the existing 800-wide turning basin located at the upstream end of the Piscataqua River Federal navigation channel to 1,200 feet and to a depth of 35-feet MLLW plus two feet of overdepth. Approximately 728,100 cy of coarse grained sandy and gravelly material, and approximately 25,300 cy of rock would be removed. All material would be removed by a mechanical dredge and take about six months to complete. About four to five months would be needed to remove the dredged material and one to two months to blast and remove the rock.

Based on data collected as part of the disposal site evaluation, the IOS-N ocean disposal site was selected for this project as the Federal base plan for dredged material placement. However, the following towns have expressed an interest in the material and have agreed to pay the difference in cost between the transport of dredged material to the IOS-N and the alternative locations to which they have expressed an interest. These alternatives include the nearshore placement sites located off the beaches of Wells, Maine, and Newbury, Newburyport, and Salisbury, Massachusetts. These four nearshore placement locations would act as feeder berms for adjacent eroding beaches. Approximately 365,000 cy of dredged material would be placed nearshore in waters off the coast of Wells, Maine, with the remaining 365,000 cy divided between the three Massachusetts communities. Division of the material among the Massachusetts communities, would be as follows: Salisbury – 90,900 cy, Newburyport – 36,400 cy, and Newbury – 236,700 cy. The final amounts will be determined during the Design Phase. In addition, the local communities would be responsible for obtaining any necessary approvals prior to construction and funding any costs above the Federal Base Plan.

The rock would be removed and taken to the IOS-N, the CADS, or an alternative location determined during the Design Phase. The bedrock would be removed to a design depth of 35-feet MLLW, plus two feet additional required removal in hard material for safe clearance, plus two feet of allowable overdepth for a total of 39-feet MLLW. If real estate investigations are completed and interest is still viable, then the rock could be used for upland projects by the State of Maine or New Hampshire. Other beneficial uses include placement of the rock at a suitable nearshore area as a rock reef for lobster and fish habitat once appropriate studies have been conducted. This alternative would be explored further during the Design Phase of the project. In addition, Section IX (Mitigation) discusses methods to avoid or minimize impacts to biological resources from blasting. See Figure EA-4 for a location of the four nearshore placement sites and the IOS-N.

In addition to the material described above for removal as part of the improvement project, approximately 7,800 cy of maintenance material within the existing turning basin limits and its

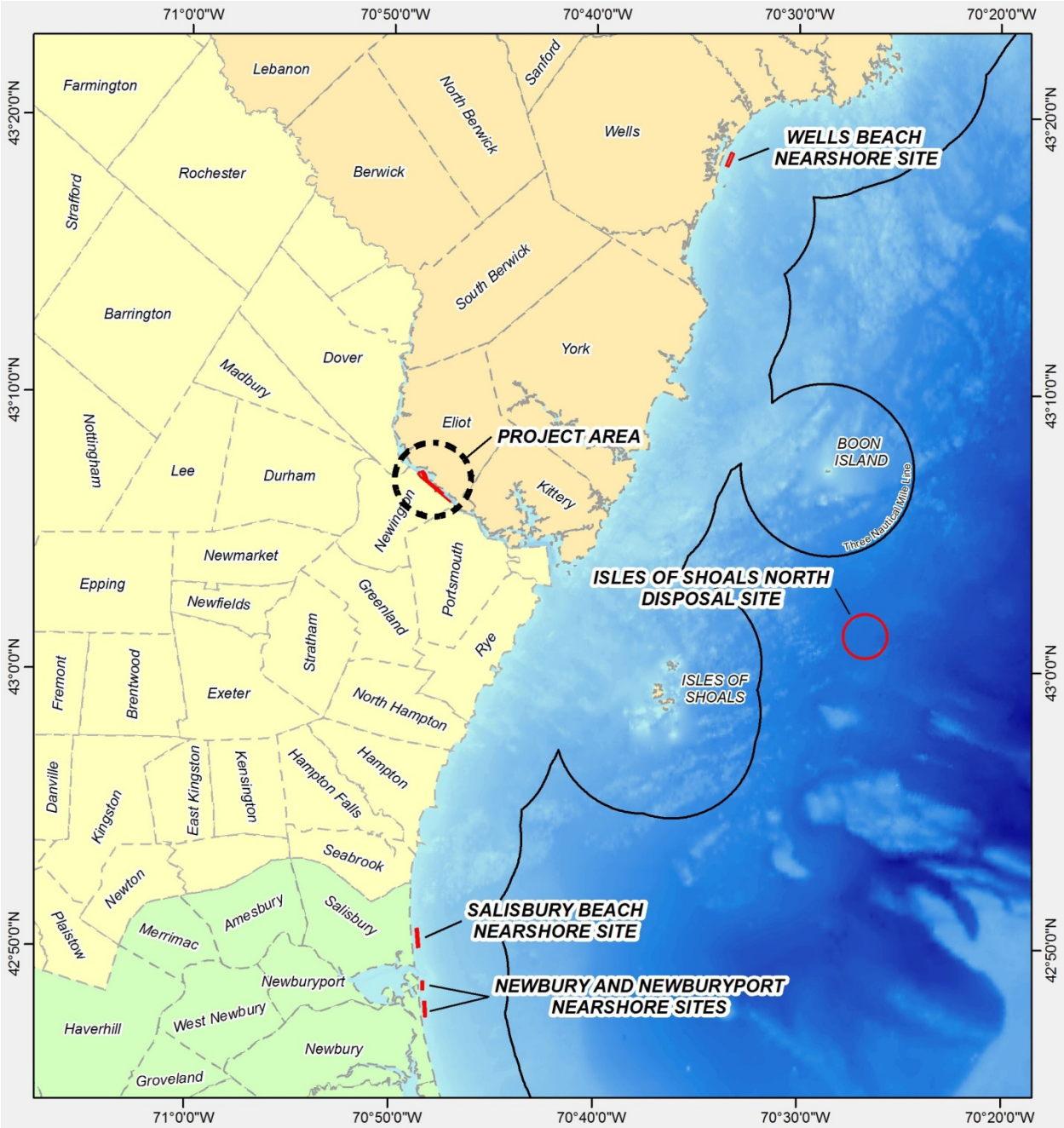


FIGURE EA-4. Location of the Proposed Nearshore Placement Sites and the Isle of Shoals-North Site

approaches could potentially be removed to bring the current turning basin and its approaches to its authorized depth 35-foot depth, if that material meets the suitability requirements for aquatic disposal. Testing for suitability for placement in these nearshore areas, CADS or IOS-N would occur in the next project phase (Design Phase). All other maintenance material removed from the river over the several decades since the 35-foot deepening has been clean sandy material.

Based on the biological resources in the project areas, the material would be removed between the months of mid-October through mid-April to protect biological resources. Prior to placement at the Massachusetts nearshore placement sites, commercial shellfishermen would be contacted to remove any surf clams (*Spisula solidissima*) located at these sites.

VI. AFFECTED ENVIRONMENT

A. General

The Piscataqua River is a long tidal river formed by the confluence of the Cocheco and Salmon Falls Rivers. It is also a component of the Great Bay Estuary. Land use along the river's shoreline consists of a mixture of commercial and industrial port facilities, and residential areas. Portsmouth Harbor located near the mouth of the river serves as a major commercial port. This port handles almost all of New Hampshire's petroleum products and large shipments of fish and shellfish. The river is also an important recreational resource and the site of a major U.S. naval facility near the mouth of the river, the Portsmouth Naval Shipyard located on Seavey's Island in Kittery, Maine.

B. Hydrology and Water Quality

Dredge Area: The following information, and the references, on the project area hydrology and water quality are taken from the New Hampshire Estuaries Project produced by Jones (2000). The Great Bay Estuary is a tidally dominated embayment located on the southern New Hampshire and Maine border. The estuary extends inland from the mouth of the Piscataqua River between Kittery, Maine, and New Castle, New Hampshire through Little Bay to Great Bay proper, a total distance of about 15 miles. The junction of Little Bay and the Piscataqua River occurs at Dover Point. Little Bay turns sharply west at Cedar and Fox Points near the mouth of the Oyster River and ends at Furber Strait near Adams Point. Great Bay begins immediately inland or "upstream" of Furber Strait. Tidal waters from the Atlantic Ocean enter the Great Bay Estuary in Portsmouth Harbor and flood the three major areas of the Piscataqua River, the Little Bay and Great Bay.

The estuary derives its freshwater inflow from seven major rivers, the Lamprey, Oyster, Cocheco, Salmon Falls, Squamscott, Bellamy and Winnicut Rivers. River flow varies seasonally, with the greatest volumes occurring as a result of spring runoff. However, the tidal component in the estuary dominates over freshwater influence throughout most of the year. Freshwater input typically represents only two percent or less of the tidal prism volume (Reichard and Celikkol, 1978; Brown and Arellano, 1979 *cited in* Jones, 2000). Estimates of

flow for all rivers suggest that the average combined freshwater inflow is greater than 1,000 cubic feet per second. Approximately 50 percent of the average annual precipitation (42 inches) in the Great Bay Estuary drainage basin enters the estuary as stream flow (NHWSPCC, 1975 *cited in* Jones, 2000).

The average tidal range for Portsmouth Harbor is 9.4 feet. The average mean spring tidal range is 9.7 feet and the average mean tide level is 4.2 feet. The mean tidal range decreases to 6.6 feet where the Piscataqua River meets the Cocheco and Salmon Falls Rivers. The phase of the tide lags significantly moving up the Great Bay Estuary from the ocean and the slack tides can be as much as 2.5 hours later in the Squamscott River than at the mouth of the estuary. The large tidal range during spring tides results in exposure of extensive mudflats along the fringing areas of the Piscataqua River, Little Bay and the tributaries as well as large expanses of exposed tidal flats in the central part of Great Bay.

The Piscataqua River is one of the fastest flowing tidal waterways among commercial ports in the northeastern United States. The average current velocity at full strength in the lower Portsmouth Harbor varies from about 2.6 to 4.0 knots. Strong tidal currents and mixing throughout the estuary limit vertical stratification during most of the year. Partial stratification may occur during periods of intense freshwater runoff, particularly at the upper tidal reaches of rivers entering the estuary (Jones, 2000). A horizontal gradient of decreasing salinity exists from the mouth of the harbor to the tidal reaches of the tributaries and the upper portions of Great Bay. The range of this salinity gradient (0-30 ppt) depends on tidal cycle, season and rainfall conditions (Jones, 2000).

New Hampshire and Maine have an agreement to maintain acceptable water quality in the Piscataqua River by regulating their effluent discharges into the river. The river is designated by the State of New Hampshire as a Class B stream segment and by the State of Maine as a Class SB. New Hampshire Class B waters are acceptable for bathing and other recreational purposes. Maine Class SB waters are suitable for water contact recreation, fishing, shellfish harvesting and propagation, and are valuable fish and wildlife habitat.

Isle of Shoals-North (IOS-N): Site specific information on the hydrology and tidal currents is not available for the IOS-N disposal site, but would be expected to be affected by the surrounding Gulf of Maine environment. The site would be tidally flushed and have good water quality. The affect of storms on the bottom sediments within the site would be expected to be minimal as the site is located in a deep area (approximately 300 feet deep). This is evident by the nearly uniform layer of fine sediments throughout the area (see next section).

Nearshore Placement Sites: Figure EA-4 shows the location of the four proposed nearshore placement sites: Wells, Salisbury, Newburyport, and Newbury. All of these sites are located in water with depths of -3 and -27 feet MLLW. The Wells nearshore placement site ranges in depth from -9 to -24 feet MLLW, the Salisbury nearshore placement site ranges in depth from -9 to -27

feet MLLW, the Newburyport nearshore placement site ranges in depth from -3 to -18 feet MLLW, and the Newbury nearshore placement site ranges in depth from -5 to -26 feet MLLW. These sites are subject to currents and wave climate typically found in nearshore environments and were selected to provide indirect beach nourishment for adjacent beach areas.

C. Sediments

Dredge Area: Tidal currents cause considerable fluctuations of water clarity, temperature, salinity and current speeds, and have a major impact on bottom substrata. Shallow areas of the estuary are also greatly affected by wind-wave conditions which can influence grain size distributions and sediment transport throughout the estuary. Waves re-suspend sediments, increasing turbidity levels well above levels attributed to tidal currents alone (Anderson, 1972 *cited in* Jones, 2000).

To determine the grain size of the material to be removed from the proposed project and to determine if the material is suitable for open water disposal, borings were collected in the fall of 2007 from the proposed expanded turning basin. Except for sample B5, all the samples were comprised of predominately sand and gravel (see Table EA-3, Figure EA-5). Additional grab samples were obtained in June 2009 from the proposed turning basin to determine the extent of the silt area near boring sample B5. Only one sample out of 16 (number 6) contained more than 20% silt (see Table EA-4, Figure EA-6). Based on this information and the swift currents in the project area, it was determined that the material from the proposed turning basin met the exclusionary criteria of the Clean Water Act and is deemed suitable for open water placement (see Appendix A for the suitability determination).

TABLE EA-3. GRAIN SIZE FOR SELECTED PISCATAQUA RIVER BORING SAMPLES - SEPTEMBER AND NOVEMBER 2007 -

Station No. (Depth)	% Gravel	% Sand	% Silt and Clay
B-1 (20.0-22.0 ft)	1.5	89.9	8.6
B-2 (10.0-12.0 ft)	1.0	90.4	8.6
B-4 (15.0-17.0 ft)	1.7	83.8	14.5
B-5 (0-2.0 ft)	—	5.7	94.3
B-5 (10.0-11.8 ft)	13.4	45.1	41.5
B-7 (0-2.0 ft)	0.3	89.1	10.6
B-7 (5.0-7.0 ft)	2.5	84.2	13.3
B-7 (10.0-12.0 ft)	16.2	76.5	7.3
B-8 (0-2.0 ft)	13.5	76.5	10.0
B-8 (5.0-7.0 ft)	19.4	74.9	5.7

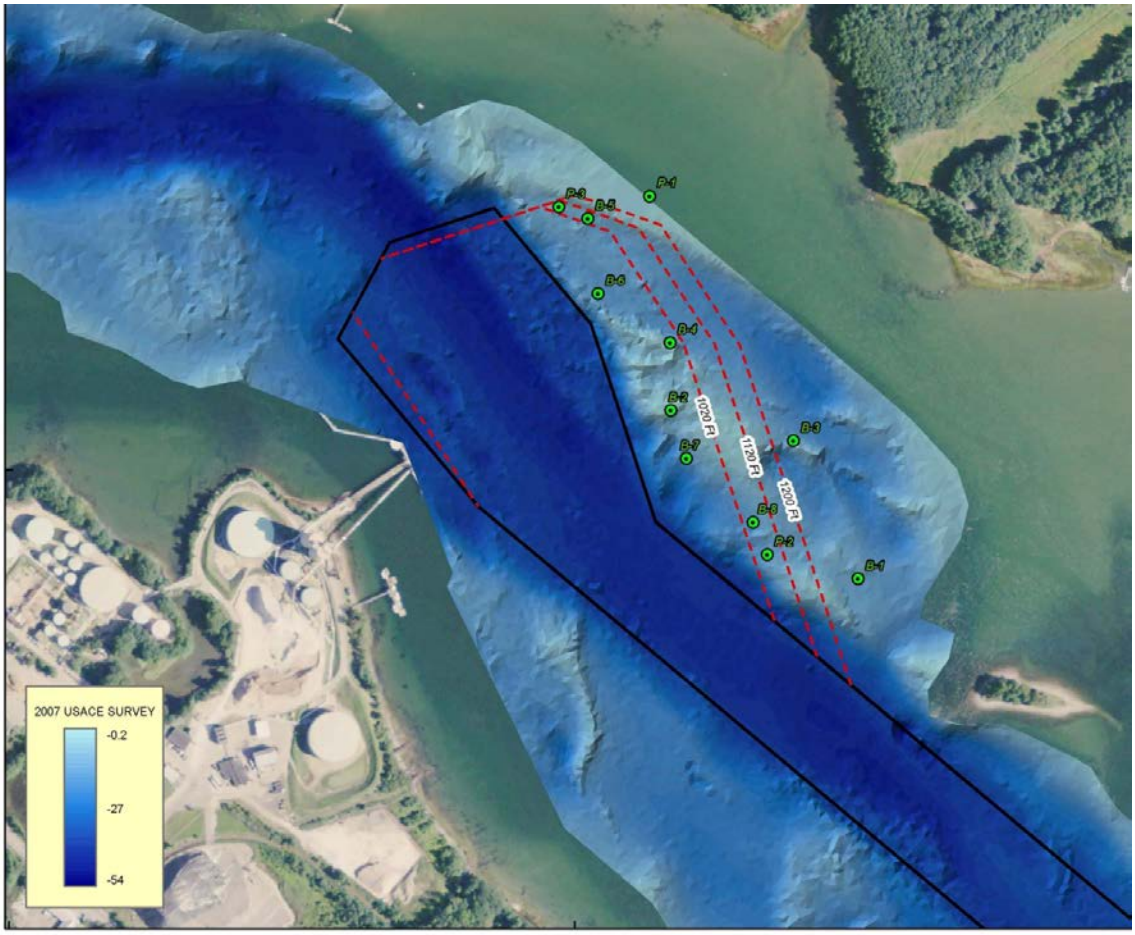


FIGURE EA-5. Location of Borings Collected from the Proposed Expanded Turning Basin in 2007

TABLE EA-4. GRAIN SIZE FOR PISCATAQUA RIVER GRAB SAMPLES – JUNE 2009 -			
Station Number	**% Gravel**	**% Sand**	**% Silt and Clay**
1	--- Sample Not Attainable ---		
2	--- Sample Not Attainable ---		
3	78.0	20.7	1.3
4	--- Sample Not Attainable ---		
5	45.9	53.3	0.8
6	1.1	67.6	31.3
7	14.4	76.9	8.7
8	--- Sample Not Attainable ---		
9	57.0	42.1	0.9
10	41.0	58.1	0.9
11	—	92.9	7.1
12	67.0	31.0	2.0
13	--- Sample Not Attainable ---		
14	11.8	85.4	2.8
15	82.1	16.9	1.0
16	0.8	90.2	9.0
17	5.7	83.4	10.9
18	36.8	61.5	1.7
19	60.9	33.5	5.6
20	Sample Not Attainable ---		
21	3.1	78.4	18.5
22	5.5	87.0	7.5

FIGURE EA-6. Location of Grabs Collected from the Proposed Expanded Turning Basin in 2009

IOS-N: With the exception of Station B, all the grain size data collected from the Isle of Shoals-North disposal site was found to be nearly uniform in composition. These samples contained at least 90% fines, with most samples containing more than 95% fines (silt and clay). See Table EA-5 for the grain size results and Figure EA-7 for the sample locations. Grain size curves can be found in Appendix M. Based on testing data, material at this placement site is much finer than the material to be removed from the proposed expanded turning basin.

TABLE EA-5. GRAIN SIZE FOR ISLE OF SHOALS-NORTH - NOVEMBER 2010 -			
Station	**Depth (ft)**	**% Sand**	**% Silt & Clay**
A	319	2.1	97.9
B	314	20.2	79.8
C	315	2.4	97.6
D	318	3.4	96.6
E	316	3.7	96.3
F	321	2.4	97.6
G	317	3.9	96.1
H	328	7.3	92.7
I	313	2.1	97.9

Nearshore Placement Sites: Grain size was collected from the proposed nearshore placement sites to determine grain size compatibility with the material from the dredge area. Material collected in July 2013 from the Wells, Salisbury, Newburyport, and Newbury nearshore placement sites were found to be nearly uniform in sediment composition and contained approximately 90% or more of medium and fine-grained sand (see Table EA-6 below). The Wells site is the only nearshore site that contained over 98% fine sand. None of the nearshore placement sites contained fine grained material. The material collected from the proposed turning basin is more variable in composition than the nearshore placement sites; it contains some fines (10% or less silt and clay) and gravel. See Appendix N for additional information on the nearshore placement sites.

D. Estuarine Biology

New Hampshire's estuaries are composed of a variety of habitats. They serve as nursery areas for commercially important fish and shellfish species as well as sustaining runs of numerous anadromous species. The primary producers include a diverse community of benthic organisms, seaweeds and eelgrass.

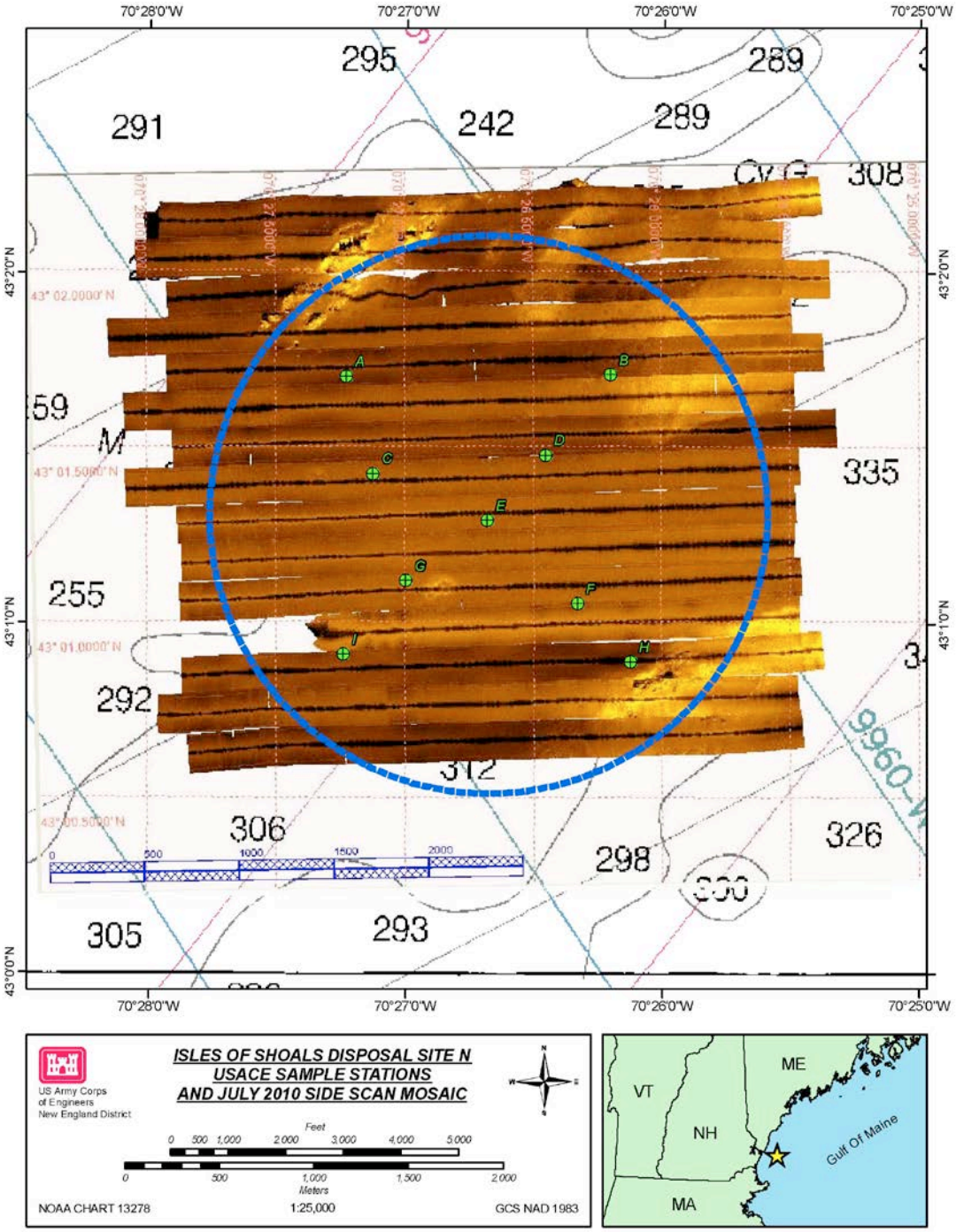


FIGURE EA-7. Sample Locations at the Isle of Shoals-N Dredged Material Disposal Site

TABLE EA-6. GRAIN SIZE RESULTS FOR THE NEARSHORE PLACEMENT SITES - JULY 2013 -					
Station Number	% Fine Gravel	% Sand			% Fines
		Coarse	Medium	Fine	
Wells-A	0.0	0.1	1.0	98.9	0.0
Wells-B	0.2	0.4	1.4	98.1	0.0
Wells-C	0.1	0.0	0.6	99.3	0.0
Wells-D	0.0	0.1	1.2	98.7	0.0
Wells-E	0.5	0.2	0.5	98.8	0.0
Salisbury-A	0.0	0.1	73.2	26.7	0.0
Salisbury-B	0.0	0.0	2.7	97.3	0.0
Salisbury-C	0.0	0.0	74.9	25.0	0.0
Salisbury-D	0.0	0.1	83.1	16.8	0.0
Salisbury-E	0.0	0.0	1.4	98.5	0.0
Newburyport-A	1.6	8.6	85.4	4.4	0.0
Newburyport-B	0.0	0.9	98.1	1.0	0.0
Newburyport-C	0.2	3.2	85.9	10.7	0.0
Newburyport-D	5.1	4.3	36.2	54.5	0.0
Newburyport-E	0.8	2.2	74.1	22.9	0.0
Newbury-A	0.0	0.1	49.1	50.8	0.0
Newbury-B	0.3	0.7	87.2	11.9	0.0
Newbury-C	0.0	0.0	66.0	34.0	0.0
Newbury-D	0.1	0.2	57.2	42.6	0.0
Newbury-E	0.0	0.2	96.5	3.2	0.0

1. Estuarine Vegetation

General: The majority of the salt marsh in the Great Bay Estuary can be found in the lower portions of the Piscataqua River (near Portsmouth Harbor and Little Harbor), the Squamscott River, and in Great Bay (Jones, 2000). A salt marsh fringe is located along the edges of Mast Cove, which is located along the Maine side of the river where the proposed turning basin is proposed.

Seaweeds mapped in Mast Cove are Iris moss *(Chondrus crispus)*, tufted red weed *(Macrocarpus stellatus)* knotted wrack *(Ascophyllum nodosum)* (Jones, 2000).

Eelgrass (*Zostera marina*) is an essential species for the Great Bay Estuary because it is the basis of an estuarine food chain that supports many of the recreationally, commercially and ecologically important species in the estuary and beyond (Short, 2009). Despite its ecological importance, there has been a continuing loss of eelgrass biomass in the estuary. Eelgrass is

primarily found in Great Bay, with limited distribution in Portsmouth Harbor and Little Bay (Short, 2013). Eelgrass distribution continued its long-term trend of decline in the Great Bay Estuary in 2012, with a 37% loss since 1996 (Short, 2013).

Dredge Area: No eelgrass was observed during an eelgrass video survey conducted in the proposed turning basin on October 14, 2008 by staff from the USACE, New England District, and a University of New Hampshire (UNH) eelgrass scientist. This survey included the use of underwater video using a towed camera along several transects within the proposed expansion area of the turning basin. The results of the survey determined that no eelgrass exists in the proposed navigation improvement area.

A second eelgrass survey was conducted in the project area on November 5, 2009 to document the presence/absence of eelgrass in the project area when it was reported by a UNH eelgrass scientist at a NH Dredged Material Task Force Meeting on October 21, 2009 that eelgrass had returned to the proposed project area. Depths in the survey area ranged from five to 24 feet (intertidal to 19 feet adjusted to MLLW). The results of this survey confirmed that no eelgrass was present in the project area. The bottom type consisted of sand with cobble, gravel and shell, with several areas of dense kelp beds. A record of the field survey along with supporting, video survey log, and screen captures from each of the video survey stations can be found in Appendix L.

It has been reported that a new patchy eelgrass bed of 1.6 acres representing an expansion of the seedlings planted in 2011 located off of Adlington Creek exists on the Maine side of the river (Short, 2013). No eelgrass would be expected in the navigation channel due to the depths.

IOS-N: Given the oceanic conditions and associated water depths no salt marsh or submerged aquatic vegetation (eelgrass) exists at the site.

Nearshore Placement Sites: All proposed nearshore placement sites, Wells, Salisbury, Newburyport, and Newbury, were surveyed for eelgrass in July and August of 2013 using hydroacoustic survey transect data which was processed using the SAVEWS Jr. (Submersed Aquatic Vegetation Early Warning System) software package developed by the US Army Engineer Research and Development Center (ERDC) and a video survey. This data was compared with video transect footage to validate the SAVEWS Jr. output and delineate areas of SAV coverage. Appendix N contains additional details on the survey methods and results.

Based on this survey, no eelgrass was observed within any portion of the proposed nearshore placement sites. Any vegetation detected by SAVEWS was found to be either clumps of drift algae or green fleece (*Codium fragile).*

2. Benthic Invertebrates

General: Benthic invertebrates include epibenthos such as motile bottom dwelling taxa (e.g. snails, crabs and lobsters) and sessile taxa that attach to hard substrates (e.g. oysters, barnacles)

as well as infaunal benthos that burrow in the sediments. Environmental conditions that are important in influencing invertebrate occurrence include water depth, substratum, temperature, and salinity. Of these, tidal regulated depth creates a division between intertidal and subtidal populations. Substratum type is also a major determinant of species composition.

Infaunal benthic populations can provide information that is integral to determining the ecological condition of estuaries (Jones, 2000). They are important regulators of the deposition and resuspension of bottom sediments and the exchange of constituents between bottom sediments and overlying water. Because of their burrowing and feeding habits, benthic animals affect the geochemical profiles of sediments and pore waters, particularly in higher salinity habitats with fine grained sediments. Jones (2000) reviewed the data bases on infaunal macrobenthos in the Great Bay Estuary compiled over the past years and found the following results. The data indicate that species richness and dominant species are essentially unchanged over twenty plus years (1972-1995). Biomass and the number of individuals can change dramatically throughout the year, with peaks in both numbers and total biomass occurring in spring and fall. Low summer populations were attributed to predation. Data also found that community composition is determined to a great extent by sediment grain size. Although species dominance can vary spatially and temporally, generally speaking the dominant taxa in the Great Bay Estuary are the polychaetes *Streblospio benedicti*, *Heteromastus filiformis*, *Scolopos sp.*, *Pygospio elegans*, *Aricidea catherinae*, oligochaetes, the amphipod *Ampelisca abdita/vadorum*, and the bivalves *Gemma gemma* and *Macoma balthica*. Abundance, number of taxa and species diversity generally increase with decreasing distance from the open coast, indicating that fewer species are tolerant of the seasonal temperature extremes and daily tidal salinity changes, which can be as much as 18 ppt, in the upper reaches of Great Bay's tidal tributaries.

Dredge Area: To determine benthic community structure and associated potential impact from the proposed project, six benthic samples were collected from the proposed turning basin using a Van Veen (0.04 m^2) grab on September 11, 2007 and passed through a 0.5 mm sieve. See Figure EA 8 for sample locations. A visual inspection of the sediments collected with the grab samples determined that the substrate is composed of coarse sand and gravel. Amphipod species comprised three of the four dominant species making up 79% of the total individuals in the area. The results of the benthic survey are typical of that found in coarse grained sediments. The fourth species was an unidentified Oligochaete. See Appendix L for benthic results.

IOS-N: Benthic samples were collected at nine stations on November 1, 2010 within the proposed Isles of Shoals-North disposal area. At each station, samples for fauna and sediment analyses were retrieved using a 0.04 m^2 modified Van Veen grab (see Appendix M for details). The result of this benthic survey showed that this site is uniform both physically and biologically. Because of the nearly uniform depth of the site, the stations were located in a very narrow depth range and the sediments have very high fine silt/clay content.

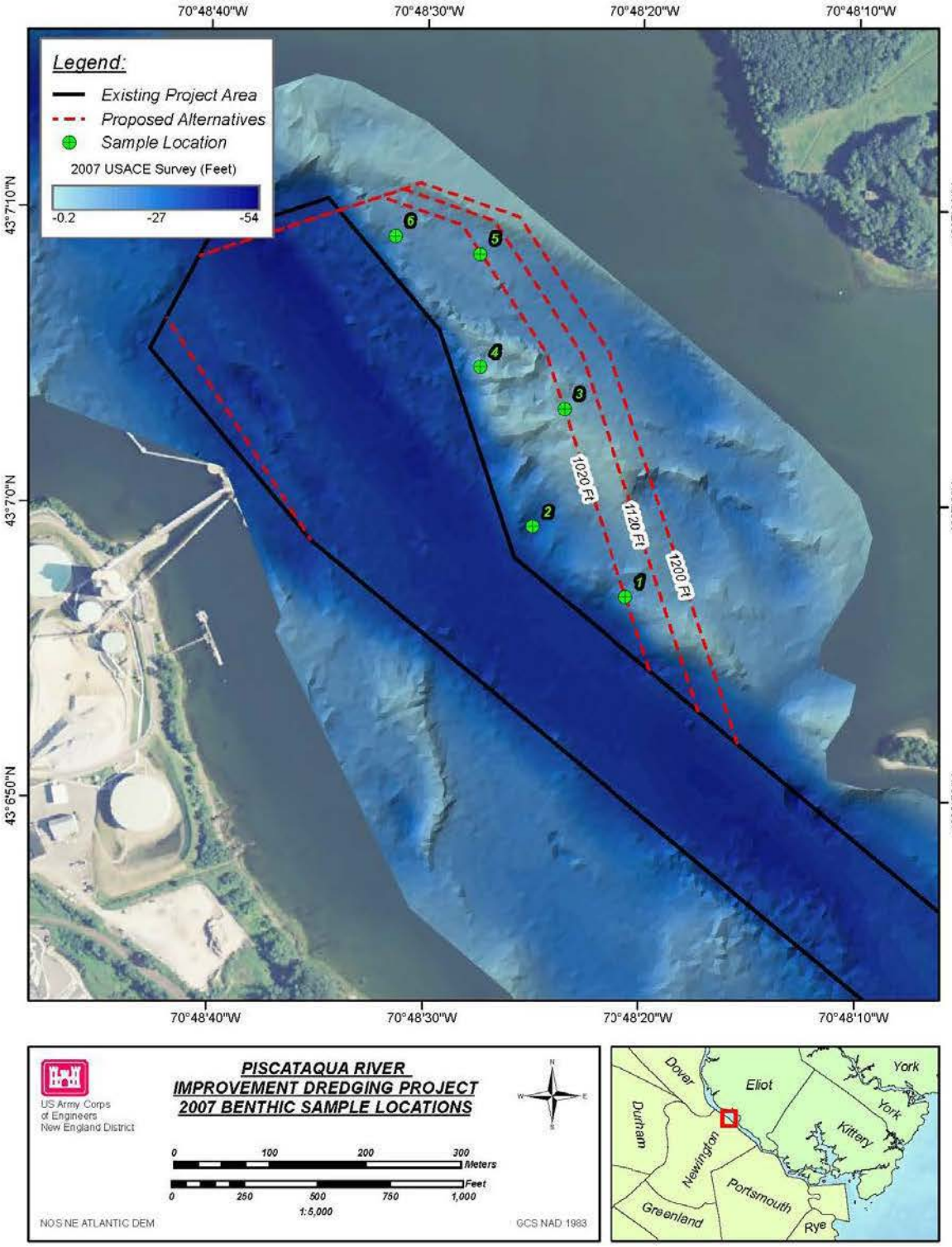


Figure EA-8. Benthic Sample Locations from the Proposed Expanded Turning Basin

The results of the benthic survey indicate that the macroinvertebrate fauna at the IOS-N is limited. The benthic community consists of 40 species representing just four phyla. The assemblage is noteworthy for its lack of oligochaetes, nearly ubiquitous elsewhere, and the absence of echinoderms and colonial species. Polychaetes are the characteristic taxa overwhelmingly dominating the community in terms of numbers of species and individuals. Density is relatively low while the species richness, diversity and evenness, are also at low to modest levels. One species, the polychaete *Paraonis gracilis*, is the numerical dominant at eight of the nine stations.

In summary, the study area is physically homogeneous and inhabited by a limited benthic invertebrate community. Richness, at the species and higher taxonomic levels, and density are low relative to both more inshore and more offshore habitats. Deposit-feeding polychaetes dominate the fauna qualitatively and quantitatively.

Nearshore Placement Site-Wells: Five benthic samples were collected with a Van Veen grab on July 30, 2013. The results of the benthic samples indicated that the benthic community within the nearshore site off Wells Beach was dominated by burrowing amphipods (*Haustorius canadensis*). A wide range of polychaete species were also present. Juvenile razor clams (*Ensis directus*) and commercially important juvenile surf clams (*Spisula solidissima*) were abundant throughout the site. The individuals found at this site represent a sandy nearshore assemblage typical of New England intertidal and shallow subtidal environments (Croker, et al. 1974, Larsen and Doggett, 1990). A complete species list and abundance data from the benthic survey are presented in Table 3 in Appendix N.

Nearshore Placement Site-Salisbury: Five benthic samples were collected with a Van Veen grab on July 31, 2013. The results of the benthic samples indicated that the benthic community within the nearshore site off Salisbury was dominated by burrowing amphipods (*Haustorius canadensis*). A wide range of polychaete species (typically syllids and spionids) were also present. Razor clams (*Ensis directus*) were present in low numbers, while juvenile surf clams (*Spisula solidissima*) were abundant. The individuals found at this site represent a sandy nearshore assemblage typical of New England intertidal and shallow subtidal environments (Croker, et al. 1974, Larsen and Doggett, 1990). A complete species list and abundance data from the benthic survey are presented in Table 5 in Appendix N.

Nearshore Placement Site-Newburyport: Five benthic samples were collected with a Van Veen grab on July 31, 2013. The results of the benthic samples indicated that the benthic community within the nearshore site off Newburyport was dominated by syllid polychaetes (*Brania* sp. and *Exogone dispar*), capitellid polychaetes (*Capitella* sp.), and various species of burrowing amphipods (e.g. *Haustorius canadensis*). Razor clams (*Ensis directus*) and surf clams (*Spisula solidissima*) were also present in low numbers. All clams were juvenile. The individuals found at this site represent a sandy nearshore assemblage typical of New England intertidal and shallow

subtidal environments (Croker, et al. 1974, Larsen and Doggett, 1990). A complete species list and abundance data from the benthic survey are presented in Table 7 in Appendix N.

Nearshore Placement Site-Newbury: Five benthic samples were collected with a Van Veen grab on July 31, 2013. The results of the benthic samples indicated that the benthic community within the nearshore site off of Newbury was dominated by a mix of syllid polychaetes (*Brania* sp. and *Exogone dispar*), capitellid polychaetes (*Capitella* sp.) and oligochaetes. Surf clams (*Spisula solidissima*) were present within the site in low numbers. All surf clams were juvenile. The community found at this site represents a sandy nearshore assemblage typical of New England intertidal and shallow subtidal environments (Croker, et al. 1974, Larsen and Doggett, 1990). A complete species list and abundance data from the benthic survey are presented in Table 9 in Appendix N.

3. Shellfish

The Great Bay Estuary supports populations of eastern oyster *Crassostrea virginica*, European flat oysters *Ostrea edulis*, softshell clams *Mya arenaria*, blue mussels *Mytilus edulis*, razor clams *Ensis directus*, and sea scallops *Placopecten magellanicus* (Jones, 2000). Other common or important crustaceans in the estuary system are American lobster *Homarus americanus*, horseshoe crabs *Limulus polyphemus*, green crabs *Carcinus meanas* and rock crab *Cancer irroratus* (Jones, 2000). Lobsters are fished commercially in all but the upper tidal reaches of the estuaries (Jones, 2000). Adult lobsters undergo a seasonal migration, moving inshore in spring and offshore in fall, though within that time period, they may move about a great deal within estuaries (Dr. S. Jury, pers. comm. *cited in* Jones, 2000). The preferred juvenile settlement substrate is rock-cobble (Wahle and Steneck, 1991 and 1992 *cited in* Jones, 2000).

Dredge Area: During the benthic survey described above in the previous section for the proposed turning basin expansion conducted in September 2007, soft-shell clams were collected at two of the six stations sampled and blue mussels were collected at all six stations sampled. Densities for soft-shell clam ranged from six to eight per sample; the blue mussel density ranged from four to 63 per sample. See Appendix L for shellfish results.

IOS-N: No shellfish of commercial value were recovered from the site during the benthic survey reported above.

Nearshore Placement Site-Wells: As noted above, juvenile razor clams and juvenile surf clams were abundant throughout the site.

Nearshore Placement Site-Salisbury: As noted above, razor clams were present in low numbers, while juvenile surf clams were abundant.

Nearshore Placement Site-Newburyport: As noted above, razor clams and surf clams were present in low numbers. All clams were juvenile.

Nearshore Placement Site-Newbury: As noted above, juvenile surf clams were present within the site in low numbers.

4. Finfish

The Great Bay Estuary supports 52 species of resident and migratory fish (Nelson, 1981) which are listed in Appendix E of Jones, 2000 and in Table EA-7 below. Estuarine species include year round resident such as tomcod, mummichogs, and silversides, seasonal migrants such as bluefish and striped bass, and anadromous fish such as the river herrings, shad and lampreys (Jackson, 1944; Nelson, 1981, 1982; Sale et al., 1992; Jury et al., 1994 *cited in* Jones, 2000). Fishways constructed on the Cocheco (2), Exeter (2), Oyster, and Lamprey Rivers and dam removal on the Winnicut River in the Great Bay Estuary have enabled populations of several anadromous species to rebound. However, some species such as the Atlantic salmon and shad have not successfully been reestablished, despite stocking efforts for Atlantic salmon and shad. Commercially and recreationally important species include, smelt, winter flounder, smooth flounder, and striped bass (Jones, 2000).

As mentioned above, this area also serves as habitat for a number of anadromous fish species, including blueback herring, alewife, American shad, rainbow smelt, striped bass. The catadromous species, American eel is also present. These species are present in the Piscataqua River and in the vicinity of the Portsmouth Harbor during spawning migrations (NMFS letter dated May 27, 2008).

Smelt, followed by alewives and blueback herring, were the most abundant anadromous fish captured during the Newington Generating Station Study (ACOE, 1983). Smelt enter Great Bay estuary in late fall and winter and move up and down river channels with the tides. In spring, after ice-out, spawning occurs in the tributaries. Adults then return to more saline water and eventually leave the estuary.

Alewives move into the bay and freshwater tributaries to spawn from late April or early May through June; blueback spawn at or just above tidewater during this period. Striped bass are in the estuary from late June through September.

New Hampshire estuaries also serve as an important nursery area from many recreationally and commercially important marine species, as well as many forage fish that they feed upon. A juvenile finfish beach seine survey has been conducted on a monthly basis from June to November since 1997 in New Hampshire estuaries (NH Marine Fisheries, 2007). Species collected in 2007 from the fixed location station closest to the turning basin, and with similar substrate as the turning basin, include alewife, green crab, winter flounder, red hake, Atlantic menhaden, little sculpin (grubby), Atlantic silverside, rainbow smelt, and ninespine stickleback (NH Marine Fisheries, 2007). Relative abundance indices for this station, calculated as the geometric mean catch per seine haul, were Atlantic silversides with 28% of the catch, followed by green crab and rainbow smelt.

TABLE EA-7. FINFISH SPECIES OF GREAT BAY ESTUARY (Nelson, 1981)			
Species	**Common Name**	**Species**	**Common Name**
MARINE		*Menidia menidia*	Atlantic silverside
Acipenser oxyrhynhus	Atlantic sturgeon	*Myoxocephalus aenaeus*	Grubby
Ammodytes americanus	American sand lance	*Fundulus heteroclitus*	Common mummichug
Scopthalmus aquosus	Windowpane	*Fudulus majalis*	Striped mummichog
Alosa aestivalis	Blueback herring	*Microgadus tomcod*	Atlantic tomcod
Alosa pseudoharengus	Alewife	*Apeltes quadracus*	4-spine stickleback
Alosa sapidissima	American shad	*Gasterosteus aculeatus*	3-spine stickleback
Brevoortia tyrannus	Atlantic menhaden	*Pungitius pungitius*	9-spine stickleback
Clupea harengus harengus	Atlantic herring	*Morone americanus*	White perch
Hemitripterus americanus	Sea raven	*Petromyzon marinus*	Sea lamprey
Cyclopterus lumpus	Lumpfish	*Liopsetta putnami*	Smooth flounder
Gadus morhua	Atlantic cod	*Pseudopleuronectes americanus*	Winter flounder
Pollachius virens	Pollock	*Syngnathidae fuscus*	Northern pipefish
Urophycis chuss	Red hake	**FRESHWATER**	
Urophycis tenuis	White hake	*Catastomus commersoni*	White sucker
Tautogolabrus adspersus	Cunner	*Lepomis gibbosus*	Pumpkinseed
Osmerus mordax	Rainbow smelt	*Lepomis macrochirus*	Bluegill
Pholis gunnellus	Rock gunnel	*Micropterus dolomieui*	Smallmouth bass
Pomatomus saltatrix	Bluefish	*Micropterus salmoides*	Largemouth bass
Raja erinacea	Little skate	*Notemigonus crysoleucas*	Golden shiner
Raja ocellata	Winter skate	*Notropis hudsonius*	Spottail shiner
Oncorhynchus kisutch	Coho salmon (i)	*Semotilus corporalis*	Fallfish
Oncorhynchus tshawytscha	Chinook salmon (i)	*Esox niger*	Chain pickerel
Salmo salar	Atlantic salmon	*Ictalurus nebulosus*	Brown bullhead
Centropristis striata	Black sea bass	*Perca flavescens*	Yellow perch
ESTUARINE		*Oncorhynchus mykiss*	Rainbow trout
Anguilla rostrata	American eel	*Salvelinus fontinalis*	Brook trout

(i) Introduced Species, no longer present (NH Fish and Game, 1981)

Since 2000, an inshore trawl survey has been conducted in the spring and fall by the NH Fish and Game Department and the Maine Department of Marine Resources (NH Fish and Game, 2013). Silver hake was the dominant species collected during the spring and fall 2012 survey in Region 1 (NH and southern ME) in the 36-55 fathom (216-330 feet) depth stratum. American plaice and alewife were the other two of the top 5 dominant species collected during both the spring and fall surveys. The two other dominant species collected only in the spring were the bristled longbeak and the American lobster. The two other dominant species collected in the fall were the longfin squid and Atlantic herring. Shrimp were not included as a dominant species.

5. Wildlife

Portsmouth Harbor is surrounded by a combination of industrial, commercial, and recreational land uses. Some wetlands do exist and provide habitats for reptiles, amphibians and mammals. Harbor seals *Phoca vitulina* can be found throughout the Great Bay Estuary, but they and the harbor porpoises *Phocoena phocoena* are more frequent in the lower portions of the estuary (Jones, 2000). Harbor seals can be found from November through April, most often during March and April. They were sighted most often in Little Bay, with infrequent sightings in Great Bay and the Piscataqua River (Jones, 2000).

Great Bay is part of the Atlantic flyway and an important migratory stopover as well as wintering area for many waterfowl and wading birds. As a result, there are both substantial seasonal and year round populations of waterfowl throughout the Great Bay area. Common species include cormorants, Canada geese, bald eagles, sea gulls, terns, ducks, herons, snowy egrets, common loons and a large variety of perching birds (Jones, 2000).

E. Threatened and Endangered Species

1. Federally Listed Species

The following Federally listed threatened or endangered species under the jurisdiction of NOAA Fisheries (based on letters received on September 2, 2011 and November 15, 2013), may occur in the project area for: fish species, the endangered shortnose sturgeon (*Acipenser brevirostrum*), and Atlantic salmon (*Salmo salar*), and the threatened Gulf of Maine (GOM) Distinct Population Segment (DPS) of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*); for sea turtles, endangered leatherback (*Dermochelys coriacea*), Kemp's ridley (*Lepidochelys kempii*), and green (*Chelonia mydas*) turtles, and the threatened loggerhead *(Caretta caretta*); listed whale species include the endangered North Atlantic right whale (*Eubalaena glacialis*), humpback whale (*Megaptera novaeangliae*), fin whale (*Balaenoptera physalus*), and sei whale (*Balaenoptera borealis*). The following habitat information for these species is taken from the above mentioned letters.

Shortnose sturgeon occur along the U.S. Atlantic coast. Available information on shortnose sturgeon indicates that they make coastal migrations with the Gulf of Maine (i.e. between the Merrimack and Kennebec Rivers) and make at least occasional short visits to Great Bay. Based

on patterns of detections by acoustic receivers in Great Bay, it is thought that shortnose sturgeon visit Great Bay at least during the spring and fall; although there is no known spawning in the Piscataqua River. Habitat within the dredge area appears to be consistent with shortnose sturgeon foraging habitat and given the detection of shortnose sturgeon in Great Bay, NOAA Fisheries believes it is reasonable to expect that at least some individual shortnose sturgeon will be present in Piscataqua River from the spring through the fall and may be engaged in foraging. Migrating shortnose sturgeon may be present in the nearshore areas of the Gulf of Maine. No tagged shortnose sturgeon was detected at a deployed buoy in the vicinity of the potential IOS-N site.

The marine range for Atlantic sturgeon includes all marine waters, plus coastal bays and estuaries from Labrador, Canada to Cape Canaveral, Florida. An Atlantic sturgeon was detected as recently as June 2012 in Great Bay. The best available information indicates that suitable habitat for Atlantic sturgeon spawning and rearing does not occur in the lower Piscataqua River because of relatively high salinities. Occasional subadult Atlantic sturgeon could be present in the Piscataqua River while foraging between spring and fall if suitable forage habitat is present. Because of the lack of spawning and rearing habitat, the dredge area should only be considered a migratory corridor for both sturgeon species. Most detections occurred in the spring (March 2010) with one detection in mid-June 2009. However, Atlantic sturgeons do not overwinter in their natal streams so they may occur in the dredge area regardless of season or time of year.

Tagged Atlantic salmon from Penobscot Bay, Maine were detected heading south prior to heading offshore to northern waters off Greenland. Tagged smolts were detected near a buoy located off of Rockland, Maine.

No tagged shortnose sturgeon or Atlantic salmon have been detected near the buoy deployed in the vicinity of the potential project disposal site IOS-N.

Sea turtles occur in New England waters during the warmer months when water temperatures are above 15^0 C. The sea turtles in these waters are generally small juveniles with the most abundant being the leatherback, loggerhead, green, and Kemp's ridley. However, Kemp's ridley are rare in waters north of Massachusetts and only leather back or loggerhead sea turtles are likely to occur in coastal New Hampshire and Maine waters. Sea turtles move into waters of the Gulf of Maine from their southern wintering grounds in late June/July and most sea turtles move south from these waters by the first week of November. The highest numbers of sea turtles are present in these waters between July and October. Sea turtles generally do not occur in the area where dredging and blasting will occur, and are also not likely to be present at the placement sites or along the transit routes during the environmental window.

Whales occur in the offshore waters of Maine, New Hampshire and Massachusetts. Due to the riverine nature of the dredge area, the shallow depths of the nearshore placement sites and transit

routes, no listed whale species are expected to occur in these areas. At the IOS-N site, right whales, as well as occasional humpback whales and fin whales could be present.

The Atlantic Coast population of piping plover, which breeds on sandy beaches along the east coast of North America from Newfoundland to South Carolina, was designated as Federally threatened under the provisions of the Endangered Species Act of 1973 (ESA), as amended on January 10, 1986. Piping plovers are present on New England beaches during the breeding season, generally between March 15 and August 31. These territorial birds nest above the high tide line on sandy ocean beaches on gently sloping fore-dunes, blowout areas behind primary dunes, wash-over areas cut into or between dunes, and the ends of sand spits. Piping plover nests consist of a shallow scrape in the sand, frequently lined with shell fragments and often located near small clumps of vegetation. Females lay four eggs that hatch in about 25 days and surviving chicks learn to fly (fledge) after about 25 to 35 days. The flightless chicks follow their parents to feeding areas, which include the intertidal zone of ocean beaches, ocean wash-over areas, mud flats, sand flats, wrack lines (organic ocean material left by high tide), and the shorelines of coastal ponds, lagoons, and salt marshes.

The red knot was proposed to be listed as a threatened species on September 30, 2013 by the U.S Fish and Wildlife Service (FWS). There is currently no legal obligation to conference on candidate or other species being considered for listing such as the red knot, but the FWS strongly encourages consideration of these species during project planning to avoid potential future project delays.

The red knot migrates annually between its breeding grounds in the Canadian Arctic and several wintering regions, including the Southeast United States (Southeast), the Northeast Gulf of Mexico, northern Brazil, and Tierra del Fuego at the southern tip of South America. During both the northbound (spring) and southbound (fall) migrations, red knots use key staging and stopover areas to rest and feed. The coast of Massachusetts is one of the important fall stopovers; however, large and small groups of red knots, sometimes numbering in the thousands, may occur in suitable habitats all along the Atlantic and Gulf coasts during migration. Habitats used by red knots in migration and wintering areas are similar in character, generally coastal marine and estuarine habitats with large areas of exposed intertidal sediments. In North America, red knots are commonly found along sandy, gravel, or cobble beaches, tidal mudflats, salt marshes, shallow coastal impoundments and lagoons, and peat banks (Federal Register, vol. 78, no. 189). No critical habitat for red knots is proposed in the project area (U.S. Fish and Wildlife Service letter dated January 24, 2014).

2. State Listed Species

Maine: Marine species that utilize the aquatic habitat off the coast of Maine and are State listed as endangered or threatened are the right whale, humpback whale, finback whale, sperm whale and sei whale, leatherback, Atlantic ridley and loggerhead turtles, as well as shortnose sturgeon.

All are listed as endangered except the loggerhead turtle which is listed as threatened (Maine revised statues, Title 12, Part 9, Chapter 631).

The proposed nearshore placement of dredged material off of Wells Beach is in the vicinity of Maine's endangered roseate tern and the breeding habitat of piping plover. The red knot is listed as a species of special concern in Maine. Species of special concern is any species that does not meet the criteria of an endangered or threatened species but is particularly vulnerable, and could easily become, an endangered, threatened, or extirpated species due to restricted distribution, low or declining numbers, specialized habitat needs or limits, or other factors.

New Hampshire: No State listed rare species have been recorded at the dredge site (NH Natural Heritage Bureau, December 4, 2013).

Massachusetts: The proposed nearshore placement of dredged material in the vicinity of Newbury, Newburyport and Salisbury will occur within the foraging habitat of the least tern (*Sternula antillarum*) and common tern (*Sterna hirundo*), and is in close proximity to breeding habitat for piping plover (*Charadrius melodus*). Both tern species are State-listed as "Special Concern" and the piping plover is State-listed as "Threatened". The piping plover is also Federally protected as "Threatened" pursuant to the U.S. Endangered Species Act (ESA, 50 CFR 17.11).

F. Essential Fish Habitat

The 1996 amendments to the Magnusson-Stevens Fishery Conservation Management Act strengthen the ability of the National Marine Fisheries Service and the New England Fishery Management Council to protect and conserve the habitat of marine, estuarine, and anadromous finfish, mollusks, and crustaceans. This habitat is termed "essential fish habitat", and is broadly defined to include "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity."

Dredge Area: Managed species listed for the 10' x 10' square of latitude and longitude which includes Piscataqua River are: Atlantic salmon *Salmo salar* (juveniles, adults), Atlantic cod *Gadus morhua* (juveniles, adults), haddock *Melanogrammus aeglefinus* (eggs, larvae), pollock *Pollachius virens* (eggs, larvae, juveniles, adults), whiting *Merluccius bilinearis* (juveniles, adults), red hake *Urophycis chuss* (eggs, larvae, juveniles, adults), white hake *Urophycis tenuis* (eggs, larvae, juveniles, adults), winter flounder *Pleuronectes americanus* (eggs, larvae, juveniles, adults), yellowtail flounder *Pleuronectes ferrugineus* (larvae, adults), windowpane flounder *Scophthalmus aquosus* (eggs, larvae, juveniles, adults), American plaice *Hippoglossoides platessoides* (adults), Atlantic halibut *Hippoglossus hippoglossus* (eggs, larvae, juveniles, adults), Atlantic sea scallop *Placopecten magellanicus* (eggs, larvae, juveniles, adults), Atlantic sea herring *Clupea harengus* (larvae, juveniles, adults), bluefish *Pomatomus saltatrix* (juveniles, adults), Atlantic mackerel *Scomber scombrus* (eggs, larvae, juveniles), and bluefin tuna *Thunnus thynnus* (adults).

IOS-N: Managed species listed for the area that includes the IOS-N are: Atlantic cod (eggs, larvae, juveniles, adults), haddock (juveniles, adults), pollock (eggs, larvae, juveniles), whiting (eggs, larvae, juveniles, adults), red hake (eggs, larvae, juveniles, adults), white hake (eggs, larvae, juveniles, adults), redfish *Sebastes fasciatus* (larvae, juveniles, adults), witch flounder *Glyptocephalus cynoglossus* (juveniles), winter flounder (eggs, larvae, juveniles, adults), yellowtail flounder *Pleuronectes ferruginea* (eggs, larvae, adults), windowpane flounder (eggs, larvae, juveniles, adults), American plaice (juveniles, adults), Atlantic halibut (eggs, larvae, juveniles, adults), Atlantic sea scallop (eggs, larvae, juveniles, adults), Atlantic sea herring (juveniles, adults), monkfish *Lophius americanus* (eggs, larvae, juveniles, adults), scup *Stenotomus chrysops* (juveniles, adults), ocean quahog *Artica islandica* (juveniles, adults), spiny dogfish *Squalus acanthias* (juveniles, adults), and bluefin tuna (adults).

Nearshore Placement Site – Wells: Managed species listed for the Wells Beach nearshore placement area are: Atlantic cod (adult), whiting (adult), white hake (juvenile, adult), winter flounder (eggs, larvae, juveniles, adults, spawning adults), yellowtail flounder (larvae, adults), windowpane flounder (eggs, larvae, juveniles, adults, spawning adult), American plaice (juveniles, adults), Atlantic halibut (eggs, larvae, juveniles, adults), Atlantic sea scallop (eggs, larvae, juveniles, adults), Atlantic sea herring (larvae, juveniles, adults), bluefish (juveniles, adults), and bluefin tuna (adults).

Nearshore Placement Sites – Salisbury, Newburyport, and Newburyport: Managed species listed for the Salisbury, Newburyport and Newbury nearshore placement areas are: Atlantic cod (eggs, larvae), pollock (juveniles), red hake (eggs, larvae, juveniles), winter flounder (eggs, larvae, juveniles, adults), windowpane flounder (eggs, juveniles, adults), Atlantic sea scallop (eggs, larvae), Atlantic mackerel (eggs, juveniles, adults), surf clam *Spisula solidissima* (juveniles, adults), and bluefin tuna *Thunnus thynnus* (juveniles, adults).

See Appendix P for a list of the EFH managed species and their life history.

G. Special Reserves/Places

Although the New Hampshire coastline is short in length, it is supported by several Federal, State, and local initiatives to protect and enhance its coastal and estuarine environment. The Great Bay, located upstream of the project area, was designated in 1989 as a National Estuarine Research Reserve. The National Estuarine Research Reserve System is a network of 27 areas representing different biogeographic regions of the United States that are protected for long-term research, water-quality monitoring, education and coastal stewardship. Established by the Coastal Zone Management Act of 1972, as amended, the reserve system is a partnership program between the National Oceanic and Atmospheric Administration and the coastal states. NOAA provides funding, national guidance and technical assistance. Each reserve is managed on a daily basis by a lead State agency or university, with input from local partners. In the case of Great Bay, it is managed by the New Hampshire Department of Fish and Game.

The Piscataqua River is also a component of the Piscataqua Region Estuaries Partnership (PREP), a U.S. Environmental Protection Agency National Estuary Program. The National Estuary Program is a joint local/State/Federal program established under the Clean Water Act with the goal of protecting and enhancing nationally significant estuarine resources. The PREP strives to:

- Improve the water quality and overall health of the region's estuaries;
- Support regional development patterns that protect water quality, maintain open spaces and important habitat, and preserve estuarine resources;
- Track environmental trends though implementation of a long-term monitoring program to assess indicators of estuarine health, and;
- Develop broad-based popular support for the implementation of the Management Plan by encouraging involvement of the public, local government, and other interested parties in its implementation.

Wells Harbor in Maine is also located adjacent to the Wells Reserve National Estuarine Reserve established in 1986 as well as the Rachael Carson National Wildlife Refuge.

H. Air Quality

Ambient air quality is protected by Federal and State regulations. The U.S. Environmental Protection Agency (EPA) has developed National Ambient Air Quality Standards (NAAQS) for certain air pollutants, with the NAAQS setting concentration limits that determine the attainment status for each criteria pollutant. The six criteria air pollutants are carbon monoxide, lead, nitrogen dioxide, particulate matter (PM_{10} ad $PM_{2.5}$), ozone, and sulfur dioxide.

The U.S. Army Corps of Engineers guidance on air quality compliance is summarized in Appendix C of the Corps Planning Guidance Notebook (ER 1105-2-100, Appendix C, Section C-7). Section 176 (c) of the Clean Air Act (CAA) requires that Federal agencies assure that their activities are in conformance with Federally-approved CAA State Implementation Plans (SIP) for geographic areas designated as non-attainment an maintenance areas under the CAA. The EPA General Conformity Rule to implement Section 176 (c) if found in 40 CFR Part 93.

Clean Air Act compliance, specifically with EPA's General Conformity Rule, requires that all Federal agencies, including the Department of the Army, to review new actions and decide whether the actions would worsen an existing NAAQS violation, cause a new NAAQS violation, delay the SOP attainment schedule of the NAAQS, or otherwise contradict the State's SIP.

I. Cultural Resources

The current inventory of known pre-contact site documents a lengthy sequence of Native American settlement in coastal Maine. The region has been home to human populations for more than 10,500 years. The archaeological record of this area suggests a history that is dynamic and complex which is strongly linked to the resource rich ocean and the region's major rivers,

including the Piscataqua. The importance of the sea to Maine's Native peoples continued even long after the initial contact period, as Native mariners were quick to adopt European nautical technologies and use sailing vessels for conducting trade and warfare far from their home territories. Far from presenting an obstacle to significant cultural contacts with other regions, the ocean and Maine's coastlines in particular, actually appear to have facilitated inter-regional interaction among Native peoples.

The initial documented European incursions up the Piscataqua were those of Englishmen Martin Pring in 1603 and John Smith in 1614. Before English settlers arrived on the shore of the Piscataqua, there were active fishing communities on the abutting offshore islands. European settlement of Eliot was initiated in the 1630s through a series of land grants stemming from a charter by King James. The area's early settlers established riverfront farms and extracted timber from the interior.

As settlement increased, dams and mills were built at strategic points along the river to harness and control its power. Abundant clay deposits along the river's banks were also utilized for brick-making. Shipbuilding and repair became increasingly important during and after the Revolutionary War, until eclipsed by larger harbors such as Boston and New York.

By the late nineteenth century, tourism began to replace most traditional economic activities in the area, as summer visitors were drawn to the coast for its cool climate, beaches, scenic shores, and relative lack of development.

The Piscataqua River project area and its surrounding environs fit the prevailing predictive model as a productive ecological zone that would have been highly attractive for pre-contact land use from the Archaic Period through the Contact Period. No pre-contact, contact or post-contact sites have been identified within the underwater study area. For stratified archaeological deposits preserved in meaningful contexts to exist within the Piscataqua River study area, intact elements of the paleo-land surface in which they were deposited must be present. Such deposits would need to have survived the post-glacial marine transgression of the Piscataqua River valley and the subsequent disturbances from the river's fluvial processes and/or human activities. Recognizing the erosional effects of the river's extremely strong tidal flow, the Piscataqua River project area is considered to possess a low potential for containing formerly terrestrial archaeological deposits of the pre-contact period. Instead, it would be more probable that pre-contact Native American archaeological deposits present in the study area would be of a maritime nature (e.g., watercraft or fishing weirs) and date to the later pre-contact periods.

The project area was determined to have a moderate archaeological potential for post-contact or historic period archaeological resources. These potential resources could be small vessels and/or the remains of coastal structures.

J. Socioeconomic Resources

Based on the 2010 U.S. Census, the Town of Newington, New Hampshire has a population of 753 people, contained 322 housing units, and had a median household income of $72,500 from 2008 to 2012. From 2008-2012, 6.4% of individuals lived below the poverty level. Over 82 percent of the population is 18 years of age or older and a median age of 47.9 years old. Ninety-six percent of the population is white.

According to the 2010 U.S. Census, the Town of Eliot, Maine has a population of 6,204 people, contains 2,669 housing units, and had a median household income of $75,904 from 2008-2012. From 2008-2012, 5.2% of individuals lived below the poverty level. The median age is 45 years old; over 78 percent of the population is 18 years of age or older. Nearly 97 percent of the population is white.

Both towns are located near the city of Portsmouth, New Hampshire, a major shipping and commercial center, with a population of nearly 21,000 people according to the 2010 U.S. Census. Over 83 percent of the population is 18 years or older and over 91 percent of the population is white. The median household income from 2008-2012 was $65,347 with 7.8% of the population living below the poverty level.

VII. ENVIRONMENTAL CONSEQUENCES

A. Impacts of Dredging

Dredging about 730,000 cubic yards of coarse gravel and sand from the turning basin in the Piscataqua River would be performed by a mechanical dredge. The potential impacts of dredging and disposal on water quality and biological resources in the area are addressed below.

1. Water Quality

Ward (1994) measured the suspended sediment concentrations in the lower estuary (Portsmouth Harbor) and near the mid-estuary (Dover Point) over a number of tidal cycles in July, 1992. The concentrations were low and varied little across the channel and with depth in Portsmouth Harbor. The total suspended sediment concentrations ranged from 1.1 to 3.7 mg/l over a complete tidal cycle at the mouth of the Harbor and from 1.5 to 5.9 mg/l at a cross-section near Seavey Island. Similarly, Shevenell (1974 *cited in* Jones, 2000) found suspended sediment concentrations were generally less than 3 mg/l at a station in the mouth of the Piscataqua River in 1972-1973, except during winter when concentrations exceeded 6 mg/l. According to Shevenell (1974 *cited in* Jones, 2000), the main sources of particulate matter in the coastal shelf waters adjacent to the Piscataqua River were biological productivity, resuspension of bottom sediments and estuarine discharge from the Piscataqua River. Shevenell (1974 *cited in* Jones, 2000) also noted particulate matter concentrations fluctuated seasonally and spatially due to meteorological effects (e.g., storms, high river discharges). Total suspended sediment concentrations were higher in the mid-estuary, ranging from 2.4 to 12.7 mg/l over a tidal cycle at a cross-section at Dover Point in July, 1992 (Ward, 1994). The increase in total suspended

sediments in the mid-estuary over the concentrations measured near the mouth reflects the impact of higher suspended sediment inputs from the upper estuary (e.g., Great Bay, upper Piscataqua River, tributaries). The spatial pattern of the total suspended sediment concentrations from the mouth of the estuary in Portsmouth to the upper estuary is reflected in the results of transects run in July, 1992 (Ward, 1994). The concentrations measured at high tide or early ebb tide ranged from 1.3 mg/l at the mouth to 17.7 mg/l at the entrance to the Squamscott River. Concentrations along the same transect run at low tide and during the early flood ranged from 2.4 mg/l to over 50 mg/l at the Squamscott River.

Dredging operations will have no significant long-term impact on turbidity levels or water column chemistry, since the material is clean sand and gravel. The removal of material from the expanded turning basin in the Piscataqua River will resuspend sediments into the water column. This will result in slight localized increases in turbidity during the dredging operation. The amount of turbidity generated during dredging operations depends on the sediment characteristics, ambient currents and the skill of the dredge operators. Given the coarse grained nature of the material to be dredged these increases are expected to be of short duration.

A clam shell dredge typically releases about 1.5 to 3% of the sediment volume in each bucket load, producing suspended solid concentrations on the order of 100 to 900mg/1 in the immediate vicinity of the dredge and declining rapidly with distance from the dredge (Bohlen *et al*. 1979; WES, 1986). A hopper dredge generates similar suspended solid concentrations (250 to 700 mg/1). Although suspended solid concentrations at the cutterhead are usually less than that of the clam shell, barge overflow reintroduces fine sediment to the water column and turbidity impacts are generally less localized. Because of the coarse nature of the sediment (<l% fines) turbidity impacts associated with dredging are not likely to be significant.

The majority of the material from the expanded turning basin consists of coarse sand, and any overflow would therefore settle rapidly. Most of the material would settle out within a couple of hours. The small amount of suspended sediments that would remain in the water column would not exceed natural turbidity levels typical of estuaries (see section V.B.1). The strong currents of the Piscataqua River may carry the turbidity plume beyond the immediate vicinity of the dredging area, but due to the minor amount of material likely to be re-suspended, the impact of any turbidity plume would likely be minimal.

The effects of dredging on the water column chemistry will be minimal (are likely to be minor). The material to be dredged is considered to be uncontaminated because water quality in the area is high and because the shoal area is a relatively high energy sandy environment with a low percentage of fines. Therefore little release of sediment contaminants into the water column is expected. There should be no significant long-term degradation of Class B waters.

2. Effects on Marine Organisms

Potential impacts of dredging on marine organisms is restricted to physical effects, as dredging operations will likely have little, if any, impact on water column chemistry.

Benthic organisms inhabiting the dredging area would likely suffer mortality as a result of the dredging process. Turbidity plumes from dredging may also impact adjacent habitat. The amount of impact would be dependent on the spatial and temporal size of the plume. As the material is generally coarse-grained sand and gravel, a large or substantial turbidity plume is not expected. Dredging is not expected to take longer than approximately six months and will occur during the colder months of the year when biological productivity is low. Recolonization following dredging should take place within weeks to months or one to two years (Guerra-Garcia, et. al., 2003; http://www.ukmarinesac.org.uk/activities/ports/ph5_2_2.htm) depending on time of year. Any temporary loss of fish foraging area would be extremely localized and short-lived.

The only commercial shellfish species that were found in the dredging area were the soft shell clam and the blue mussel. These resource species would be impacted by direct removal of the individuals and their habitat. Softshell clams along the intertidal banks of the Piscataqua River would not be impacted by dredging operations as any increases in turbidity levels would be short-lived and localized. Also, softshell clams spawn in the area during two periods, spring and last summer-fall (Jones, 2000). Blue mussels' peak spawning period is June through August (Jones, 2000). The proposed dredge window would occur outside the shellfish spawning season. The new exposed substrate is expected to be physically similar to the pre-existing substrate; thereby providing the same firm substrate for blue mussel settlement and softshell clam recruitment.

More motile forms (e.g. lobsters and crabs) would be expected to have the ability to avoid the work area resulting in minimal impacts (and should not be seriously affected by dredging). Localized elevations in turbidity generated by the dredging may result in lobsters temporarily vacating the project area for short periods of time. Lobsters begin migrating into the Great Bay Estuary in late spring and well into the estuary in the summer and early fall (Jones, 2000). Lobster larvae are likely to be abundant from May through July. Lobster juveniles may overwinter in the lower Piscataqua River and coastal area of New Hampshire in their preferred habitat of rock-cobble bottom; although they can also be found in shallow subtidal and the deepest areas of the channel areas of the estuary (Jones, 2000). Restricting the dredging operations to the mid-October to mid-April window will minimize impacts to lobsters and shellfish peak spawning periods.

Approximately 9.3 acres of shallow water habitat (depth less than -13 feet MLW) would be impacted with the new proposed project depth of -35 feet MLLW plus overdepth. Shallow water habitats are thought to be important nursery areas for post-larval and juvenile fish and shellfish (Ray, 2005). Dredging will have the direct impact of sediment removal and the deepening of the

habitat. This may affect some estuarine fish and shellfish that are dependent on shallow water habitat for predation refuge (Ray, 2005). While some loss of shallow water habitat will occur, other areas along the Piscataqua River and within Great Bay can serve as refuge for these estuarine species. As noted above, benthic recolonization should occur in relatively short periods of time to return the area as a food source for estuarine fish.

Dredging can be conducted without significant impacts to anadromous fisheries. The timing of the dredging operation avoids spring runs of anadromous fish (alewife, April - June; American shad, May - June; blueback herring, May - June; smelts, April – June). Striped bass spawn in the estuary in June and early July. The presence of Atlantic salmon is uncommon in coastal New Hampshire (Jones, 2000). Restricting dredging and disposal to the mid-October to mid-April window would avoid any impacts to these anadromous fish species. Turbidity impacts would be short-lived and localized. Due to the width of the river, fish would be expected to be able to avoid the work area. Overall, no or minimal impacts to finfish are expected.

B. Impacts of Blasting

Approximately 25,000 cy of rock could be removed by blasting in order to achieve the required depths in the expanded turning basin. Potential aquatic impacts associated with blasting include noise, thermal energy release, increased turbidity, all of which are expected to be minor and temporary in nature given the actions to be taken to mitigate impacts for this project. Blasting impacts to resources could be realized from vibrations, explosion-induced surface water waves, or air overpressure. Measures to be taken to minimize blasting impacts to resources in the project area are noted further below in this section.

Any impacts to aquatic populations would be localized and temporary, with the most pronounced effect on aquatic species in the immediate vicinity. The effect of blasting on hard-bodied invertebrates would tend to be less than soft-body invertebrates except in the immediate vicinity of the blast. Damage to hard-bodied invertebrates near the blast site might include cracked or broken shells and carapaces. Soft-bodied invertebrates in the immediate vicinity of the blast would be killed; while populations of invertebrates further from the blast would sustain less damage. Long term impacts are not expected.

The extent of damage to fish populations depends primarily on the proximity to the blast and the presence or absence of a swim bladder. Fish with swim bladders (e.g., Atlantic herring) will be unable to adjust to the abrupt change in pressure propagated by the blast. If they are within a zone of influence, fish with swim bladders may be injured or killed. Fish without swim bladders (e.g., winter flounder) are less likely to be injured, and would likely sustain injuries only if they are in the immediate vicinity of the blast. Blasting may displace resident fishes, although this impact is expected to be only temporary.

Harbor seals may be found throughout the Great Bay Estuary and are common in the lower part of the estuary (Jones, 2000). Seals can be sighted from November through April and most

frequently during March and April in Little Bay, with infrequent sightings in Great Bay and the Piscataqua River (Jones, 2000). Harbor porpoises are frequent in the lower portions of the estuary and have been found in Little Bay; as well as a humpback whale that travelled up the Piscataqua River to the mouth of Little Bay in 1995 (Jones, 2000).

Blasting impacts to marine mammals and fish will be avoided or minimized by the following methods:

- No blasting after March 31st,
- Use of a fish detecting and startle system to avoid blasting when fish or marine mammals are present or transiting through the area, including placing the fish startle system on a separate boat;
- Require the use of sonar and the presence of a fisheries and marine mammal observer;
- Prohibiting blasting during the passage of schools of fish, or in the presence of marine mammals, unless human safety was a concern;
- Monitor the blast pressure waves using hydroacoustics;
- Using inserted delays of a fraction of a second per blast drill hole,
- Placing material on top of the borehole (stemming) to deaden the shock wave reaching the water column, and;
- Blasting during periods of slack tide.

In addition, an acoustic monitoring plan to record blast effects will be implemented to monitor sound pressure levels during blasting to confirm the effectiveness of the blast pressure minimization measures. The acoustic monitoring will consist of a series of hydrophones and a digital recorder capable of operating at a minimum of 3,000 samples/second for a minimum of one second, with an adjustable trigger level, and a range of at least30 psi. A minimum of two monitoring sites will be utilized, one upstream and one downstream, with each hydrophone located approximately 1,500 feet from the sound source, assuming the blast pressure will span the entire river. Both stations would be required to simultaneously record the resulting sound pressure level during blasting to verify that blast pressure area calculations are correct, which will also reflect the effectiveness of the above minimization techniques.

C. Impacts of Disposal

1. Water Quality

The material from the expanded turning basin is composed of coarse grained material (sand and gravel) and rock. This area has not been dredged before so the material has little anthropogenic influences (contamination). Dredged material released from a barge would descend through the water column as a dense fluid-like mass. Because the dredged material is coarse grained almost all of the material would be expected to settle rapidly resulting in limited turbidity of short duration.

2. Sediment Quality

The sediments to be dredged consist of clean, coarse sand and gravel that is considered to be free of contaminants due to the lack of fined grained material removed from any known sources of contamination. The material at the IOS-N site is primarily fine grained. Placement of dredged material and rock at the IOS-N would change the sediment characteristics at this disposal site where material is disposed from fine grained to sand and gravel, making the site more physically diverse.

Disposal of this material at the nearshore sites would not significantly alter the present character of the nearshore areas under consideration since the nature of the material (grain size distribution) is generally compatible with the sediments in these placement areas. The exception is the Wells nearshore placement site which contains mostly fine sand.

3. Sediment Movement

Dredged material and rock placed at the IOS-N site is not expected to move from the area. The depths at the IOS-N (about 300 feet) and the fine grained nature of the material indicate that this site is not subject to storm generated waves and currents. In comparison, monitoring of similar deep water disposal sites such as the MBDS under the Disposal Area Monitoring System (DAMOS), have not shown significant movement of dredged material away from the disposal mound.

Low mounds of dredged material are created when placed in a nearshore environment for the purposes of beach nourishment. This type of placement is considered a “feeder berm” allowing for indirect beach nourishment to occur naturally by migration of sand to these nearshore areas. Tidal currents and wave action would redistribute the material over the course of several seasons or years. The average height of disposal mound would be several feet above the seafloor and placed at the 12-foot MLLW contour and seaward in the nearshore placement sites to maximize movement of the material towards shore. Approximately 364,100 cy of dredged material could be disposed in waters off the coast of Wells, Maine, with the remaining 364,000 cy divided between the three Massachusetts communities as follows: Salisbury – 90,900 cy, Newburyport – 36,400 cy, and Newbury – 236,700 cy. The final amount of material disposed at each site will be dependent on the local communities obtaining the necessary approvals prior to implementation. Material would be placed in a manner to maximize amount of material to be carried by currents and longshore transport to the nearby beaches for nourishment.

4. Effects on Marine Organisms

The primary impacts of dredge material disposal on aquatic resources can result from increased turbidities and direct burial in the immediate vicinity of the disposal site. Turbidity impacts would be minimal, short lived and localized and not likely to significantly impact the biota due to the coarse grained nature of the material being disposed. The temporary mounds formed by the disposal of material will result in the burial of any individuals (shellfish and benthos) directly in the disposal footprint at the placement area. Some mobile species would likely have the

ability to move away from the area during disposal operations. Any lobsters inhabiting the area could be buried during initial disposal events. However, lobsters would be expected to have moved into deeper waters from the nearshore placement sites during the colder months of the year when construction is scheduled. Given the coarse grained nature of the material, and the gradual erosion rate of the dredged material at the placement site over time, no increased turbidity above ambient conditions is expected. Dredged material from this project would be placed in areas that have been previously used for similar purpose of indirect beach nourishment, and/or are adjacent to or overlap previously used beach nourishment sites at the Wells, Salisbury, and Newburyport/Newbury.

Limiting work from mid-October to mid-April would minimize impacts to lobsters and spawning benthic organisms. In addition, prior notice will be provided to local commercial fisherman allowing for any commercially harvestable shellfish resources (i.e. surf clams) to be removed from any of the nearshore disposal sites prior to disposal events. Once disposal operations have been completed it can be expected that shellfish and benthic organisms will recolonize these areas in a short period of time.

D. Threatened and Endangered Species

1. Federally Listed Species

While Federally listed endangered whales and sea turtles can be found seasonally off the coast of New Hampshire, the occurrence of any of these species in Piscataqua River is extremely unlikely (NMFS letter dated March 27, 2008). Since the bulk of the dredging and disposal activities are planned to occur during the late fall and early spring months (mid-October – mid-April), it is unlikely that listed sea turtles species would be in the project area during the construction activities. Therefore, the proposed dredging and disposal operations are not expected to adversely affect listed species of sea turtles. Federally listed whales would not be expected to occur at shallow nearshore placement sites or along the transit routes to these sites (NMFS letter dated November 15, 2013). Whales could be present at the IOS-N site. The contractor will be required to contact the Right Whale Advisory prior to transit and a threatened and endangered species monitor will be present during transport of material to the IOS-N site from the project area to avoid potential ship strikes. Also, vessels will not be allowed to travel greater than 10 knots to minimize the potential for ship strike.

As stated in NMFS' letter dated September 2, 2011, seaward migrating juvenile Gulf of Maine (GOM) DPS Atlantic salmon (*Salmo salar*) (listed as Federally endangered) have been recorded by acoustic telemetry moving southward toward the vicinity of the proposed Isles of Shoals Disposal area (IOS-N). Atlantic salmon have also been detected in the vicinity of GoMOOS Buoy E01, however they have not been detected in the vicinity of the monitoring buoy closest to the IOS-N, B01 since its deployment in 2005 (which is located approximately 10 miles south from E01). Therefore it is unlikely that this species would be in the vicinity of the Isles of Shoals disposal area during the time of disposal operations. In addition, once out-migrating

Atlantic salmon smolts have transitioned to saltwater, growth is rapid, and the post-smolts have been reported to move close to the surface in small schools and loose aggregations (Dutil, J. D., and J. M. Coutu. 1988). Therefore, given the fact that this species has not been detected in the area of the disposal, as well its migratory behavior being close to the surface where it could avoid any vessel in the area, it is unlikely that the disposal of dredged material at the Isle of Shoals will adversely affect the Gulf of Maine DPS of Atlantic salmon.

The proposed dredging and blasting activities at the Piscataqua River turning basin are planned to be conducted during the late fall/early winter and late winter/early spring, during the months of mid-October – mid-April. A small number of shortnose and/or Atlantic sturgeons could be potentially exposed to the effects of dredging and blasting between mid-October and early November. Beyond early November, shortnose sturgeon in the action area is extremely unlikely. Given the relatively low probability that either sturgeon species would be present when and where dredging will occur and the low likelihood that any individual sturgeon would be captured in a slow moving dredge bucket, it is extremely unlikely that a sturgeon would be captured, injured, or killed during dredging activities, or that turbidity increases or reduced prey base would be significant (NMFS letter dated February 3, 2014). Due to the proposed mitigation measures to reduce blast impacts to aquatic resources notes in Section VII.b above, any behavioral disturbance is expected to be brief as impacts to the sturgeon species is expected to be of a very short duration (less than seven seconds); pre-disturbance behaviors would be expected to resume quickly (NMFS letter dated February 3, 2014).

Atlantic sturgeons have been detected in the vicinity of the IOS-N site as well as some whale species. However, based on measures to protect whales, the unlikely event that any whales will be at the IOS-N site because of water temperature during disposal, and that vicinity of the IOS-N site is used solely as a migratory route and not a forage site for Atlantic sturgeon, NMFS has determined that the effects from disposal at the IOS-N on Atlantic sturgeon or whales are discountable (NMFS letter dated February 3, 2014).

NMFS also concluded that the effects of nearshore disposal on Atlantic sturgeon and whales would also be insignificant and discountable given the temporary nature of the disturbance to the benthic community at the nearshore placement sites. See NMFS letter dated February 3, 2014 for additional details on NMFS conclusion that the effects of the proposed project will be insignificant and discountable, based on the above mitigation measures.

No impacts to the Federally threatened piping plover, the proposed threatened listing of the red knot, or their critical habitat is expected from dredging or disposal. Piping plover nest on beaches and they forage in intertidal areas, away from the proposed nearshore placement sites. See New Hampshire USFWS letter dated December 11, 2013. However, the Maine USFWS office in a letter dated February 14, 2014 determined that the project may affect the piping plover and red knot at Wells Beach. The ME USFWS office stated that the USACE would need to make a determination of effects based on a clear project description and evaluation of effects on

these species. If resolution of this issue cannot be resolved during the Design Phase of this project, then the material proposed for nearshore placement off of Wells will be placed at the IOS-N or distributed to the other proposed nearshore placement sites in Massachusetts.

2. State Listed Species

Maine: As the State listed species for the State of Maine are the same as the Federally listed species, any potential impacts described above for the Federal species would be relevant to Maine's State listed species.

New Hampshire: No known State listed species are known to occur in the project area.

Massachusetts: The proposed nearshore placement of about 365,000 cubic yards (or some other amount to be determined during the Design Phase of the project) of dredged material in the vicinity of Newbury, Newburyport and Salisbury will occur within the foraging habitat of the least tern (*Sternula antillarum*) and common tern (*Sterna hirundo*), and is in close proximity to breeding habitat for piping plover (*Charadrius melodus*). Both tern species are State-listed as "Special Concern" and the piping plover is State-listed as "Threatened". The piping plover is also Federally protected as "Threatened" pursuant to the U.S. Endangered Species Act (ESA, 50 CFR 17.11).

Based on the information provided, the Natural Heritage & Endangered Species Program of the Massachusetts Division of Fisheries & Wildlife does not anticipate impacts to State-listed species associated with the nearshore placement of about 365,000 cy of dredged material (email dated October 2, 2013).

E. Essential Fish Habitat

Dredge Area: The only EFH managed species listed for the Great Bay and the Piscataqua River are the: transiting Atlantic salmon (juveniles, adults), Atlantic cod (eggs, larvae), haddock (eggs, larvae), pollock (eggs, larvae, juveniles), red hake (juveniles, adults), white hake (eggs, juveniles, adults), winter flounder (eggs, larvae, juveniles, adults, spawning adults), yellowtail flounder (eggs, larvae), windowpane flounder (eggs, larvae, juveniles, adults, spawning adults), Atlantic halibut (eggs, larvae, juveniles, adults, spawning adults), Atlantic sea scallop (juveniles, adults), Atlantic sea herring (larvae, juveniles), bluefish (juveniles, adults), and Atlantic mackerel (eggs, larvae, juveniles).

Short-term and temporary impacts to EFH species from dredging and associated blasting operations are expected. The Piscataqua River is very wide, with swift currents. The reach of river where dredging to expand the turning basin would occur is over 2,000 feet in width. Since the material to be dredged is composed primarily of sand and gravel, the majority of the material is expected to settle less than 1,000 feet from the dredging area based on prior monitoring studies conducted during Boston Harbor and other dredging operations. Monitoring performed while dredging silty material showed that the majority of resuspended material settled within a 1,000 feet from the dredge. This could be considered a conservative indication of the settling distance

as it applies to this project since the material that was monitored was fine grained and more likely to be transported farther when compared to the coarse grained material from this project. Dredging activities are not expected to impede the passage of migrating fish within the Piscataqua River due to the substantial width of the river relative to the footprint of the dredging operation and the short duration of any increase in turbidities within the water column given the coarse grained material being removed from the turning basin. No significant impacts (minimal amount of entrainment) of fish eggs or larvae would be expected to occur from dredging due to the time of year dredging operations will occur (mid-October to mid-April), and the small area of impact compared to the remaining estuary. Also, ongoing dredging activities may deter these species from spawning in locations within and adjacent to these activities.

Blasting activities has the potential to kill or injure finfish species with air bladders in close proximity to areas of detonation. Demersal species such as flounder which lack air bladders would not be expected to be as impacted as greatly from the shock wave from blasting. Mitigation techniques to reduce these blasting impacts are discussed above and will be employed during construction of the project.

Long-term impacts to the benthic community is not expected since recolonization by organisms from adjacent areas would be expected to begin shortly after dredging has been completed. No significant and long-term impact to forage habitat for EFH species is expected from deepening the turning basin.

IOS-N: The following remaining EFH managed species listed for the IOS-N that may be found at the disposal site based on depth and substrate type are: Atlantic cod (eggs), pollock (eggs, larvae, juveniles, adults), whiting (eggs, larvae, juveniles, adults), red hake (eggs, larvae), white hake (eggs, larvae, juveniles, adults), redfish (larvae, juveniles, adults), winter flounder (juveniles), American plaice (larvae, juveniles, adults), ocean pout (adults), Atlantic halibut (eggs, larvae, spawning adults), Atlantic sea scallop (eggs, larvae, juveniles), Atlantic sea herring (juveniles, adults), monkfish (eggs, larvae, juveniles, adults), bluefish (juveniles, adults), long-finned squid (juveniles, adults), short-finned squid (juveniles, adults), Atlantic butterfish (eggs, larvae, juveniles, adults), Atlantic mackerel (larvae, juveniles, adults), summer flounder (adults), scup (juveniles, adults), ocean quahog (juveniles, adults), spiny dogfish (juveniles, adults), bluefin tuna (juveniles, adults).

Eggs and larvae of these species can be found in the surface and pelagic waters of the placement site during certain times of the year. Any eggs and larvae within the water column directly in the disposal footprint and on the bottom sediments at the placement site during disposal operations would likely be impacted as the material falls though the water column and settles on the bottom. Disposal during the cooler months of the year could impact Atlantic cod eggs, pollock eggs and larvae, American plaice eggs and larvae, Atlantic halibut eggs and larvae, monkfish eggs and larvae, and Atlantic mackerel larvae. It is possible that more mobile juveniles and adults would be able to swim away from and avoid impacts from placement. Overall, given the temporary and

limited impact of disposal on these species no significant impact to the fisheries resource is expected.

The material proposed for placement is composed of coarse-grained material. The current bathymetry and sediment type is homogenous and fine-grained. Disposal mounds of coarser grained material and rock could provide a benefit to EFH species by providing some physical diversity to the site which may attract additional EFH species.

Nearshore Placement Site – Wells: Managed species for the Wells nearshore placement site are: Atlantic cod (adult), whiting (adult), white hake (juvenile, adult), winter flounder (eggs, larvae, juveniles, adults, spawning adults), yellowtail flounder (larvae, adults), windowpane flounder (eggs, larvae, juveniles, adults, spawning adult), American plaice (juveniles, adults), Atlantic halibut (eggs, larvae, juveniles, adults), Atlantic sea scallop (eggs, larvae, juveniles, adults), bluefish (juveniles, adults), and bluefin tuna (adults).

The only managed species listed above which would be expected to inhabit the Wells nearshore placement site based on the available depths and marine conditions include: white hake (juveniles and adults), winter flounder (juveniles, adults, and spawning adults), windowpane flounder (eggs, larvae, juveniles, adults, and spawning adults), Atlantic halibut (eggs, larvae, and spawning adults), and bluefish (juveniles and adults). The potential impact to these species is discussed below.

White Hake: The nearshore placement sites are at their lower limit of their preferred depth; consequently the number of individuals at the placement location would be expected to be small. Any potential impacts from nearshore placement on this species would not be expected to be significant. Considering the overall project area in comparison to the available habitat of the Gulf of Maine, potential impacts to this EFH species would not be considered insignificant.

Winter Flounder: The material to be disposed is coarse grained sand and gravel so turbidity impacts would be expected to be minimal and of a short duration. Winter flounder spawning, eggs and larvae could be minimally affected as placement could occur during a portion of the spawning period. Any adult fish in nearshore placement site would be expected to move away from the disruption. Benthic resources would be expected to recolonize the area quickly. Fish could swim to other areas to avoid the disturbance and for foraging while the area recolonizes.

Windowpane Flounder: The coarse nature of the sediment would minimize turbidity impacts at the nearshore placement sites. Therefore, impacts from turbidity are expected to the localized and temporary. The nearshore placement would occur sometime between mid-October through mid-April. This would further avoid or minimize potential adverse impacts to windowpane flounder. Peak observations of windowpane flounder eggs and larvae are May and October in the middle Atlantic and July through August on Georges Bank. If adults are in the project area, they would be expected to move away from areas of disturbance. Benthic resources would be

expected to recolonize the area quickly. Fish could swim to other areas with better forage species while the area recovers.

Atlantic Halibut: Atlantic halibut would not be expected to be found in large numbers in the project area as they are generally located in deeper marine areas. Spawning occurs between late fall and early spring, with peaks in November and December. Spawning could coincide with the placement at the nearshore placement site. This potential temporary impact from placement would be considered insignificant as the project area is not generally associated with this species and nearshore placement will only have a temporary and localized turbidity impact.

Bluefish: Bluefish juveniles and adults are found in pelagic waters generally from June through October. It is unlikely that large numbers of bluefish would be found off of Wells Beach. If present, these highly mobile fish would be expected to avoid the nearshore placement activities. The temporary and limited impact from nearshore placement is not expected to have any significant impact on the bluefish population in the Gulf of Maine.

<u>Nearshore Placement Sites – Salisbury, Newburyport, and Newbury:</u> Managed species for the Salisbury, Newburyport and Newbury nearshore placement areas are: Atlantic cod (eggs, larvae), pollock (juveniles), red hake (eggs, larvae, juveniles), winter flounder (eggs, larvae, juveniles, adults), windowpane flounder (eggs, juveniles, adults), Atlantic sea scallop (eggs, larvae), Atlantic mackerel (eggs, juveniles, adults), surf clam (juveniles, adults), and bluefin tuna *Thunnus thynnus* (juveniles, adults).

Atlantic cod: Some entrainment of eggs and larvae could occur from placement at the nearshore placement sites. However, the area of placement is small compared to the remaining area of Massachusetts Bay.

Pollock: The coarse nature of the material would minimize turbidity impacts to this species. Juveniles would be expected to move from the area of disturbance. Any potential impacts would be expected to be minimal and short-term.

Red Hake: Some entrainment of eggs and larvae could occur from placement at the nearshore placement sites. However, the area of placement is small compared to the remaining area of Massachusetts Bay. Juveniles would be expected to move from the area of disturbance.

Winter Flounder: Placement of the material is coarse sand and gravel so turbidity impacts would be expected to be minimal. Winter flounder spawning, eggs and larvae could be minimally affected as placement could occur during some of the spawning period, but these nearshore areas would not be considered prime flounder spawning habitat. Any adult fish in nearshore placement site would be expected to move away from the disruption. Benthic resources would be expected to recolonize the area quickly. Fish could swim to other areas with better forage species while the area recovers.

Windowpane Flounder: The coarse nature of the sediment would minimize turbidity impacts at the nearshore placement sites. Therefore, impacts from turbidity are expected to the localized and temporary. The nearshore placement would occur sometime between mid-October through mid-April. This would further avoid or minimize potential adverse impacts to windowpane flounder. Peak observations of windowpane flounder eggs and larvae are May and October in the middle Atlantic and July through August on Georges Bank. If adults are in the project area, they would be expected to move away from areas of disturbance. Benthic resources would be expected to recolonize the area quickly. Fish could swim to other areas with alternative source of forage species while the area recovers.

Atlantic Sea Scallop: Atlantic sea scallop eggs and larvae could be buried at the site from placement. However, the nearshore placement would occur sometime between mid-October through mid-April avoiding the peak spawning occurrences. Impacts are expected to be minimal and temporary.

Atlantic Mackerel: Atlantic mackerel would not be expected to be found in large numbers in the project area as they are generally located in pelagic waters. Some entrainment could occur during placement, but this would not be considered significant as the project area is small compared to the Massachusetts Bay. Nearshore placement will only have a temporary and localized turbidity impact.

Surf Clams: All of the Massachusetts nearshore placement sites contain juvenile surf clams. Some of these clams may be able to ascend burial through the thinner layers of deposited sediments. The coarse nature of the sediment would result in minor elevations of turbidity over a limited timeframe and further minimize turbidity impacts at the nearshore placement sites. The dredging project would occur sometime between mid-October through mid-April. This would further avoid or minimize potential adverse impacts to spawning surf clams. Commercial fishermen may be allowed to remove any clams prior to burial.

Bluefish: Bluefish juveniles and adults are found in pelagic waters generally from June through October. It is unlikely that large numbers of bluefish would be found off during the window of disposal. If present, these fish would be expected to avoid the nearshore placement activities. The temporary and limited impact from nearshore placement is not expected to have any significant impact on bluefish population in the Gulf of Maine.

F. Special Reserves/Places

The proposed navigation improvement project is not expected to have a significant adverse effect on any of the special reserves or places discussed above. The material to be removed consists of coarse-grained material and should not cause a significant degradation in water quality beyond a few hundred feet of the dredge. Some temporary loss of shellfish habitat may occur but affected species will likely re-colonize the area since the exposed substrate would be of similar physical

characteristics or hard bottom. Nearshore placement sites will also not have a significant impact on nearby reserve places.

G. Clean Air Act

General Conformity under the Clean Air Act, Section 176 has been evaluated for the action according to the requirements of 40 CFR 93, Subpart B. The General Conformity Rule applies to Federal actions occurring in regions designated as being in non-attainment for the NAAQS or attainment areas subject to maintenance plans (maintenance areas). Threshold (*de minimis*) rates of emissions have been established for Federal actions with the potential to have significant air quality impacts. If the action is located in an area designated as non-attainment and exceeds the *de minimis* levels, a General Conformity Analysis is required. A conformity review must be performed when a Federal action generates air pollutants in a region that has been designated a non-attainment or maintenance area for one or more NAAQS. Non-attainment areas are geographic regions where the air quality fails to meet the NAAQS.

As the dredging in Piscataqua River in Maine/New Hampshire and the placement of material off of Wells Beach in Maine, and off the beaches located in Salisbury, Newburyport, and Newbury, Massachusetts are in attainment for 2008 Ground-level Ozone Standards (Region 1 Final Designations, April 2012), 2006 24-Hour $PM_{2.5}$ Standards (Region 1 Final Designations, October 2009 [to be updated December 2013 for 2012 Standards]), 2010 Nitrogen Dioxide Standards, 2010 Sulfur Dioxide Standards, and 2008 Lead Standards, no General Conformity Analysis is required.
(http://www.epa.gov/airquality/ozonepollution/designations/2008standards/final/region1f.htm),
(http://www.epa.gov/airquality/particlepollution/designations/2006standards/final/region1.htm),
(http://www.epa.gov/no2designations/region/region1.html),
(http://www.epa.gov/airquality/greenbook/snca.html),
(http://www.epa.gov/airquality/lead/designations/2008standards/final/region1f.html)

H. Cultural Resources

A marine archaeological survey of the proposed project area was completed in 2008 (Robinson and Gardner, 2008). The survey consisted of archival research and field investigation using differential GPS, side-scan sonar, a marine magnetometer, and sub-bottom profiler to acquire 100 percent coverage within the project area along a series of parallel surveyed track lines spaced 50 feet apart.

Systematic, multidisciplinary archival research, remote sensing archaeological field survey, and geotechnical data analysis of the Piscataqua River navigation improvement project area documented no targets with potential to be National Register–eligible post-contact archaeological deposits and no areas of buried paleosols with archaeological sensitivity for potentially containing pre-contact period archaeological deposits. Based on the results of this study, no additional archaeological investigations within the project area are recommended.

No historic properties will be affected during the proposed placement of dredged material at the nearshore areas. These areas are in a highly active environment within the littoral zone. It is anticipated that sand placed at these locations will eventually wash landward to nourish the adjacent beaches. Any historic properties within these areas would have already been damaged or destroyed due to water and wave action

This proposed project was coordinated with the Maine State Historic Preservation Officer (SHPO), the New Hampshire SHPO, the Massachusetts SHPO, the Massachusetts Board of Underwater Archaeological Resources, the Penobscot Nation Tribal Historic Preservation Officer (THPO), the Wampanoag Tribe of Gay Head (Aquinnah) THPO, and the Passamaquoddy THPO. The MA SHPO concurred on November 12, 2013 with the determination that the proposed navigation improvement project will have no effect on historic properties in Massachusetts. The ME SHPO concurred on January 3, 2014 that no historic properties in Maine would be affected by the proposed project. We can assume that the NH SHPO, the Wampanoag Tribe THPO, the Penobscot THPO, and the Passamaquoddy THPO concur with the no effect determination stated in the USACE letters sent to these organizations as no responses were received within 30 days on the proposed project from these entities.

I. Environmental Justice and Protection of Children

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" requires Federal agencies to identify and address any disproportionately high and adverse human health or environmental effects of its program, policies, and activities on minority and low-income populations in the U.S., including Native Americans. Executive Order 13045, "Protection of Children from Environmental Health Risks and Safety Risks," requires Federal agencies to identify and assess environmental health risks and safety risks that may disproportionately affect children.

The population near the proposed turning basin has a higher than average national median household income, and a lower than the U.S. average of minority and low-income populations (U.S. Census Bureau, 2010). In addition, the percentage of the population below 18 years of age is also below the national average (U.S. Census Bureau, 2010).

According the U.S. Census Bureau 2005-2009 American Community Survey, 9,952 people live in the Town of Wells, Maine. Because of its coastal location and stock of seasonal housing units, the population of Wells increases significantly during the summer. When adding the number of seasonal unit occupants to the number of year-round residents, the peak seasonal population of Wells swells to an estimated 33,306. This represents an increase of about 19 percent over the 1994 estimate of 28,000 (The Town of Wells Comprehensive Plan, Appendix A, 2004).

The Town of Wells' 2009 population, like the rest of York County, is predominantly middle aged. The median age is 46 years, which is 10 years higher than the national average. Almost

one in five Wells residents in 2000 was over 65 years of age. Alternatively, Wells has a relatively smaller population in the younger age groups than the rest of the county (The Town of Wells Comprehensive Plan, Appendix A, 2004). According to the U.S. Census Bureau, 2005-2009 American Community Survey, 21% of the population is comprised of children under the age of 18.

Minorities make up a very small percentage of the population, less than 1%. Families and individuals below the poverty level are 4.2% and 5.1% respectively, this compares to the national average of 9.9% and 13.5% respectively (U.S. Census Bureau, 2005-2009 American Community Survey).

The Towns of Salisbury, Newburyport and Newbury are all located in Essex County. The 2010 population for Salisbury, Newburyport, and Newbury was 8,283, 17,416, and 6,666 respectively http://www.sec.state.ma.us/census/essex.htm. Almost 88% of the population living in Essex County is white alone (in Newburyport it is 96.4%). This is slightly above the Commonwealth of Massachusetts population (87.7% vs. 83.7%). Hispanic or Latino makes up the largest portion of the minority population. The percentage of persons in Essex County under 18 years old is 22.5%; slightly above the State average of 21.1%. Persons 65 years and over is nearly 15%, comparable to the State average of 14.4%. Persons living below the poverty level is 10.6% http://quickfacts.census.gov/qfd/states/25/25009.html.

The proposed navigation improvement project will deepen and expand an anchorage area to provide safe navigation to the Piscataqua River for deep drafts vessel traffic and dispose of the material off of eroding shorelines to nourish nearby beaches. No significant adverse impacts to children, minority or low income populations are anticipated as a result of this project. Besides increasing navigation efficiency, the proposed project would reduce the likelihood of an adverse environmental and economic impact from grounding. Also, the project area does not have a large minority or low-income population or a number of above the national average of children less than 18 years old that could be affected by the proposed project. In addition, the proposed placement would benefit nearby beaches which can be enjoyed by anyone. Therefore, no potential environmental effects of this project on minorities, low-income or children are expected.

VIII. COORDINATION AND CORRESPONDENCE

Coordination with Federal, State, and local agencies was initiated in a letter dated April 22, 2008 with a date for a coordinated site visit and which also requested information and comments on the proposed project. Another letter was sent July 22, 2011 to the U.S. Environmental Protection Agency (EPA) and the National Marine Fisheries Service (NMFS) when the proposed placement of material at nearshore placement sites in Rye, New Hampshire and York, Maine was met with local opposition. This letter requested EPA's and NMFS' concurrence that the IOS-N was "likely selectable" for one time use under the MPRSA. Identification of the IOS-N as "likely selectable" would provide a basis for measuring the difference in haul costs for beneficial use

sites. EPA concurred that the IOS-N is "likely selectable" for one time use, while NMFS made a preliminary determination that the IOS-N may be more favorable than the IOS placement site.

After receipt of the above letters, additional letters were sent July 5, 2012 to the States of Maine, New Hampshire, and Massachusetts as well as the following communities to determine which communities were interested in receiving dredged material for beach nourishment: Wells, Ogunquit, and Kittery, Maine; Rye, New Hampshire; Salisbury, Newburyport, Newbury, and Winthrop, Massachusetts.

The communities of Wells, Maine, and Salisbury, Newburyport, and Newbury, Massachusetts expressed an interest in receipt of beach nourishment material from the expanded turning basin. As the initial coordination letters did not include these nourishment placement sites, another round of letters were sent to the applicable Federal and Maine, New Hampshire and Massachusetts State agencies on September 4, 2013. See Table EA-8 below for a list of organizations contacted during preparation of the draft Environmental Assessment.

TABLE EA-8. LIST OF COORDINATION WITH THE FOLLOWING ORGANIZATIONS

Federal Agencies	State Agencies (cont.)	Local Agencies/Tribes
U.S. Environmental Protection Agency (EPA)	Maine State Historic Preservation Officer (SHPO)	Town of Ogunquit, ME
National Marine Fisheries Service	New Hampshire Dept. of Environmental Services	Town of Eliot, ME
U.S. Fish and Wildlife Service	New Hampshire Fish and Game Dept.	Town of Wells, ME
U.S. Coast Guard	New Hampshire Natural Heritage Bureau	Town of Kittery, ME
U.S. Navy	New Hampshire Dept. of Resources and Economic Dev	Town of Rye, NH
Academia	New Hampshire Div of Parks and Recreation	Town of Salisbury, MA
University of New Hampshire	New Hampshire SHPO	Town of Newburyport, MA
State Agencies	Massachusetts Dept of Conservation and Recreation	Town of Newbury, MA
Maine Dept. of Environmental Protection	Massachusetts EOEEA-Coastal Zone Management	Town of Winthrop, MA
Maine State Planning Office-Coastal Program	Massachusetts SHPO	Penobscot Nation
Maine Dept. of Marine Resources	Massachusetts Board of Underwater Archaeological Resources	Wampanoag Tribe of Gay Head
Maine Dept. of Inland Fisheries and Wildlife		Passamaquoddy Tribe

Also, a 30-day public notice was made available on March 31, 2014 to Federal, State, and local agencies, and other interested parties by email, media outlet, and/or postal mail. The public notice informed interested agencies and parties of the availability of the draft Feasibility Report and draft Environmental Assessment for review. Construction of the project is not expected to begin before Federal Fiscal Year 2016.

IX. CUMULATIVE IMPACTS

Cumulative impact is defined by NEPA as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably 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."

The creation of a turning basin will allow ships to maneuver more easily. This may have the benefit of potentially avoiding groundings. The placement of dredged material at the IOS-N is likely to create a more diverse benthic community which could benefit other species dependent on benthos for food. The placement of material at the nearshore disposal sites would provide a temporary benefit to the adjacent and nearby beaches. A temporarily wider and more stable beach may mean more recreational activity during the warmer months. No change to public access should occur with the placement of beach material.

No other known activities associated with the proposed project is known or anticipated.

X. MITIGATION

Dredging will be scheduled to occur between mid-October through mid-April in order to avoid spawning periods of most sensitive resources. Blasting impacts will be avoided or minimized by instituting the following methods and procedures:

- No blasting will occur after March 31st;
- Blast during periods of slack tide;
- Use of a fish detecting and startle system to avoid blasting when fish are present or transiting through the area, including placing the fish startle system on a separate boat;
- Require the use of sonar and the presence of a fisheries and marine mammal observer;
- Prohibiting blasting during the passage of schools of fish, or in the presence of marine mammals, unless human safety was a concern;
- Monitor the blast pressure waves and hydroacoustics;
- Using inserted delays of a fraction of a second per blast drill hole, and;
- Placing material on top of the borehole (stemming) to deaden the shock wave reaching the water column.

The proposed dredging and placement at the IOS-N is the least costly environmentally acceptable alternative. However, placement at the nearshore placement sites in Wells, Maine

and Salisbury, Newburyport and Newbury, Massachusetts will provide a beneficial use to nearby beaches as a source of sand for indirect beach nourishment. Local sponsors will be required to fund the difference in cost between placement at the IOS-N and the nearshore placement sites, as well as obtain all necessary approvals. No significant adverse long term impacts are anticipated or cumulative impacts from dredging and placement at either the IOS-N or the nearshore placement sites.

Prior to placement at the Massachusetts nearshore placement sites, commercial shellfishermen will be allowed to remove any surf clams.

The contractor will be required to contact the Right Whale Advisory prior to transit, and a threatened and endangered species monitor will be present for transport of material to the IOS-N site to avoid potential ship strikes. Vessels will not be allowed to travel greater than 10 knots.

As mentioned in the Federally preferred project description above, approximately 7,800 cy of maintenance material within the existing turning basin limits could potentially be removed if it meets the suitability requirement for placement at the ocean or alternative nearshore placement sites. Testing for suitability for placement in these nearshore areas would occur during the Design Phase. All other maintenance material removed from the river over the several decades since the 35-foot deepening has been clean sandy material.

XI. COMPLIANCE WITH ENVIRONMENTAL FEDERAL STATUTES AND EXECUTIVE ORDERS

Federal Statutes

1. *Clean Water Act of 1977 (Federal Water Pollution Control Act Amendments of 1972) 33 U.S.C. 1251 et seq.*

Compliance: Not applicable, disposal at the IOS-N will occur outside State boundaries. Local communities will need to obtain appropriate approvals from State and Federal agencies for nearshore placement of dredged material.

2. *Marine Protection, Research, and Sanctuaries Act of 1972, as amended, 33 U.S.C. 1401 et seq.*

Compliance: The dredged material and rock is suitable for placement at the Isle of Shoals-North. However, prior to disposal, a site selection document will need to be prepared.

3. *National Historic Preservation Act of 1966, as amended, 16 U.S.C 470 et seq.*

Compliance: The project was coordinated with the Maine, New Hampshire, and Massachusetts State Historic Preservation Offices, as well as the Wampanoag, Penobscot, and Passamaquoddy Tribal Historic Preservation Officers, in compliance with the National Historic Preservation Act.

4. *Preservation of Historic and Archaeological Data Act of 1974, as amended, 16 U.S.C. 469 et seq. This amends the Reservoir Salvage Act of 1960 (16 U.S.C. 469).*

Compliance: Not applicable: project does not require mitigation of historic or archaeological resources.

5. *Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq.*

Compliance: Coordination with the National Marine Fisheries Service (letter dated February 3, 2014) indicated that the effects from the proposed project would be insignificant and discountable. The U.S. Fish and Wildlife Service, New Hampshire office (letter dated December 11, 2013) indicated that no Federally listed endangered and/or threatened species or their critical habitat are known to exist in the project area. However, the U.S. Fish and Wildlife Service, Maine office in a letter dated February 14, 2014 did not concur that nearshore placement of material off of Wells Beach would not affect listed species and that future ESA Section 7 consultation would be needed. Section 7 consultation will either be completed before construction or the material will be disposed at the I0S-N or the Massachusetts nearshore placement sites.

6. *Estuary Protection Act (16 U.S.C. 1221)*

Compliance: Not applicable.

7. *Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661 et seq.*

Compliance: Coordination with the USFWS, NMFS, and the New Hampshire State Planning Office, Maine State Planning Office, and Massachusetts Division of Marine Fisheries signifies compliance with the Fish and Wildlife Coordination Act.

8. *National Environmental Policy Act of 1969, as amended, 42 U.S.C. 4321 et seq.*

Compliance: Preparation of this report signifies partial compliance with NEPA. Full compliance shall be noted at the time the Finding of No Significant Impact is issued.

9. *Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271 et seq.*

Compliance: Not Applicable.

10. *Coastal Zone Management Act of 1972, as amended, 16 U.S.C. 1431 et seq.*

Compliance: A CZM consistency determination shall be provided to the States of New Hampshire and Maine for review and concurrence that the proposed project is consistent, to the maximum extent practicable, with the approved State CZM program.

11. *Clean Air Act, as amended U.S.C. 7401 et seq.*

Compliance: Public notice of the availability of this report to the Regional Administrator of the Environmental Protection Agency for review pursuant to Sections 176c and 309 of the Clean Air Act signifies compliance.

12. *Federal Water Project Recreation Act, as amended, 16 U.S.C. 4601-12 et seq.*

Compliance: Not Applicable

13. *Land and Water Conservation Fund Act of 1965, as amended, 16 U.S.C. 4601-1.*

Compliance: Public notice of the availability of this report to the National Park Service (NPS) and the office of Statewide Planning relative to the Federal and State comprehensive outdoor recreation plans signifies compliance with this Act.

14. *Rivers and Harbors Act of 1899, as amended, 33 U.S.C. 401 et seq.*

Compliance: No requirements for Corps' projects or programs authorized by Congress.

15. *Watershed Protection and Flood Prevention Act, as amended, 16 U.S.C. 1001 et seq.*

Compliance: Not applicable.

16. *Marine Mammal Protection Act of 1972*

A Letter of Authorization from the National Marine Fisheries Service will be obtained in the Design Phase of the project.

Executive Orders

1. *Executive Order 11593, Protection and Enhancement of the Cultural Environment, May 13, 1971, (36 FR 8921, May 15, 1971).*

Compliance: This order has been incorporated into the National Historic Preservation Act of 1980.

2. *Executive Order 11988, Floodplain Management, 24 May 1977 amended by Executive Order 12148, 20 July 1979.*

Compliance: Not applicable.

3. *Executive Order 11990, Protection of Wetlands, 24 May 1977.*

Compliance: Not applicable.

4. *Executive Order 12372, Intergovernmental Review of Federal Programs, July 14, 1982, (47 FR 3959, July 16, 1982).*

Compliance: Not applicable.

5. *Executive Order 12114, Environmental Effects Abroad of Major Federal Actions, 4 January 1979.*

Compliance: Not applicable.

6. Executive Order 12898, Environmental Justice, 11 February 1994.

Compliance: Not Applicable; project is not expected to have a significant impact on minority or low income population, or any other population in the United States.

7. Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks, 21 April 1997.

Compliance: Not Applicable; the project would not create a disproportionate environmental health or safety risk for children.

Executive Memorandum

1. Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing NEPA, 11 August 1980.

Compliance: Not Applicable; project does not involve our impact agricultural lands.

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DRAFT FINDING OF NO SIGNIFICANT IMPACT

The Federally preferred project would widen the existing 800-wide turning basin located at the upstream end of the Federal channel in the Piscataqua River in New Hampshire and Maine to 1,200 feet at the existing depth of -35-feet MLLW plus two feet of overdepth. Approximately 728,100 cubic yards (cy) of coarse grained and gravelly material and 25,300 cy of rock would be removed. The Isle of Shoals-North ocean placement site was selected as the Federal base plan for dredged material placement. However, the following towns have expressed an interest in the material and have agreed to pay the difference in cost between the transport of dredged material to the Isle of Shoals-North and the nearshore placement locations. Approximately 365,100 cy of dredged material would be disposed in waters off the coast of Wells, Maine, with the remaining 365,000 cy divided between the three Massachusetts communities of Newbury, Newburyport, and Salisbury as follows: Salisbury – 90,900 cy, Newburyport – 36,400 cy, and Newbury – 236,700 cy.

The bedrock would be removed to a design depth of 35-feet MLLW plus two feet of overdepth and another two feet for safety clearance for a total of 39-feet MLLW. The rock would be removed and taken to the CADS, the IOS-N site, or preferably beneficially reused. If real estate investigations are completed and interest is still viable, then the rock could be used for upland projects by the State of Maine or New Hampshire or in the Pepperell Cove wave berm project proposed by the Town of Kittery. Other beneficial uses include placement of the rock at a suitable site for a rock reef, if the necessary studies are performed and documented. These efforts to use the rock beneficially would occur during the Design Phase of the project. See Section IX Mitigation for a discussion of methods to avoid or minimize impacts to biological resources from blasting.

In addition to the material described above for removal, approximately 7,800 cy of maintenance material within the turning basin could potentially be removed if it meets the suitability requirement for placement at the nearshore beneficial use sites. Testing for suitability would occur in the next project phase (Design Phase).

Material would be removed between the months of mid-October through mid-April to protect biological resources. Prior to placement at the Massachusetts nearshore placement sites, shellfishermen will be allowed to remove any surf clams (*Spisula solidissima*) located at these sites.

I find that based on the evaluation of environmental effects discussed in this document, the decision on this application is not a major federal action significantly affecting the quality of the human environment. Under the Council on Environmental Quality ("CEQ") NEPA regulations, "NEPA significance" is a concept dependent upon context and intensity (40 C.F.R. § 1508.27). When considering a site-specific action like the proposed project, significance is measured by the impacts felt at a local scale, as opposed to a regional or

nationwide context. The CEQ regulations identify a number of factors to measure the intensity of impact. These factors are discussed below, and none are implicated here to warrant a finding of NEPA significance. A review of these NEPA "intensity" factors reveals that the proposed action would not result in a significant impact--neither beneficial nor detrimental--to the human environment.

Impacts on public health or safety: The project is expected to have no effect on public health and safety.

Unique characteristics: There are no unique characteristics associated with this project.

Controversy: The proposed project is not controversial. State and Federal resource agencies agree with the Corps impact assessment.

Uncertain impacts: The impacts of the proposed project are not uncertain, they are readily understood based on past experiences the Corps has had with similar projects, such as the Wells Harbor, Newburyport, and Boston Harbor.

Precedent for future actions: The proposed project is a navigation improvement dredging project and will not establish a precedent for future actions.

Cumulative significance: As discussed in the Environmental Assessment (EA), to the extent that other actions are expected to be related to project as proposed, these actions will provide little measurable cumulative impact.

Historic resources: The project will have no known negative impacts on any pre-contact, contact, or post-contact archaeological sites as coordinated with the States of Maine, New Hampshire, and Massachusetts, as well as the tribes of Wampanoag, Penobscot, and the Passamaquoddy.

Endangered species: The project will have no known positive or negative impacts on any State or Federal threatened or endangered species. Any remaining ESA issues will be resolved during the Design Phase of the project.

Potential violation of state or federal law: This Federal action would not violate Federal or State law.

Measures to minimize adverse environmental effects of the proposed action are discussed in Section IX of the EA. Dredging will be scheduled to occur from mid-October through mid-April in order to avoid spawning periods of most biological organisms. Blasting impacts will be avoided or minimized by the methods discussed below:

- Blasting will be completed by March 31st;
- Blasting will occur during periods of slack tide;

- Use of a fish detecting and startle system to avoid blasting when fish are present or transiting through the area, including placing the fish startle system on a separate boat;
- Require the use of sonar and the presence of a fisheries and marine mammal observer;
- Prohibiting blasting during the passage of schools of fish, or in the presence of marine mammals, unless human safety was a concern;
- Monitor the blast pressure waves using hydroacoustics;
- Using inserted delays of a fraction of a second per blast drill hole, and;
- Placing material on top of the borehole (stemming) to deaden the shock wave reaching the water column.

Prior to placement at the Massachusetts nearshore placement sites, commercial shellfishermen will be allowed to remove any surf clams (*Spisula solidissima*) located at these sites.

Based on my review and evaluation of the environmental effects as presented in the Environmental Assessment, I have determined that the navigation improvement dredging project at Piscataqua River is not a major Federal action significantly affecting the quality of the human environment. Therefore, this action is exempt from requirements to prepare an Environmental Impact Statement.

_____	_____
Date	Charles P. Samaris Colonel, Corps of Engineers District Engineer