FINAL ENVIRONMENTAL IMPACT STATEMENT

CRANEY ISLAND EXPANSION

NORFOLK HARBOR AND CHANNELS, VIRGINIA

U.S. Army Corps of Engineers
Norfolk District
803 Front Street
Norfolk, Virginia 23510-1096

April 2006

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Final Environmental Impact Statement for the
Craney Island Eastward Expansion
Norfolk Harbor and Channels
Hampton Roads, Virginia

Responsible Agency: U.S. Army Corps of Engineers, Norfolk District

ABSTRACT: The Norfolk District of the U.S. Army Corps of Engineers (USACE) and the Virginia Port Authority (VPA) have prepared this Final Environmental Impact Statement (FEIS) to present information regarding a 580-acre eastward expansion of the Craney Island Dredged Material Management Area (CIDMMA) and development of a container terminal. A notice of availability of the Draft EIS (DEIS) was published in the *Federal Register* on September 23, 2005. The 45-day comment period for the DEIS ended on November 7, 2005. Seventy letters and over 200 comments were received. These comments were analyzed and considered in preparing this FEIS, and responses to comments appear in the document. The proposed project is located in the Port of Hampton Roads between the cities of Portsmouth and Norfolk, Virginia. Such an expansion would extend the useful life of the CIDMMA, provide additional acreage for long-term berthing and landside port facilities, and possibly serve as a logistical and tactical area supporting deployment of national defense forces. Numerous alternatives for this project were evaluated during the study. The FEIS addresses the direct, indirect, and cumulative impacts of the proposed development on human and environmental issues identified during the public interest review, including onsite and offsite alternatives. All factors that may be relevant to the proposed development were considered. Among those factors are air quality, dredged material management, surface transportation, economics, aesthetics and light, wetlands, cultural resources, fish and wildlife resources, land use and coastal zone management, navigation, hydrodynamics, recreation, water quality, public safety, hazardous materials, social characteristics, environmental justice, noise, and, in general, the needs and welfare of the people. The FEIS provides relevant information to Federal, State, and local agencies and the public, on the potential impacts of the proposed project.

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E1.0 PROJECT OVERVIEW

This Final Environmental Impact Statement (EIS) has been developed by the U.S. Army Corps of Engineers (USACE), Norfolk District and its non-Federal sponsor, the Virginia Port Authority (VPA), in accordance with the requirements of the National Environmental Policy Act of 1969 (NEPA) (42 USC 4321-4347), 40 CFR Parts 1500-1508, and 33 CFR Parts 230 and 325. This document has been prepared to assess a range of alternatives and to evaluate the potential environmental consequences of those alternatives including proposed eastward expansion of the Craney Island Dredged Material Management Area (CIDMMA) and subsequent development of a marine containerized cargo terminal complex (container port) on the new cell.

The CIDMMA is a Federally-owned and USACE -operated dredged material placement area that is open for public and private dredged material from the Norfolk Harbor and adjacent waters as defined in House Document 563 of the 79th Congress. The CIDMMA has been in continuous use since 1957, serving the dredging needs of the Norfolk Harbor. Originally designed for a life span of 20 years, with a capacity of 96 million cubic yards, the CIDMMA has over 225 million cubic yards of dredged material deposits as of the end of Federal Fiscal Year (FY) 2004. Without adding additional dredged material placement capacity, the CIDMMA is projected to reach its useful life in 2025.

The site of the proposed project, shown on Figure ES-1, lies between, and is adjacent to, the CIDMMA and the Craney Island Reach Federal navigation channel in the Elizabeth River. Specific elements of the proposed project include:

- 580 acres of marine bottom and open-water for construction of a new dredged material placement cell, including a main dike and perimeter dikes; and

- Subsequent re-development of the 580-acre cell for a container terminal complex including an access channel, berths, wharves, container yards, cranes, gate facilities, intermodal yards, new access roads and ramps, new rail track, cargo processing and support facilities, and stormwater management areas.

E2.0 PURPOSE AND NEED

E2.1 Dredged Material Containment Cell

In accordance with the authorizing document, CIDMMA is to be used for the benefit of the maintenance and development of navigation improvements serving Government and private interests. CIDMMA is authorized to handle all types of navigational dredged material, including material suitable and unsuitable for open ocean disposal. It cannot be limited to only unsuitable material without additional Congressional authorization.

Since its construction, CIDMMA has received an average of 4.8 million cubic yards of dredged material annually. These deposits include both new work and maintenance of Federal channels and anchorages, as well as permit dredging from other Federal, state, municipal, and private users. The total annual volume varies from year to year.

Future inflow estimates were based on a survey of current and potential CIDMMA users. The estimates were also based on the assumption that CIDMMA would accept all material that was eligible for disposal, as is the actual practice. Furthermore, it was assumed that the District will continue to use dredged material beneficially whenever possible; however, based on the experience of recent years, it was assumed that little of the material will be suitable for beneficial use.

Based on Engineer Research and Development Center (ERDC) simulations, CIDMMA will reach its maximum capacity in 2025. The CIDMMA capacity forecast was based on continuation of the management practices such as use of drying cells, optimization of layer thickness, dike raising, and implementation of alternative beneficial uses of dredged material. Interior dike heights currently range from 33 to 36 feet above MLW. The dikes are capable of being raised to an interior height of 47 feet, which is projected to accommodate forecasted inflow volumes until 2025. After 2025, with the dikes at an interior height of 47 feet, the CIDMMA foundation will have reached its bearing capacity, and additional inflows will no longer be accommodated.

The need for a dredged material placement facility to accommodate Norfolk Harbor dredging projects will continue beyond 2025, when the CIDMMA is expected to reach capacity. However, without a Federal expansion project, future dredging operations will be forced to utilize the Environmental Protection Agency (USEPA)-designated Norfolk Ocean Disposal Site (NODS) as the primary disposal location for ocean-suitable material. The NODS is located approximately 35 nautical miles east of CIDMMA.

E2.2 Terminal Development

In recent years, the Port of Virginia has experienced average annual growth rates in containerized cargo of over 6 percent. These growth rates have resulted in significant annual cargo throughput, peak-operating conditions, and associated congestion that challenges the existing port infrastructure and equipment. Current market analysis indicates that the VPA will continue to see and have to accommodate steady growth well into the future. The VPA 2040 Master Plan was based on a 1999 forecast of containerized cargo at The Port of Virginia with a conservative and sustainable growth rate between 3.5 and 4.7 percent (average rate of 4.1 percent per year).

In the short-term, VPA will improve its existing facilities by maximizing the capacity at its existing cargo handling terminals prior to investing in new terminal development. Most of these improvements are planned to be in place by or before the year 2020. The Master Plan includes maximizing land use for high revenue generating cargo and minimizing non-revenue or less-revenue generating areas. This

optimization program will make use of nearly all developable VPA lands. Even with these actions, The Port of Virginia will run out of capacity in 2007.

Based on the VPA 2040 Master Plan, an estimated 664 acres of total container cargo area will be available after maximizing land use at VPA's existing terminals (i.e., Norfolk International Terminals, Portsmouth Marine Terminal, and Newport News Marine Terminal). This is 1,200 acres short of the over-1,800 acres projected to be needed in 2050. Even factoring in the new Maersk Sealand 280-acre port facility in Portsmouth, VA, more than 850 acres of container cargo area would still be needed by 2050. The proposed Craney Island Marine Terminal would provide 580 acres of new marine terminal space and meet port facility needs well into the planning horizon, but it would not meet all of them.

E3.0 PROJECT ALTERNATIVES

E3.1 Identification, Examination, and Screening of Potential Alternatives

Dredged material disposal alternatives were identified and evaluated individually on the basis of their suitability, applicability, and merit in meeting the planning objectives and constraints for the study. Potential port facilities were evaluated based on the availability of large tracts of waterfront property up to 850 acres, deep water access, and proximity to high capacity road and rail infrastructure. Alternatives that did not fulfill dredged material disposal and/or port infrastructure needs or were inappropriate due to other factors such as prohibitively high costs, were screened out. Judgments were made about each alternative based on knowledge from researching past studies and reports, including the USACE Reconnaissance Report, the VPA 2040 Master Plan, and the professional experience and expertise of the Project Delivery Team.

E3.2 Development of Initial Alternatives (Including No Action) and Initial Screening

The following comprehensive list of all the alternatives identified for initial screening was developed .

- No Action Alternative: Under without project conditions, the dikes are capable of being raised to an interior height of 47 feet, which is projected to accommodate forecasted inflow volumes until 2025. After 2025, with the dikes at an interior height of 47 feet, the CIDMMA foundation will have reached its bearing capacity, and additional inflows will no longer be accommodated
- On Site Alternatives: These included modifications of the existing site that could extend the life of CIDMMA and provide port development.
- East Expansions: These included potential alternatives for eastward expansion footprints of the existing site that could extend the life of CIDMMA and provide port development.
- North Expansions: These included potential alternatives for northward expansion footprints of the existing site that could extend the life of CIDMMA and provide port development. A larger northward expansion and a smaller northward expansion were considered.

- West Expansions: These included potential alternatives for westward expansion footprints of the existing site that could extend the life of CIDMMA and provide port development. Several different westward expansion footprints were considered.
- East and North Expansions: These include potential alternatives for eastward and northward expansion footprints of the existing site that could extend the life of CIDMMA and provide port development. These expansion footprints were combinations of the north and east expansion footprints identified above.
- East and West Expansions: These included potential alternatives for eastward and westward expansion footprints of the existing site that could extend the life of CIDMMA and provide port development. These expansion footprints are combinations of the east and west expansion footprints identified above.
- North and West Expansions: These included potential alternatives for northward and westward expansion footprints of the existing site that could extend the life of CIDMMA and provide port development. These expansion footprints were combinations of the north and west expansion footprints identified above.
- Upland Placement Sites: These included new confined upland placement sites involving acquisition of upland real estate and construction of new diked facilities.
- Ocean Placement Sites: These included two ocean placement sites that were identified previously and were considered to be possible alternatives to the CIDMMA.
- Beneficial Use Sites: Beneficial use sites for the purposes of this EIS were those sites where dredged material could be used to achieve environmental benefits. Examples of such benefits include beach nourishment, marsh creation or restoration, oyster ground creation, fish and wildlife habitat, and use of dredged material as construction materials.
- Creation of New Containment Islands: These included building new islands in open water similar to the existing CIDMMA that could be operated as new DMMA's. These sites were identified in prior studies and were revisited for this EIS.
- Deep Hole Sites: These included locations within the Hampton Roads area where deep water exists that may have sufficient capacity to serve as repositories for placement of dredged material.
- Combined Aquatic Disposal Facilities: These included marine sites that could provide sand for various construction projects. Once the removal of borrow material was complete, dredged material could be placed into the pit. The pit would be filled until the bottom contours matched the adjacent bathymetry.
- Sites evaluated for Marine Terminal Construction
    - 400 acres along the Chesapeake Bay and Back River in Hampton, VA.
    - Crab Neck in York County. The site is located south of Goodwin Islands along the Chesapeake Bay, VA.
    - Gloucester Point along the York River in Gloucester, VA.
    - Maersk Sealand Property along the Elizabeth River in Portsmouth, VA.
    - Sites along the James River in in Newport News and Isle of Wight County, VA.
    - Sites along the Elizabeth River in Norfolk and Portsmouth, VA.

E3.3 Evaluation of Alternative Plans

Initial screening was conducted to identify the preferred alternatives and ultimately the Recommended Plan. Alternatives evaluated during this process included an examination of the existing CIDMMA facility, structural and operation improvements to extend the life of the existing CIDMMA and provide more capacity within it, various expansion footprints, and ocean placement. Sites were also evaluated in terms of land requirements for port development, proximity to the 50-foot Federal navigation channel, and access to major highway and railroad corridors. Environmental, economic, and engineering analyses were performed to determine each alternative's feasibility for construction, operation, and maintenance of a dredge material management area and a port facility.

E3.4 No Action Alternative

Under a No Action scenario, CIDMMA would reach its capacity by 2025. The CIDMMA would close and a new disposal site would need to be constructed for material deemed unsuitable for ocean disposal. In addition, engineering constraints would prohibit a marine terminal from being constructed on the current site as the elevation of the site would be too high. The VPA would continue to operate, but its future capacity would be limited to the combined maximum capacity of existing port facilities and the Maersk Property that is currently being developed. The unmet port facilities demand in Virginia would have to be diverted to other U.S. ports. The planning objectives are not satisfied by this alternative. Therefore, it was not carried forward for detailed evaluation.

E3.5 Optimization and Comparison of Alternatives

Screening and evaluation eliminated all but two plans that were considered for optimization to determine the Recommended Plan: 1) an eastward expansion and 2) the eastward expansion with a western dike strengthening. These alternatives received further scientific analysis, including a ship navigation study for port terminal operations, cumulative impacts evaluation, hydrodynamic modeling, and inflow modeling to predict ultimate dredged material storage capacity volume. More detailed cost data were also obtained.

E3.6 East Port Expansion and West Berm Plan

This alternative proposes the construction of a 580-acre disposal cell on the east side of the existing CIDMMA, in conjunction with strengthening the western dike in 2028. Perimeter dikes would be constructed around the area of the new cell to contain dredged material. The western limit of the proposed cell would tie into the existing east dike of the CIDMMA. After filling, the new cell would be turned over to the VPA for the construction of a new marine terminal. This alternative provides 17 years of additional life to CIDMMA.

E3.7 Eastward Expansion Alternative

This alternative proposes the construction of a 580-acre disposal cell on the east side of the existing CIDMMA. Perimeter dikes would be constructed around the area of the new cell to contain dredged material. The western limit of the proposed cell would tie into the existing east dike of the CIDMMA. After filling, the new cell would be turned over to the VPA for the construction of a new marine terminal. No dike strengthening beyond routine operation and maintenance needs would occur. This alternative provides 3 years of additional life to CIDMMA.

E3.8 Plan Selection

The East Port Expansion and West Berm Plan was the alternative that reasonably maximized net economic benefits consistent with protecting the Nation's environment. Although the eastern expansion in combination with the western dike strengthening meets the planning objectives and maximizes beneficial contributions to the Nation, the plan is not supported by the local sponsor because of the uncertainty of recommending an alternative that occurs so far in the future. Only the eastern expansion is supported by the local sponsor; therefore, the Eastward Expansion Alternative is designated as the Recommended Plan.

E3.9 Recommended Plan

Strong opposition from property owners located adjacent to the western boundary of the CIDMMA and from the city of Portsmouth to any project located on the western side of the CIDMMA discouraged further evaluation of the west dike strengthening option. Moreover, inflow modeling determined that the west dike strengthening is not needed until 2028. As a result, the Recommended Plan is the construction of the Eastward Expansion Alternative.

The Recommended Plan ensures an extension of the useful life of CIDMMA, meets the minimum acreage required to ensure future cargo capacity in Hampton Roads, is accessible via the 50-foot Norfolk Harbor channel, and may be accessed by road and rail service. In addition, the Recommended Plan provides significant benefits to the Nation in terms of average annual economic benefits of $258 million. Average annual costs are also slightly less for the Recommended Plan. For these reasons, it is believed that implementation of the Recommended Plan is warranted.

E4.0 ENVIRONMENTAL CONSEQUENCES

E4.1 HYDRODYNAMICS AND WATER QUALITY

E4.1.1 CIDMMA Expansion

Two hydrodynamic modeling studies were undertaken to evaluate the potential impacts of alternative CIDMMA expansion plans on the Lower James River, Hampton Roads Harbor, and the Elizabeth River. The conclusion of the initial modeling study indicated that there would be no significant effects to water

circulation, sedimentation, salinity, currents, and tidal flushing from the Elizabeth River with an eastward expansion of the CIDMMA. As part of the modeling study, several directional expansion scenarios were evaluated, and the eastward expansion demonstrated the least effects.

In order to assess the impacts of dredging and ship berthing during extreme conditions, more detailed hydrodynamic modeling was conducted testing the cumulative impact of the CIDMMA expansion, the dredging of the Maersk Terminal area, and the berthing of ships. As in the initial analyses, little change was noted when compared to the hydrodynamic effects of the eastward expansion alone.

The degree to which the Recommended Plan will impact water quality is expected to be relatively minor and short-term. The primary effect on water quality from dredging and cell construction will be the temporary increase in turbidity and total suspended solids from the incidental release of sediments. Short-term and localized increases in turbidity will occur during the dredging operations, along with reduced dissolved oxygen levels due to releases of organic materials into the water column. The steady state increase in suspended sediment associated with the dredging activities is on the order of the background concentration in the Elizabeth River and within the natural short-term variability in the background concentrations. Elevated contaminant levels in the sediment are not anticipated, but sediment will be evaluated during the next phase of the project (advanced design) to ascertain sediment quality and to develop appropriate mitigation (avoidance and minimization) measures.

The proposed eastward expansion containment area will be designed to retain dredged material solids, while allowing the clarified carrier water to be released from the containment area through spillboxes. Four spillboxes are anticipated, two at the division dike, and two along the north dike. A water quality assessment will be conducted during the PED Phase to ensure that any effluent discharged meets prescribed water quality standards.

E4.1.2 Terminal Development

Water quality impacts from terminal construction will be mitigated by erosion and sediment controls and best management practices (BMP's) implemented at the site, in accordance with state regulations.

Results of a preliminary analysis using the Simple Method (Schueler, 1987) indicate that, under the performance-based criteria, the proposed facility could potentially have to implement BMP's to remove about 4,000 lbs of phosphorus per year. The predicted net increase in load for phosphorus and other constituents is conservative (high) due to the relatively high concentrations (C) assumed. The estimated BMP removal efficiency target of 76 percent is dominated by the net increase loads due to the addition of impervious area. A more refined facility design information and pollutant loading analysis could result in a different estimated target for BMP removal efficiency.

At full Build-Out, shipping traffic in the Hampton Roads Harbor System is expected to increase by about 20 percent or 19 vessel calls per week. Although the increased traffic also nominally increases the risk for potential maritime collisions, ship to ship computer aided simulations and modeling conducted by the

U.S. Merchant Marine Academy show that impact to navigation from the Recommended Plan is negligible. Accordingly, hazardous material or fuel spills related to maritime collisions are not expected to increase as a result on the eastward expansion.

Most container ships that dock at VPA terminals do not refuel in the Hampton Roads area. However, a small percentage of container ships do take on fuel from barges while moored at the Norfolk Harbor Anchorage. Although the projected increase in ship traffic would nominally increase the risk of refueling-related spills, the actual risk is expected to be small. No fuel will be transferred from the container terminal to ships.

The proposed project would increase shipping traffic, and, therefore, has the potential to increase the chance for introduction of nuisance or exotic species into the Hampton Roads area by way of ship ballast water and, to a lesser extent, cargo. Mitigation measures for reducing the risk of exotic species introduction include strict adherence to applicable U.S. and international laws and implementation of voluntary guidelines regarding exchange of ballast water.

E4.2 AIR QUALITY

E4.2.1 CIDMMA Expansion

The CIDMMA eastward expansion project constitutes a non-transportation Federal action within the Hampton Roads ozone nonattainment area. Provisions of the general conformity regulation are potentially applicable to Federal projects locating within nonattainment and maintenance areas. For the 2012 Build-Out condition (dredging and cell construction), both VOC and NO_x emission estimates exceed the 100 tons per year threshold. Consequently, general conformity issues must be addressed in order to obtain approval to develop the facility. Appropriate air quality permits may be required prior to initiating construction, and, if needed, will be obtained prior to any proposed construction taking place. Compliance with general conformity requirements can be accomplished by the following approaches:

Estimated dredging and cell construction emissions can be "offset" by obtaining emissions reductions within the Hampton Roads ozone nonattainment area. Emissions associated with dredging and cell construction can be incorporated into an approved State Implementation Plan (SIP) for the nonattainment area.

Based on information obtained from Virginia Department of Environmental Quality (VDEQ), the process of developing a new SIP for the Hampton Roads ozone nonattainment area is expected to occur in 2005-2007. Coordination between the USACE, VPA, and appropriate state and local agencies will be needed to demonstrate that the proposed CIDMMA expansion construction will conform with future SIP's for the Hampton Roads regional area.

Other mitigation measures that could be used to reduce emissions include either, or a combination of, watering to reduce construction dusts, increased usage of low sulfur fuels for diesel dredges, and

electrification of diesel-powered dredges. Other technologies considered include: fuel emulsions, engine retrofits, particulate filters, oxidation catalysts, selective catalytic reduction technology, and other emerging technologies. VPA presently has a policy that requires all new and replacement equipment to be of the lowest emission rating available.

E4.2.2 Terminal Development

The Craney Island terminal project constitutes a non-transportation Federal action within the Hampton Roads ozone nonattainment area. Provisions of the general conformity regulation are potentially applicable to Federal projects locating within nonattainment and maintenance areas. To determine if a conformity determination is required, an emissions inventory of VOC and NO_x emissions has been completed for the terminal. For the 2017 Phase I Condition, estimated NO_x emissions from the planned terminal facility exceed the 100 tons per year threshold level prescribed by the general conformity regulation. For the 2050 Build-Out condition, both VOC and NO_x emission estimates exceed the 100 tons per year threshold. Consequently, general conformity issues must be addressed in order to obtain approval to develop the facility. Compliance with general conformity requirements can be accomplished by the following approaches:

- Estimated terminal facility emissions can be "offset" by obtaining emissions reductions within the Hampton Roads ozone nonattainment area.
- Emissions associated with the terminal can be incorporated into an approved SIP for the nonattainment area.

Based on information obtained from VDEQ, the process of developing a new SIP for the Hampton Roads ozone nonattainment area is expected to occur in 2005-2007. Coordination between the USACE, VPA and appropriate state and local agencies will be needed to demonstrate that the proposed Craney Island terminal will conform with future SIP's for the Hampton Roads regional area.

E4.3 PROTECTED SPECIES AND CRITICAL HABITAT

No nesting Piping Plover pairs have been observed at CIDMMA since 1997. Development of the east expansion and the new port facility will not impact nest sites and the minimal historical use of the east side of the CIDMMA facility by Piping Plover furthers reduces any potential (future) impact. CIDMMA itself, where nests have been found in the past, is the site of continual construction activities. Ultimate Build-Out of the proposed port facility is not expected to impact piping plover habitat, as these birds are highly mobile and can easily avoid construction activities, no accidental takings during the construction process would be expected.

In order to obtain material for dike construction, sand will be dredged from offshore channel areas by hopper dredge. The Atlantic Ocean Channel is designated as the primary source of material for dike construction. Endangered Species Act, Section 7, consultation has been completed for hopper dredging in the Atlantic Ocean Channel and the Thimble Shoal Channel. A Biological Opinion was completed and

approved by the National Marine Fisheries Service (NMFS). Reinitiation of consultation with NMFS may be required to accommodate the volume of sand needed for the proposed project. If required, this will be accomplished during the PED Phase when more specific design information is developed on volumes and locations of suitable sand.

One bald eagle nest was identified in 2002 approximately 2.5 miles east-southeast of the proposed east expansion within Hoffler Creek Wildlife Preserve, but was destroyed during Hurricane Isabel in September 2003. To date, eagles have not returned to this site. Eagles are most vulnerable to disturbance early in the nesting period. The largest recommended buffer zone around eagle nest sites in the Chesapeake Bay Region (CBR) has a radius of 1,320 feet (1/4 mile). Even if eagles should eventually return to occupy this nest site, it is unlikely that any disturbances resulting from construction and operation activities will impact nesting at this location given its 2.5 mile distance from the proposed expansion and port site.

According to the Virginia Marine Science Museum, dolphins and Atlantic right whales are sometimes involved in collisions with commercial, military, and recreational vessels each year throughout the CBR. Encounters with harbor porpoises are less common. Development of the proposed east expansion and port facility will cause an unavoidable increase in the number of vessels making calls to the Hampton Roads area, thus increasing the potential number of vessel encounters with marine mammals. However, marine mammals are mobile and typically are found in areas away from the proposed port facility; thus, the increased opportunity for collision and injury is expected to be minimal.

E4.4 AQUATIC BIOTA

E.4.4.1 Fisheries and Essential Fish Habitat

The Elizabeth River and vicinity contain Essential Fish Habitat (EFH) for egg, larvae, juveniles, and/or adults life stages of 11 fish species. It is notable that one species, sandbar shark (Charcharinus plumbeus), is designated as having a Habitat Area of Particular Concern (HAPC). The lower James River and nearby areas near the mouth of the Chesapeake Bay cover approximately 29,500 acres of open water, and the total HAPC for the sandbar shark in the lower Chesapeake Bay is approximately 89,000 acres of open water. The permanent loss of aquatic habitat within the 580-acre cell footprint represents less than 1 percent of this area. Assessment of the project led to a determination that the project will not have an adverse effect on EFH; and, therefore, expanded EFH consultation is not required.

Rip-rap placed on the dikes is likely to attract fish species that are normally associated with reef structures, species that are commonly found around estuarine inlets, and species that seasonally migrate along the coast.

Bottom habitat in the dredged area will be modified as the water depth will be increased from 3-4 meters (m) to approximately 16 m. This may alter the fish use of the area by potentially favoring pelagic adults in lieu of smaller juveniles. Crab harvesting activities would be precluded. The resident benthic

invertebrate community in the dredged area will be eliminated for approximately one year or less until a new assemblage repopulates.

E.4.4.2 Benthos

There will be a temporary loss of benthic infauna from dredging associated with deepening the inbound channels and from preparing the ship access/egress areas to and from the proposed terminal facility. There will be a permanent loss of approximately 580 acres of estuarine bottom habitat used by fish, shellfish, crabs, and bottom dwelling organisms. In addition, a loss of about 580 acres of open water above the estuarine bottom habitat will also occur.

Based on Benthic Index of Biotic Integrity evaluations and other site specific studies, the area to be filled is generally poor quality and exhibits degraded conditions. No significant quantities of commercially valuable species, such as clams and oysters, are in the impact area. Off-site and out-of-kind mitigation is proposed to mitigate the effects of bottom habitat loss and open water effects to finfish, crabs, and bottom-dwelling organisms. Mitigation alternatives presented in the mitigation plan that has been developed to compensate for lost functional values include: oyster habitat restoration, wetland restoration, sediment cleanup, riparian buffers/conservation areas, bird management, and shoreline stabilization. Mitigation of the loss of about 580 acres of open water will occur partially via the widening and deepening of adjacent berthing areas for the port facility, which will provide an equivalent cross-sectional area of open water.

Increases in turbidity associated with dredging significant enough to impact populations of phytoplankton, macro-algae, and zooplankton near the proposed action site are not expected.

The "rough" structure provided by rip-rap on the exterior surface of the dikes at the proposed CIDMMA eastward expansion, especially given the large area of the dike surface, is likely to provide an extremely diverse and productive community, and serve as a nursery and feeding area for many fishes and invertebrates, including oysters and the blue crab. During the advanced Design Phase, other options may be investigated to provide an ecologically-friendly surface on the dikes, thereby helping to offset a portion of the benthic and fisheries habitat that is lost.

E4.5 WETLANDS AND SUBAQUEOUS BOTTOM

No wetlands occur between the existing perimeter dike and rip-rap shoreline at CIDMMA and the Norfolk Harbor Channel to the east. Therefore, no vegetated wetland impacts are anticipated within the east expansion footprint or the adjoining access channel areas. No wetlands occur between the existing perimeter dike and rip-rap shoreline at CIDMMA and the Norfolk Harbor Channel to the east. Therefore, no vegetated wetland impacts are anticipated within the east expansion footprint or the adjoining access channel areas.

Wetland impacts may occur from construction and operation of the rail corridor within the VDOT Craney Island connector highway and the I-664 expansion corridor from the intersection of VA Route 164 to I-64. Efforts to avoid or minimize wetlands impacts where feasible will be evaluated during the Design Phase of the projects.

The USACE has determined that the CIDMMA eastward expansion project will not require permits, pursuant to Section 404 and/or Section 10 of the Rivers and Harbors Act of 1899 (33 U.S. Code § 403). The USACE does not permit its own Civil Works projects. A Section 404 (b) (1) Evaluation was conducted as part of the EIS and appears in Appendix H of the EIS.

E.4.6 SANCTUARIES AND REFUGES

Hoffler Creek Wildlife Preserve, located approximately 2.5 miles west of the proposed project area, consists of 142 acres of wetlands, dense forest, and a saltwater lake. The preserve is inland from the Hampton Roads Harbor and, therefore, would not have a view of the proposed port facility. No impacts to this preserve are anticipated from port development or operation. Other sanctuaries and refuges located in the region are at least 10 miles away from the CIDMMA eastward expansion area. Therefore, port development and operations are not expected to impact these resources.

Compensatory mitigation involving wetland and aquatic habitat restoration is proposed at Ragged Island Wildlife Management Area in the lower James River. Oyster restoration is proposed in Hoffler Creek, adjacent to the Hoffler Creek Wildlife Preserve in the city of Portsmouth.

E4.7 TRANSPORTATION

Construction and operation of the Craney Island terminal will have minimal impacts on local streets and major highways. Future terminal operations will access the site from a new connector highway to VA Route 164 and from there to I-664 and I-64.

An average of six to seven additional trains per day would be needed to transport containers in and out of the Craney Island terminal under Build-Out conditions. Significant impacts on existing railroads are not anticipated since additional rail capacity will be provided when developing the new rail corridor to connect the Craney Island terminal with existing rail lines.

E4.8 UTILITIES

Little utility infrastructure currently exists on Craney Island, so it will be necessary to add additional infrastructure to extend utilities (power lines, phone/cable lines, water mains, sanitary sewer lines, etc.) from the city of Portsmouth to the proposed project site. All such utility work will have environmental permitting requirements to protect wetlands, endangered species, water quality, etc. There will be temporary construction impacts associated with the utility extension.

A Navy fuel line that extends along the east side of the existing CIDMMA will have to be relocated for construction of the new cell. A discussion of environmental impacts associated with the fuel line relocation will occur during the advanced planning and design phase and appropriate permitting activities will be undertaken at that time. Compliance with state and Federal regulations for this activity will minimize the potential for adverse environmental impact.

E.4.9 WASTE MANAGEMENT

Construction of the proposed expansion cell will not produce significant quantities of waste. Any solid waste resulting from cell construction will be disposed of according to applicable state and Federal regulations. Therefore, no impacts are expected.

Hazardous materials or fuel products associated with the activities conducted during the Construction Phase of the CIDMMA terminal are expected to be minimal. Contractors involved with the construction activities will be required to prepare emergency response plans and waste management plans for any hazardous materials required during the Construction Phase, although no other hazardous materials are expected to be encountered during the Construction Phase of the project.

E4.10 LAND USE

The expansion of CIDMMA and the development of the container terminal are not anticipated to result in the conversion of land use outside the limits of the eastward expansion and the existing CIDMMA. Direct impacts on land uses along the route of the proposed freight rail line are also not anticipated to be significant, as the route, although not finalized at this time, is expected to traverse the existing rights-of-way of the Craney Island connector highway and existing VA Route 164 and I-664. If the final rail corridor substantially deviates from this route, then the land use analysis would be updated as part of supplemental NEPA documentation prepared by the VPA prior to port facility construction.

E4.11 NOISE

Noise impacts from construction activities associated with the eastward expansion will be localized to the area where construction equipment and/or dredging is occurring. In addition, construction activities will occur at sufficient distances (i.e., greater than 1 mile away) from sensitive receptors so that no excessive or out-of-character noise levels will be experienced. Therefore, no mitigation measures will be required.

Under Build-Out conditions, noise levels from terminal operations will not have an adverse effect on any sensitive receptors, given the long distances (8,000 feet or more) between the port footprint and the receptors. Furthermore, no residential areas would be exposed to sound levels that approach the Federal Highway Administration noise abatement criterion of 67 dBA for "Activity Category B."

E4.12 VISUAL AND AESTHETIC RESOURCES

Impacts on the area's visual and aesthetic resources from cell construction will range from no impact to low impact as a result of: (1) the substantial distance between the project site and most prospective viewer(s); (2) the fact that the existing CIDMMA obstructs most views of the expansion site, especially from land; and (3) the visually imperceptible difference from most perspectives across the landscape between the expansion site and the existing (adjacent) 2,500-acre CIDMMA.

The proposed terminal facility would result in an increase in nighttime ambient light levels resulting from general lighting and security lighting at the property boundaries of the container terminal. The port facility would also receive light reflections from surrounding water bodies. Viewsheds for residential communities likely would not experience increases in nighttime ambient light levels from operation of the proposed port due to the distance of those areas from the port boundary.

E4.13 RECREATIONAL AND COMMERCIAL USE OF WATERS

The anticipated increase in vessel traffic from 9 to 15 weekly calls under Phase I and Build-Out, respectively, could be accommodated and would not be expected to significantly affect safety in the harbor (Virginia Pilots Association, April 2002). Voluntary displacement of recreational boaters to other areas of Hampton Roads may occur.

The east cell expansion will displace all commercial and recreational fishing within the boundaries of the footprint of the cell. Mitigation will be provided to enhance and restore wetlands, oyster grounds, and bottom areas where many fish species feed and use as habitat and nursery areas.

E4.14 ECONOMICS

Construction of the terminal in four phases is estimated to cost $1.28 billion and is expected to provide direct and indirect employment for more than 1,100 individuals in construction and other industries over the 20-year construction period (2013-2032). This equates to generated earnings of approximately $734 million and $1.4 billion in final output to the economy.

At full Build-Out in 2032, demand for terminal facilities is projected to reach 2,500,000 TEU's, resulting in increased local benefits over the 50-year study period. Annual averages will be 27,000 permanent jobs throughout Virginia's economy, $870 million in earnings, and $2.5 billion in average annual output. Port-oriented distribution centers are expected to add an additional 25,000 jobs, $788 million in annual earnings, and $2.7 billion in output. Resulting income taxes are estimated at approximately $155 million.

E.4.15 ENVIRONMENTAL JUSTICE

No adverse impacts associated with environmental justice issues are expected to occur. However, long-term economic benefits to the community are anticipated due to an increase in employment opportunities and increased demand for local services.

E4.16 PUBLIC SAFETY

The development and operation of the new cell and terminal are not anticipated to adversely affect, or to be affected by, various elements of public safety in the project area.

E4.17 HISTORIC AND ARCHAEOLOGICAL RESOURCES

No historical/cultural resources have been identified within the project footprint. Thus, no impacts to such resources are anticipated.

E4.18 SECONDARY GROWTH

Operation of the proposed container terminal is not anticipated to have a significant adverse affect on population growth or associated residential development, as most jobs that would be created at the Craney Island terminal, or at other businesses indirectly benefiting from the Preferred Alternative, are expected to be filled by workers already living in the region. A beneficial effect on commercial and industrial development, however, is anticipated, as new businesses or expanded businesses that would serve the Craney Island terminal are likely to be located at existing facilities or on redeveloped sites.

E4.19 CUMULATIVE EFFECTS

A total of 17 Federal, state, and private economic development, maritime, environmental remediation, and transportation projects were evaluated and identified as contributing to cumulative effects in the Hampton Roads area, including the Elizabeth River Basin. The Recommended Plan, when considered in the context of past, present, and future activities, can be expected to contribute to the overall cumulative effects to specific resources. Some of these cumulative effects can be considered positive, while others, if not successfully mitigated, would be considered in a negative context. However, the potential cumulative effects associated with this proposed project, when mitigated, are not expected to be substantial.

E4.20 MITIGATION

In accordance with CEQ Regulations for Implementing NEPA, and with ER 1105-2-100, "Policy and Planning Guidance for Conducting Civil Works Planning Studies (Planning Guidance Notebook)," the project-related adverse environmental impacts (i.e., impacts to fish and wildlife resources) have been avoided or minimized to the extent practicable, and a mitigation plan has been developed to compensate

for remaining unavoidable significant adverse impacts. A Cost Effectiveness/Incremental Cost Analysis (CE/ICA) has been performed to identify the most cost-effective plan(s).

The mitigation plan was developed with input from representatives of 12 Federal and state agencies and 3 local interest groups. The Mitigation Committee convened on 15 occasions between June 2002 and May 2005. Using data from existing studies, and those performed specifically for this feasibility investigation, the group was tasked with assessing the degree of habitat impact associated with the 580-acre fill, formulating mitigation ratios to replace or to increase the ecological function and productivity of the area lost, and developing a conceptual mitigation plan comprised of various tidal and sub-tidal habitats. A "landscape approach" was pursued to establish physical connectivity between various mitigation sites and to establish ecological synergy.

The USACE and VPA, in collaboration with the Mitigation Committee, has identified specific feasible mitigation options. The USACE has used CE/ICA to evaluate the options and to identify a "Best Buy" plan that is cost-effective and fully compensates for the unavoidable environmental impacts of the project. During plan development, every effort was made to accommodate the diverse input of the stakeholders involved in this process. The recommended plan, which is based on 3 years of stakeholder involvement, scientific study, and thorough analysis of all data and information collected, proposes 487 acres of compensatory mitigation in the form of sediment clean-up and restoration, wetlands restoration and conservation, and oyster reef restoration, and provides large scale ecosystem benefits at a total cost of approximately $50 million. To reduce risk, a monitoring and adaptive management program will be implemented to maintain the restored oyster reefs and wetlands over time. Upon successful completion, the mitigation plan will restore and replace important ecological functions and habitat in the lower James River and Elizabeth River estuaries and the Chesapeake Bay in compensation for the aquatic habitat and resources impacted by implementation of the Recommended Plan.

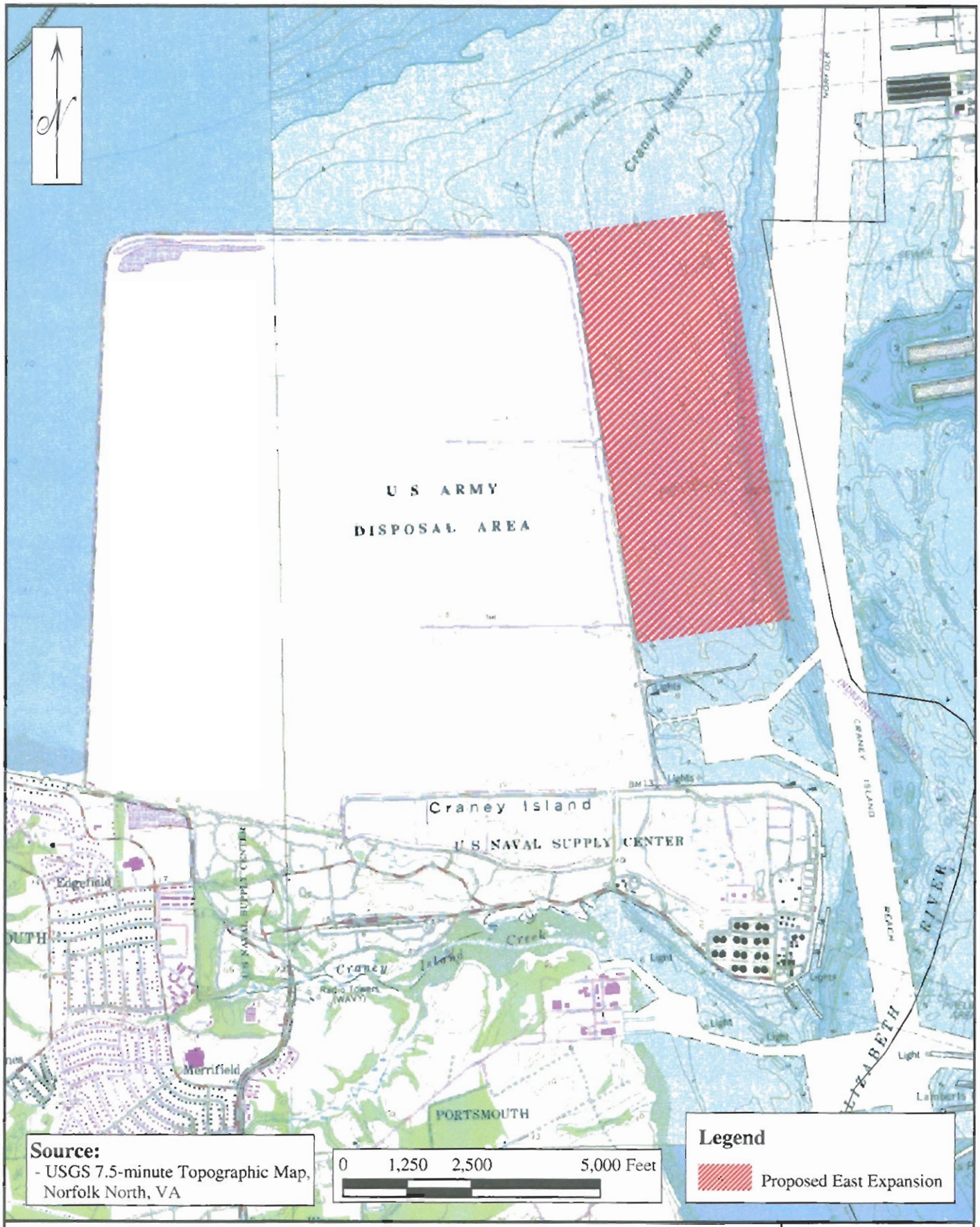
E4.21 PERMITS

All applicable water protection and/or wetland permits have not been applied for at the time of the preparation of this FEIS but will be obtained prior to construction. These may include, but may not necessarily be limited to, a VDEQ Virginia Water Protection permit pursuant to Section 401 of the Clean Water Act (CWA), a Virginia Marine Resources Commission permit for encroaching on state bottom pursuant to Title 28.2 and 62.1 of the Code of Virginia, and local Wetlands Board Permit. By regulation, a USACE Section 404 CWA permit is not required for USACE Civil Works projects [33 CFR 323.3(b)]. A Section 404 (b) (1) evaluation was prepared for the proposed project and appears as Appendix H. Other permits, as applicable, will be obtained prior to construction.

E4.22 SCOPING

A NEPA Technical Committee was assembled to assist the USACE in developing the scope and breadth of the NEPA document, to identify significant resource concerns, and to provide technical review of work products supporting the NEPA document. The committee was comprised of representatives from 12 Federal and state agencies and 3 local interest groups and met on 6 occasions between November 2000 and December 2005. As mentioned previously, a Mitigation Subcommittee also assisted in the scoping

and review of a comprehensive mitigation plan. A separate and complementary technical subcommittee oversaw the development, conduct, and technical review of the hydrodynamic modeling studies. These subcommittees reported their findings to the NEPA Technical Committee. The mitigation plan development strategy was independently reviewed by a team of 13 scientists in May 2003. Additionally, a workshop of scientists and experts in the lower Chesapeake Bay, James and Elizabeth Rivers, and vicinity environmental resources convened in August 2001 to identify resource concerns and available information. During the NEPA scoping process, independent review meetings took place with NMFS (September 2002), and EPA (September 2002, March 2005).



PROJECT LOCATION / EAST EXPANSION

Figure ES-1

Purpose and Need

PART I

PURPOSE AND NEED

I.1.0 CIDMMA EXPANSION

Craney Island Dredged Material Management Area (CIDMMA) (see Figure I-1) is a Federally-owned and U.S. Army Corps of Engineers (USACE)-operated dredged material placement area that is open for public and private dredged material from the Norfolk Harbor and adjacent waters as defined in House Document 563 of the 79th Congress. The CIDMMA has been in continuous use since 1957, serving the dredging needs of the Norfolk Harbor. Located approximately 140 miles southeast of Washington, D.C., the site is bordered by the Elizabeth River to the east; the James River to the north and west, and the City of Portsmouth, Virginia to the south. Originally designed for a life span of 20 years, with a capacity of 96 million cubic yards, CIDMMA has over 225 million cubic yards of dredged material deposits as of the end of Federal Fiscal Year (FY) 2004.

This Environmental Impact Statement (EIS) evaluates the potential environmental consequences of the USACE and the non-Federal sponsor, the Virginia Port Authority's (VPA's) proposed action to construct a 580-acre eastward expansion of the existing CIDMMA. The proposed project would accommodate additional dredged material placement capacity and, after the cell is filled, port development on top of the dredged material placement facility. This document presents the environmental consequences associated with the dredging of access channels, cell construction, and port development and operation on the constructed 580-acre cell.

This EIS was prepared in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality regulations implementing NEPA (40 Code of Federal Regulations 1500-1508), and USACE procedures for implementing NEPA (ER 200-2-2).

Article I. Study Authority

This study is authorized by resolution of the U.S. House of Representatives Committee on Transportation and Infrastructure dated 24 September 1997, which reads:

"Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, That the Secretary of the Army is requested to review the report of the Chief of Engineers on the Norfolk Harbor and Channels (Deepening), contained in House Document 99-88, 99th Congress, 1st Session, and conduct a study of eastward expansion of the Federally owned Craney Island Dredged Material Management Area (CIDMMA). Such study shall be directly coordinated with the sponsor, the Commonwealth of Virginia, through the Secretary of Transportation represented by the Virginia Port Authority, and shall give specific attention to rapid filling to accommodate anticipated port expansion and to the operation of the existing facility while extending the useful life of CIDMMA, and shall take into account all relevant environmental issues and the subsequent transfer of the expanded area of CIDMMA to the Commonwealth of Virginia."

Study Area

The Port of Hampton Roads is located in the southeastern region of the Commonwealth of Virginia at the southern end of Chesapeake Bay, midway on the Atlantic Seaboard (approximately 170 miles south of Baltimore, MD, and 220 miles north of Wilmington, N.C.). The harbor is a natural roadstead of 25 square miles formed by the confluence of the James, Nansemond, and Elizabeth Rivers. It is recognized as one of the largest and finest natural harbors in the world and is a primary stimulus to the economic well-being of the region, the Commonwealth, and the Nation. The land area surrounding the harbor encompasses about 1,500 square miles and includes the cities of Chesapeake, Norfolk, Portsmouth, Suffolk, and Virginia Beach, as well as Isle of Wight County on the southside and Hampton and Newport News on the northside. The 2004 population of this area was approximately 1.4 million people.

Hampton Roads is one of the largest and most active ports in the U.S. Foreign, national, regional, and local markets are conveniently accessible to the port through the numerous steamship services to worldwide ports and the strategic position that the port occupies with respect to national and regional transportation patterns. The geographic location of the port and an excellent rail and highway network make it economically and efficiently available to a significant portion of the Nation's population and manufacturing centers. The port is most strategically located with respect to the vast coal fields of Virginia, West Virginia, and Kentucky, and extensive amounts of steam and metallurgical coal resources are transported by rail from these areas to Norfolk and Newport News for both overseas shipment and domestic use. Other bulk commodities and breakbulk commodities also comprise a significant and important part of the waterborne shipments through the port. Container shipments have grown significantly in recent years and are projected to show substantial increases in the future. The port generates significant local, regional, and national economic impacts, providing employment, payroll, and tax revenues in Hampton Roads, the Commonwealth, and the Nation. The location and the study area are shown on Figure I-1.

Article II. Need For and Objective of Action

The purpose of the Feasibility Study was to determine the need for and Federal interest in an eastward expansion of CIDMMA. Three areas of potential Federal interest in the eastward expansion of CIDMMA were identified in the Reconnaissance Phase for further evaluation as follows:

1. Increased dredged material disposal capacity. The additional cell would extend the useful life of CIDMMA as a dredged material containment area. Studies to further evaluate alternatives to extend the useful life of CIDMMA as an economical dredged material placement area are in the Federal interest and would be consistent with Army policies.
2. Growth in commodity movements and waterborne transportation savings. Once filled, CIDMMA could provide additional acreage for the development of projected long-term berthing and landside port facilities adjacent to the Norfolk Harbor Channel. Expansion could provide National Economic Development (NED) benefits in terms of transportation savings by providing an area for development of a containerized cargo terminal.
3. National Defense. Expansion of CIDMMA could serve as a defense logistical and tactical area supporting deployment of national defense forces. The potential exists for using the future port terminal as a logistical shipping point for military cargo in times of wars.

NEPA and the USACE Principles and Guidelines (ER 1105-2-100) provide the basis for Federal Policy concerning multi-objectives planning. The Federal objective of water and related land resources project planning is to contribute to NED consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. Water and related land resources project plans are formulated to alleviate problems and take advantage of opportunities in ways that contribute to this objective.

Article III. Need for Additional Dredged Material Storage Capacity

(a) CIDMMA Existing Conditions

Placement of dredged material at CIDMMA is limited to users within the geographical area of Norfolk Harbor and adjacent waters. In general, this includes the navigable waters of the ports of Norfolk, Portsmouth, Chesapeake, Hampton, and Newport News. Each project requesting use of CIDMMA is evaluated by the District on a case-by-case basis. The District determines if the project can legally use the facility, consistent with the project's authorizing documents.

In accordance with the authorization, CIDMMA is to be used for the benefit of the maintenance and development of navigation improvements serving Government and private interests. CIDMMA is authorized to handle all types of navigational dredged material, including material suitable and unsuitable for open ocean disposal. It cannot be limited to only unsuitable material without additional Congressional authorization.

If dredging is not related to navigation, i.e., road building, railroad crossings, interior lakes and ponds etc., then disposal at CIDMMA will be denied. Also, CIDMMA cannot be used for disposal of material excavated from upland areas or for disposal of construction debris, except for limited special cases, such as beneficial use of concrete for rip-rap to protect exterior dikes from erosion.

The current management strategy for operating CIDMMA is based on Section 148 of the Water Resources Development Act (WRDA) of 1976 (P.L. 94-587) that states the "Chief of Engineers, shall...extend the capacity and useful life of dredged material disposal areas such that the need for new dredged material disposal areas is kept to a minimum." The Engineer Research and Development Center (ERDC), formerly Waterways Experiment Station, published Technical Report EL-91-11, Development of a Management Plan for CIDMMA in December 1991.

ERDC recommended that Norfolk District sub-divide CIDMMA into three cells so that the dredged material could be placed in one cell while the other two cells dry out. The benefit of drying the dredged material is that significantly more volume is created for dredged material placement. The ERDC Management Plan also noted "...lift thicknesses in excess of 5 feet begin to significantly affect desiccation and consolidation behavior."

In addition to drying the material, another way of increasing storage capacity is by increasing the facility's dike height. The CIDMMA was built on top of clay layers that were naturally deposited within Hampton Roads. Soils investigations revealed that water was trapped in the marine clay under CIDMMA and was under pressure due to the weight of the facility and that this water limited the foundation's load bearing

capacity. In order to relieve the pressure, strip drains were installed to create water exit pathways that improved foundation strength. Strip drains were installed from 1995 through 2001.

With greater foundation strength, the dike elevations have been increased to heights greater than allowed without the installation of strip drains. Currently the dikes have been raised to elevations ranging from 36 to 40 feet above mean lower low water (MLLW). Under the current management program, the dikes are raised in anticipation of the next year's inflow.

(b) CIDMMA Future Conditions

Since its construction, CIDMMA has received an average of 4.8 million cubic yards of dredged material annually. These deposits include both new work and maintenance of Federal channels and anchorages, as well as permit dredging from other Federal, state, municipal, and private users. The total annual volume varies from year to year (see Table I-1). For example, in 1970, prior to the subdivision of the site into three cells, more than 16 million cubic yards of material were placed in CIDMMA. At the other extreme, less than 1 million cubic yards were deposited in 1990. Some of this annual variation is due to the 2- to 3-year dredging cycle of the CIDMMA Rehandling Basin, which receives material from vessels that do not have pump-out capabilities, such as bottom dumping scows.

In developing future deposition rate estimates for CIDMMA, the District queried Norfolk Harbor users that have historically placed large volumes of material into the CIDMMA, such as the USACE Norfolk District Operations Division, Navy, and the VPA. In addition, known future users, such as Maersk, that will require dredged material volume capacity in the future were also queried. All of the queried users provided the approximate location of dredging, estimates of future dredged material inflow quantities, and the anticipated timing of the inflows. The inflow schedules were reviewed to ensure the scheduled deposits would not exceed the capabilities of the facility. In addition, the dredged material inflow estimates were periodically updated during the course of the Feasibility Study.

Future inflow estimates are also based on the assumption that CIDMMA would accept all material that was eligible for disposal, as is the actual practice. Furthermore, it is assumed that the District will continue to use dredged material beneficially whenever possible; however, based on the experience of recent years, it is assumed that little of the material placed into the existing site will be suitable for beneficial use.

Individual year-by-year inflow projections were developed for 2005-2022. For years beyond 2022, this analysis assumes that the historic average of 4.8 million cubic yards per year will continue to be a reasonable estimate of the future deposition rate into CIDMMA, inclusive of maintenance and identified new work dredging. This estimate is consistent with the Norfolk Harbor and Channels, Virginia, Long-Term Disposal (Inner Harbor) draft information report, dated June 1990, which projected the deposits into CIDMMA to be 4 million cubic yards annually without accounting for new dredging projects that have been initiated since 1990, such as the 50-foot inbound element and the new Maersk container handling facility. In addition, sensitivity analyses were conducted on the in-flow estimate for the years beyond 2022, and it was found that in-flow during these later years has only a small impact on the projected useful life of the facility.

Table I-1. Historical and Total CIDMMA Inflow (1957 – 2004)

Fiscal year	Volume (cubic yd)	Fiscal year	Volume (cubic yd)
1957	3,700,000	1982	6,170,000
1958	6,550,000	1983	2,690,000
1959	8,060,000	1984	10,070,000
1960	7,020,000	1985	1,890,000
1961	4,120,000	1986	3,710,000
1962	4,680,000	1987	2,830,000
1963	1,440,000	1988	12,800,000
1964	3,730,000	1989	3,100,000
1965	5,730,000	1990	930,000
1966	6,320,000	1991	3,910,000
1967	11,560,000	1992	1,530,000
1968	4,890,000	1993	3,960,000
1969	5,060,000	1994	1,440,000
1970	16,460,000	1995	2,630,000
1971	8,910,000	1996	5,370,000
1972	4,030,000	1997	1,060,000
1973	3,170,000	1998	2,000,000
1974	5,290,000	1999	2,940,000
1975	3,540,000	2000	1,990,000
1976	5,890,000	2001	3,110,000
1977	2,000,000	2002	3,030,000
1978	7,030,000	2003	3,610,000
1979	2,880,000	2004	3,000,000
1980	6,340,000		
1981	3,170,000	**Total**	**225,630,000**

(c) Without Project Conditions: Dredged Material Disposal Capacity Shortfall

Table I-2 presents the CIDMMA dredged material inflow forecast. The CIDMMA inflow forecast is based on the user survey and historical inflows discussed in the "Existing Conditions" section. The inflow forecast includes only those future inflows that have the highest level of certainty. Other potential inflows, such as material that would result from deepening the main channel to its authorized depth of 55 feet, or material that would result from berth deepening beyond existing conditions, have not been included in the forecast.

User surveys and other information were forwarded to ERDC for analysis and development of with and without project capacity projections for CIDMMA. ERDC used the Primary Consolidation, Secondary Compression and Desiccation of Dredged Fill computer model to estimate the lifespan of the CIDMMA.

The model was calibrated using past surveys of CIDMMA and past inflows. Based on ERDC simulations, CIDMMA will reach its maximum capacity in 2025 under without project conditions.

Table I-2. Forecasted and Total CIDMMA Inflow (2005 – 2025)

Fiscal year	Volume (cubic yd)	Fiscal year	Volume (cubic yd)
2005	10,600,000	2016	4,600,000
2006	8,500,000	2017	4,700,000
2007	3,900,000	2018	2,500,000
2008	5,150,000	2019	2,650,000
2009	7,400,000	2020	4,100,000
2010	3,720,000	2021	2,500,000
2011	4,300,000	2022	2,650,000
2012	4,020,000	2023	4,800,000
2013	3,900,000	2024	4,800,000
2014	4,620,000	2025	4,800,000
2015	3,950,000		
		Forecast total (2005-2025)	**98,160,000**
		CIDMMA useful life total	**323,790,000**

Section 3.02

The CIDMMA capacity forecast is based on continuation of the management practices identified in the "Existing Conditions" section, such as use of drying cells, optimization of layer thickness, dike raising, strip drains, and implementing alternative beneficial uses of dredged material. CIDMMA capacity is regularly increased to meet short-term inflow projections by raising the interior height of the dikes. Interior dike heights currently range from 33 to 36 feet above MLW. Under without project conditions, the dikes are capable of being raised to an interior height of 47 feet, which is projected to accommodate forecasted inflow volumes until 2025. After 2025, with the dikes at an interior height of 47 feet, the CIDMMA foundation will have reached its bearing capacity, and additional inflows will no longer be accommodated.

I.2.0 TERMINAL CONSTRUCTION

Purpose of New VPA Container Terminal

The purpose of the proposed container terminal at CIDMMA will be to provide the Commonwealth of Virginia with sufficient capacity to meet the containerized cargo forecast for Hampton Roads and

continuing long-term cargo growth anticipated during the 2050 planning horizon. In recent years, The Port of Virginia has experienced average annual growth rates in containerized cargo of over 6 percent. These growth rates have resulted in significant annual cargo throughput, peak-operating conditions, and associated congestion that challenges the existing port infrastructure and equipment. Current market analysis indicates that the Commonwealth, represented by the VPA, must continue to accommodate steady growth well into the future.

The VPA 2040 Master Plan was based on a 1999 forecast for containerized cargo at The Port of Virginia with a growth rate between 3.5 and 4.7 percent, or an average rate of 4.1 percent per year (see Figure I-2). This growth rate is lower than the recent historical rate and, therefore, is considered conservative and sustainable. In fact, recent forecasts (2004) used to develop the economic benefits project a growth rate of 4.6 percent. It is the recent experience of most U.S. ports that actual growth has outpaced forecasted growth. Therefore, positive cargo growth is realistic for the Port of Virginia, which has the natural advantages of deep water and geographic location to accommodate a significant portion of the projected growth in East Coast cargo for the next 20 to 50 years.

Improvements to Existing VPA Facilities to Meet Short-Term Needs

Portions of VPA's current facilities were constructed prior to 1920. Due to age, these facilities are both functionally obsolete and deteriorated to a point where repair and maintenance yields diminished returns. Additionally, much of the port's container handling equipment is at the end of its useful life and will soon require replacement.

In order to improve existing facilities and protect capital, the VPA has chosen to maximize the capacity at its existing cargo handling terminals prior to investing in new terminal development. This approach has resulted in development of a capital investment program for the VPA's three existing maritime terminals. The capital improvement projects for existing VPA facilities through the year 2040 planning horizon include:

- Norfolk International Terminals (NIT) $735 million
- Portsmouth Marine Terminal (PMT) $187 million
- Newport News Marine Terminal (NNMT) $ 26 million

The recommendations of the VPA 2040 Master Plan include specific projects for each of the VPA facilities. The recommendations for all VPA maritime facilities are summarized as:

- Reconstruction of some container wharfage for anticipated larger (Suez Class) vessels
- Acquisition of 100-foot gage (Suez Class) container cranes
- Dredging along berthing areas varies by terminal and ranges from -45 feet to -55 feet
- Rehabilitation of container yard to replace aging pavement
- Intermodal yard renovation
- Increase gate capacity and other civil/utility improvements
- Straddle carrier and other equipment acquisitions
- Demolition of aged warehouses and replacement with container storage yard

Most of these improvements are planned to be in place by 2020. In fact, the NIT South Renovations are well underway. The wharf reconstruction (Phase I) is complete, and 8 new 100-foot gage cranes are in use. The container yard repaving is Phase II, and the first 48 of 108 is complete. Dredging of the berths and access channels at NIT to -50 feet MLW is expected to be completed in 2006.

In addition, in an effort to maximize capacity of the VPA's existing terminals, a Master Plan for optimizing land use was developed. This Plan includes maximizing land use to accommodate the expected increase in containerized cargo volume until an additional terminal facility can be constructed. Site plan maps are included in the appendices that depict the current land use of the VPA marine terminals and the future land use after the implementation of the VPA 2040 Master Plan. To maximize the VPA container handling area, the VPA also minimized non-revenue or low-revenue generating areas. This optimization program will make use of all developable VPA lands, as summarized in Table I-3 and Figures I-3 and I-4. Much of what remains in the "undeveloped area" category is not suitable for cargo handling use (e.g., lands designated for required environmental mitigation).

Table I-3. UNDEVELOPED AREA AT VPA FACILITIES

VPA Facility	Current Undeveloped Area (acres)	2040 Plan Undeveloped Area (acres)
NIT	89.0	19.0
PMT	34.7	0.0
NNMT	5.8	5.8

Even with the extensive plans for expanding the capacity of its existing facilities, the VPA's terminals will run out of capacity in 2007. Figure I-5 shows the unmet demand curve as projected by the conservative growth rate in the VPA 2040 Master Plan.

Effect of Maersk Property to Help Meet Short Term Needs

In April 2004, Maersk Sealand, a division of the A.P. Moller Group, announced the development of a 500-acre waterfront site in Portsmouth, VA. The planned 280-acre container terminal will significantly enhance the Port of Virginia's capability to handle containerized cargo between its opening in 2007 and the opening of the (proposed) Craney Island Marine Terminal in 2017. This terminal will not eliminate the need for the VPA to improve its existing facilities or the need to develop a port facility at CIDMMA in order to meet long-term forecasted cargo growth. Instead, development of the Maersk Property will extend the date by which the (proposed) Craney Island Marine Terminal would need to be operating by about 8 years (i.e., year 2015 opening date versus about 2007 without development of Maersk Property). See Figure I-6 for the increased regional capacity as a result of the Maersk Terminal.

Additional Land Area Required to Meet Long Term Port Needs

The substantial on-going efforts to increase the capacity of the VPA's existing marine terminals and to develop the Maersk property will help meet cargo demand in short-term. However, despite these efforts, a new container terminal will be needed to provide the VPA with sufficient capacity to meet the long-term containerized cargo forecast. Planning, design, and construction of a new terminal will require 10 to 15 years. Therefore, in order to meet future needs, it is necessary to plan for port expansion now.

An analysis was conducted to project additional required port land area for the long-term. As an initial step, the Hampton Roads container cargo forecast was extended to the year 2050 based on the VPA 2040 Master Plan. The baseline forecast of 4.1 percent was used for the land analysis. Refer back to Figure I-2 to see this curve.

Using the 2050 containerized cargo forecast, corresponding container yard acreage requirements were projected as shown in Figure I-7. Over 1,800 acres are needed to accommodate the projected increases in containerized cargo volume. Note the operating efficiency of the terminals is assumed to increase at 2 percent per year and is capped at a maximum practical capacity of 5,000 twenty-foot equivalent units (TEU's) per acre per year.

An estimated 664 acres of total container cargo area will be available after maximizing land use at VPA's existing terminals (i.e., NIT, PMT, and NNMT). This is 1,200 acres short of the over-1,800 acres projected to be needed in 2050 (from Figure I-7). Even factoring in the new Maersk port facility in Portsmouth, more than 850 acres of container cargo area would still be needed by 2050. The proposed site of the east expansion of CIDMMA would provide 580 acres of new marine terminal space and will help meet minimum cargo capacity demands through 2035. An additional 270 acres will still be needed to meet the 2050 forecasted capacity demand. The "Evaluation of Potential Locations" section of this document will discuss the other locations that were considered.

Figures

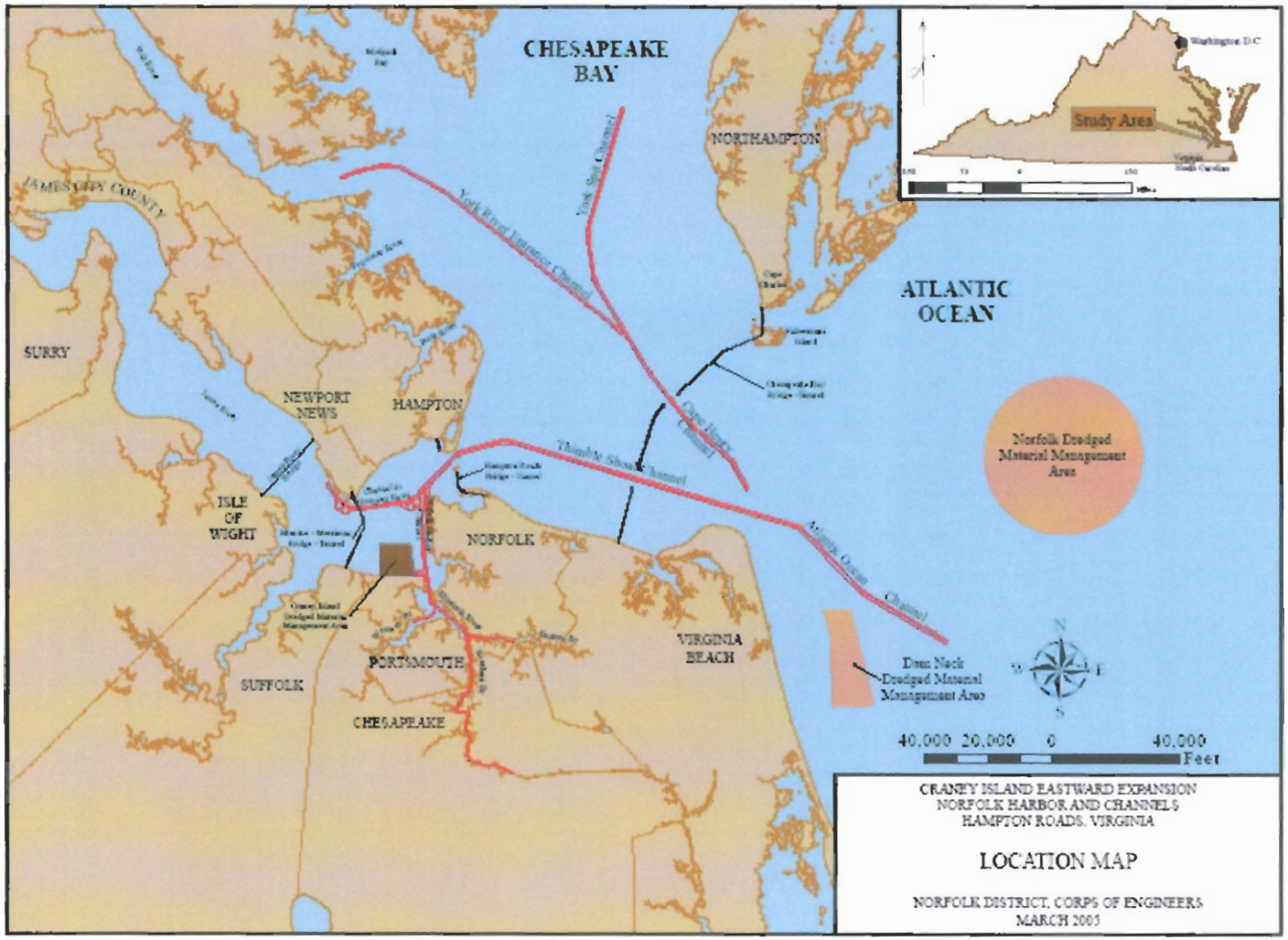
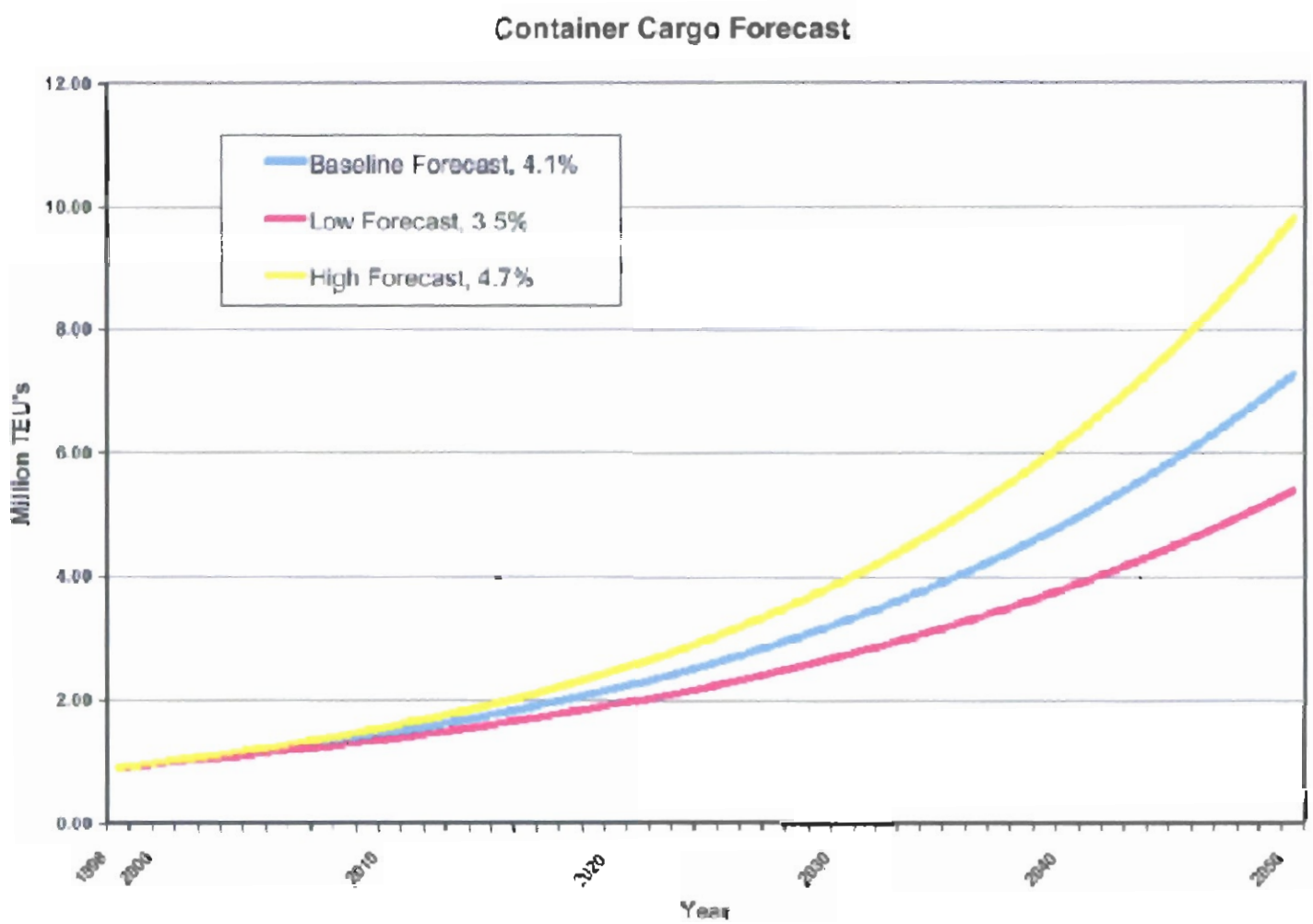


PLATE 1

LOCATION MAP

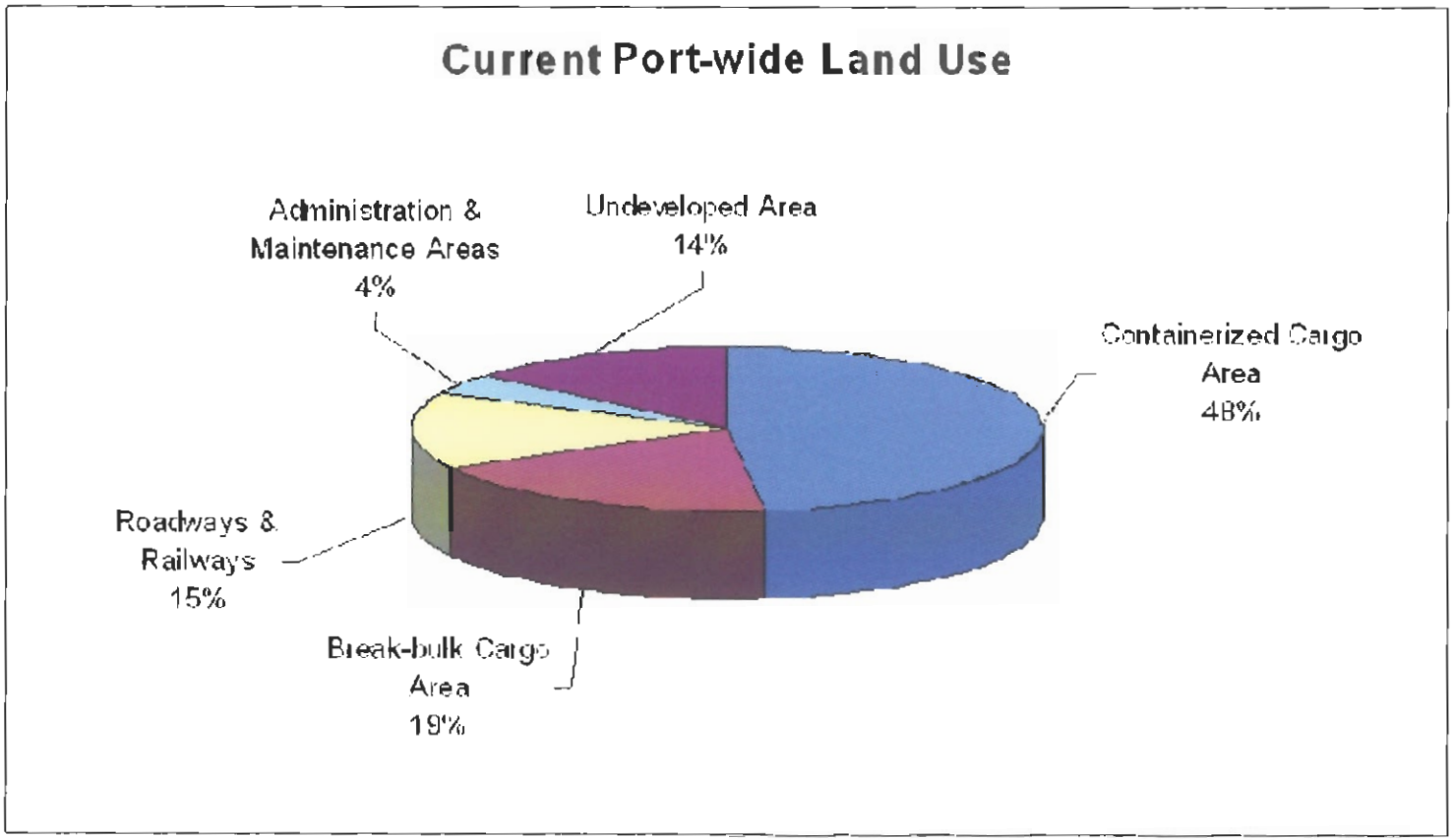
Figure I-1



Source: VPA 2040 Master Plan

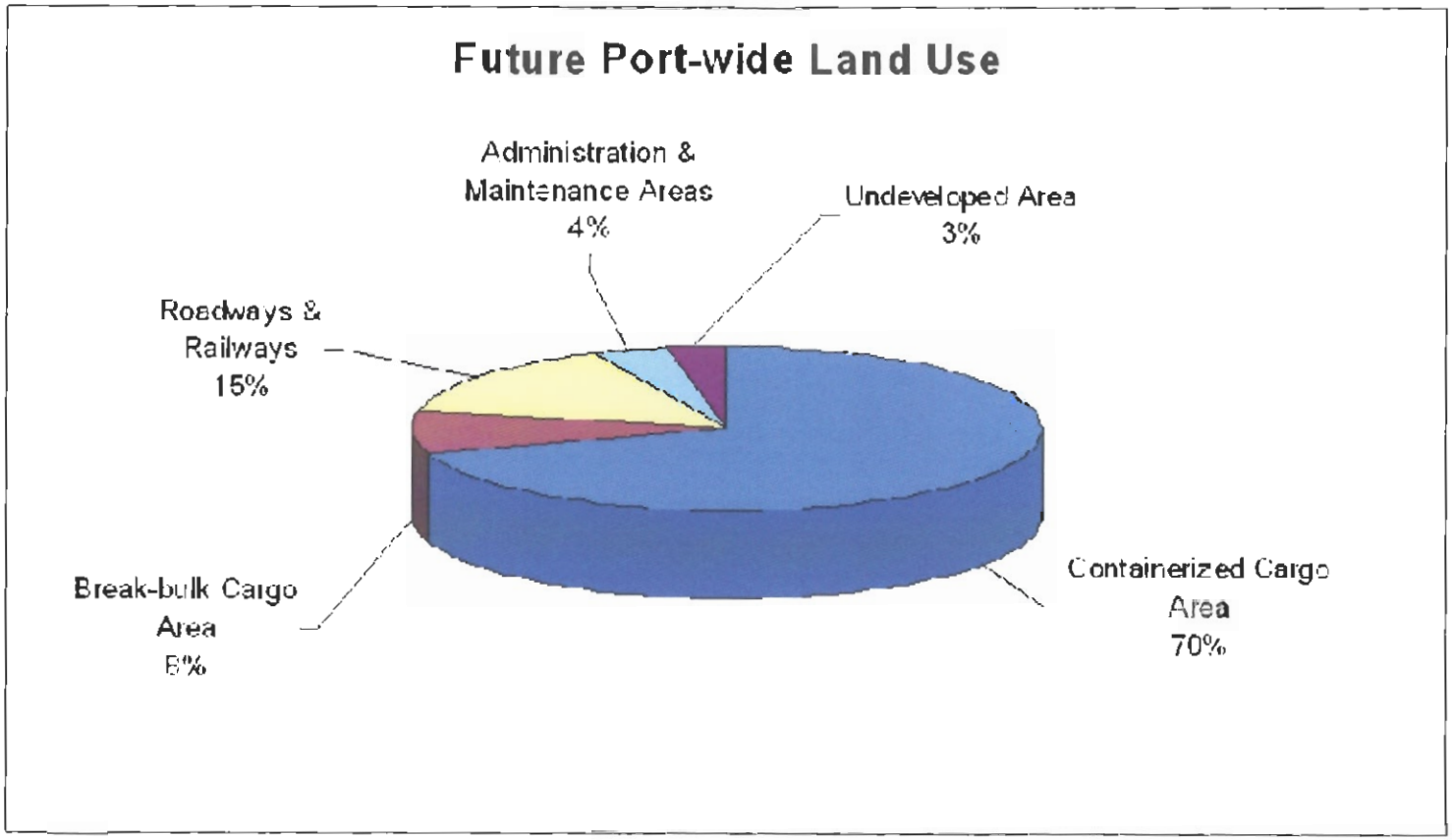
CONTAINER CARGO FORECAST

Figure I-2



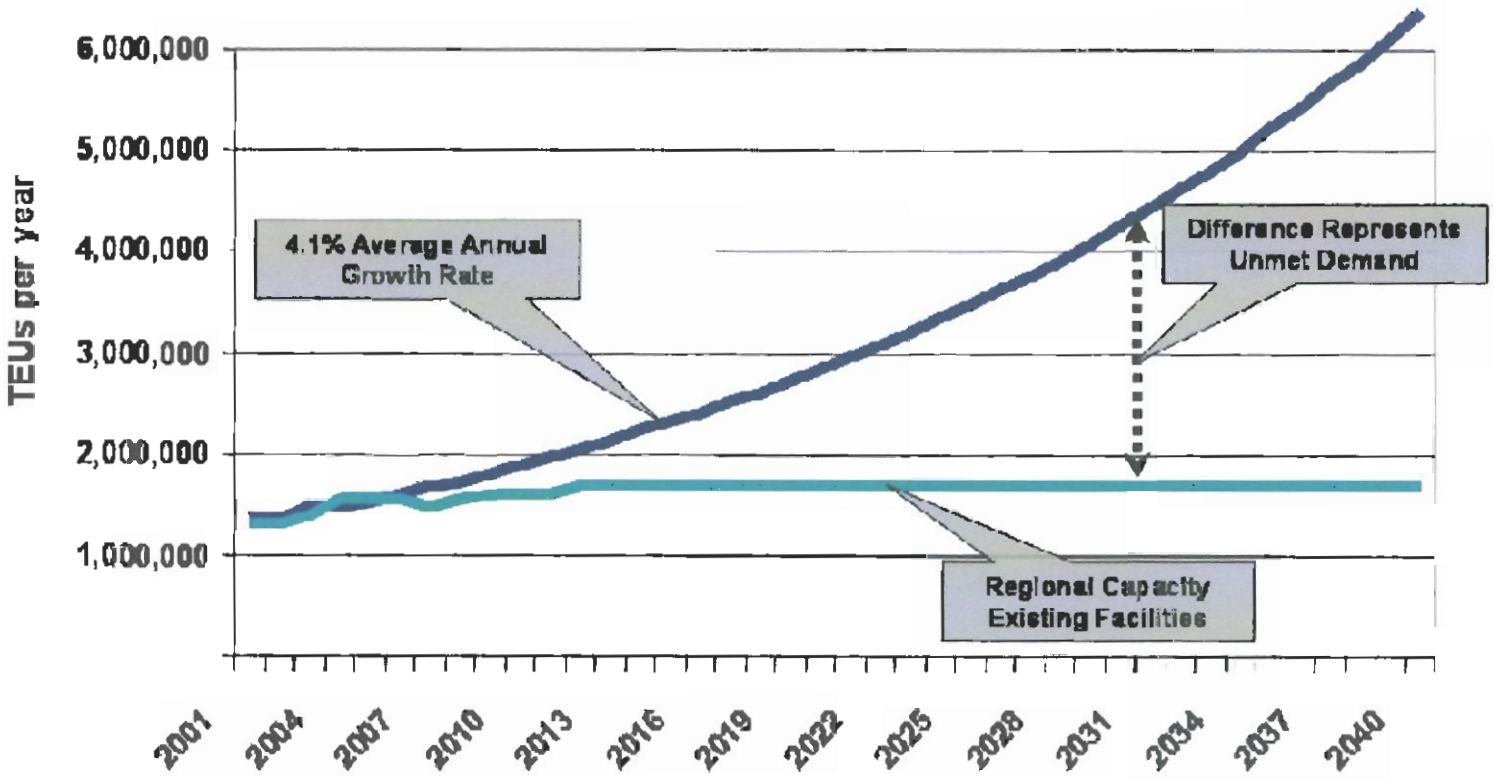
CURRENT PORT-WIDE LAND USE

Figure I-3



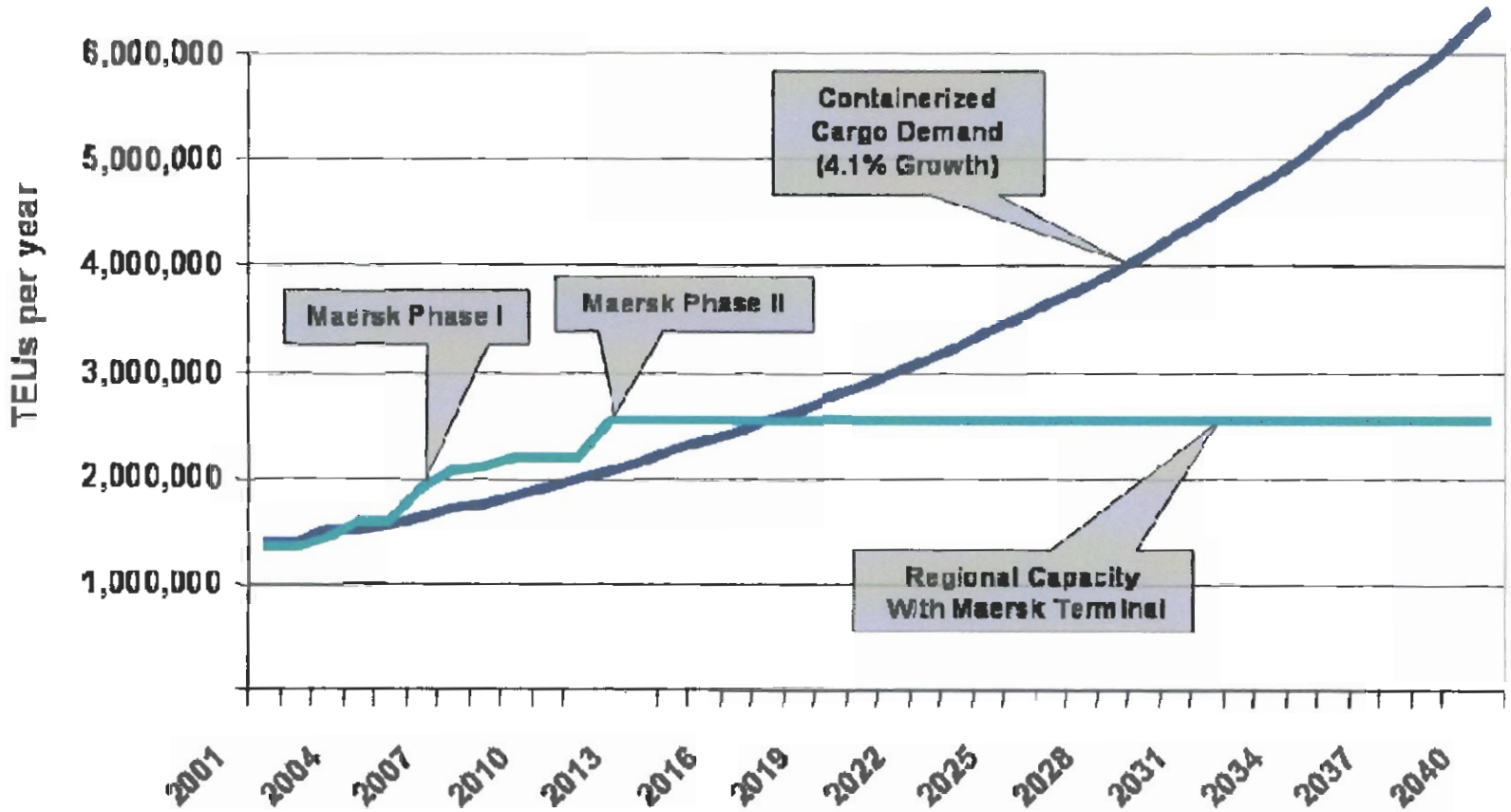
FUTURE PORT-WIDE LAND USE

Figure I-4



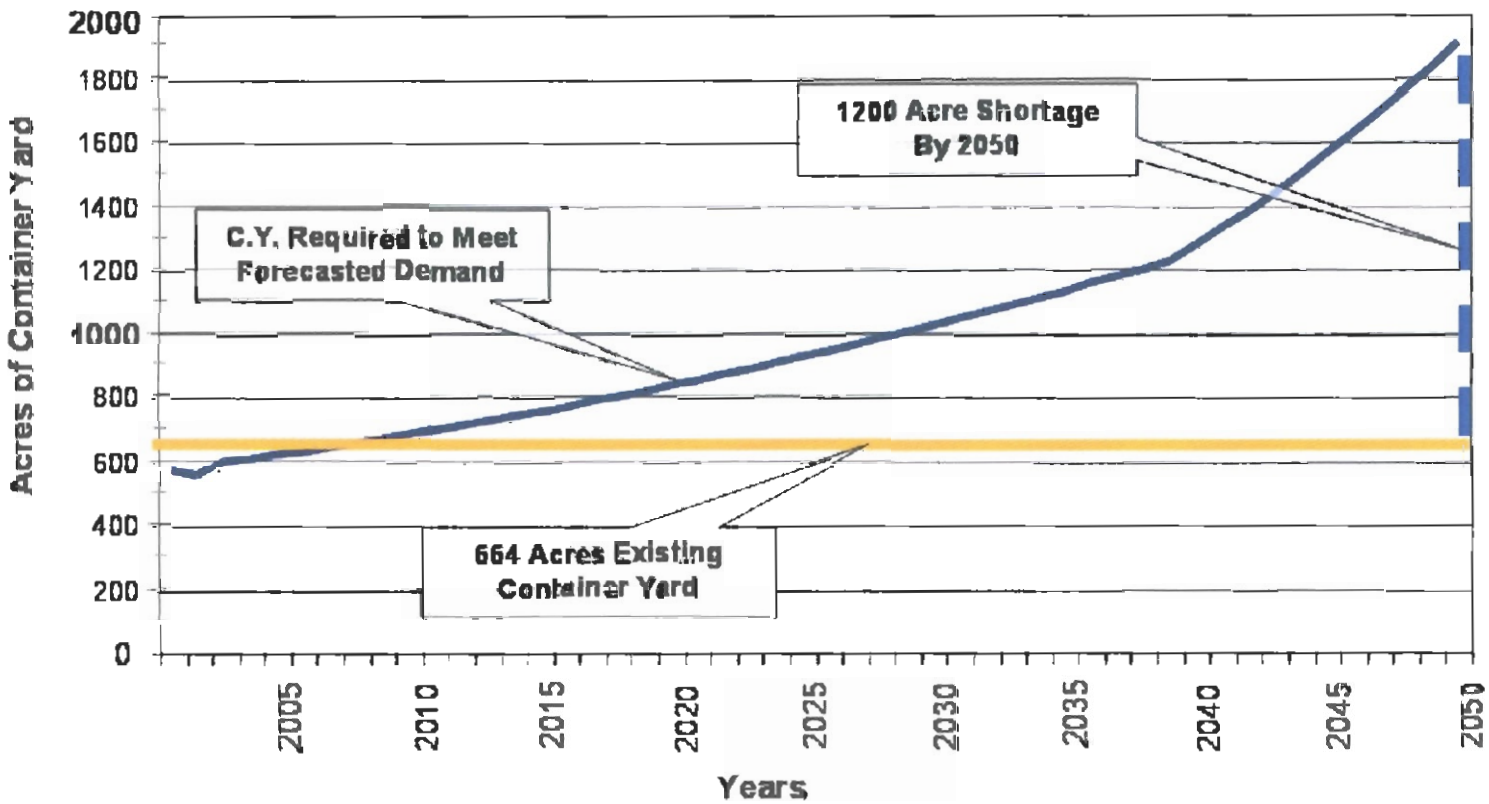
PROJECT DEMAND AND CURRENT CAPACITY

Figure 1-5



PROJECT DEMAND AND PLANNED CAPACITY

Figure I-6



MINIMUM CONTAINER PORT LAND REQUIREMENT

Figure I-7

Evaluation of Alternatives

PART II

EVALUATION OF ALTERNATIVES

II.1.0 ALTERNATIVE PLAN DEVELOPMENT

The alternative plan formulation process is designed to identify plans that are publicly acceptable, implementable, and feasible from economic, environmental, engineering, and social standpoints. . The process was developed by the U.S. Army Corps of Engineers (USACE) and is described in detail in ER 1105-2-100. It requires the systematic preparation and evaluation of alternative solutions for addressing identified problems, needs, and opportunities under the objectives of National Economic Development (NED), consistent with protecting the Nation's environment. Alternative plans are formulated to identify specific ways to achieve the planning objectives, so as to solve the identified problems and realize the identified opportunities. Each alternative plan is formulated in consideration of four criteria: (1) completeness, (2) efficiency, (3) effectiveness, and (4) acceptability. Completeness is the extent to which the alternative plans provide and account for all necessary investments or other actions to ensure the realization of the planning objectives, including actions by other Federal and non-Federal entities. Efficiency is the extent to which an alternative plan is the most cost-effective means of achieving the objectives. Effectiveness is the extent to which the alternatives plans contribute to achieve the planning objectives. Acceptability is the extent to which the alternative plans are acceptable in terms of applicable laws, regulations, and public policies.

Alternatives evaluated in this section include new and existing sites for dredge material management and port facilities. The primary objective of this analysis is to determine which alternative or combination of alternatives will meet the need for increased dredge material disposal capacity, additional marine cargo handling facilities, and military logistical and tactical deployment support areas while minimizing environmental impacts to the extent practical.

II.1.1 ALTERNATIVE PLAN DEVELOPMENT CRITERIA

The following specific formulation and evaluation criteria have been identified for this study.

Technical Criteria

- The plan selected should be consistent with local, regional, and state goals for water resources development.
- Plans must be realistic and reflect state-of-the-art measures and analysis techniques.
- The optimization scale of project development should be identified by analyzing NED and engineering feasibility.
- The plan should be capable of handling all types of material normally dredged in Hampton Roads, i.e., silt, sand, shell, and mixtures of these, as well as suitable and unsuitable material.
- The plan should accommodate large and small input loads without undue sacrifice of

effectiveness. It should be capable of accommodating unanticipated new work without appreciable disruption.

- With the possible exception of extreme storms, the plan should function regardless of weather conditions.
- The entire plan should withstand disruption as a result of damage to part of the system. It should be a product of proven elements and practices and be resilient under emergency or catastrophic conditions, such as storms, floods, waves, and so on.
- The plan should be capable of serving or utilizing all types of dredging equipment, including hopper dredges, hydraulic pipeline dredges, and mechanical (bucket) dredges. It should permit simultaneous operation of several types of dredges.
- Levees must be sized sufficiently to withstand storm tides and wave action.
- The plan should be capable of accommodating future port development.

Economic Criteria

- Each separable unit of improvement must provide benefits at least equal to its costs.
- The scope of the proposed development must be scaled to provide maximum net benefits. However, departure from a project that provides economic optimum is possible in cases where the departure is justifiable and substantiated.
- There must be no more economical means, evaluated on a comparable basis, of accomplishing the same purpose that would be precluded from development if the Federal plan was under taken. This limitation applies only to those alternative possibilities that would be physically displaced or economically precluded from development if the project were undertaken. The Federal plan cannot be used to eliminate a more economical plan because it would be physically displaced by the Federal plan.

Institutional Criteria

- Plans must be consistent with existing Federal, state, and local laws;
- Plans must be locally supported to the extent that non-Federal partner provide a letter of intent stating that it understands its responsibilities and obligations as set forth in the WRDA of 1986, as amended.
- Prior to the Preconstruction Engineering and Design (PED) Phase, the non-Federal partner would enter into a written Design Agreement to cost share 25 percent of the costs of the Design Phase upfront. Ultimate cost-sharing of design is the same percentage as for construction. Settlement is made at the time of construction subsequent to execution of the Project Cooperation Agreement (PCA).
- Prior to the Construction Phase, the non-Federal partner would enter into a written PCA to provide all items of local cooperation satisfactory to the Secretary of the Army, as mandated by Section 22 of Public Law 91-611, as amended.

Environmental and Social Criteria

- The plan should minimize the commitment of natural resources, whether they are marine bottom-lands, wetlands, other coastal zones, inland environments, or wildlife in these areas.
- The plan should minimize environmental impacts and maximize environmental quality in the project area to the extent practicable considering environmental, economic, and engineering criteria.
- The available sources of expertise should be used to identify environmental resources that might be endangered, damaged, or destroyed by plan implementation. These would include the U.S. Fish and Wildlife Service (USFWS), Environmental Protection Agency (USEPA), National Marine Fisheries Service (NMFS), and appropriate state agencies, such as Virginia Institute of Marine Science (VIMS), Virginia Marine Resources Commission (VMRC), Virginia Department of Environmental Quality (DEQ), and the Virginia Department of Historic Resources (VHDR).
- Measures should be incorporated into the Recommended Plan to protect, preserve, restore, or enhance environmental quality in the project area.
- The plan should be capable of being integrated into local or regional planning for water and air pollution abatement, transportation, recreation, and land use.
- As much as possible, the plan should minimize noise, dust, odor, unsightliness, and potential health risks.
- The plan should meet existing public health and environmental control standards.
- As nearly as possible, the plan should be aesthetically pleasing to the public, which has to support and live with it.
- The plan should not displace, devalue, or destroy important historical and cultural landmarks or sites.
- The adverse impacts on area recreation resources should be minimized.
- The plan should be publicly acceptable.

The degree to which any water resources development project meets the foregoing criteria is taken as a measure of its relative merit. Clearly, no plan could meet all these criteria fully. However, the evaluation, selection, and development of alternatives will emphasize optimization in terms of the respective economic (NED) benefits along with the consideration of environmental, social, and regional impacts.

II.2.0 ALTERNATIVES ANALYSIS

The alternatives analysis involves six essential steps:

- Step 1: Identification, examination, and screening of potential solutions;
- Step 2: Development of initial alternative plans;
- Step 3: Screening of initial alternative plans;
- Step 4: Evaluation of alternative plans;

- Step 5: Optimization and comparison of alternative plans; and
- Step 6: Selection of a plan.

II.2.1 IDENTIFICATION AND EXAMINATION, AND SCREENING OF INITIAL ALTERNATIVES, INCLUDING NO ACTION ALTERNATIVE (STEPS 1-3)

In Steps 1-3, dredged material disposal alternatives and potential marine terminal sites were identified and evaluated individually on the basis of their suitability, applicability, and merit in meeting the planning objectives and constraints for the study. Without undertaking an in-depth analysis, the goal of this step was to screen out those solutions that obviously do not accommodate the need for increased dredged material disposal capacity or port expansion, have significant environmental impacts, or are inappropriate due to other factors such as prohibitively high costs. As part of this step, all the long-term dredge material management alternatives and all potential marine terminal locations in the Hampton Roads area are considered.

II.2.1.1 CIDMMA EXPANSION ALTERNATIVES

A comprehensive list of all the dredge material alternatives identified for initial screening is included in Table II-1. Identified potential long-term dredged material storage locations are shown in Figure II-1. Currently the CIDMMA operates consistent with a Dredged Material Management Plan (DMMP). Part of the plan calls for use of the existing north, center, and south containment cells to be rotated. Rotation allows optimal drying of the dredged material within the facility. A general assumption for initial alternatives screening is that any proposed confined disposal facility (CDF) expansion cell will be added into the cell rotation plan to continue optimal drying of material within the facility. In addition, it is assumed that expansion cells will be rapidly filled for port development, which consists of having dredged material placed into that cell as rapidly as possible without the expansion cell participating in the DMMP cell rotation for optimal drying.

Table II-1 serves as a simplified synopsis of the initial screening analysis. This section explains how to use this table.

The first column is a listing of all the possible alternatives for long-term dredged material storage for Hampton Roads. The remaining columns are grouped together to provide a concise reference to indicate whether the associated alternative meets the objectives of the study: provision for dredged material capacity, consideration to port development, military usage, and environmental considerations. The alternatives are grouped into the following major categories:

- **No Action Alternative:** Based on ERDC simulations, CIDMMA will reach its maximum capacity in 2025 under without project conditions. CIDMMA capacity is regularly increased to meet short-term inflow projections by raising the interior height of the dikes. Interior dike heights currently range from 33 to 36 feet above MLW. Under without project conditions, the dikes are capable of being raised to an interior height of 47 feet, which is projected to accommodate forecasted inflow volumes until 2025. After 2025, with the dikes at an interior

height of 47 feet, the CIDMMA foundation will have reached its bearing capacity, and additional inflows will no longer be accommodated. At this time ocean disposal will be utilized for suitable material.

- **On Site Alternatives:** These include modifications of the existing site that could extend the life of CIDMMA and provide port development. An example of such a measure is installation of strip drains to help consolidate material within the site.

- **East Expansions:** These include potential solutions for eastward expansion footprints of the existing site that could extend the life of CIDMMA and provide port development. Expansion cell dikes would be constructed from the existing CIDMMA eastern dike into the Elizabeth River, and the cell would be filled with dredged material. Many different dike construction and construction phasing techniques were considered. Consideration was given to utilization of this site as only a CDF and as a CDF with port terminal development. When considering a port terminal, such development would occur on top of the expansion footprint once the cell has been filled with dredged material. A channel and berthing area would be dredged to allow for both dike construction and ship access to the port facility.

- **North Expansions:** These include potential solutions for northward expansion footprints of the existing site that could extend the life of CIDMMA and provide port development. A larger northward expansion and a smaller northward expansion were considered. A northward expansion cell would require dike construction from the existing CIDMMA northern dike northward into Hampton Roads. The cell would be filled with dredged material. Many different dike construction and construction phasing techniques were considered. Utilization of this site both as only a CDF and as a CDF with port terminal development was both considered. When considering a port terminal, such development would occur on top of the expansion footprint once the cell has been filled with dredged material. A channel and berthing area would be dredged to allow ship access to the port facility.

- **West Expansions:** These include potential solutions for westward expansion footprints of the existing site that could extend the life of CIDMMA and provide port development. Several different westward expansion footprints were considered. The smallest footprint expansion was one that would minimally extend the life of the facility. The largest possible expansion was the footprint that would fit within physical constraints surrounding the site. A westward expansion cell would require dike construction from the existing CIDMMA western dike westward into the James River. The cell would be filled with dredged material. Many different dike construction and construction phasing techniques were considered. Utilization of this site both as only a CDF and as a CDF with port terminal development was both considered. When considering a port terminal, such development would occur on top of the expansion footprint once the cell has been filled with dredged material. A channel and berthing area would be dredged to allow ship access to the port facility.

- **East and North Expansions:** These include potential solutions for eastward and northward expansion footprints of the existing site that could extend the life of CIDMMA and provide port

development. These expansion footprints are combinations of the north and east expansion footprints discussed above.

- **East and West Expansions:** These include potential solutions for eastward and westward expansion footprints of the existing site that could extend the life of CIDMMA and provide port development. These expansion footprints are combinations of the east and west expansion footprints discussed above.

- **North and West Expansions:** These include potential solutions for northward and westward expansion footprints of the existing site that could extend the life of CIDMMA and provide port development. These expansion footprints are combinations of the north and west expansion footprints discussed above.

- **Upland Placement Sites:** These include new confined upland placement sites involving acquisition of upland real estate and construction of new diked facilities. Such sites are located in land areas that are considered upland, not periodically inundated with seawater during tidal fluctuations. Such placement sites generally require larger tracts of land. The tracts should be of such a shape to facilitate water clarification goals of a dredged material placement site. Upland sites are constructed by building containment dikes to hold the dredged material. The dimensions of the upland site should be such that appropriate ponding and freeboard are maintained at all times. Weir structures should be installed to allow ponding of the water and decanting of clarified water. Management plans should be developed to optimally operate the site and maximize its lifespan. For the upland sites examined in this study, each lifecycle phase should be considered. Design efforts should consider site location, environmental and institutional considerations, real estate, technical parameters, and so forth. Initial construction and operation and maintenance (O&M), as well as closeout phases are also considered.

- **Ocean Placement Sites:** These include the two ocean placement sites accessible off the Virginia coast: Dam Neck Ocean Disposal Site (DNODS), and Norfolk Ocean Site (NOS). These two sites were designated previously and are considered to be possible alternatives to the CIDMMA.

- **Beneficial Use Sites:** These include beneficial use of dredged material placement. Beneficial use sites for the purposes of this study are those sites where dredged material could be used to accomplish environmental benefits. Examples of such benefits could include beach nourishment, marsh creation or restoration, oyster ground creation, creation of fish and wildlife habitat, and use of dredged material as construction materials. Design, construction, and placement techniques, as well as O&M procedures are specific to the beneficial use goal.

- **Creation of New Island Facilities:** These include building new islands in open water similar to the existing CIDMMA that could be operated as new DMMA's. These sites were identified in prior studies and were revisited for this study. In most cases, such sites would require building dikes up from the existing subaqueous bottom to contain a large area of harbor, bay, or river bottom. Dredged material would be deposited into the site until the dredged material elevation exceeded the high water line. Then the site would be operated much as the existing CIDMMA is operated. Management plans should be developed to optimally operate the site and maximize its

lifespan. Each lifecycle phase should also be considered. Design efforts should consider site location, environmental and institutional considerations, real estate, technical parameters, etc. Initial construction, O&M, and closeout phases are also considered.

- **Deep Hole Sites:** These include locations within the Hampton Roads area where deep water exists that may have sufficient capacity to serve as pits for placement of dredged material. The concept of such a placement site is that dredged material would be deposited into the deep holes such that the deep holes would eventually be filled enough for the bottom contours to increase enough to match the surrounding bathymetry.

- **Combined Aquatic Disposal Facilities:** These include sites that could be used as borrow sources of sand that could be used for numerous construction projects. Once the sand is removed, a pit would remain that could provide dredged material storage capacity. Once the removal of borrow material is complete, dredged material could be placed into the pit. The pit would be filled until the increasing bottom contours match the surrounding bathymetry.

The second column indicates whether the alternative provides dredged material placement capacity. Results of screening analysis are summarized in the third column as:

- **"Yes."** In this case, the alternative provides long-term dredged material storage capacity for Norfolk Harbor (generally the geographic area currently included within the bounds authorized to the existing CIDMMA facility).
- **"No."** In this case, the alternative does not provide sufficient long-term dredged material storage capacity.
- **"Possibly."** The level of design detail to determine whether dredged material storage capacity could be increased cannot be determined. However, with the limited information available increased storage appears to be likely.
- **"Minimally."** At the current level of design, an increase of dredged material storage capacity appears likely, but the increased capacity does not really increase enough to provide long-term capacity for Norfolk Harbor.

The third column includes information as to whether the alternative would allow development of a port terminal facility in conjunction with the dredged material placement site. Results of the screening analysis for this study objective are summarized as:

- **"Yes."** In this case, the alternative has potential for port terminal development and as a dredged material placement site.
- **"No."** The alternative does not provide potential for terminal development.

The fourth column includes information as to whether the alternative provides for military use of the site. There were two potential military uses of each alternative. The first use would be use of the alternative as a port facility for military logistics. The facility could be used to provide for transport of troops, supplies, weapons, equipment, and so forth. The second use would be for military training purposes. The Army

has at times used a portion of the east side of the CIDMMA at the Rehandling Basin to practice landings. The extent to which the Army would use it in the future is unknown; however, the option remains open. The results of screening analysis for this study objective are summarized as:

- **"Yes."** In this case, the alternative provides potential for both types of military use, training and logistics.
- **"No."** The alternative does not provide potential for either military use.
- **"Partial."** Here, the alternative provides for either logistical or training use. In most cases, "Partial" means only training use is support.
- **"Possibly."** There could be military use opportunities, but the degree to which the site could be used cannot be determined at the level of design for this study.
- **"Conflict."** A conflicting use would be an alternative that prevents military activities that are current on-going at an alternative's location from continuing once the alternative is constructed.

The fifth column depicts the results of the initial environmental analysis of the various alternatives in an abbreviated form. This analysis, presented in Tables II-2 and II-3, evaluated the degree of impact of the alternatives in various environmental categories.

The last column in Table II-1 is a brief synopsis of the major reasons for eliminating or carrying forward an alternative. This column's data indicate whether an alternative progressed to the next phase of the analysis or was eliminated from consideration.

Table II-1. RESULTS OF SCREENING OF DREDGE MATERIAL MANAGEMENT ALTERNATIVES

Potential solutions	Meets objectives: Extends life of existing CIDMMA facility	Meets objectives: Provides for anticipated future port development (1)	Meets objectives: Supports national defense needs	Environmental considerations	Determination
NO ACTION ALTERNATIVE	No	No	No	No significant effects	**Does not meet objectives.** This does not allow for more capacity, port development, or support of national defense needs.
ON SITE ALTERNATIVE: Existing CIDMMA & west berm construction	Yes	No	Partial	No significant effects	**Retain For Least-Cost Dredged Material Disposal Analysis -** An additional alternative site is needed to meet the port development objective.
ON SITE ALTERNATIVES: Various potential solutions that include port development on existing CIDMMA	No/ Possibly	No	Yes	No significant effects	Constructability, operability, and storage capacity problems. Possible reduction in capacity. Elevation is too high for marine terminal construction.
EAST EXPANSION: Eastward expansion for CDF cell only	Yes	No	Partial	Aquatic biota	**Retain For Least-Cost Dredged Material Disposal Analysis -** An additional alternative site is needed to meet the port development objective.
EAST EXPANSION: Eastward expansion for CDF cell & port development (1)	Yes	Yes	Yes	Aquatic biota and air quality	**Retain For Least-Cost Dredged Material Disposal Analysis -** (First, southern 1/3 of cell is filled, then port is constructed, then remaining 2/3rd's of cell is filled.)

Table II-1. RESULTS OF SCREENING OF DREDGE MATERIAL MANAGEMENT ALTERNATIVES
(Cont'd)

	Meets objectives				
Potential solutions	Extends life of existing CIDMMA facility	Provides for anticipated future port development (1)	Supports national defense needs	Environmental considerations	Determination
EAST EXPANSION: EASTWARD EXPANSION FOR CDF CELL & PORT DEVELOPMENT & WEST BERM CONSTRUCTION (1)	Yes	Yes	Yes	Aquatic biota and air quality	**RETAIN.** (First, southern 1/3 of cell is filled, then port is constructed, then remaining 2/3rd's of cell is filled.)
NORTH EXPANSION: Large northward expansion for CDF cell only	Yes	No	Partial	Aquatic biota, hydrodynamics, and water quality	Hydrodynamic impacts and larval dispersion cause a non-workable solution among stakeholder community. Also, institutional concerns.
NORTH EXPANSION: Large northward expansion for CDF cell & port development (1)	Yes	Yes	Yes	Aquatic biota, hydrodynamics, water quality, and air quality	Hydrodynamic impacts and larval dispersion cause a non-workable solution among stakeholder community. Also, institutional concerns.

Table II-1. RESULTS OF SCREENING OF DREDGE MATERIAL MANAGEMENT ALTERNATIVES
(Cont'd)

Potential solutions	Meets objectives: Extends life of existing CIDMMA facility	Meets objectives: Provides for anticipated future port development (1)	Meets objectives: Supports national defense needs	Environmental considerations	Determination
NORTH EXPANSION: Small northward expansion for CDF cell only	Yes	No	Partial	Aquatic biota, hydrodynamics, and water quality	Hydrodynamic impacts and larval dispersion cause a non-workable solution among stakeholder community. Also, institutional concerns.
WEST EXPANSION: Large westward expansion for a CDF cell only	Yes	No	Partial	Water quality, aquatic biota, visual/aesthetic, and recreational/ commercial water use	Current State law prohibits a westward expansion of the CIDMMA. Hydrodynamic impacts and larval dispersion cause a non-workable solution among stakeholder community.
WEST EXPANSION: Medium westward expansion for a CDF cell only	Yes	No	Partial	Water quality, aquatic biota, visual/aesthetic, and recreational/ commercial water use	Current State law prohibits a westward expansion of the CIDMMA. Hydrodynamic impacts and larval dispersion cause a non-workable solution among stakeholder community.

Table II-1. RESULTS OF SCREENING OF DREDGE MATERIAL MANAGEMENT ALTERNATIVES
(Cont'd)

Potential solutions	Meets objectives: Extends life of existing CIDMMA facility	Meets objectives: Provides for anticipated future port development (1)	Meets objectives: Supports national defense needs	Environmental considerations	Determination
WEST EXPANSION: Small westward expansion for CDF cell only	Yes	No	Partial	Water quality, aquatic biota, visual/aesthetic, and recreational/comer -cial water use	Current State law prohibits a westward expansion of the CIDMMA. Hydrodynamic impacts and larval dispersion cause a non-workable solution among stakeholder community.
WEST EXPANSION: Modified (after hydrodynamic modeling) large westward expansion for a CDF cell only	Yes	No	Partial	Water quality, aquatic biota, visual/aesthetic, and recreational/comer -cial water use	Current State law prohibits a westward expansion of the CIDMMA. Hydrodynamic impacts and larval dispersion cause a non-workable solution among stakeholder community.
WEST EXPANSION: Large westward expansion for CDF cell & port development (1)	Yes	Yes	Yes	Water quality, aquatic biota, visual/aesthetic, air quality, and recreational/comm er-cial water use	Current State law prohibits a westward expansion of the CIDMMA. Hydrodynamic impacts and larval dispersion cause a non-workable solution among stakeholder community.

Table II-1. RESULTS OF SCREENING OF DREDGE MATERIAL MANAGEMENT ALTERNATIVES
(Cont'd)

Potential solutions	Meets objectives: Extends life of existing CIDMMA facility	Meets objectives: Provides for anticipated future port development (1)	Meets objectives: Supports national defense needs	Environmental considerations	Determination
WEST EXPANSION: Medium westward expansion for CDF cell & port development (1)	Yes	Yes	Yes	Water quality, aquatic biota, visual/aesthetic, air quality, and recreational/commercial water use	Current State law prohibits a westward expansion of the CIDMMA. Hydrodynamic impacts and larval dispersion cause a non-workable solution among stakeholder community.
WEST EXPANSION: Small westward expansion for CDF cell & port development (1)	Yes	Yes	Yes	Water quality, aquatic biota, visual/aesthetic, air quality, and recreational/commercial water use	Current State law prohibits a westward expansion of the CIDMMA. Hydrodynamic impacts and larval dispersion cause a non-workable solution among stakeholder community.
EAST & NORTH EXPANSIONS: Various combinations of various sizes of eastward & northward expansions for CDF cells only	Yes	No	Partial	Water quality, aquatic biota, and hydrodynamics	Hydrodynamic impacts and larval dispersion cause a non-workable solution among stakeholder community.

Table II-1. RESULTS OF SCREENING OF DREDGE MATERIAL MANAGEMENT ALTERNATIVES
(Cont'd)

Potential solutions	Meets objectives: Extends life of existing CIDMMA facility	Meets objectives: Provides for anticipated future port development (1)	Meets objectives: Supports national defense needs	Environmental considerations	Determination
EAST & NORTH EXPANSIONS: Various combinations of eastward & northward expansions for CDF cells & port development (1)	Yes	Yes	Yes	Water quality, aquatic biota, hydrodynamics, and air quality	Hydrodynamic impacts and larval dispersion cause a non-workable solution among stakeholder community.
EAST & WEST EXPANSIONS: Various combinations of various sizes of eastward & westward expansions for CDF cells only	Yes	No	Partial	Water quality, aquatic biota, hydrodynamics, visual/aesthetics, and recreational/ commercial water use	Current State law prohibits a westward expansion of the CIDMMA. Hydrodynamic impacts and larval dispersion from westward expansion cause a non-workable solution among stakeholder community.
EAST & WEST EXPANSIONS: Various combinations of various sizes of eastward & westward expansions for CDF cells & port development (1)	Yes	Yes	Yes	Water quality, aquatic biota, hydrodynamics, visual/aesthetics, air quality, and recreational/com -ercial water use	Current State law prohibits a westward expansion of the CIDMMA. Hydrodynamic impacts and larval dispersion from westward expansion cause a non-workable solution among stakeholder community.

Table II-1. RESULTS OF SCREENING OF DREDGE MATERIAL MANAGEMENT ALTERNATIVES
(Cont'd)

Potential solutions	Meets objectives: Extends life of existing CIDMMA facility	Meets objectives: Provides for anticipated future port development (1)	Meets objectives: Supports national defense needs	Environmental considerations	Determination
NORTH & WEST EXPANSIONS: Various combinations of various sizes of northward & westward expansions for CDF cells only	Yes	No	Partial	Water quality, aquatic biota, hydrodynamics, visual/aesthetic s, and recreational/ commercial water use	Current State law prohibits a westward expansion of the CIDMMA. Hydrodynamic impacts and larval dispersion from westward and northward expansions cause a non-workable solution among stakeholder community.
NORTH & WEST EXPANSIONS: Various combinations of various sizes of northward & westward expansions for CDF cells & port development (1)	Yes	Yes	Yes	Water quality, aquatic biota, hydrodynamics, visual/aesthetics , and recreational/ commercial water use	Current State law prohibits a westward expansion of the CIDMMA. Hydrodynamic impacts and larval dispersion from westward and northward expansions cause a non-workable solution among stakeholder community.

Table II-1. RESULTS OF SCREENING OF DREDGE MATERIAL MANAGEMENT ALTERNATIVES
(Cont'd)

Potential solutions	Meets objectives: Extends life of existing CIDMMA facility	Meets objectives: Provides for anticipated future port development (1)	Meets objectives: Supports national defense needs	Environmental considerations	Determination
UPLAND PLACEMENT SITE: Southeastern Public Service Authority landfill site in Suffolk	Yes	No	No	Water quality, sanctuaries and refuges, protected species/critical habitat, visual/ aesthetics, and wetlands	**RETAIN** Many environmental, real estate, engineering, and institutional concerns.
UPLAND PLACEMENT SITE: Upland site in Portsmouth between power generation plant and State Highway 164	Possibly	Yes	Yes	Transportation, visual/aesthetics, wetlands, land use, and utilities	**RETAIN** Conflict of land use with Maersk port development.

Table II-1. RESULTS OF SCREENING OF DREDGE MATERIAL MANAGEMENT ALTERNATIVES
(Cont'd)

Potential solutions	Meets objectives: Extends life of existing CIDMMA facility	Meets objectives: Provides for anticipated future port development	Meets objectives: Supports national defense needs	Environmental considerations	Determination
OCEAN PLACEMENT: Dam Neck ocean placement site	Possibly	No	No	No significant effects	**RETAIN** An additional alternative site is needed to meet the port development objective. Also, placement site would require major modifications.
BENEFICIAL USE OF DREDGED MATERIAL SITE: Ragged Island site	Possibly	No	No	Hydrodynamics, water quality, and protected species and critical habitat	**RETAIN** Site cannot be rapidly filled. An additional alternative site is needed to meet the port development objective given that site is a State wildlife management refuge.
BENEFICIAL USE OF DREDGED MATERIAL SITE: Hoffler Creek site	No	No	No	Hydrodynamics, water quality, protected species and critical habitat, and aquatic biota	Conflict of use, since it is a wildlife preserve Also, cannot be rapidly filled.

Table II-1. RESULTS OF SCREENING OF DREDGE MATERIAL MANAGEMENT ALTERNATIVES
(Cont'd)

Potential solutions	Meets objectives: Extends life of existing CIDMMA facility	Meets objectives: Provides for anticipated future port development	Meets objectives: Supports national defense needs	Environmental considerations	Determination
BENEFICIAL USE OF DREDGED MATERIAL SITE: Lily Creek site	No	No	No	Hydrodynamics, water quality, protected species and critical habitat, and aquatic biota	Cannot be rapidly filled. Also, conflict of use since the land was recently developed as residential housing.
CREATION OF NEW ISLAND FACILITIES: Buckroe Beach/Horseshoe Flats	Yes	Possibly	Possibly	Hydrodynamics, water quality, aquatic biota, and recreational/commercial water use	Conflict of use since area is borrow site for Buckroe Beach Federal project. Also, this is a finfish migratory route and crab nursery.

Table II-1. RESULTS OF SCREENING OF DREDGE MATERIAL MANAGEMENT ALTERNATIVES
(Cont'd)

Potential solutions	Meets objectives: Extends life of existing CIDMMA facility	Meets objectives: Provides for anticipated future port development	Meets objectives: Supports national defense needs	Environmental considerations	Determination
CREATION OF NEW ISLAND FACILITIES: Willoughby Bay Island	Yes	Possibly	Could conflict	Hydrodynamics, water quality, aquatic biota, and recreational/com-mercial water use	Protected area for juvenile fish. Also, drainage of the Mason Creek area could be disrupted. Also, strong recreational and military use of this bay.
CREATION OF NEW ISLAND FACILITIES: Ocean View offshore/ Chesapeake Bay	Yes	Possibly	Possibly	Hydrodynamics, water quality, aquatic biota, and recreational/com-mercial water use	Heavy use of this site for fishing, and recreation would be lost and is, therefore, socially unacceptable. Also, there are possible incompatibilities with Norfolk Redevelopment Plan.
CREATION OF NEW ISLAND FACILITIES: East of Chesapeake Bay Bridge-Tunnel	Yes	Possibly	Possibly	Hydrodynamics, water quality, aquatic biota, and recreational/com-mercial water use	Conflicts with Chesapeake Bay multi-agency goals. Also, site would likely need larger capacity than other alternatives considered for this report, since its location would be favorable for projects not traditionally allowed to use CIDMMA. Also, beyond the scope of this study.

Table II-1. RESULTS OF SCREENING OF DREDGE MATERIAL MANAGEMENT ALTERNATIVES
(Cont'd)

Potential solutions	Meets objectives: Extends life of existing CIDMMA facility	Meets objectives: Provides for anticipated future port development	Meets objectives: Supports national defense needs	Environmental considerations	Determination
CREATION OF NEW ISLAND FACILITIES: Hampton Flats	Yes	Possibly	Possibly	Hydrodynamics, water quality, aquatic biota, and recreational/commercial water use	Would be detrimental to shellfish larvae and other marine organisms. Also, disruptive to hydrodynamics.
DEEP HOLE SITE: Site in James River	Possibly	No	No	Hydrodynamics, water quality, and aquatic biota	**RETAIN** Dredged material nutrient release concerns. Also, scour concerns. An additional alternative site is needed to meet the port development and national defense objectives.
DEEP HOLE SITE: Site near Hampton Roads Bridge-Tunnel	Possibly	No	No	Hydrodynamics, water quality, and aquatic biota	**RETAIN** Dredged material nutrient release concerns. Also, scour concerns. An additional alternative site is needed to meet the port development objective.

Table II-1. RESULTS OF SCREENING OF DREDGE MATERIAL MANAGEMENT ALTERNATIVES
(Cont'd)

Potential solutions	Meets objectives: Extends life of existing CIDMMA facility	Meets objectives: Provides for anticipated future port development	Meets objectives: Supports national defense needs	Environmental considerations	Determination
DEEP HOLE SITE: Site in southern Chesapeake Bay	Possibly	No	No	Hydrodynamics, water quality, aquatic biota, and recreational/commercial water use	**RETAIN** Dredged material nutrient release concerns. Also, scour concerns. An additional alternative site is needed to meet the port development and national defense objectives.
COMBINED AQUATIC DISPOSAL FACILITY: Offshore of River Shore neighborhood in Portsmouth	Minimally	No	No	Hydrodynamics, water quality, and aquatic biota	**RETAIN** An additional alternative site is needed to meet the port development and national defense objectives.
COMBINED AQUATIC DISPOSAL FACILITY: Offshore of old Tidewater Community College campus in Suffolk	Minimally	No	No	Hydrodynamic, water quality, and aquatic biota	**RETAIN** High commercial fishery value. An additional alternative site is needed to meet the port development objective.

Table II-1. RESULTS OF SCREENING OF DREDGE MATERIAL MANAGEMENT ALTERNATIVES (Cont'd)

Potential solutions	Meets objectives: Extends life of existing CIDMMA facility	Meets objectives: Provides for anticipated future port development	Meets objectives: Supports national defense needs	Environmental considerations	Determination
COMBINED AQUATIC DISPOSAL FACILITY: Mouth of Nansemond River	Minimally	No	No	Hydrodynamics, water quality, aquatic biota, and recreational/ commercial water use	**RETAIN** Environmental impacts to James and Nansemond Rivers. An additional alternative site is needed to meet the port development and national defense objectives.
COMBINED AQUATIC DISPOSAL FACILITY: James River between mouths of Nansemond River and Chuckatuck Creek	Minimally	No	No	Hydrodynamics, water quality, aquatic biota, and recreational/ commercial water use	**RETAIN** Disruptive of discharge from Nansemond River and Knotts Creek. An additional alternative site is needed to meet the port development and national defense objectives.
COMBINED AQUATIC DISPOSAL FACILITY: Middle ground site west of Monitor Merrimac Bridge-Tunnel	Minimally	No	No	Hydrodynamics, water quality, aquatic biota, and recreational/ commercial water use	**RETAIN** High commercial fishery value. An additional alternative site is needed to meet the port development and national defense objectives.

Table II-1. RESULTS OF SCREENING OF DREDGE MATERIAL MANAGEMENT ALTERNATIVES
(Cont'd)

Potential solutions	Meets objectives: Extends life of existing CIDMMA facility	Meets objectives: Provides for anticipated future port development	Meets objectives: Supports national defense needs	Environmental considerations	Determination
COMBINED AQUATIC DISPOSAL FACILITY: Middle ground site east of Monitor Merrimac Bridge-Tunnel	Minimally	No	No	Hydrodynamics, water quality, aquatic biota, and recreational/commercial water use	High commercial fishery value. VMRC Clam brood stock area.
COMBINED AQUATIC DISPOSAL FACILITY: Hampton Flats west side	Minimally	No	No	Hydrodynamics, water quality, aquatic biota, recreational/commercial water use, and submerged aquatic vegetation (SAV)	High commercial fishery value. Also, disruptive to "plunging front" hydrodynamics that are critical to larval fisheries. Also, possible navigation concerns.
COMBINED AQUATIC DISPOSAL FACILITY: Channel to Newport News	Minimally	No	No	Water quality, aquatic biota, and recreational/commercial water use	Full time use as a placement site would disrupt navigation.
COMBINED AQUATIC DISPOSAL FACILITY: Adjacent to Hampton Creek entrance	Minimally	No	No	Hydrodynamics, water quality, aquatic biota, recreational/commercial water use, and SAV	High commercial fishery value. Also, proximity to Hampton Flats and associated "plunging front" hydrodynamics that are critical to larval fisheries.

Table II-1. RESULTS OF SCREENING OF DREDGE MATERIAL MANAGEMENT ALTERNATIVES
(Cont'd)

Potential solutions	Meets objectives: Extends life of existing CIDMMA facility	Meets objectives: Provides for anticipated future port development	Meets objectives: Supports national defense needs	Meets objectives: Environmental considerations	Determination
COMBINED AQUATIC DISPOSAL FACILITY: Adjacent to Willoughby Federal navigation channel in Norfolk	Minimally	No	Possible conflicts with other military use	Hydrodynamics, water quality, aquatic biota, and recreational/commercial water use	High commercial fisheries value. Also, proximity to navigation channel is undesirable. Also, possible conflicts with Virginia Department of Transportation and/or Navy interests.
COMBINED AQUATIC DISPOSAL FACILITY: North of Norfolk Naval Base carrier docks	Minimally	No	Conflicts with other military use	Water quality, aquatic biota, and recreational/commercial water use	Placement site option is incompatible with Navy's use of site.
COMBINED AQUATIC DISPOSAL FACILITY: Norfolk Harbor	Minimally	No	No	Water quality, aquatic biota, and recreational/commercial water use	**RETAIN** An additional alternative site is needed to meet the port development objective.
COMBINED AQUATIC DISPOSAL FACILITY: Adjacent to Norfolk International Terminals North	Minimally	No	No	Aquatic biota and recreational/commercial water use	Navigational issues. Conflicts with Virginia Pi Association and port facility interests. An addi alternative site is needed to meet the port development objective.

Table II-1. RESULTS OF SCREENING OF DREDGE MATERIAL MANAGEMENT ALTERNATIVES
(Cont'd)

Potential solutions	Meets objectives: Extends life of existing CIDMMA facility	Meets objectives: Provides for anticipated future port development	Meets objectives: Supports national defense needs	Environmental considerations	Determination
COMBINED AQUATIC DISPOSAL FACILITY: Adjacent to Norfolk International Terminals South	Minimally	No	No	Aquatic biota and recreational/commercial water use	Conflict of use with borrow site for oyster shell for oyster restoration programs. Borrow material quality is questionable. An additional alternative site is needed to meet the port development and national defense objectives.
COMBINED AQUATIC DISPOSAL FACILITY: East side of existing CIDMMA	Minimally	No	No	Aquatic biota and recreational/commercial water use	**RETAIN** An additional alternative site is needed to meet the port development and national defense objectives.

(1) See Section 2.1.2 and Table II-4 for additional information on site selection for port development.

Alternatives that, according to the modeling results, result in significant hydrodynamic impacts or are counter to current State laws specific to CIDMMA expansion were automatically eliminated. Sites that present a conflict with current Federal or State government use or U. S. military use, present navigational concerns, or are located in a defined fishery management area were also eliminated.

The following tables provide a more detailed evaluation and comparison of potential environmental impacts that may result from implementation of various alternatives including the No Action Alternative. A brief description of the significance criteria for evaluating degrees of impacts to each resource is provided in Table II-2 and focuses on the resources that are most likely to be impacted by the alternatives. Table II-3 presents the relative degree of impact expected to occur in each resource category for each alternative.

Table II-2. CRITERIA FOR RATING LEVEL OF IMPACTS

Impact Level	Aquatic Biota[1]	Threatened, Endangered, or Candidate Species	Air Quality	Water Quality/ Hydrodynamics	Wetlands and Submerged Vegetation (SAV)
None (0)	No appreciable impact	No appreciable impact	No appreciable impact	No appreciable impact	No appreciable impact
Negligible (1)	Impact localized and not detectable, or at lowest levels of detection	Change in a population or individuals of a species; consequences to population not measurable or perceptible, or other changes not measurable or perceptible	Impact not perceptible and not measurable; not affecting surroundings	Impact not detectable, no discernible effect on water quality/hydrodynamics.	Impact barely perceptible and not measurable; confined to small areas and would not fill or destroy wetland or SAV.
Minor (2)	Impact localized and slightly detectable but would not affect overall structure of any natural community	Change in a population or individuals of a species, if measurable, would be small and localized, or other changes would be slight but detectable	Impact perceptible but not measurable; would remain localized.	Impact slightly detectable but would not affect overall water quality/hydrodynamics.	Impact perceptible and measurable, but would remain localized; affecting a wetland or SAV that is unavoidable, such as repairing a pipeline or burying an upgraded electrical line.
Moderate (3)	Impact clearly detectable; could affect individual species, communities, or natural processes appreciably	Change in a population or individuals of a species measurable but localized	Impact detectable and possibly affecting integrity of surroundings. Air quality testing would be required.	Impact clearly detectable and could have an appreciable effect on water quality/hydrodynamics.	Impact sufficient to change a wetland or SAV but would not diminish resource's integrity enough to jeopardize its viability.
Major (4)	Impact highly noticeable and would substantially influence natural resources, e.g. individuals or groups of species, communities, or natural processes	Change in a population or individuals of a species measurable and would result in permanent consequence to the population	Impact would have a significant impact on surroundings.	Impact would have a substantial, highly noticeable, potentially permanent effect on water quality/hydrodynamics.	Substantial, highly noticeable change in the wetland or SAV resulting in a significant impact.

[1]Aquatic biological resources including finfish, shellfish, and other benthic populations.
Short-term = Less than one year, normally during construction and recovery; *Long-term* = Longer than one year, normally from operations; *Cumulative* = Cumulative impacts to environmental resources result from incremental effects of proposed actions when combined with other past, present, and reasonably foreseeable future projects in the area.

Table II-2. CRITERIA FOR RATING LEVEL OF IMPACTS
(Cont'd)

Impact Level	Sanctuaries and Refuges	Noise	Human Effects[2]	Historical and Cultural Resources	Executive Orders
None (0)	No appreciable impact	No appreciable impact	No appreciable impact	No appreciable impact	No appreciable impact
Negligible (1)	Impact barely perceptible and not measurable.	Impact not detectable, no discernible effect	Impact not perceptible and not measurable; not affecting surroundings	Impact barely perceptible and not measurable; confined to small areas or affecting a single contributing element of a larger National Register District with low data potential	Impact localized and not detectable, or at lowest levels of detection
Minor (2)	Impact perceptible and measurable, but would remain localized, affecting an area that is unavoidable.	Impact slightly detectable but would not affect targets including residential dwellings.	Impact perceptible but not measurable; would remain localized.	Impact perceptible and measurable, but would remain localized; affecting a single contributing element of a larger National Register District with low to moderate data potential, or would not affect character-defining features of a National Register eligible or listed property	Impact localized and slightly detectable but would not affect overall community.
Moderate (3)	Impact sufficient to change resource area's features but with sufficient implementable mitigation that would not diminish the usefulness of the site(s).	Impact clearly detectable and could have an appreciable effect on targets including residential dwellings.	Impact detectable and possibly affecting integrity of surrounding area.	Impact sufficient to change a character-defining feature but would not diminish resource's integrity enough to jeopardize its National Register eligibility, or it generally would involve a single or small group of contributing elements with moderate to high data potential	Impact clearly detectable; could affect community; implementable mitigation provided to avoid impacts
Major (4)	Change in resource area that is measurable and would result in permanent consequence to the environment.	Impact would have a substantial, highly noticeable, and potentially permanent influence on targets including residential dwellings.	Impact would have a significant affect on surrounding area.	Substantial, highly noticeable change in character-defining features would diminish resource's integrity so much that it would no longer be eligible for National Register listing, or it would involve a large group of contributing elements or individually significant properties with exceptional data potential	Impact highly noticeable and would substantially influence individuals/communities outside Fort Monroe.

2 – Includes transportation, utilities, waste management, land use, visual and aesthetic resources, recreational and commercial uses, economics, environmental justice, secondary growth, and public safety

Short-term = Less than one year, normally during construction and recovery; ***Long-term*** = Longer than one year, normally from operations; ***Cumulative*** = Cumulative impacts to environmental resources result from incremental effects of proposed actions when combined with other past, present, and reasonably foreseeable future projects in the area.

Table II-3. ENVIRONMENTAL IMPACTS OF ALTERNATIVES

Resource Impact Categories	Hydrodynamics/Water Quality	Air Quality	Protected Species and Critical Habitat	Aquatic Biota	Wetlands and SAV	Sanctuaries and Refuges	Transportation	Utilities	Waste Management	Land Use	Noise	Visual and Aesthetic Resources	Recreational and Commercial Use of Waters	Economics	Environmental Justice	Public Safety	Historical and Archaeological Resources	Secondary Growth
Alternatives																		
NO ACTION	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ON SITE (CIDMMA)	0	3	2	0	0	0	2	1	0	2	1	2	0	1	0	0	0	1
EAST EXPANSION																		
CDF Cell Only	2	2	1	3	1	1	1	1	1	1	1	2	3	1	1	1	1	1
CDF Cell and Port	2	3	1	3	1	1	2	2	2	2	2	2	3	1	1	1	1	2
CDF Cell, Port and West Berm	2	3	1	3	1	1	2	2	2	2	2	2	3	1	1	1	1	2
NORTH EXPANSION																		
CDF Cell Only	4	2	2	4	1	2	1	1	1	1	1	2	4	1	1	1	1	1
CDF Cell and Port	4	3	2	4	1	2	2	2	2	2	2	2	4	1	1	1	1	2
CDF Cell, Port, and West Berm	4	3	2	4	1	2	2	2	2	2	2	2	4	1	1	1	1	2

0=None; 1-Negligible; 2=Minor; 3=Moderate; 4=Major (see Table II-2)

Resource Impact Categories	Hydrodynamics/Water Quality	Air Quality	Protected Species and Critical Habitat	Aquatic Biota	Wetlands and SAV	Sanctuaries and Refuges	Transportation	Utilities	Waste Management	Land Use	Noise	Visual and Aesthetic Resources	Recreational and Commercial Use of Waters	Economics	Environmental Justice	Public Safety	Historical and Archaeological Resources	Secondary Growth
Alternatives (Continued)																		
WEST EXPANSION																		
CDF Cell Only – Small, Medium, Large	3	2	3	3	1	1	1	1	1	2	2	2	3	1	1	1	1	2
CDF Cell and Port – Small, Medium, Large	3	3	3	3	1	1	2	2	2	2	3	3	3	1	1	1	1	2
EAST AND NORTH EXPANSION (CDF and Port)	4	3	2	4	1	1	2	2	2	2	2	2	3	1	1	1	1	2
EAST AND WEST EXPANSION																		
CDF Cell Only	3	2	3	3	1	2	1	1	1	2	2	2	3	1	1	1	1	2
CDF Cell and Port	3	3	3	3	1	3	2	2	2	2	3	3	3	1	1	1	1	2
NORTH AND WEST EXPANSION																		
CDF Cell Only	4	2	3	4	1	2	1	1	1		2	2	3	1	1	1	1	2
CDF Cell and Port	4	3	3	4	1	3	2	2	2		3	3	3	1	1	1	1	2
UPLAND PLACEMENT																		
SPSA Landfill in Suffolk	3	2	3	2	4	4	2	2	2		2	2	2	1	1	1	1	2
Portsmouth @ State Highway 164	1	2	2	2	3	1	2	2	2		2	2	2	1	1	1	1	2

0=None; 1-Negligible; 2=Minor; 3=Moderate; 4=Major (see Table II-2)

Resource Impact Categories	Hydrodynamics/Water Quality	Air Quality	Protected Species and Critical Habitat	Aquatic Biota	Wetlands and SAV	Sanctuaries and Refuges	Transportation	Utilities	Waste Management	Land Use	Noise	Visual and Aesthetic Resources	Recreational and Commercial Use of Waters	Economics	Environmental Justice	Public Safety	Historical and Archaeological Resources	Secondary Growth
Alternatives (Continued)																		
OCEAN PLACEMENT																		
Dam Neck Site	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Norfolk Site	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
BENEFICIAL USE SITES																		
Ragged Island	3	2	3	3	2	2	2	1	1	2	1	2	2	1	1	1	2	2
Hoffler Creek	4	2	4	3	2	3	2	1	1	2	2	2	3	1	1	2	2	2
CREATION OF NEW ISLAND FACILITIES																		
Hampton Flats	4	2	3	4	1	1	1	1	1	2	1	2	4	1	1	2	2	2
Buckroe Beach/Horseshoe Flats	3	2	2	4	1	1	1	1	1	2	2	2	4	1	1	2	2	2
Willoughby Bay	4	2	2	3	1	1	1	1	1	2	1	2	4	1	1	2	2	2
Ocean View/Chesapeake Bay	3	2	2	3	1	1	1	1	1	2	1	2	4	1	1	2	2	2
DEEP HOLE SITES																		
James River	2	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1
Hampton Roads Bride Tunnel	3	2	2	2	1	1	2	1	1	1	1	1	2	1	1	1	2	1
Southern Chesapeake Bay	3	2	2	3	1	1	1	1	1	1	1	1	2	1	1	1	2	1

0=None; 1-Negligible; 2=Minor; 3=Moderate; 4=Major (see Table II-2)

Resource Impact Categories	Hydrodynamics/Water Quality	Air Quality	Protected Species and Critical Habitat	Aquatic Biota	Wetlands and SAV	Sanctuaries and Refuges	Transportation	Utilities	Waste Management	Land Use	Noise	Visual and Aesthetic Resources	Recreational and Commercial Use of Waters	Economics	Environmental Justice	Public Safety	Historical and Archaeological Resources	Secondary Growth
Alternatives (Continued)																		
COMINED AQUATIC DISPOSAL FACILITIES																		
Offshore TCC in Suffolk	2	2	2	3	1	1	1	1	1	1	1	1	2	1	1	1	2	1
Mouth of Nansemond River	2	2	2	3	1	1	1	1	1	1	1	1	2	1	1	1	2	1
James River Between Nansemond River and Chuckatuck Creek	3	2	2	3	1	2	1	1	1	1	1	1	3	1	1	1	2	1
Middle Ground West Of Monitor Merrimack Bridge-Tunnel	2	2	2	4	1	1	1	1	1	1	1	1	4	1	1	1	2	1
Hampton Flats	3	2	2	4	4	1	1	1	1	1	1	1	4	1	1	2	2	1
Hampton Creek Entrance	2	2	2	3	4	1	1	1	1	1	1	1	4	1	1	2	2	1
Adjacent to Willoughby Federal Navigation Channel	2	2	2	3	1	1	1	1	1	1	1	1	3	1	1	2	2	1
North of Norfolk Naval Base Carrier Docks	2	2	2	2	1	1	1	1	1	1	1	1	3	1	1	1	2	1
Norfolk Harbor	2	2	2	2	1	1	1	1	1	1	1	1	3	1	1	1	2	1
Adjacent to NIT North	2	2	2	2	1	1	1	1	1	1	1	1	3	1	1	1	2	1
Adjacent to NIT South	2	2	2	2	1	1	1	1	1	1	1	1	3	1	1	1	2	1
East of CIDMMA	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1

0=None; 1-Negligible; 2=Minor; 3=Moderate; 4=Major (see Table II-2)

II.2.1.2 TERMINAL CONSTRUCTION ALTERNATIVES

Overview

In addition to the dredge material management alternatives described previously in Part II, various sites throughout Hampton Roads were evaluated for the construction and operation of a marine terminal. Alternatives meeting the criteria for development of a marine terminal would be developed in conjunction with alternatives that would satisfy the dredge material disposal objective.

As discussed in Part I, Need for Port Facilities section, the container terminals operated by the VPA are nearing their capacity to handle cargo growth. In an attempt to meet forecasted cargo area demand at the Port of Hampton Roads, the VPA has chosen to increase the capacity at its existing cargo handling terminals (i.e., NIT, PMT, and NNMT). In addition to expanding the VPA terminals, Maersk Sealand is constructing a new 280-acre container terminal in Portsmouth that would increase The Port of Virginia's capability to handle containerized cargo. However, this terminal combined with increasing capacity at VPA's existing terminals will not meet the forecasted cargo demand. The VPA has determined that a new container terminal is needed to provide sufficient capacity to meet the containerized cargo forecast for Hampton Roads and continuing long-term cargo growth anticipated during the 2050 planning horizon.

New Container Terminal Requirements

Container vessels are growing in size to meet market demand. These newer vessels require larger cranes and deeper water, resulting in the need for dredging and for rehabilitating or renovation of existing wharf structures. These larger vessels will require loading and discharging a higher number of containers per vessel call without an increase in port time. Thus, state-of-the-art landside facilities and handling equipment will be required at new container terminal facilities. In summary, a feasible site to develop a new marine terminal requires:

- large tracts of waterfront land to develop port infrastructure,
- good road infrastructure,
- good rail infrastructure, and
- deep water access to Federal navigation channels.

Land Area

As discussed in the Need for Port Facilities section, 850 acres of land is needed to meet the 2050 projected cargo volume.

Transportation Corridors

Successful port development is dependent upon proximity to major highways, railroads, and deep navigation channels. Roadways in the vicinity of the proposed port facility must be capable of accommodating the movement of freight into and out of the Hampton Roads region and providing trucks and worker vehicles with ready access to the port terminal. The internal height of tunnels and underpasses associated with the access roadways must be sufficient to accommodate all trucks (minimum of 14.6 feet). Existing freight rail networks are required in the vicinity of the port facility to provide direct links between the Hampton Roads area and major consumer centers throughout the United States.

The port terminal must be close to one of the Hampton Roads commercial marine transportation channels, such as the Norfolk Harbor Channel, the Newport News Channel, the Thimble Shoal Channel, or other Hampton Roads ancillary channels. To support the newer container cargo vessels, navigation channels to the port facility must be at least 50 feet deep. Figure II-2 identifies major roadways, rail corridors, and navigation channels in the Hampton Roads area, along with available mapping of current land use.

Description of Potential Locations

A search for large undeveloped sites in the Hampton Roads area was conducted using available digital land use mapping (digital mapping of current land use for Gloucester County, Poquoson, Suffolk, and Isle of Wight County was not available). Figure II-3 identifies all land classified as vacant or undeveloped in the Hampton Roads area (in red), based on the available information. No large undeveloped, waterfront sites were identified in Chesapeake, Newport News, Norfolk, or Virginia Beach.

Craney Island Eastward Expansion

The eastward expansion of CIDMMA would provide approximately 580 acres of waterfront property for container terminal development in the Hampton Roads area. The terminal would be close to deep navigation channels, rail corridors, and major highways. Access from the terminal to major transportation corridors would be provided by a connector highway from VA Route 164 to CIDMMA. The proposed Third Hampton Roads Crossing would function as a strategic complementary project but is not absolutely necessary for the success of the site of the east expansion of CIDMMA since the proposed connector road corridor could be completed without constructing the Third Crossing. Existing rail corridors would be accessed via new rail lines from the terminal. To the extent practicable, the new rail lines would be constructed within existing rail and road ROW's to minimize impacts. Vessel access to the terminal would occur via the existing Norfolk Harbor Reach and Craney Island Reach navigation channels. Dredging activities proposed for the Craney Island eastward expansion would provide adequate port access and 50-foot deep channels to accommodate deep draft ships. Expansion of the east side of the CIDMMA is limited to 580 acres as the area is bounded by the Federal navigation channel, the CIDMMA re-handling basin, and the hydrodynamic impacts associated with any subaqueous fill on the North side of the CIDMMA.

Waterfront Sites in Hampton

Three large undeveloped areas consisting of at least 400 acres were identified along the Chesapeake Bay frontage and Back River frontage of Hampton.. The site fronting the Chesapeake Bay is bordered to the north by the Grandview Natural Preserve, which forms the northeast corner of the city of Hampton. Based on the city of Hampton Tidal Marsh Inventory (Barnard, 1975), approximately half of the site consists of tidal wetlands known as White Pond Swamp. This wetland system is noted as having high environmental values by providing flood attenuation, sediment retention, and habitat for Federal- and state-protected wildlife and waterfowl (Barnard, 1975). The other two Hampton sites front both Harris River and Back River, tributaries of the Chesapeake Bay. According to the City of Hampton Tidal Marsh Inventory (Barnard, 1975) and the National Wetland Inventory Hampton quadrangle (USFWS, 1973), valuable tidal wetlands also constitute a substantial portion of these sites. These two sites also fall within the Accident Potential Zone of the Langley Air Force Base runways. Furthermore, all of the Hampton sites are surrounded by residential zoning areas.

In addition to wetland impacts, access to these sites from existing commercial marine transportation channels would require substantial dredging. The existing transportation channels are located at least 5 miles offshore. Based on U.S. Geological Survey mapping, existing depths in the vicinity of these sites are less than 1 foot and remain less than 30 feet deep to the Chesapeake Bay Channel and less than 20 feet deep to Thimble Shoal in the vicinity of the Thimble Shoal Channel. Primary roadways and rail corridors are not readily accessible from these sites. Substantial road and rail corridor construction would be required to develop these sites as container cargo port facilities.

Waterfront Site in York County

One large undeveloped, waterfront site was identified on Crab neck in York County.. The site is located south of Goodwin Islands and fronts the Chesapeake Bay. Based on the York County and Town of Poquoson Tidal Marsh Inventory (Silberhorn, 1981), the site contains substantial acreages of tidal wetlands. This marsh system provides high values in productivity, wildlife and waterfowl habitat, fish spawning and nursery areas; is important to the shellfish industry; and provides shoreline stabilization (Silberhorn, 1981). This site is located over 5 miles from the York River Entrance Channel, and the existing depth in the vicinity of the site is less than 1 foot and remains less than 30 feet deep to the channel; therefore, extensive dredging would be required to provide access to large container cargo vessels. Disposal of the large amount of dredged material would provide further difficulties.

Roadways in the vicinity of the site include U.S. 17, a major transportation corridor within the Hampton Roads region. However, U.S. 17 is already heavily congested due to commuter traffic between Gloucester County and the Lower Peninsula. This travel corridor is also heavily commercialized with numerous traffic lights, which would significantly delay truck traffic associated with a large cargo facility.

Other Potential Sites in York and Gloucester Counties

Although digital mapping of current land use was not available for Gloucester County, the information in Figure II-3 does show that the Gloucester Point area fronting the York River and the Chesapeake Bay is either developed or contains substantial tidal wetland areas. Waterfront sites north of Gloucester Point may have adequate land area to support port development, but these rural areas lack major roads and rail corridors capable of supporting a large containerized cargo facility. As stated above, U.S. 17, the major roadway within Gloucester County, is not capable of supporting heavy volumes of additional truck traffic and does not provide ready connections with other major U.S. highways.

Large undeveloped areas may also exist upstream of the Coleman Bridge on the York River; however, frequent bridge openings would cause significant traffic problems between Gloucester and the Lower Peninsula. Dredging would also be required since the navigation channel upstream of the bridge is less than 45 feet deep and decreases in depth upstream of the Cheatham Annex.

Maersk Sealand Property

Another large area identified on Figure II-3, which fronts the Elizabeth River, is the 500-acre Maersk Sealand property in Portsmouth. As described in the "Need for Proposed Port" section, Maersk Sealand is planning to develop a 280-acre container cargo facility on this property.

Sites Fronting the James River

No large undeveloped areas of waterfront property exist between the I-664 Monitor-Merrimac Bridge Tunnel and the James River Bridge. According to information obtained from Figure II-3, within this stretch of river, industrial development occupies the majority of waterfront property on the east bank of the river. Residential development, golf courses, and wetlands occupy the majority of the waterfront property along the west bank of the James River and along the Nansemond River. Although large waterfront areas may be available upstream of the James River Bridge, the channel depth is less than 40 feet and less than 30 feet upstream of Fort Eustis. Substantial dredging would be required to deepen the navigation channel, to create an access channel to a new port facility, and to establish a deep draft anchorage. Port development upstream of the James River Bridge would also result in significant traffic impacts resulting from the high frequency of bridge lifts required to accommodate the large cargo vessels. In rural areas, existing rail and roadway infrastructure would not be capable of supporting a large containerized cargo port facility.

Recently, a 620-acre site on the James River located just upstream of Fort Eustis in James City County was released for sale. The property provides valuable waterfront access and existing rail corridors; however, substantial dredging would be required to provide access for the large container cargo vessels. The site is located 18 miles upstream of the James River Bridge, and, as stated above, the channel depth upstream of the bridge is less than 40 feet. The navigation channel in the vicinity of the site, the Tribell Shoal Channel, is 1 mile west of the site, and the water depths decrease from 30 feet at the channel to less than 3 feet at the site. Port development on this site would also cause significant traffic impacts resulting from frequent James River Bridge lifts required to accommodate large cargo vessels.

Sites Fronting the Elizabeth River

There are no large undeveloped waterfront sites on the Elizabeth River. Although there are a few small, undeveloped waterfront sites along the Upper Reach of the Southern Branch that are near each other, they would have to be contiguous in order to allow the operational efficiency that is required of a container terminal. There are also traffic concerns related to sites in this area. Only limited road and rail corridors serve the immediate area, and there would be a negative impact on local traffic across the Jordan Bridge due to the multiple daily openings that would be required to allow passage for container ships arriving to and departing from the terminal.

The size of the Upper Reach channel itself also raises concerns. It is only 35 feet deep and 500 feet wide, which is not deep or wide enough for deep-draft container ships. Even if the channel can be dredged deeper, a turning basin for a 1,100 feet ship is impossible.

Comparison of Marine Terminal Alternatives

Table II-4 compares the ability of the various potential locations to meet the container terminal requirements. It should be noted that, as discussed previously, 850 acres of land are required to meet the cargo needs during the planning horizon. Small sites were not necessarily eliminated out of hand, and the initial screening criteria were to provide:

- Large tracts of land
- Access to the 50-feet channel
- Access to road
- Access to rail

The above criteria quickly eliminated most areas from further consideration. For example, there are brownfield sites in the Southern Branch of the Elizabeth River; however, these sites are far from the 50-foot channel, and the size of vessels that carry containerized cargo would not be able to transit this portion of the river due to the narrow winding river and the length of the large container ships (900 – 1200 feet in length). Sites such as these were not listed in the table because they were eliminated from further consideration early in the screening process.

Table II-4. CONTAINER TERMINAL REQUIREMENTS FOR IDENTIFIED POTENTIAL DREDGED MATERIAL STORAGE LOCATIONS

Potential Locations	Container Terminal Requirements		
	Land Area (> 400 acres)	**Road and Rail Corridors**	**Deep Water Channel Access**
CIDMMA Eastward Expansion	Provides 580 acres of container cargo area	Close proximity to major transportation corridors	Provides port access for deep draft vessels; minimal dredging required to access Federal navigation channel relative to other options.
Hampton Sites	Substantial acreages of tidal wetlands	Not readily accessible	Federal navigation channels at least 5 miles from sites, extensive dredging required to access federal navigation channel.
York County Site	Substantial acreages of tidal wetlands	Not readily accessible	Navigation channel at least 5 miles from site, extensive dredging required to access federal navigation channel.
Other Potential York and Gloucester County Sites	No known undeveloped waterfront sites	Frequent bridge openings to allow vessels upstream of the Coleman Bridge would result in significant traffic impacts; U.S. 17 not suitable to support additional heavy truck traffic; no major roads and rail corridors within rural areas	Substantial dredging would be required to deepen the navigation channel, to create an access channel to a new port facility, and to establish a deep draft anchorage.
Maersk Sealand Property	Proposed 280 acres of container cargo area	Close proximity to major transportation corridors	Provides port access for large container cargo vessels.
James River Sites	No sites downstream of the James River Bridge; one known site just upstream of Fort Eustis	Significant traffic impacts resulting from frequent James River Bridge lifts to accommodate vessels; no major roads and rail corridors within rural areas	Substantial dredging would be required to deepen the navigation channel, to create an access channel to a new port facility, and to establish a deep draft anchorage.
Elizabeth River Sites	Multiple small sites, questionable suitability since non-contiguous	Traffic impacts resulting from Jordan Bridge openings to accommodate vessels; limited major road and rail corridors in areas	Substantial dredging would be required to deepen the navigation channel; a turning basin is physically infeasible.

Selected Port Alternative

Based on the evaluation of these potential sites, it was determined that other than the CIDMMA eastward expansion alternative, no other sites in the Hampton Roads area could reasonably support the land capacity, navigational access, and transportation requirements of a major container handling facility. The proposed eastward expansion site is close to 50-foot deep navigation channels and major highway and railroad corridors.

This eastward expansion is also the only proposed port location that is a dredge material disposal area alternative that remained after the initial screening. As a result, the eastward expansion alternatives that include port facility construction are the only alternatives that meet the requirements of the study authorization and are believed to have minimal hydrodynamic and navigation impacts relative to all possible alternatives, other than the "No Action" alternative. It should be noted that any combination of alternatives that provide for port expansion and extending the life of CIDMMA would be acceptable. If a large tract of land could be identified off-site, it could be considered; however, the screening process determined that no sites are reasonably available that are close to the 50-foot channel and major road and rail connections.

II.3.0 ELIMINATION OF NO ACTION ALTERNATIVE

Under a No Action scenario, CIDMMA would reach its capacity by 2025. The CIDMMA would close and a new disposal site would need to be constructed for material deemed unsuitable for ocean disposal. In addition, engineering constraints would prohibit a marine terminal from being constructed on the current site as the elevation of the site would be too high. The Port of Virginia would continue to operate, but its future capacity would be limited to the combined maximum capacity of existing port facilities and the new Maersk terminal that is under construction.

The most noteworthy local effect of the No Action alternative would be the negative economic consequences to the Hampton Roads area. Direct economic benefits to the regional economy from construction and operation of the terminal site on the east expansion of CIDMMA in the short-term and long-term would not be realized. The anticipated shortfall in cargo handling capacity and potential delays in moving and handling cargo would likely result in a shift in vessel traffic and business to other East Coast ports. This scenario would, thus, have a negative impact on the local and regional economy.

Long-term economic benefits from secondary growth would also be greatly reduced under the No Action alternative. Commercial and industrial development would be reduced since new businesses or expanded businesses would no longer be needed to serve the terminal site on the east expansion of CIDMMA. This, in turn, would reduce regional benefits from increased employment, the purchase of goods and services, and the tax revenues generated by secondary growth. These effects would be felt by the entire Commonwealth of Virginia.

The most noteworthy national effect of the No Action alternative would be the economic consequences felt by the entire East Coast and Midwest markets. The trade growth experienced by Virginia is felt throughout the Nation, and most other ports are also experiencing capacity challenges. Therefore, one can not assume that cargo can simply be diverted to other East Coast ports with no additional costs being incurred. There are only a few ports that are expected to have available capacity, but there would be significant added inland transportation costs as a result of diverting cargo through the other ports.

Two separate studies on the potential economic impacts of the proposed the terminal site on the east expansion of CIDMMA have been conducted. The first study, "Craney Island Eastward Expansion Feasibility Study" (Benefits Analysis), is national in scope and is was conducted by David Miller & Associates for the USACE (David Miller & Associates, 2004). This study examines the national landside savings the proposed port expansion may deliver and provides a detailed explanation of how the No Action alternative has a negative impact on the national economy. The findings of the report detail the added landside transportation costs that would be incurred without the terminal site on the east expansion of CIDMMA and are as follows:

- If the terminal site on the east expansion of CIDMMA is not built, the Port of Virginia will not be able to meet its forecasted demand and cargo will have to be diverted to other ports (18 alternate ports were considered).
- Diverted cargo incurs significant added landside transportation costs over a Norfolk routing. This equates to approximately $331 million in additional transportation costs on an annual basis when compared to an eastern expansion.
- Over the 50-year study period (2010-2060), these added costs equal $5.9 billion or $331 million annually.
- The second study, "Economic Impact Study: Craney Island Marine Container Terminal," is regional in scope and is being conducted by Moffat & Nichol for the VPA (Moffat & Nichol, 2004). The draft Impact Study was commissioned to determine the state/regional economic impacts from the terminal site on the east expansion of CIDMMA construction and operation, as well as the nearby distribution center activity that would be generated. Direct, indirect, and induced activities were considered at the terminal and throughout the distribution, warehousing, and transportation sectors. The preliminary findings are as follows:
- Under the No Action alternative, there would be a $1.4 billion shortfall in benefits to Virginia's economy from terminal design and construction and an average annual unrealized gain of $2.5 billion from the operation of the terminal site on the east expansion of CIDMMA.
- There would also be an annual average of $2.7 billion in lost opportunities for economic activity from distribution center operations that would be generated from the new terminal as well.

Absent a proposed eastward expansion with port facility construction, the Port of Virginia would be missing one of the keys to its successful and competitive future and CIDMMA would close. Negative economic consequences to the entire Hampton Roads region as well as the remainder of the Commonwealth and the entire Nation would be expected under the No Action alternative. As a result this alternative was eliminated since it did not meet the study objectives. The No Action alternative will continue to be the baseline against which all plans are compared to determine feasibility in addition to comparing the environmental effects those alternatives have on the study area. It is the condition that provides the basis for measuring what is an impact, beneficially or otherwise. More detailed economic information is available in Appendix B of the Feasibility Report.

II.4.0 EVALUATION OF ALTERNATIVE PLANS (STEP 4)

At the end of this multi-objective screening process, two potential alternative solutions remained: (1) eastward expansion of the CIDMMA, and (2) eastward expansion of the CIDMMA with construction of a west berm. Additional navigation simulations and comprehensive hydrodynamic modeling were conducted on the alternatives. The results of these studies indicated that hydrodynamic and navigational impacts resulting from the construction of the alternative would be minimal. These reports may be found in the Feasibility Report, Appendix A, and are referenced in EIS Sections III and IV.

Eastward Expansion Alternative

The Eastward Expansion of the CIDMMA alternative includes the construction of an additional 580-acre disposal cell to the east of the existing CIDMMA. Perimeter dikes will be constructed around the area of the new cell to contain dredged material. The western limit of the proposed cell will tie into the existing east dike of the CIDMMA. After filling, the new cell will be turned over to the local sponsor for the construction of a new marine terminal.

The main dike will be approximately 8,500 feet in length and constructed to elevation +18 feet MLLW, with a 5H:1V side slope below elevation +5 feet and 2H:1V side slope above +5 feet. The remaining dikes, which run east-west, will be constructed with a 10H:1V side slope from the mudline to elevation +5 feet MLLW and an 8H:1V side slope from +5 feet to +18 feet.

Eastward Expansion with West Dike Strengthening Alternative

The Eastward Expansion With West Dike alternative includes the construction of an additional 580-acre disposal cell to the east of the existing CIDMMA in conjunction with a strengthening of the western dike in 2028. Perimeter dikes will be constructed around the area of the new cell to contain dredged material. The western limit of the proposed cell will tie into the existing east dike of the CIDMMA. After filling, the new cell will be turned over to the local sponsor for the construction of a new marine terminal.

The main dike will be approximately 8,500 feet in length and constructed to elevation +18 feet MLLW, with a 5H:1V side slope below elevation +5 feet and 2H:1V side slope above +5 feet. The remaining dikes, which run east-west, will be constructed with a 10H:1V side slope from the mudline to elevation +5 feet MLLW and an 8H:1V side slope from +5 feet to +18 feet.

The strengthening of the western dike will be accomplished with the construction of a berm along the outside of the dike. It would consist of a 150-foot berm extending from the outside edge of the existing dike and would have to be constructed of suitable sandy material to elevation +8 feet MLLW. With the construction of the stability berm and building the dike exterior slopes on a 10H:1V side slopes, the west dike can be built to elevation +60 feet MLLW with adequate factors of safety, while the existing facility without a west dike strengthening can only be raised to +47 feet MLLW with adequate factors of safety.

II.5.0 ECONOMIC EVALUATION OF ALTERNATIVE PLANS (STEP 5)

Economic benefits for the Eastward Expansion alternative and the Eastward Expansion with West Dike alternative plan were derived from the reduction in the systems dredging costs, the actual cost of dredging and disposing of material in Hampton Roads, and the reduction in transportation costs of containerized cargo traffic. Cost inputs included the following:

- Expansion Costs
- Systems Dredging Costs
- O&M Costs
- Environmental Mitigation Costs
- Real Estate Costs
- Transportation Costs

Expansion Costs

Expansion costs are the initial costs necessary to construct a containment facility or port facility. The cost estimates require a feasibility level design of containment cell structures (including dikes, weirs, etc.) and port structures (including alternative construction techniques for bulkheads, foundation treatments, channel design, etc).

Systems Dredging Costs

Systems dredging costs were developed to determine how much dredging in the local area would cost for each placement site alternative considered. A unit cost per cubic yard for placement of dredged material in each of the alternative placement cells was required. For this study, the systems dredging analysis included various cost variables. Among these variables are: consideration of dredging project magnitude, the distance of the user's dredging project site to the placement site alternative, a contractor's dredging plant and equipment required to perform the dredging, type of material dredged, fuel costs to operate the dredge and attendant plant, dredge hired labor costs, dredging plant availability and contractor competition, etc.

Operation and Maintenance

The O&M cost component was forecasted to estimate long-term costs associated with expansion of the CIDMMA. Some considerations captured in the O&M cost component were historical O&M costs to establish a baseline. During the study, the prior years' funding levels were examined to determine how the Norfolk District's O&M funding baselines and capabilities may be changed as the result of CIDMMA expansion alternatives. For instance, the financial records have been detailed regarding how much funding has been used to maintain the CIDMMA containment dikes. Current funding levels and existing funding capability were reviewed. Analyses were performed to determine how future O&M funding needs would increase with expansion alternatives.

Current Norfolk District policies regarding the operation of CIDMMA will likely change with different expansion alternatives. Current O&M practices have been reviewed and assumptions have been made as to how these practices must be modified with expansion alternatives. Some examples include: modifications to cell rotation cycles and dike maintenance schedules, as well as policies with customers regarding timing of dredged material placement into the CIDMMA. For all of the O&M analyses discussed in this section, the USACE ERDC filling and capacity studies were used to help predict future years' O&M funding requirements.

Environmental Mitigation Costs

Construction of any expansion at CIDMMA will adversely impact the environment with the filling of open water habitat. The proposed east expansion of CIDMMA would fill approximately 580 acres of open water. In order to offset these losses, mitigation measures include sediment remediation, wetlands

restoration and conservation, oyster restoration, and a bird management plan. The mitigation plan was developed with stakeholder input using USACE guidelines and evaluation criteria.

Real Estate

Real Estate costs consisting of administration costs as well as changes to any potential salvage value of the existing facility. As the facility ages, the discounted present value of the salvage value would be lower. Therefore, this change in the discounted present value of the salvage value is counted as a cost against any alternative..

Transportation Costs

A basic assumption of this analysis is that excess TEU's will be handled at alternative ports in order to maintain the forecasted trade between commodity origins and destinations. These alternative ports would most likely be on the same or similar service strings that include Hampton Roads as a port-of-call, so insufficient capacity would not affect vessel deployment or waterborne transportation costs. The transportation costs calculated in this analysis are the landside costs of transit between the landside origin/destination and the port handling the commodities. The single exception is the reduced waterborne transportation costs for TEU's arriving from Asia that are offloaded at the ports of Los Angeles/Long Beach (CA) instead of Hampton Roads, in which case the commodity's trip through the Panama Canal is avoided.

Average Annual Benefits. Optimization of the alternative plans was based on the two priority benefit categories of reduced dredging costs and reduced transportation costs savings at October 2005 price levels. These benefits represent the direct reduction in the costs of dredged material disposal and the reduction in transportation costs that could be realized by the Nation when a project is built. As previously discussed, the USACE has made various efforts over the years to increase the capacity of CIDMMA. This would be accomplished with the construction of a project at CIDMMA as well that could provide for anticipated future port development. A summary of the reduction in dredged material disposal costs and transportation costs for each alternative is shown in the Table II-5.

Table II-5. AVERAGE ANNUAL BENEFITS

Alternative plan	Without project total costs ($)	With project total costs ($)	Average annual benefits ($)
Eastward expansion	781,513,000	447,945,000	333,568,000
Eastward expansion with west dike strengthening	781,513,000	441,685,000	339,828,000

Average Annual Costs

Initial construction and O&M costs were developed for each alternative. The costs are annualized for comparison to the average annual benefits for individual project alternatives. The costs include estimates for initial construction and associated port terminal construction costs. They reflect October 2005 (FY 2006) price levels and were annualized over the 50-year period of analysis at a discount rate of 5-1/8 percent. Cost estimates were compiled over a period of several months and were made consistent at October 2005 (FY 2006) price levels to allow proper analysis at a common period in time. A summary of the average annual costs for the alternative plans considered for optimization is shown in Table II-6. Table II-7 shows the total investment cost of the alternative plans.

Table II-6. AVERAGE ANNUAL PROJECT COST AND INCREMENTAL COST

Item	Eastward expansion ($)	Eastward expansion with west dike strengthening ($)
Cell Construction	$37,341,000	$37,341,000
Terminal Construction 3	$4,688,000	$34,688,000
West Dike Strengthening (2)		$1,669,000
Real estate (3)	$69,000	$284,000
Incremental O&M	$65,000	$1,558,000
Access Channel O&M	$209,000	$209,000
Environmental mitigation	$3,018,000	$3,018,000
Total	$75,389,000	$78,766,000

(1) Includes annualized port terminal costs and west dike strengthening costs.
(2) Includes incremental real estate cost and annualized administrative real estate costs.

Table II-7. ALTERNATIVE PLAN INVESTMENT

Item	Eastward expansion ($)	Eastward expansion with west dike strengthening ($)
Initial construction		
Design	$27,824,000	$27,824,000
Construction management	$23,187,000	$23,187,000
Construction	$423,732,000	$423,732,000
Navy Fuel Pipeline	$40,000,000	$40,000,000
West Dike Strengthening (1)		$77,262,000
Environmental mitigation	$50,200,000	$50,200,000
Contingencies	$106,398,000	$106,398,000
Sub-Total	$671,340,000	$748,602,000
Interest during construction		
Construction	$47,590,000	$47,590,000
Environmental Mitigation	$3,846,000	$3,846,000
Total Investment	$722,776,000	$800,038,000

(1) Cost also includes cost allocated to the western dike strengthening, even though it is not needed until 2028.

II.6. 0 PLAN SELECTION (STEP 6)

Table II-8 presents the net NED benefits of the two alternative plans. Although the plan including western dike strengthening has a higher AAEQ cost, it is the alternative that reasonably maximizes net economic benefits consistent with protecting the Nation's environment.

Table II-8. AAEQ ALTERNATIVE PLAN NET BENEFITS (1)

Item	Costs	Benefits (2)	Net benefits	Benefit-to-cost ratio
Eastward expansion	$75,389,000	$333,566,000	$258,179,000	4.42
Eastward expansion with western dike strengthening	$78,766,000	$339,828,000	$261,062,000	4.31

(1) Discounted to base year 2010 at 5.125 percent.
(2) Benefits include transportation cost savings and dredged material disposal cost savings.

The previous table identifies the eastward expansion with strengthening of the western dikes in 2028 as the plan with the greatest net benefits that satisfies all the planning objectives and constraints that guided the planning process. However, the non-Federal partner, the VPA, who has collaborated in the detailed evaluation of the two alternative plans, prefers the less costly alternative plan, which excludes strengthening the western dikes. This preference is based on project cost savings and the uncertainty associated with making a decision today to strengthen the western dikes in 2028. A General Reevaluation Report and updated NEPA document would also likely be required prior to implementation in 2028. It is unlikely that such a plan would be authorized so far in advance. The USACE regulations allow the selection of the Locally Preferred Plan (LPP), if such a plan is of less scope and cost than the plan with the most NED benefits. In this case, with the previous factors, the LPP was selected. In addition, throughout the course of the study, there has been strong opposition from homeowners in the Rivershores community adjacent to the CIDMMA to any project located on the western side of the CIDMMA. The homeowners are also supported by the city of Portsmouth in their opposition. In view of these concerns, the local sponsor does not support including the western dike strengthening as a feature of the selected plan.

Recommended Plan – Eastward Expansion of the CIDMMA

Although the eastern expansion in combination with the western dike strengthening meets the planning objectives and maximizes beneficial contributions to the Nation, the plan is not supported by the local sponsor, as previously discussed. Of the two alternatives, only the Eastward Expansion is supported by the local sponsor and is therefore designated as the Recommended Plan.

The Eastward Expansion also provides significant benefits to the Nation. Average annual benefits of $258 million, or over 99 percent of the benefits that would have resulted from construction of the eastward expansion west dike alternative, are expected to accrue as a result of the Recommended Plan (Table II-8). In addition, average annual costs of the eastward Expansion are slightly less than the Eastward Expansion with West Dike annual costs.

The Recommended Plan ensures an extension of the useful life of CIDMMA by an additional 3 years and provides for anticipated future port development and related national defense needs. The Eastward Expansion also results in the least environmental impact of the expansion alternatives evaluated. For these reasons, it is believed that implementation of the Recommended Plan is warranted and in the best interest of the study area, the region, and the Nation.

II.7.0 DESCRIPTION OF EASTWARD CIDMMA EXPANSION

The Recommended Plan includes construction of a 580-acre cell to the east of the existing CIDMMA. After construction and filling the new cell will become the location for a new terminal facility. The following construction methods, assumptions, and figures are used to describe the construction as it is envisioned at this time. Construction would take place over a period of 5 years. A general layout of the expansion is shown in Figure II-4.

Pre-dredging along the main dike is anticipated to be completed by a combination of bucket and pipeline cutter-head dredges. Approximately 10 percent of the pre-dredge foundation and access channel dredging material is assumed to go into the existing CIDMMA via a pipeline dredge. The remaining 90 percent, anticipated to be dredged by a combination of hydraulic and/or mechanical dredges, would be disposed of in the Norfolk offshore placement site. Figure II-5 shows the limits of pre-dredging.

The access channel dredging is defined as the area between the Federal navigation channel (Norfolk Harbor and Craney Island Reaches) and the new wharf. The Access Channel is generally 500 feet in width and will be flared at both ends where it adjoins the Federal channel. The dredging depth will be 50 feet MLLW with 2 feet advance maintenance dredging. Maintenance material within the existing channel template was not included in the estimated quantities. Figure II-5 shows the limits of the Access Channel while Table II-9 shows the estimated quantities to be dredged.

Table II-9. ESTIMATED QUANTITIES TO BE DREDGED FROM DIKE FOUNDATIONS AND ACCESS CHANNEL

Area	**Estimated Quantity (CY)**
Pre-Dredge Foundation to -60'	15,400,000
Access Channel to -52' (50' +2' Advance Maintenance)	3,700,000

The predominately clayey material to be dredged in both locations is likely undisturbed, with contamination transport through layers unlikely. However it is assumed that by placing the upper few feet of material in CIDMMA, all remaining material will be suitable for ocean disposal. The upper several feet will be defined as 10 percent of material dredged. At this time it is not known exactly what percent of material going into CIDMMA is unsuitable for ocean placement; however, 10 percent is

thought to capture a conservative upper limit. Environmental testing to verify this assumption is anticipated to be completed during PED. The 10 percent (estimated to be up to 1.8 mcy) could be placed into CIDMMA without impacting operations.

In order to construct the dikes, sand will most likely be dredged from offshore channel areas by hopper dredge. Once transported to the eastward expansion site the material will be offloaded using a self-contained offshore transfer station buoy ("SCOTS buoy"). The Atlantic Ocean Channel is designated as the primary source of material for dike construction, with Thimble Shoal and Cape Henry Channels as secondary sources. Figure II-6 shows dike layout while Figures II-7 and II-8 show dike geometry. The total amount of required sand fill is estimated to be 19.5 mcy (in-place at dikes), dis-aggregated as shown in Table II-10:

Table II-10. REQUIRED SAND FILL FOR CIDMMA EXPANSION DIKE CONSTRUCTION

Phase 1 – 220-acre cell	
Main Dike (3,000 linear feet [LF])	5.3 million CY
South Dike (2,800 LF)	1.5 million CY
Division Dike (2,800 LF)	1.5 million CY
Phase 2 to 4 – completes remaining 380-acre cell	
Continue Main Dike (5,500 LF)	9.7 million CY
North Dike (2,800 LF)	1.5 million CY
Total	**19.5 million CY**

Note: A single hopper dredge is capable of 10,000 cy/day.

To provide protection to the dikes from erosion, slopes will be protected with riprap. As the dikes are constructed, the slopes along the exterior of the dike along the wharf will be protected from +8 feet to -3 feet MLLW. The riprap section for this reach will consist of a 4-foot thick layer of VDOT Class III riprap underlain by a 1.5-foot thick layer of VDOT No. 1 stone, underlain by geotextile. The interior slopes of the dikes in the northern cell, including the division dike, will also be protected. Interior slope riprap will consist of a 2.8-foot thick layer of VDOT Class II riprap underlain by a 1-foot thick layer VDOT No. 1 stone, underlain by geotextile. The riprap will be placed on the exterior of the slopes from elevation +8 feet to -3 feet.

USACE modeling estimated that it will take 12 months to rapidly fill the southern part of the cell to elevation +15 feet MLLW. This would be done within normal dredging operations in the Port of Hampton Roads. The northern part of the expansion cell would then be used in tandem with the existing site annually to fill it over the next 5 years. Surcharge and ground improvements will begin

approximately 3 to 6 months after the rapid filling of the southern part. After that time, a surface crust will form allowing the surcharge and strip drains to be installed.

Construction of the wharf will start concurrent with filling of the cell, as it is envisioned that shaping the main dike and beginning installation of wick drains would begin soon after the dike has be constructed.

Access to Eastward Expansion and Proposed Craney Island Marine Terminal

Vessel access to the proposed Eastward Expansion and proposed Craney Island Marine Terminal would be provided via the existing Norfolk Harbor Reach and Craney Island Reach navigation channels (see Figure II-2). As part of the proposed CIDMMA eastward expansion and other proposed harbor channel improvements, all dredging activities needed for port development and operation would be completed. These dredging activities, including the area between the navigation channel and proposed wharf, would be completed in conjunction with expansion cell construction and port development and will provide a minimum of 50-foot-deep inbound and outbound channels to accommodate deep draft ships.

Although not specifically required for the port development, the proposed VDOT Hampton Roads Third Harbor Crossing would facilitate truck and auto access to the proposed port (see Figure II-9). Access points to the port facility would connect with VDOT's proposed roadway crossing of CIDMMA, located along the eastern edge of the current limits of CIDMMA. The Third Harbor Crossing has an approved EIS, although the project is currently unfunded and will take years to complete. In the event the Third Crossing is not completed within the next 10 years, a connector highway and rail corridor would be constructed from the southern end of CIDMMA to the existing VA Route 164 freeway, from which the existing interstate highway and rail systems can be accessed.

Rail access to the Eastward Expansion and proposed Craney Island Marine Terminal would be accomplished through a VDOT rail corridor development project that would connect the port facility to both the Norfolk Southern and CSX railways in the vicinity of the Hampton Roads Airport in Suffolk. It is currently envisioned that, to the maximum extent practicable, the rail corridor would be located within the cleared ROW of VDOT's connector highway from CIDMMA to VA Route 164, and within the ROW's of existing highways VA Route 164 and I-664. This new rail corridor would provide rail access to port facilities proposed in Portsmouth by VPA and Maersk Sealand, as well as to the Craney Island Fuel Depot and businesses that may have need of the rail access (see Figure II-10).

It should be noted that when I-664 and Route 164 were built, the bridges and medians were designed to accommodate dual track for double-stack trains. Currently VPA and Norfolk Southern are working with state and Federal representatives to identify funding for this rail improvement, which is part of the Heartland Corridor Initiative. The Heartland Corridor would significantly increase intermodal freight mobility as it improved rail for containerized cargo from Portsmouth, VA, to Columbus, OH.

Phased Development of Craney Island Marine Terminal

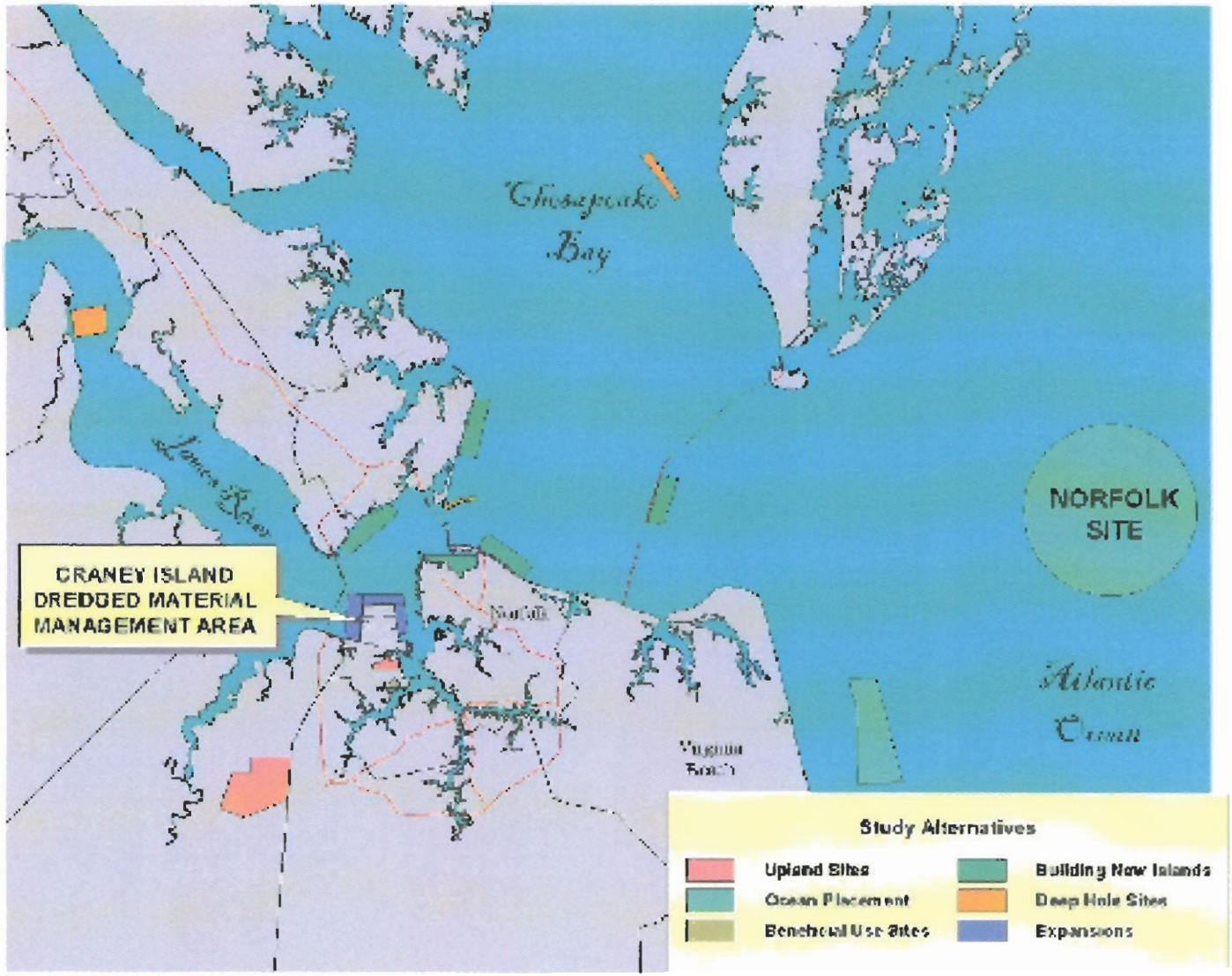
The VPA 2040 Master Plan identifies projects to renovate and expand the existing marine terminals; however, even with the build-out of the existing terminals, VPA is projected to run out of capacity by 2007. The construction of the Maersk facility will provide additional capacity to 2015. After 2015, VPA will require a new container terminal to meet long-term needs. Figure II-10 illustrates the port capacity challenges and how the new port construction will meet the long-term needs.

As shown in Figure II-11, the proposed port facility is anticipated to be constructed in four phases. Phased construction will allow the forecasted business needs to meet with the financial ability of the VPA. The initial Phase I will cover approximately 220 acres. Figure II-12 illustrates the Phase I conceptual plan of the Craney Island Marine Terminal, and Figure II-13 shows the full build-out condition. Table II-11 lists key components envisioned for each of the four phases of the proposed CIDMMA port development.

Table II-11. CRANEY ISLAND PORT DEVELOPMENT COMPONENTS BY PHASE

COMPONENTS	PHASE I	PHASE II	PHASE III	PHASE IV
Cranes	8 @ 100 ft	12 @ 100 ft	16 @ 100 ft	20 @ 100 ft
Wharf (ft)	3,000	4,800	6,600	8,400
Strad Storage	5,376 TGS (10,752 TEU @ 2 high) (16,128 TEU @ 3 high)	9,984 TGS (19,968 TEU @ 2 high) (29,952 TEU @ 3 high)	15,744 TGS (31,488 TEU @ 2 high) (47,232 TEU @ 3 high)	19,584 TGS (39,168 TEU @ 2 high) (58,752 TEU @ 3 high)
Grounded Reefer Storage	232 TGS (464 40ft cont. @ 2 high) (696 40ft cont. @ 3 high)	324 TGS (648 40ft cont. @ 2 high) (972 40ft cont. @ 3 high)	349 TGS (698 40ft cont. @ 2 high) (1,047 40ft cont. @ 3 high)	575 TGS (1,150 40ft cont. @ 2 high) (1,725 40ft cont. @ 3 high)
Transfer Zone Slots	46	61	96	144
Empty Storage	0	2,800 TGS (11,200 TEU @ 4 high) (16,800 TEU @ 6 high)	2,800 TGS (11,200 TEU @ 4 high) (16,800 TEU @ 6 high)	2,800 TGS (11,200 TEU @ 4 high) (16,800 TEU @ 6 high)
Wheeled Slots	722	722	1,841	2,329
Inbound Lanes	13	13	13	26
Outbound Lanes	6	6	6	12
Loading/Unloading Track (ft)	10,900	16,160	16,160	16,160
Runaround Track (ft)	5,400	10,690	10,690	16,160
Storage Track (ft)	22,800	37,830	37,830	37,830

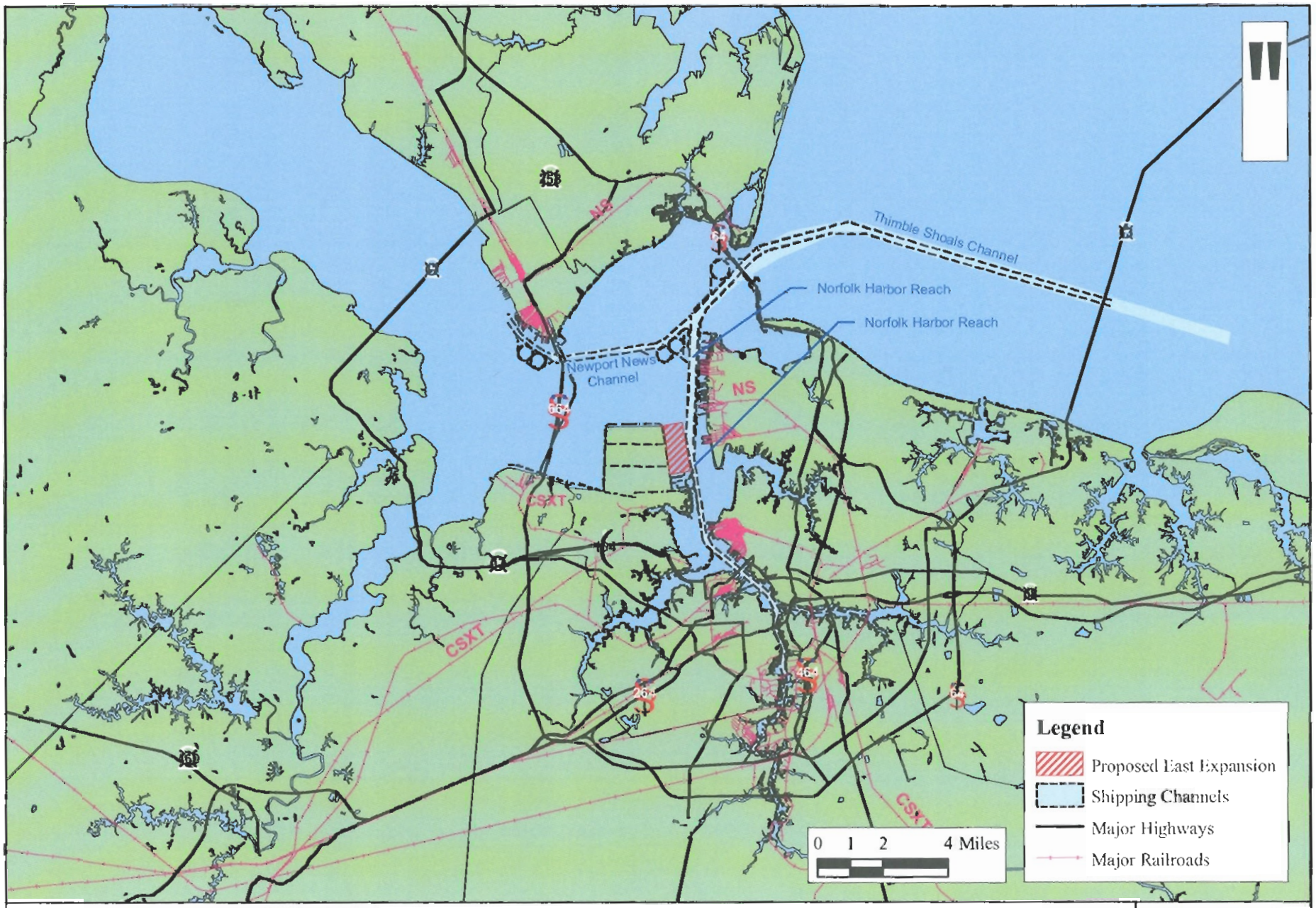
Figures



Source:
-USACE, 2005

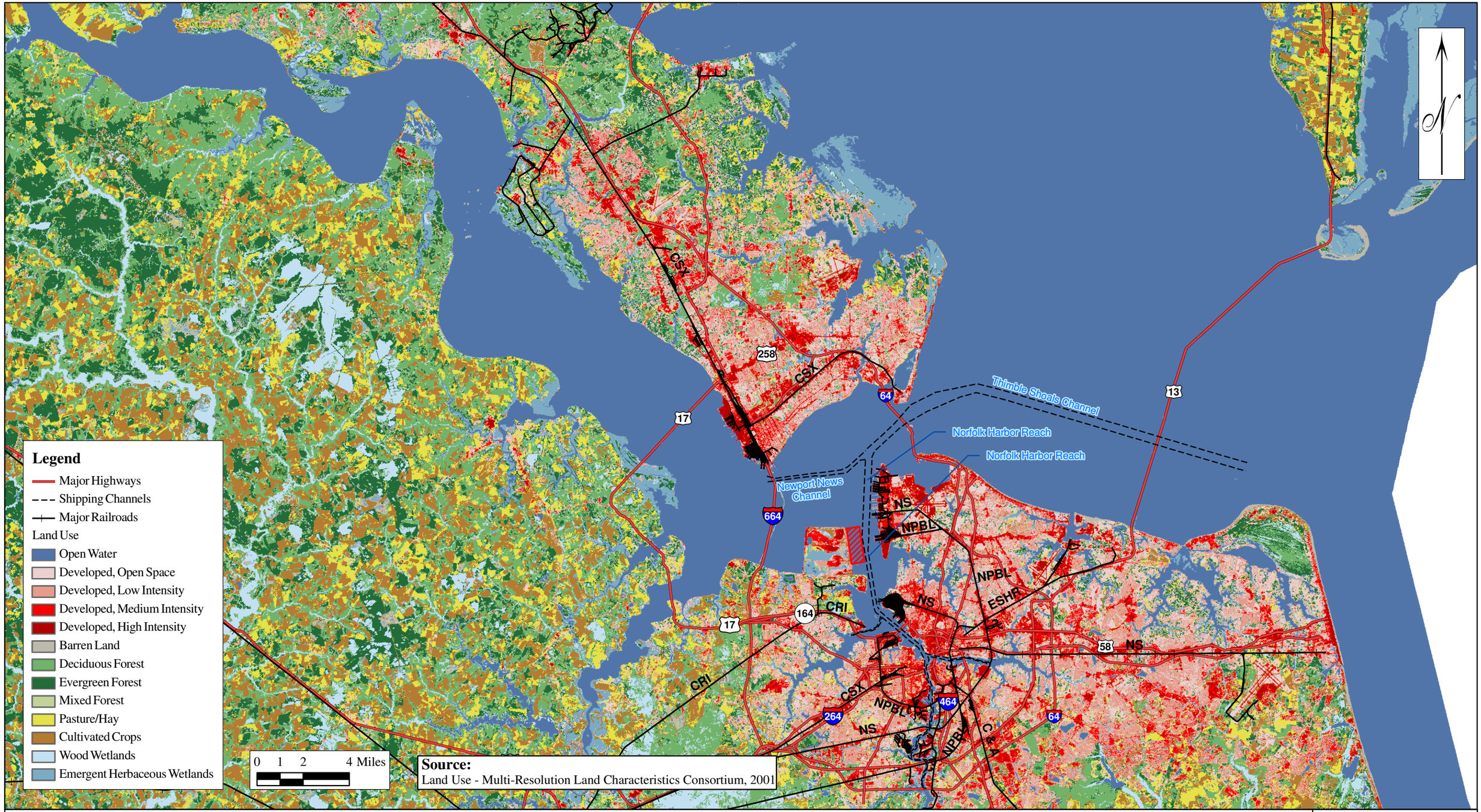
DREDGED MATERIALS PLACEMENT STUDY ALTERNATIVES CONSIDERED

Figure II-1



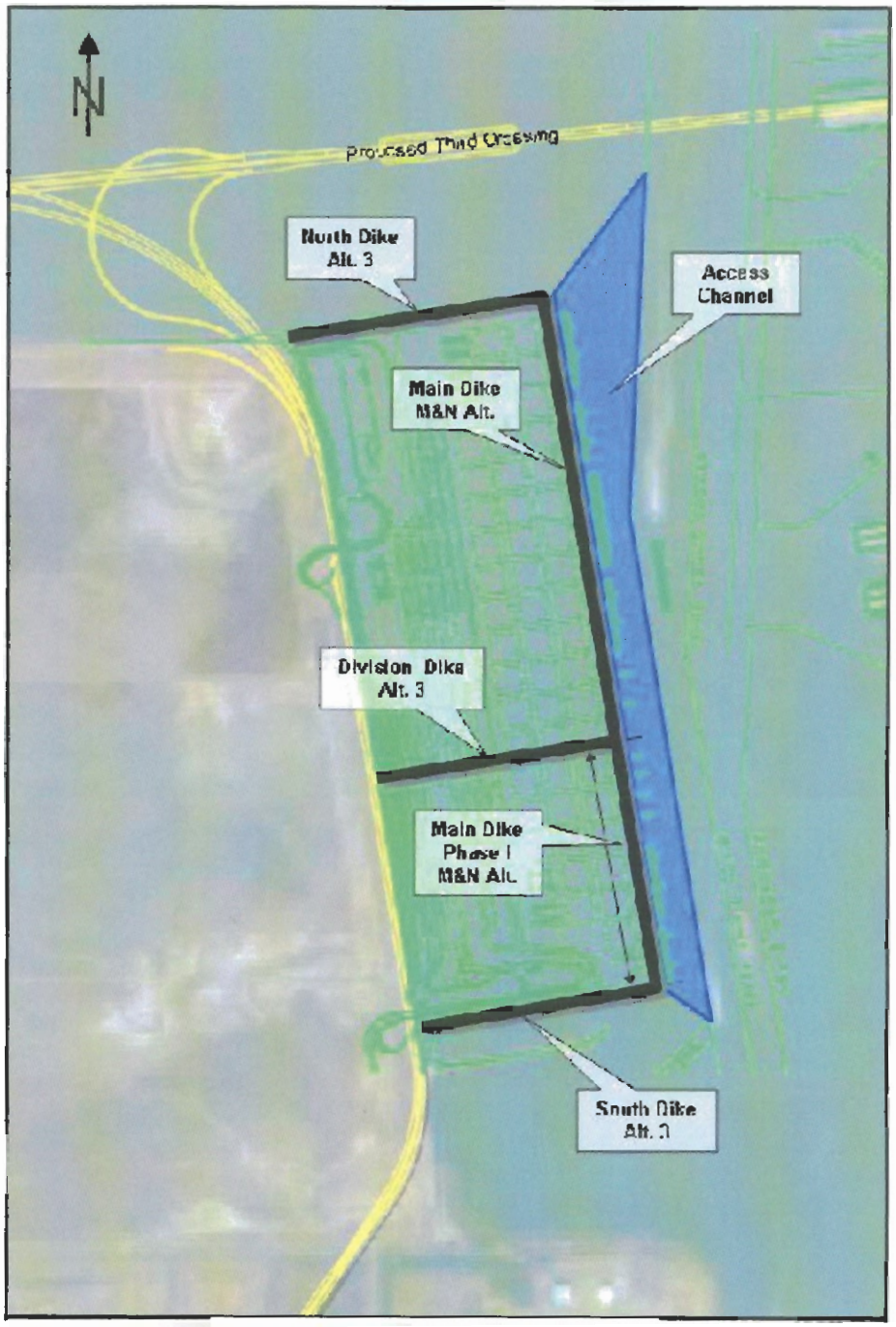
MAJOR HIGHWAYS, RAILROADS, AND CHANNELS

Figure II-2



LAND USE AND MAJOR NAVIGATION AND SURFACE TRANSPORTATION CORRIDORS

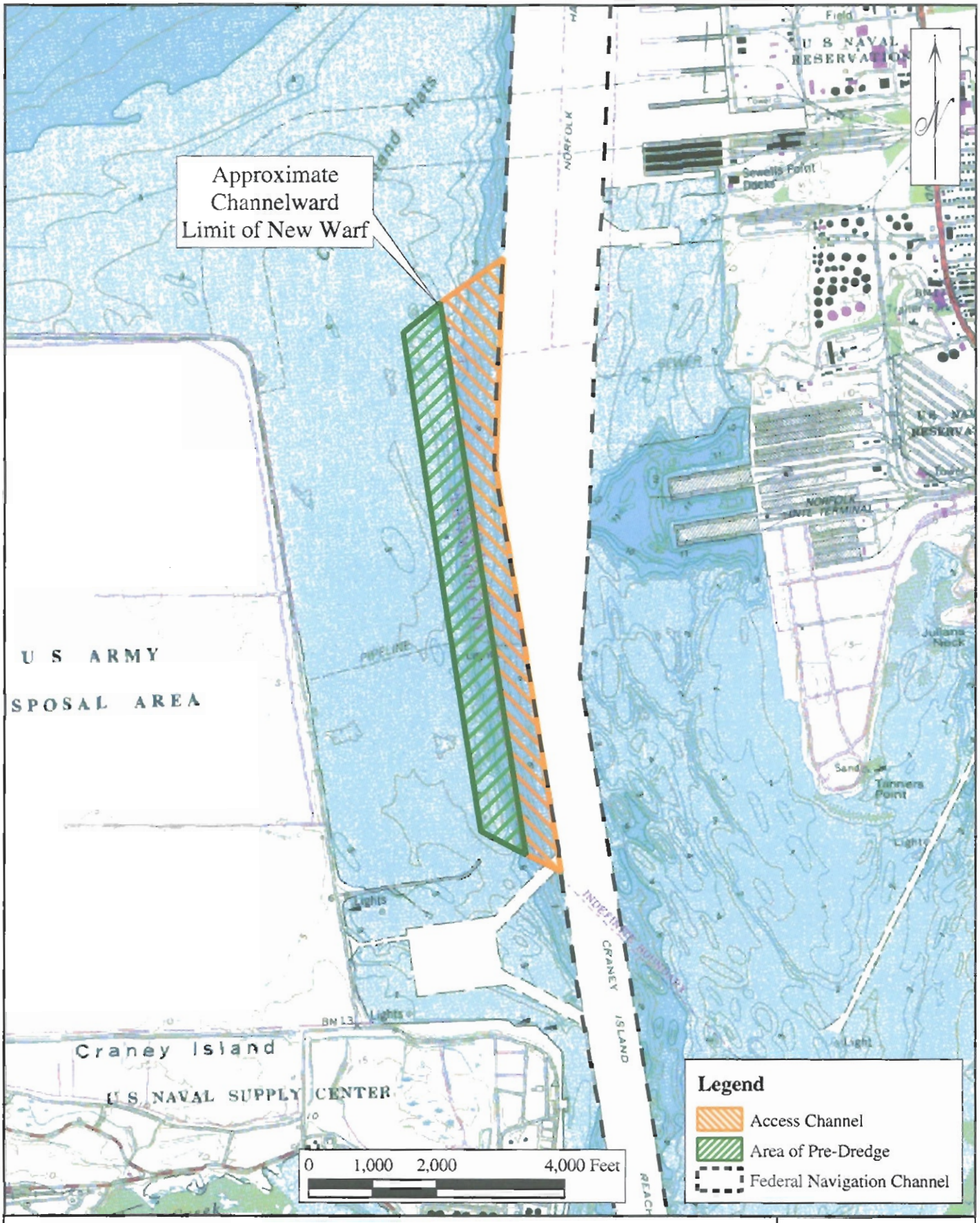
Figure II-3



Source:
- Moffat & Nichol, 2004

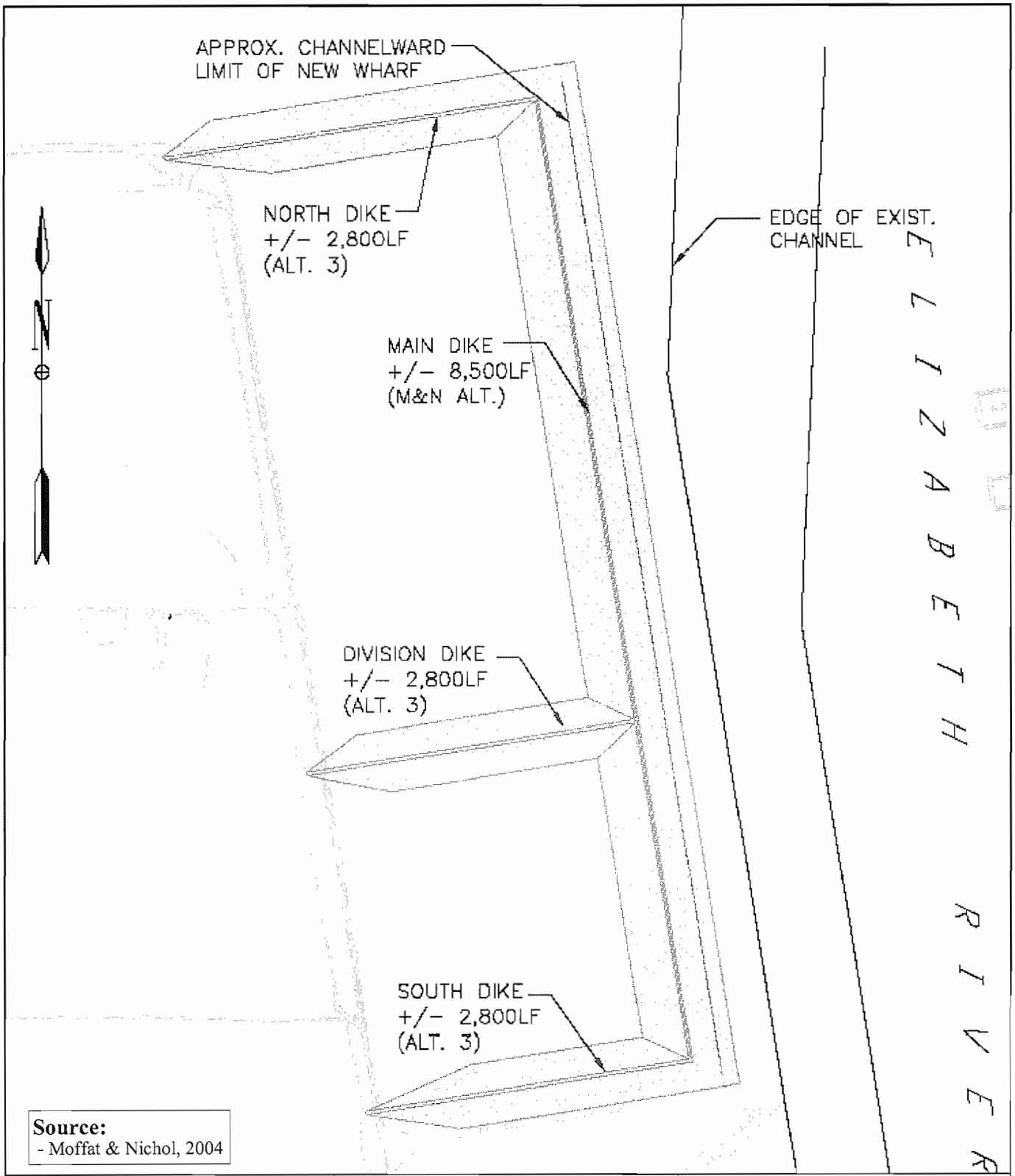
LAYOUT OF NEW CELL

Figure II-4



ACCESS CHANNEL & PRE-DREDGE LIMITS

Figure II-5



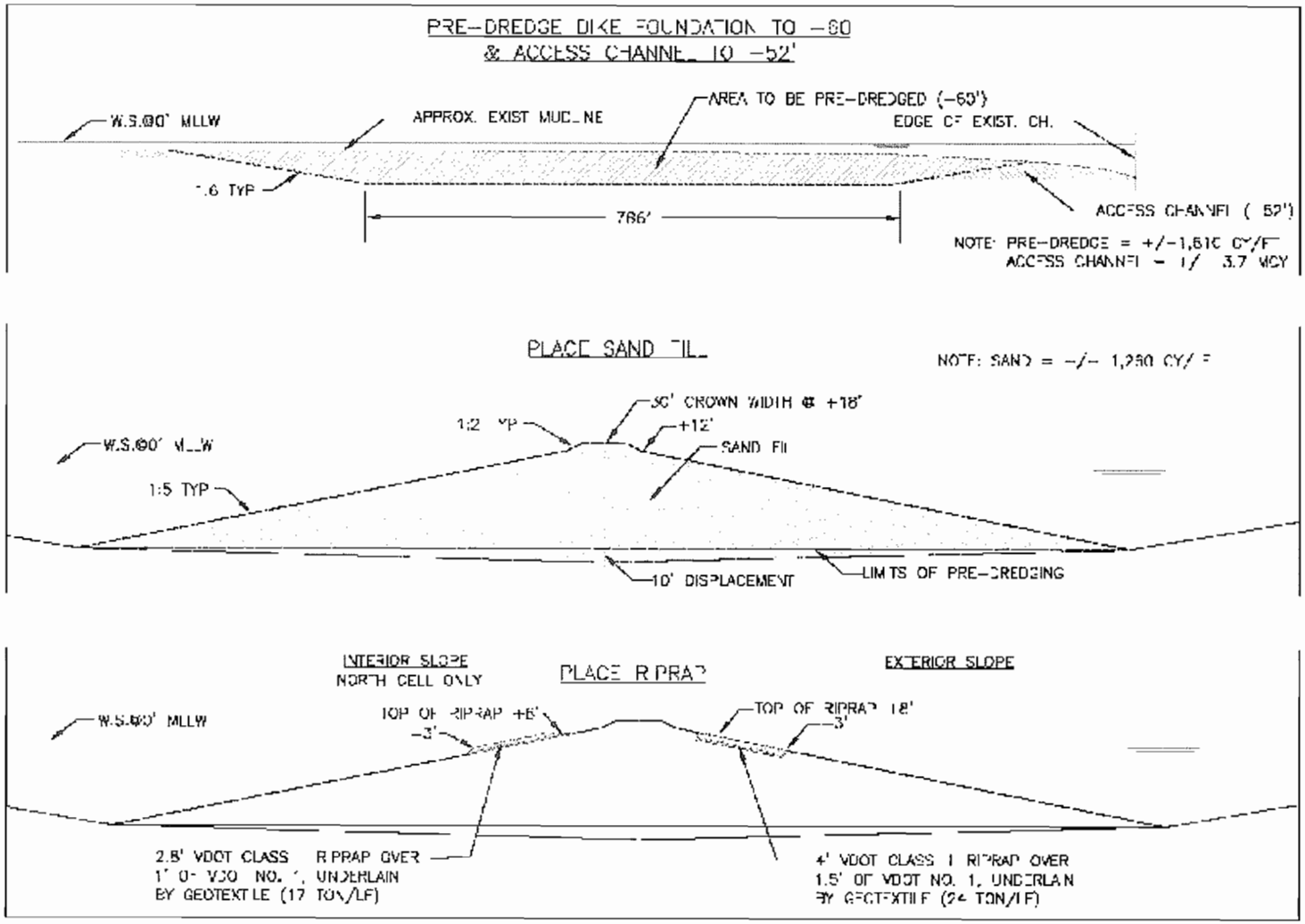
DIKE LAYOUT

0 1200' 2400'
SCALE: 1" = 1200'

CRANEY ISLAND EASTWARD EXPANSION

DIKE LAYOUT

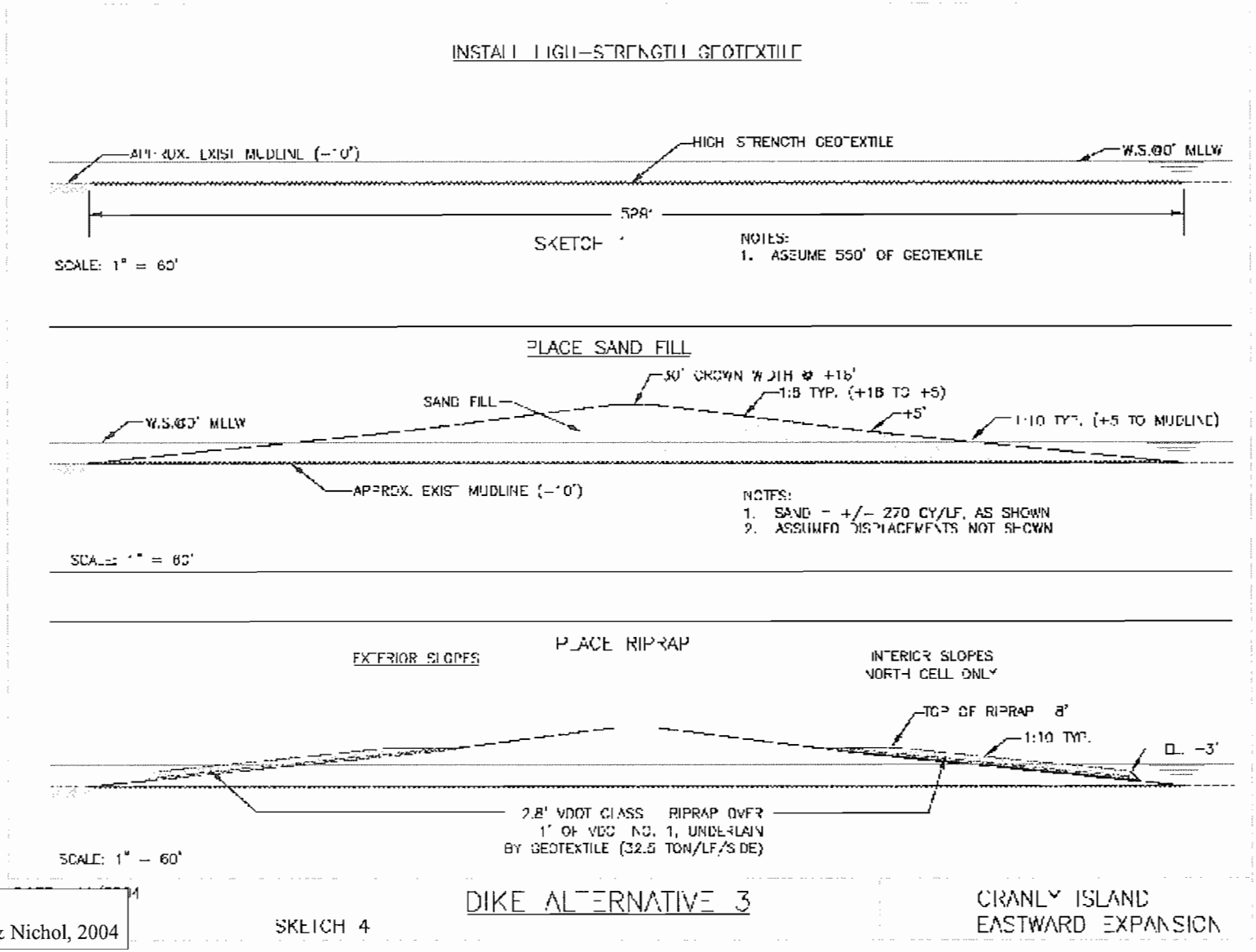
Figure II-6



Source:
- Moffat & Nichol, 2004

DIKE ALTERNATIVE 1

Figure II-7



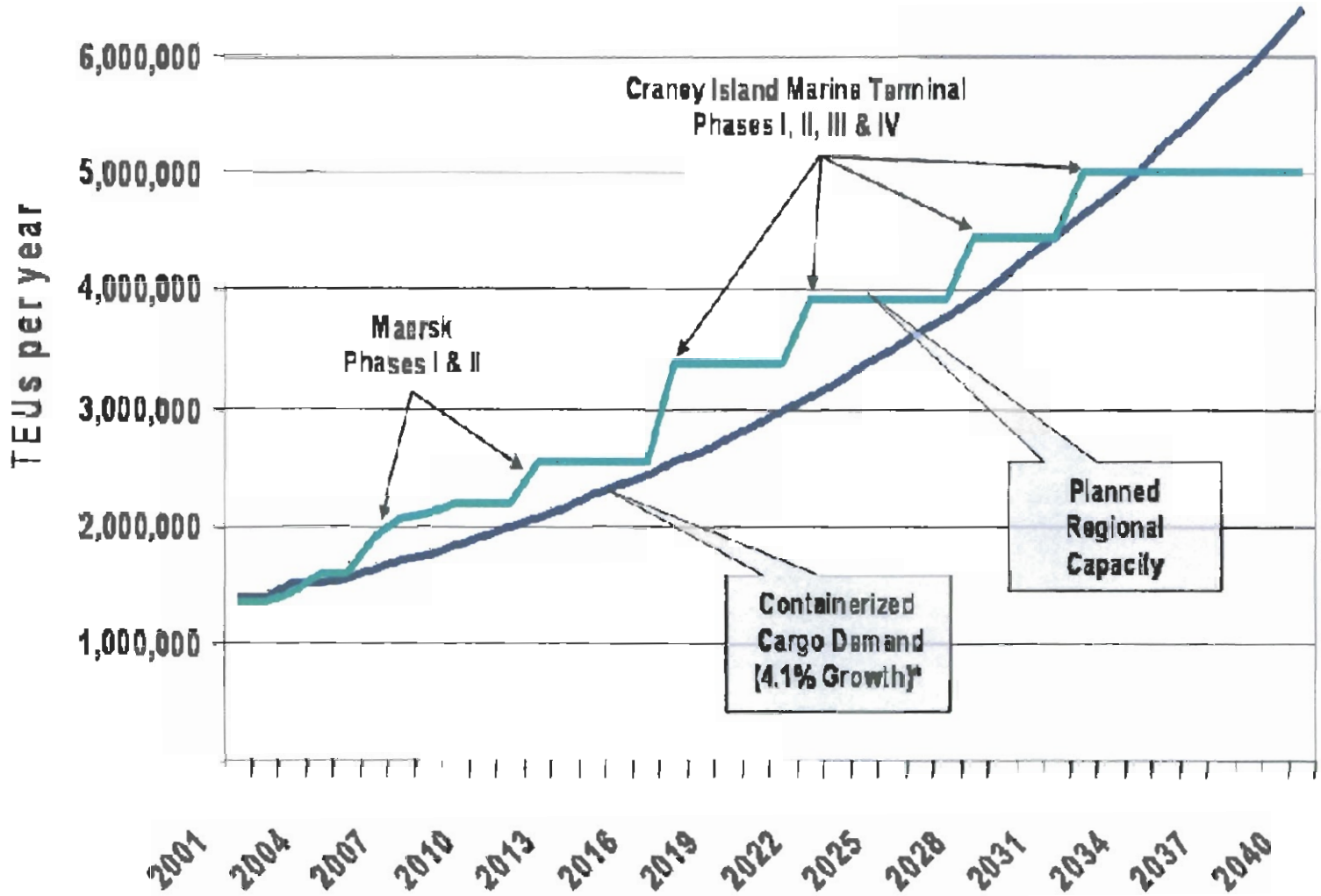
Source:
- Moffat & Nichol, 2004

DIKE ALTERNATIVE 2

Figure II-8

PROPOSED VDOT TRANSPORTATION PROJECTS IN CRANEY ISLAND VICINITY

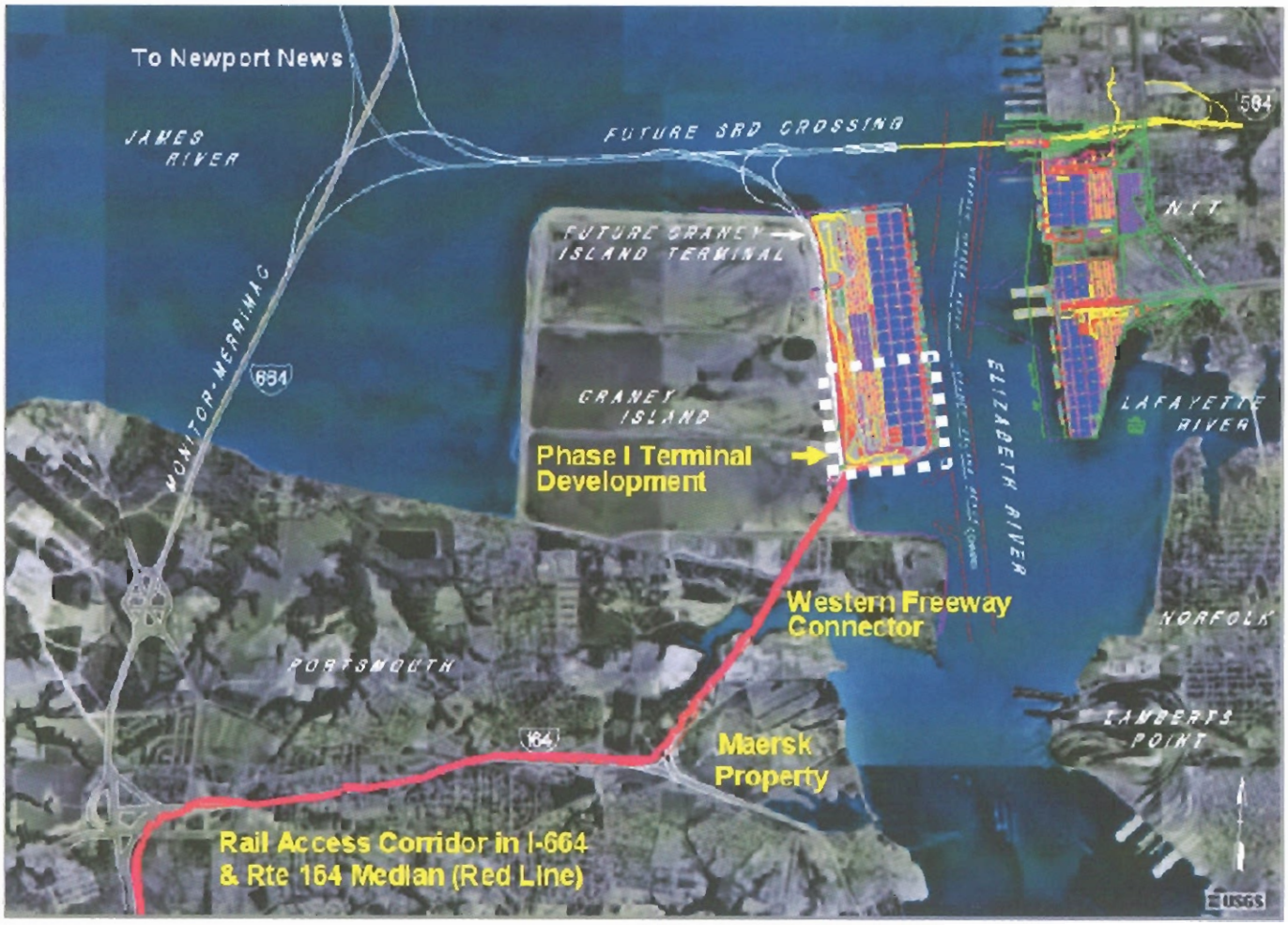
Figure II-9



Source:
- Forecast Source, Global Insight, 1999

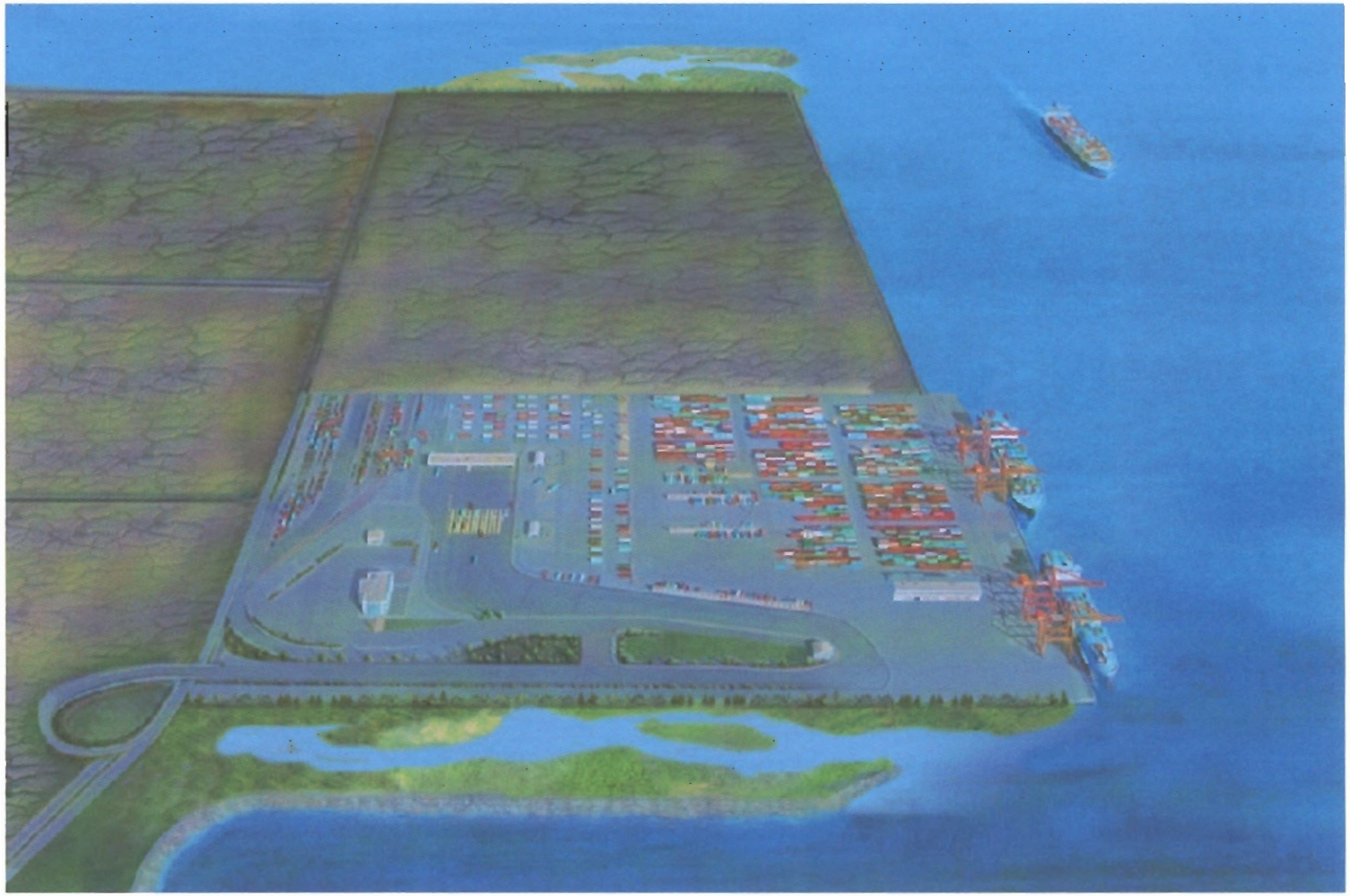
VPA 2040 MASTER PLAN CONTAINER FORECAST VS. PLANNED PORT CAPACITY

Figure II-10



CRANEY ISLAND PORT DEVELOPMENT AND SURROUNDING AREAS

Figure II-11



CRANEY ISLAND PHASE I PORT DEVELOPMENT

Figure II-12

CRANEY ISLAND BUILD OUT PORT DEVELOPMENT

Figure II-13

Affected Environment

AFFECTED ENVIRONMENT

III.1.0 COMBINED CIDMMA EXPANSION AND PROPOSED PORT DEVELOPMENT

This section presents baseline information for an understanding of the affected environment within the geographic area of the proposed CIDMMA expansion and terminal development. For each of 18 technical and scientific categories, baseline information is presented for the study area, which generally includes all land and water area within at least a 1-mile radius of the proposed site of CIDMMA expansion and terminal development.

Information is presented in technical and scientific categories with respect to the existing physical, biological, and human environments that may be affected by the proposed alternative and No Action Alternative.

III.1.1 WATER QUALITY

III.1.1.1 General Condition

Due to a long history of industrial pollution and urbanization, the Elizabeth River is considered one of the most impacted regions in the Chesapeake Bay watershed in terms of water quality and bottom sediment composition. The river receives a wide variety of point and non-point source loadings from its 300-square-mile drainage area, where approximately one-half million people reside (Cerco and Kuo, 1981). Impacts from point and non-point source loadings are exacerbated by the relatively poor flushing characteristics caused by low freshwater input and relatively weak tidal currents (USACE, 2000). Any freshwater entering the system is a result of stormwater runoff and Dismal Swamp drainage. This poor flushing tends to increase the amount of sediment and associated pollutants that are trapped within the river system (Neilson and Fang, 1975).

The Chesapeake Bay Program (CBP) has developed a water quality status and trends report to monitor the overall health of the Chesapeake Bay and its tributaries. The Chesapeake Bay Program rates the Elizabeth River as poor for habitat for submerged aquatic vegetation (SAV), poor for suspended solids, poor for chlorophyll a, and poor for water clarity. However, improving scores are noted for bottom DO, total phosphorus, and total nitrogen. Total nitrogen and phosphorus levels have been decreasing over the last five years (CBP Current Trends database, 2002).

Water quality in the vicinity of CIDMMA is considered poor but improving as nutrient levels decrease in the water column. Nitrogen and phosphorus levels are elevated, but lower than they have been measured over the last 5-year period. Total suspended solids levels are high, also indicating that water clarity is poor.

No potable water supplies, Outstanding State Resource Waters, or Wild and Scenic Rivers are located in the vicinity of the project (VDOT FEIS, 2001). Additionally, no designated sole source aquifers or wellhead protection areas are present in the project area (VDOT FEIS, 2001).

Virginia Water Quality Standards

The VDEQ classifies the Elizabeth River as Class II(a) waters, meaning tidal waters in the Chesapeake Bay Basin that support shellfish beds. The river is designated as Nutrient Enriched Waters, and has a site-specific copper standard (16.3 μg/L acute, 10.5 μg/L chronic) that was developed based on a water effects ratio.

According to Virginia's most recent 303(d) List of Impaired Waters released in 2004, the Elizabeth River does not meet Class II(a) water quality standards. Specifically, the mainstem and Southern Branch are listed as impaired for tributyltin (TBT), an anti-foulant used in paints for ship hulls. Most shellfish beds in the area have been condemned for harvesting due to enterococci/fecal coliform contamination and contaminated bottom sediments. The Elizabeth River and all branches are listed as not meeting the general standard for support of benthic macroinvertebrates. The USEPA also required that Virginia list the entire Chesapeake Bay and its tidal tributaries (including the Norfolk Harbor) as impaired by nutrient enrichment. The mainstem of the Elizabeth River is not listed as impaired for DO or toxic pollutants other than TBT, despite elevated concentrations of metals and organic chemicals in bottom sediments. However, the Southern Branch is listed as impaired for DO, and the Western Branch is listed as impaired for PCBs in fish tissue. Table III-1 below outlines the "state of the river" including water quality problems in the major branches of the Elizabeth River.

Table III-1. STATE OF THE ELIZABETH RIVER 2003

	Main Stem	Lafayette River	Western Branch	Eastern Branch	Southern Branch
Sediment Contamination (PAHs)	Borderline Problem	Borderline Problem	Borderline Problem	Problem	Severe Problem
Bottom Community Health (B-IBI)	Problem	Problem	Severe Problem	Problem	Severe Problem
Cancer in Mummichog Fish	*Insufficient Data*	Not a Problem	Not a Problem	Problem	Severe Problem
Dissolved Oxygen (DO)	Borderline Problem	Not a Problem	Not a Problem	Problem	Severe Problem
Dissolved Metals	Not a Problem	Not a Problem	Not a Problem	Not a Problem	Not a Problem
TBT	Problem	Problem	Problem	Severe Problem	Severe Problem

Source: State of the River 2003 from VA DEQ and The Elizabeth River Project.

III.1.1.2 Metals

"Point source contributions of metals have been estimated to constitute only 12 percent of the total metals load to the Elizabeth River. The highest point source loadings occur in river segments SB0, SB1, SB2, and EL4. Loadings from stormwater runoff account for 88 percent of the total metals entering the Elizabeth River watershed. The highest metal loadings from stormwater runoff occur in river segments EB2, EB3, and SB6. The main stem, the Southern Branch and parts of the Eastern Branch receive the highest combined metals loads. The combined load of heavy metals to the Elizabeth River watershed from point sources and stormwater runoff is estimated to exceed 100,000 lbs/year" (Technical Assessments in Support of the Elizabeth River Regional Action Plan Development - April 1996, pgs. 3-10 and 3-11).

For the Elizabeth River State of the River 2003 (Elizabeth River Project [ERP] and VDEQ) investigation, results were based on monitoring at 14 stations during 8 sampling events during 2000-2001. Dissolved metals samples were collected and analyzed by the Commonwealth's Division of Consolidated Laboratory Services. The results indicated that:

- There were no exceedences of the VDEQ water quality standards for any of the nine metals evaluated (arsenic, cadmium, copper, lead, mercury, nickel, selenium, silver, and zinc).
- Copper showed elevated levels in the Southern Branch but did not exceed water quality criteria.
- The Western Branch had elevated zinc values with respect to the other branches; however these were well below the chronic standard.

Tributyltin, or TBT, in the Elizabeth River

TBT is a biocide that has been popular in marine paints for its effectiveness in deterring the growth of barnacles, algae and other organisms on the hulls of boats and ships. TBT can be extremely toxic to fish and other aquatic life at very low concentrations, however, and proves to be the No. 1 problem in the water column of the Elizabeth River.

For the Elizabeth River State of the River 2003 (ERP and VDEQ) investigation, conclusions were based on three years of monitoring TBT by VIMS in the water column at 18 river stations. Stations were sampled six times a year and average concentrations were calculated for each location over the twelve-month period. The results indicated that:

- All monitoring stations had average yearly TBT concentrations that exceeded the Virginia Water Quality Criteria for TBT (1.0 ng/L) which placed them at least in the "Problem" category.
- Near the confluence of the Eastern and Southern branches, average concentrations at multiple stations were greater than 10 ng/L. This placed these branches into the "Severe Problem" category. Typically, TBT concentrations in the Elizabeth River showed a gradient with the highest levels near the confluence of the Eastern and Southern Branches.
- The highest measured concentrations, to date, occurred on September 20, 2001 with several stations near the confluence of the Eastern and Southern Branches exceeding 20 ng/L and the highest measured concentration was greater than 70 ng/L at a station in the Southern Branch.

III.1.1.3 Hydrocarbons

"Point sources are expected to contribute less than 1 percent of the total PAH load to the Elizabeth River watershed. The total estimated PAH load to the Elizabeth River watershed is more than ten times greater than the total estimated metals load. Essentially all of the PAH load can be attributed to stormwater runoff. Since fifteen of the top twenty contaminants of concern are PAH's, measures should be implemented to control stormwater runoff. The combined PAH load to the Elizabeth River watershed from point sources and stormwater runoff is estimated to exceed 1.1 million lbs/year." (Technical Assessments in Support of the Elizabeth River Regional Action Plan Development - April 1996, pgs. 3-10 and 3-11).

III.1.1.4 Dissolved Oxygen (DO)

DO is considered one of the most important and commonly employed indicators of a water body's ability to support healthy aquatic life. Adequate concentrations of DO are necessary for fish and other aquatic life.

For the Elizabeth River State of the River 2003 (ERP and VDEQ) investigation, DO levels were measured at 14 stations in the summers of 2000-2001 and were evaluated using Virginia's DO criteria for open water, deep water, and deep channel habitat.

Key Points of the Investigation

- DO concentrations show an improving trend in the Elizabeth River over the last decade.
- The Southern Branch is classified as "Severe Problem" because 31 percent of the DO values were lower than the Virginia's draft 30-day average criterion in the upper part of the water column. The daily minimum criterion for this part of the water column was consistently met both in the Southern Branch and the rest of the river. Nonetheless, aquatic life may be affected by low DO levels due to observed values in a number of stations well below (often 1 milligrams per liter (mg/1) or more below) the water quality criteria.
- Low DO occurs seasonally in several small coves and creeks in the Lafayette River and may be related to natural effects, climactic conditions, and/or storm events.
- DO values are influenced by weather conditions. The data set used in the analysis (2000-2001) represented a period of dry weather and generally good DO conditions, while in other years under different weather conditions, lower minimum DO values were observed.
- The Elizabeth River consistently met the DO criteria for deep water and channel habitat. This result is significant because the deep water category provides the largest habitat by volume. Exceedences are based on the open water habitat criteria.

Qualifications

- Analysis was limited to summer critical period (June 1 to September 30th).
- The Virginia's draft criteria for DO are:
    - Open Water: 5.0 mg/l 30-day average, 3.2 mg/1 minimum (water temp. <29 °C)
    - Deep Water: 3.0 mg/l 30-day average, 2.3 mg/11-day average, 1.7 mg/1 minimum
    - Deep Channel: 1.0 mg/l minimum

III.1.1.5 Chesapeake Bay Program (CBP)

The following initiatives of the multi-state CBP are relevant to water quality in the Elizabeth River/Norfolk Harbor:

- CBP has identified the Elizabeth River as one of three "Regions of Concern" for toxic pollution in the Chesapeake Bay watershed. In 2000, the Chesapeake Executive Council signed the *Toxics 2000 Strategy* to restore these regions, which includes goals of a 30-percent reduction in nonpoint source pollution and 15-percent reduction in pollutant loads from industrial sources by 2010.
- In accordance with the 1992 amendments to the Chesapeake Bay Agreement, Virginia developed the James River Tributary Strategy in 2000. Among other goals, this document recommends that nutrient loads to the James River be capped at 1996 levels and that sediment loads be reduced by 9 percent.
- The Chesapeake Bay Agreement 2000 called for complete restoration of water quality and sediment-related problems in the Chesapeake Bay watershed by 2010. The Agreement requires that the James River Tributary Strategy be revised to reflect new water quality standards (currently in development) and associated loading reductions.

III.1.1.6 Elizabeth River Project (ERP)/Virginia Department of Environmental Quality (VDEQ)

The ERP is a non-profit organization that establishes community involvement in efforts to improve the health of the Elizabeth River, in partnership with VDEQ, municipalities, industries, and citizens. ERP's Watershed Action Plan contains several goals related to reduction of sediment and toxic pollution of the river. ERP's State of River Report 2000 included the following conclusions:

- At only 3 of 21 stations monitored by VDEQ could concentrations of heavy metals in the river sediments (copper, lead, mercury, nickel, zinc, etc.) be classified as "not a problem."
- Toxic effects from river sediments were found at 21 of 23 stations monitored.
- No toxic effects from the water column have been determined to date at any of 11 stations monitored.
- With respect to dissolved metals in water, only copper exceeded Virginia's chronic water quality criterion at any stations.
- Out of 50 sediment samples from throughout the main stem and Southern Branches, 94 percent could be classified as a "borderline to severe problem" for polynuclear aromatic hydrocarbons (PAH's).
- DO and nutrients showed an improving trend.

ERP's "State of the River 2003" indicates similar trends including:

- The Elizabeth River consistently met DO criteria for deep water and channel habitat. This result is significant because the deep water category provides the largest habitat by volume.
- There were no exceedences of the acute water quality standards (Virginia Water Quality Standards – 9 VAC 25-260) for any of the 9 metals evaluated (arsenic, copper, lead, mercury, nickel, selenium, silver, and zinc).

- With respect to dissolved metals in water, only copper exceeded Virginia's chronic water quality criterion a total of three times.
- All monitoring stations had average yearly TBT concentrations that exceeded Virginia's water quality Criteria for TBT (1 ng/L).

Note: A synopsis of Elizabeth River Monitoring can be accessed through the query form found at http://gisweb.deq.virginia.gov/monapp/mon_query_form.cfm

III.1.1.7 Hydrodynamics

Nichols and Howard-Strobel (1991) estimated that 24 percent of the tidal prism of the Elizabeth River has been lost as a result of filling and that tidal currents at the mouth of the river have been reduced by 17 percent. Salinity values have likely increased from historic levels. These changes have contributed to the low flushing rates in the Elizabeth. While such changes have exacerbated the poor water quality of the Southern Branch, they have also acted to contain the high loading of contaminants within the Southern Branch. Fang (1975) stated that hydrodynamic studies between the 1950's and 1960's show an increase from 24 to 36 percent in the volume of flow in the natural channel to the south of the Newport News Middle Ground and a decrease from 27 to 18 percent in the volume of flow over the shallows in the area. Fang attributed this change to the initial construction of the CIDMMA in 1958, which shifted flows northward into Hampton Roads.

Three-dimensional numerical modeling efforts have assessed the impact of various expansion alternatives of CIDMMA on the circulation and sedimentation patterns of Hampton Roads and the Elizabeth River and vicinity. The Virginia Institute of Marine Science (VIMS) hydrodynamic modeling results are discussed later in this document.

Alterations to circulation patterns and current velocities are of primary concern, because such processes transport organisms, sediments, and contaminants. Of particular importance is the effect of circulation on the distribution of larval forms that are not free-swimming and, thus, depend solely upon currents for their transport to suitable habitat. The USFWS citing several modeling studies, including Fang (1975), Chen (1978), Byrne et al. (1987), and Heltzel and Granat (1988), concluded that the general circulation pattern for Hampton Roads is well known. On a flood tide, water from the Chesapeake Bay generally enters Hampton Roads across Hampton Flats and through Newport News Channel into the James River, with a lesser amount flowing into the Elizabeth River. On an ebb tide, water generally flows out of the James River through both the Newport News Channel and the area to the south of the Newport News Middle Ground, joining with the water flowing out of the Elizabeth River along the Norfolk Reach Channel. The geometry of Hampton Roads results in tidal phasing that set up circulation cells and a strong frontal system off of Newport News Point. Based on the work of Byrne et al. (1987) it is believed that this frontal system is critical to the maintenance of planktonic oyster larvae within Hampton Roads and the lower James River estuary. Salinity is also a major factor in these circulation patterns since higher salinities are found at depth, which sets up strong density gradients. These gradients were not evaluated in previous USACE two-dimensional models.

III.1.1.8 VIMS Hydrodynamic Study

The purpose of the hydrodynamic study was to determine the nature and extent of the physical changes that may occur in the estuarine environment of Hampton Roads, including the waters of the lower James River and a major tributary, the Elizabeth River, due to the implementation of a given CIDMMA expansion design. The physical changes that were evaluated included:

1) tidal range and phase;
2) strength and direction of tidal and tidally-averaged currents;
3) salinity or salinity structure;
4) circulation and flushing ability; and
5) sedimentation potential.

Sedimentation potential (Boon et al., 1999) is a modeled parameter computed as the percent of total time that the predicted bottom shear stress falls below a critical value permitting deposition. In addition to the general physical characteristics listed above, specific features observed in the local estuarine environment during previous studies were examined. These features included a tidal front system that regularly appeared in the lower James River near Newport News Point (Kuo et al., 1988; 1990) and a non-tidal eddy system observed during the time of neap tides at the Elizabeth River entrance near CIDMMA (Boon et al., 1999). The model simulation techniques described below were used to assess potential change in these features.

Another feature of key importance is the tidal prism or volume of water that enters and leaves the Elizabeth River during a tidal cycle. The magnitude of the tidal prism is an indicator of the flushing ability of the Elizabeth River Basin (Figure III-1), a system that includes not only the tidal waterways of the river stem and its four main branches but the adjacent watershed areas that deliver land-based runoff to the system as well. One of the main purposes of the study was to determine whether any of the expansion designs would impact the tidal prism, and in turn the flushing ability of the Elizabeth River Basin.

In addition to the general physical characteristics listed above, certain noted features of the local estuarine environment were examined using model simulation techniques. These features include a tidal front system that regularly appears in the lower James River near Newport News Point and a non-tidal eddy system observed during the time of neap tides at the Elizabeth River entrance near CIDMMA.

It should also be noted that hydrodynamic modeling was performed by VIMS for VDOT for the proposed Third Crossing project (Boon, et al., 1999). The effects of a third crossing were included in the modeling effort for CIDMMA expansion.

III.1.1.9 Groundwater

The groundwater system in southeastern Virginia consists of one water table aquifer and seven confined aquifers. The aquifers are, in descending order: the Columbia Aquifer (commonly referred to as the water table); the Yorktown-Eastover Aquifer; the Chickahominy-Piney Point Aquifer; the Aquia Aquifer; the

Virginia Beach Aquifer; the Upper Potomac Aquifer; the Middle Potomac Aquifer; and the Lower Potomac Aquifer. The upper two aquifers serve as the principal sources of recharge to the region's deeper aquifers and are the primary sources of discharge to surface waters. The water quality of these aquifers is considered good, although they may have elevated levels of chloride, sodium, iron, and acidity from natural resources (Southeastern Virginia Planning District Commission [SDWA], 1990). There are no designated sole-source aquifers in the study area regulated by Section 1424(e) of the Safe Drinking Water Act of 1974, as amended in 1986 (SDWA) (VDEQ, 1995). In addition, there are no wellhead protection areas in the study area regulated by Section 1428 of the SDWA (VDEQ, 1995).

III.1.2 AIR QUALITY

III.1.2.1 Air Quality Regulations and Standards

In accordance with the Clean Air Act (CAA) and as amended, USEPA has established National Ambient Air Quality Standards (NAAQS) for criteria pollutants. The primary objective of the NAAQS is to protect public health, and a secondary goal is to protect public welfare. Consequently, USEPA has set primary NAAQS for the protection of public health and secondary NAAQS to address public welfare. The criteria pollutants include carbon monoxide, ozone, nitrogen dioxide, sulfur dioxide, particulate matter, and lead. The NAAQS and applicable averaging periods for each criteria pollutant are presented in the following table.

Table III-2. NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging time	NAAQS (1) (□g/m^3)	
		Primary	Secondary
Carbon monoxide (CO)	8-hour 1-hour	10,000 40,000	none
Lead	Calendar quarter	1.5	(same as primary)
Nitrogen dioxide (NO_2)	Annual	100	(same as primary)
Ozone (3)	1-hour (2)	235	(same as primary)
PM_{10}[3]	Annual 24-hour	50 150	(same as primary)
Sulfur dioxide (SO_2)	Annual 24-hour 3-hour	80 365 none	none none 1,300

(1) National standards, other than those based on annual averages or annual geometric means, are not to be exceeded more than once per year (except where noted).
(2) The ozone standard is attained when the expected number of days per calendar year in which the maximum hourly average concentration is above the standard is equal to or less than one.
(3) New standards for ozone (8-hour) and particulate matter (PM2.5) are pending.
Source: 40 CFR Part 50.4-50.12.

In addition to setting the NAAQS for each criteria pollutant, USEPA also has the responsibility of designating the compliance status of all areas within the U.S. with respect to the NAAQS. Areas are designated in one of three general categories. Areas currently in compliance with the NAAQS are classified as attainment areas, areas not meeting the NAAQS are designated non-attainment areas, and areas currently meeting the NAAQS but that had been previously exceeding the NAAQS are classified as maintenance areas. To determine ambient air quality conditions within a regional area, a network of air quality monitors is operated under the National Air Monitoring System and the State and Local Air Monitoring System. Ambient air quality data collected from the network are evaluated by USEPA for purposes of assigning NAAQS attainment designations.

Plans describing how attainment with the NAAQS will be achieved are required for non-attainment areas. Similarly, plans for maintaining compliance with the NAAQS are required for maintenance areas. These attainment/maintenance plans are incorporated into a State Implementation Plan (SIP) for submittal to USEPA. As required under the 1990 Amendments to the CAA, USEPA has promulgated regulations to ensure that Federal actions conform and do not interfere with approved SIP's. These regulations include rules addressing transportation and general conformity, and they apply in both non-attainment and maintenance areas. Transportation conformity requirements are applicable to Federal Highway Administration (FHA) and Federal Transit Authority projects, and the General Conformity regulations apply to non-transportation Federal actions. Virginia's Transportation Conformity and General Conformity Rules are codified as 9 VAC 5-150 and 9 VAC 5-160, respectively.

III 1.2.2 Regional Conditions

CIDMMA and vicinity are within the Hampton Roads Air Quality Control Region. As shown in Figure III-2, this region encompasses the cities of Chesapeake, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach, and Williamsburg, as well as James City and York Counties. Ambient air quality in the Hampton Roads region is monitored at a network of stations maintained by VDEQ. Criteria pollutant ambient concentrations are measured at these monitoring stations. Based on ambient data collected by the monitors, the Hampton Roads region is presently in compliance with the NAAQS for all criteria pollutants. However, from 1991 to 1997 the Hampton Roads region was designated as a marginal non-attainment area with respect to the 1-hour ozone standard. In June 1997, USEPA re-designated the Hampton Roads region to attainment status and approved the maintenance SIP developed for the area. Consequently, the Hampton Roads area is currently designated a maintenance area under the one-hour ozone standard and an attainment area for all other criteria pollutants. In 1997, USEPA enacted new and more stringent standards for ozone (8-hour basis) and particulate matter. These standards have been vigorously opposed by industry groups and have led to court cases reaching the U.S. Supreme Court and U.S. Court of Appeals. The high court rulings to date have supported USEPA's authority to establish the new standards. USEPA's plan to implement the new standards and subsequent state compliance plans are now pending. Based on historical monitoring data, the Hampton Roads area was designated as a non-attainment area with respect to the new 8-hour ozone NAAQS in 2004.

Federal projects located in the Hampton Roads ozone non-attainment area are subject to conformity requirements. Since the development of the planned terminal facility constitutes a non-transportation

action involving Federal funding, the project is subject to the General Conformity Regulation. In accordance with the General Conformity Regulation, a conformity determination is required if project-related emissions of ozone precursor pollutants, nitrogen oxides (NO_x), and/or volatile organic compounds (VOC's), are above prescribed thresholds. The threshold applicable to the Hampton Roads ozone non-attainment area for an individual project is 100 tons per year for both NO_x and VOC's.

III.1.2.2.1 Projected Regional Emissions Inventory

As part of the approved SIP for the Hampton Roads ozone maintenance area, a projected inventory of VOC and NO_x emissions has been completed for the year 2008. The projected emissions inventory, as summarized in the following table, includes contributions from point sources, area/non-road activities, and mobile sources. Regional SIP emissions projections for Hampton Roads are not available beyond 2008.

Table III-3. 2008 PROJECTED EMISSION INVENTORY FOR HAMPTON ROADS

Source category	VOC (tons/day)	NO_x (tons/day)
Point sources	30.0	81.1
Area/non-road	136.6	78.1
Mobile	41.9	68.1
Total	208.5	227.2
Source: VDEQ, March 2002.		

III.1.3 PROTECTED SPECIES AND CRITICAL HABITAT

III.1.3.1 State and Federal Regulations

The Endangered Species Act (ESA) of 1973 (16 USC 1531-1543) regulates activities affecting plants and animals classified as endangered or threatened, as well as the designated critical habitat of such species. Federal agencies are required to provide for the conservation of threatened and endangered species and are prohibited from carrying out any action that would jeopardize a listed species or destroy or alter its critical habitat. Reauthorized in 1988, the provisions of the ESA apply only to those species listed in the Federal Register as endangered or threatened.

An "Endangered Species" is any species that is in danger of extinction throughout all or a significant portion of its range. Threatened species are defined as those species that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range. Excluded are species of the Class Insecta determined by the Secretary to constitute a pest whose protection under the provisions

of this Act would present an overwhelming and overriding risk to man. The term "species" includes any subspecies of fish or wildlife or plants, and any distinct population segment of any species or vertebrate fish or wildlife that interbreeds when mature. Actions affecting species proposed for listing would require the same coordination with state and Federal agencies as actions affecting listed species.

USFWS and the NMFS are the Federal agencies responsible for ESA compliance. Overall, USFWS is responsible for terrestrial and freshwater species and migratory birds, and NMFS protects marine species and anadromous fish. The Department of Agriculture Animal and Plant Health Inspection Service oversees listed terrestrial plants.

The Commonwealth of Virginia also provides protection to animal species deemed Threatened or Endangered within the state (Virginia Code §29.1-230 et seq.). The Virginia Department of Game and Inland Fisheries (VDGIF) is responsible for compliance with the state program. The Virginia Department of Conservation and Recreation (VDCR) Division of Natural Heritage maintains a database of sensitive species in the state. The Commonwealth of Virginia also provides protection to plant and insect species deemed Threatened or Endangered within the state (Virginia Code §3.1-1020 et seq.). The Virginia Department of Agriculture and Consumer Services (VDACS) oversees the program for plant and insect species.
In addition to the species listed as Threatened and Endangered, Federally-listed candidate species and state-listed special concern species were identified. The Candidate and special concern species are not legally-protected under endangered species legislation, but these species should be considered in the planning process. The Migratory Bird Treaty Act of 1918 (MBTA) provides Federal protection for migratory species by prohibiting the taking, killing, possessing, transporting, and importing of migratory birds, their eggs, parts, and nest, except when specifically authorized by the Department of the Interior.

Although some marine mammals are protected under the ESA, all marine mammals are protected under the Marine Mammal Protection Act (MMPA) of 1972. The Act establishes a Federal responsibility to conserve marine mammals, with management vested in the Department of Commerce for cetaceans and pinnipeds other than walrus. The Department of the Interior is responsible for all other marine mammals. The nature of the concerns regarding potential impacts to marine mammals is similar for both Acts. Thus, marine mammals that are known to frequent the study area are addressed in this section.

III.1.3.2 Species and Habitat

Known or potential populations of threatened or endangered species and species of special concern within the area surrounding the proposed project were identified through coordination with VDGIF and VDCR (see the following table). During the early planning stages of the study, special species inquiries were sent to VDGIF, VDCR, VDACS, NMFS and USFWS. Information provided is reflected in this section. USFWS also provided information on special species in their Planning Aid Report (EIS, Appendix A).

To date, project review coordination with VDCR and VDGIF and review of the VDGIF's Virginia Fish and Wildlife Information Service at: http://vafwis.org/WIS/ASP/default.asp, has resulted in identification of one Federally-threatened species, the piping plover (*Charadrius melodus*), which has been documented

in the proposed project vicinity (VDCR, March 2002) and (VDGIF, March 2002). The VDCR and VDGIF have also documented several other species of potential concern that are listed in Table III-3 and individually discussed below.

Piping Plover

The piping plover *(Charadrius melodus*) is Federally-listed as threatened along the Atlantic Coast and is state-listed as threatened by VDGIF. This species is also protected under MBTA. Piping plovers nest in sparsely- to moderately-vegetated coastal beaches above the high tide line or in other sandy areas. In Virginia, plovers are found from mid-March to late July, after which they migrate south.

As proposed, the port facility would adjoin and be located along the eastern shoreline of CIDMMA. Piping plovers nest on CIDMMA from mid-March to late July. The Hampton Roads Crossing (HRC) Study, FEIS, March 2001 states *"Piping plovers were first noted on Craney Island in 1989 and have been observed there for 10 of the 24 years of observation (Beck, personal communication, 1999). Observations of breeding pairs in 1994 and 1995 found that nests were placed mostly on the island's western side (5 nests) with one nest on the northern shore and one on the eastern side of the island on the eastern side of the center cell (USFWS, field notes). The maximum number of breeding pairs of piping plovers observed since 1989 was five pairs in 1994 (Hester, personal communication, 2000). According to Hecht (personal communication, 2000), no piping plovers were seen on Craney Island in 1998 or 1999 and none have been observed so far this year (Held, 2000 personal communication). These findings appear to be consistent with the observations reported by Cairns and McLaren (1980) that piping plovers are uncommon breeders on the west side of the mouth of the Chesapeake Bay."* Figure III-3 shows the approximate locations of piping plover nests observed on CIDMMA in 1994 and 1995.

No piping plovers nested on CIDMMA during 2000, and in 2001, piping plovers were noted on CIDMMA only during the migration period. No birds were observed nesting during 2000 or 2001 (Beck, 2002).

Threats to piping plover populations include loss of nesting and feeding habitat due to commercial, recreational, and residential development. Human development also causes an increase in the number of predators that may be attracted to the area. Potential nest predators on CIDMMA include red fox and raccoon. Disturbances, including foot and vehicular traffic, often impact breeding success by causing the parents to desert the nest. Exposure during storms has also been identified as an impact. Studies have suggested that piping plovers may habituate to continuous human presence as long as no direct impacts to nesting or feeding areas occur. No studies have reported directly on the effects of noise or light to piping plover nesting habits or breeding success.

Least Tern

The least tern *(Sterna antillarum*) breeds commonly around the Chesapeake Bay and along the coast. In Virginia, the least tern population is declining. Coordination with the VDCR has indicated that the least tern is a species of special concern listed by VDGIF. The least tern is also protected under MBTA. The three primary colonies of the least tern in Virginia are located on the barrier islands of the Eastern Shore,

at Grandview Beach in the city of Hampton, and on CIDMMA in the city of Portsmouth. Least terns nest on wide beaches with little vegetation and feed in saltwater near the shore.

Threats to this species include loss of nesting habitat due to development, disturbance of breeding colonies by human activities, and susceptibility to predators. Least terns nest on CIDMMA and are known to nest on the east side of the island (USFWS, 1994, 1995). Least terns were observed nesting on CIDMMA during 2001 (Beck, 2002). Figure III-3 shows the approximate locations of least tern nests observed on CIDMMA in 1994 and 1995. VDGIF recommends project coordination with the state and the USFWS to avoid impacts to the least tern.

Black-necked Stilt

Black-necked stilt (*Himantopus mexicanus*) habitat includes primarily grassy marshes, wet savannahs, mud flats, shallow ponds, flooded fields, and the borders of salt ponds. They nest along the shallow water of ponds, lakes, swamps, or lagoons and may nest on the ground or in the shallow water on a plant tussock. Black-necked stilts feed on insects, crustaceans, and small fish, as well as the seeds of aquatic plants. Black-necked stilts nested on CIDMMA during 2001 (Beck, 2002). The Black-necked stilt is protected under MBTA. VDGIF recommends project coordination with the state and the USFWS to avoid impacts to the Black-necked stilt.

Table III-4. SPECIES OF POTENTIAL CONCERN IDENTIFIED THROUGH COORDINATION WITH AGENCIES

Common Name	Scientific Name	Status
Piping plover	*Charadrius melodus melodus*	FT
Least tern	*Sterna antillarum*	SS
Black-necked stilt	*Himantopus mexicanus*	NS
Wilson's Plover	*Charadrius wilsonia wilsonia*	SE
Yellow-crowned night-heron	*Nyctanassa violacea violacea*	SS
Great blue heron	*Ardea antillarum*	NS
Green heron	*Butorides virescens*	NS
Northern diamond-backed terrapin	*Malaclemys terrapin terrapin*	FS
Atlantic sturgeon	*Acipenser oxrhynchus*	SS
Loggerhead sea turtle (1)	*(Caretta caretta)*	FT, SE
Kemp's ridley sea turtle (1)	*(Lepidochelys kempii)*	FE, SE
Bald eagle (1)	*Haliaeetus leucocephalus*	FT, SE
Peregrine falcon (1)	*Falco peregrinus*	SE
Atlantic bottlenose dolphin (1)	*Tursipos truncates*	Depleted

FE= Federally-endangered
FT= Federally-threatened
FS= Federal Species of Concern
SE= state-endangered
ST= state-threatened
SS= state special concern
NS= no status
(1) These species have been identified in the literature as occurring or having potential to occur in the project vicinity.

Wilson's Plover

Wilson's plover (*Charadrius wilsonia wilsonia*) breeds along the barrier islands and is a rare transient and summer visitor along the lower Chesapeake Bay. The Virginia barrier islands support 99 percent of the state population of Wilson's plovers during the nesting season. They are abundant breeders elsewhere in their range, although not common breeders anywhere on the U.S. Atlantic Coast. Wilson's plover is listed as state-endangered and has been identified by VDGIF as having potential to occur at or within the

project vicinity. This species also receives protection under MBTA. Wilson's plovers feed in oceanfront intertidal zones, salt marsh edges, and on mud flats. Their diet consists mostly of crustaceans, as suggested by their thick bill, including fiddler and mole crabs. The population is threatened due to loss of nesting habitat as a result of development. VDGIF recommends project coordination with the state and the USFWS to avoid impacts to Wilson's plover.

Yellow-crowned Night Heron

The yellow-crowned night heron (*Nyctanassa violacea violacea*) breeds commonly along the coast. Declines in urban areas of the Tidewater region have been attributed to loss of foraging habitat and intentional disruption of nesting pairs, as well as loss of wetlands. This species was listed as State Special Concern on January 1, 1992 and is protected under MBTA. Threats include relocation and abandonment of nest sites resulting from intentional or unintentional human disturbance. VDGIF recommends project coordination with the state and the USFWS to avoid impacts to the yellow-crowned night heron.

Great Blue Heron

The great blue heron (*Ardea herodias herodias*) is a permanent resident of the coastal plain. Although the great blue heron does not receive protection under the ESA, the heron is protected under MBTA. Draining, filling, and dredging of wetlands have resulted in loss of habitat and a subsequent reduction in numbers. Great blue herons feed on fish, frogs, snakes, insects, and other aquatic animals. VDGIF recommends project coordination with the state and the USFWS to avoid impacts to the great blue heron.

Green Heron

The green heron (*Nyctanassa violacea*) breeds throughout Virginia. It is a common transient and summer resident but is a rare winter visitor statewide. The green heron is a migratory species and is protected under MBTA. Green herons are susceptible to human disturbance and loss of wetland habitat. They feed on fish, crustaceans, mollusks, insects, reptiles, amphibians, spiders, and leeches. VDGIF recommends project coordination with the state and the USFWS to avoid impacts to the green heron.

Northern Diamond-backed Terrapin

The northern diamond-backed terrapin (*Malaclemys terrapin terrapin*) is a Federal species of concern. Northern diamond-backed terrapins are the only truly estuarine turtle. It is usually found in coastal, brackish marshes and their tributaries, bays, inlets, and tidal portions of coastal rivers. It can also be found rarely in the Atlantic Ocean. It is mostly on the ocean side of the Eastern Shore, and comparatively fewer are seen in the Chesapeake Bay. Trapping for the restaurant market and incidental capture and drowning in crab pots have most likely reduced Virginia's population. Raccoons often prey upon adults and eggs. Raccoons, skunks, and possibly foxes also prey upon nests. This species feeds mainly on snails, worms, crabs, and clams. The classification "Federal species of concern" is not a legal designation; therefore, further coordination regarding this species is not required.

Atlantic Sturgeon

The Atlantic sturgeon (*Acipenser oxyrhynchus*) is fully-protected in Virginia by laws pertaining to Fisheries of Tidal Waters. The Atlantic sturgeon was designated a State Special Concern species on

January 1, 1992 and is covered by the marine fishing ban on taking of sturgeons in Virginia. Atlantic sturgeon are anadromous, ascending large rivers to spawn in April and May in the Chesapeake Bay. Juveniles may spend several years continuously in fresh water of some large rivers; in others they may move downstream to brackish water when temperature drops in the fall. This species is also migratory. Atlantic sturgeon are opportunistic benthic feeders. They take worms, crustaceans, aquatic insects, snails, and sand lances. Populations are threatened by over-fishing, pollution, and dam construction. The maximum age reported is 60 years. A reproducing Atlantic sturgeon population persists in the James River, into which the Elizabeth River flows. This population is likely very small and may be the only remaining reproducing population in the Chesapeake Bay. Atlantic sturgeon is an anadromous species; therefore, spawning habitat likely lies in waters up the James River with much lower salinity.

Sea Turtles and Turtle Migration

Of the seven sea turtle species found throughout the world, five appear seasonally in the lower Chesapeake Bay. All five are Federally-listed species. The most common is the Federally-threatened loggerhead turtle (*Caretta caretta*). Loggerheads account for close to 90 percent of the summer sea turtle population. VIMS has estimated that between 2,000 and 10,000 young loggerheads use the Chesapeake Bay each summer as foraging areas. A significant number of Kemp's ridley (*Lepidochelys kempii*) also summer in the Chesapeake. The other marine turtles that may be found in the region include the endangered leatherback (*Dermochelys coriacea),* Atlantic hawksbill (*Eretmochelys imbricata*), and the Atlantic Green Sea Turtle *(Chelonia mydas*). These three species are found only rarely in the Chesapeake Bay area.

The Loggerhead sea turtle is Federally-listed as threatened and state-listed as endangered. It is a common visitor to the Chesapeake Bay and its estuarine tributaries during the spring, summer, and fall. Hampton Roads is considered an estuarine tributary to the Chesapeake Bay. The loggerheads' diet consists of benthic crustaceans (primarily horseshoe crabs), bivalves, jellyfish, sponges, crabs, shrimp, barnacles, fish, and sea grasses. Nesting has been reported on the barrier islands and in Back Bay National Wildlife Refuge. Juveniles become residents for the summer and occupy channel edges, foraging back and forth along the bottom within a home range of 10 to 80 square kilometers.

The Kemp's ridley is the second most abundant sea turtle in the Chesapeake Bay and is Federally- and state-listed as endangered. The only known nesting ground of Kemp's ridley is a single location along the Gulf of Mexico. Young Kemp's ridley turtles feed on sargassum weed and associated species. Adult Kemp's ridley turtles feed primarily on shelled benthic invertebrates including blue crabs. Research suggests that these turtles rely heavily upon the Chesapeake Bay during juvenile stages.

Based on information from VIMS, turtles are present within the Chesapeake Bay each year from May to November when temperatures are from 16 to 18 degrees Celsius (°C). The peak migration into the Chesapeake Bay occurs during late May and early June. Virginia coastal water temperatures drop to 1 to 4 °C during most winters prompting turtle migration out of the Chesapeake Bay to warmer waters during October and November.

Bald Eagle

On February 2, 1978, the bald eagle (*Haliaeetus leucocephalus)* was listed as an endangered species in many parts of the U.S. and as a threatened species in the rest of the U.S. The Chesapeake Bay bald eagle population was designated as endangered. The major limiting factor for the Chesapeake Bay Region (CBR) bald eagle population was lowered reproductive capacity as a result of DDT and other contaminants. Other factors limiting population growth were shooting, disturbance, and habitat destruction. Since the late 1970's, the CBR bald eagle population has grown substantially, as a result of the reduced usage and presence in the environment of persistent pesticides like DDT, and has demonstrated some tolerance and adaptability to disturbance or loss of habitat (USFWS, 1990). On August 11, 1995, the bald eagle was reclassified from endangered to threatened on the Federal list. In July 1999, the USFWS recommended that the bald eagle be removed from the list of endangered and threatened wildlife; however, at this time the species is still listed as threatened, pending further action. The bald eagle remains a state-listed endangered species in Virginia.

In addition to receiving protection under ESA and MBTA, the bald eagle is protected under the Bald and Golden Eagle Protection Act, which prohibits, except under certain specified conditions, the taking, possessing, transporting, exporting or importing, bartering, or offering to sell, purchase, or barter a bald or golden eagle, alive or dead, or any part, nest, or eagle egg.

Ideal bald eagle habitat consists of mature shoreline forests with scattered opening and little human use, adjacent to water with abundant fish and waterfowl. Such habitat must contain adequate nesting, roosting, and perching sites (Fraser et al., 1991). Bald eagles frequent estuaries, large lakes, reservoirs, major rivers, and some seacoast habitats. However, such areas must have an adequate food base, perching areas, and nesting sites meeting certain requirements to support bald eagles. Major threats include habitat loss, disturbance by humans, biocide contamination, and decreasing food supply.

One bald eagle nest was identified in 2002 approximately 2.5 miles east-southeast of the proposed port facility within Hoffler Creek Wildlife Preserve, a 142-acre wilderness area located in the Churchland area of Portsmouth. At least one eaglet was identified in the nest (Hoffler Creek Wildlife Foundation, 2002). However, the nest was destroyed during Hurricane Isabel in September 2003 and, while still occasionally seen in the area, the eagles have not returned to nest.

Peregrine Falcon

The peregrine falcon (*Peregrinus falco*), a state-listed endangered species, was de-listed from Federal protection on August 25, 1999, based on data indicating the species has recovered following restrictions on DDT, and following the implementation of successful management strategies. Although the species is no longer protected by the ESA, protection is provided by MBTA.

Peregrine falcons live mostly along mountain ranges, river valleys, and coastlines. The peregrine falcon has been identified nesting on bridges and other elevated structures throughout the Hampton Roads area (VDOT, 2001). This species feeds primarily on other birds, such as songbirds, shorebirds, ducks, and in rural areas, starlings and pigeons. Threats to the species are human-induced disturbances and include the

use of pesticides and the reduction of nesting habitat (Byrd, 1991). Although DDT has been banned in the U.S. since 1972, DDT continues to be used in many Latin American countries where some peregrines and prey spend the winter.

Marine Mammals

The Atlantic bottlenose dolphin (*Tursiops truncatus*) is a species protected by the MMPA of 1972. This species is not listed as threatened or endangered but is listed as "depleted" under the MMPA. Bottlenose dolphins are seen in Virginia's waters and in Hampton Roads from May through October, with limited sightings in spring and winter. The harbor porpoise (*Phocoena phocoena*) is a Federal candidate species and is a marine mammal protected by the MMPA. Harbor porpoises have been documented in Virginia's coastal waters from January through March and have been found stranded along the coast from March through May. Harbor porpoises are not commonly found in the Hampton Roads harbor.

The Right Whale (*Eubalaena glacialis*) is a species protected by the MMPA of 1972. This species is listed as Endangered. Their north-south migration movement off the Virginia coast takes place in the months of November through April. Right whales have been observed in Virginia waters near the mouth of the Chesapeake Bay. Right whales are not commonly found in the Hampton Roads harbor.

The U.S. Navy is required to report whale sightings in these areas, and commercial vessels participate in voluntary reporting when traveling in this region. Sightings data are maintained by the National Oceanic and Atmospheric Administration (NOAA) and reported to mariners by the U.S. Coast Guard.

The *NOAA Fisheries Service Mid-Atlantic Sightings Archive: Right Whales Sightings for the Mid–Atlantic Region from 1974 through 2002* reported between 13 and 15 right whales within 30 nautical miles of the entrance to the Chesapeake Bay. Only two whales were reported within the nearshore shipping channels, and none were reported in the inshore shipping channels. The frequency of whale sightings in the shipping channel is very low (two sighted in 28 years), and navigation safety regulations require vessels to travel within the designated channels. Figure III-4 depicts the spatial distribution of whale sightings.

Critical Habitat

"Critical habitat" is a specific geographic area(s) that is essential for the conservation of a threatened or endangered species and that may require special management and protection (USFWS, April 2002). Critical habitat areas are determined based on the availability of physical and biological features required to support the species (shelter, food, breeding areas, and protection). Critical habitat areas have been designated for the Federally-threatened piping plover; however, no critical habitat has been identified within the project area or within the state (USFWS, April 2002). Critical habitat has not been designated for any of the other species discussed above.

III.1.4 AQUATIC BIOTA

III.1.4.1 Finfish

The Chesapeake Bay and its tributaries sustain a wide diversity of species and have for centuries provided fishing grounds for commercial and recreational purposes. More than 295 species of fish are known to occur in the CBR. Of these fish species, only 32 species are year-round residents of the Chesapeake Bay. The remaining species enter the Chesapeake Bay either from freshwater streams or the Atlantic Ocean to feed, reproduce and find shelter.

The fish in the CBR fall into two categories: resident and migratory. Resident fish tend to be smaller than migratory species and often occur in shallow waters, where they feed on a variety of invertebrates. Migratory fish fall into two categories: catadromous or anadromous. Catadromous fish live in freshwater but travel to the high-salinity ocean waters to spawn. Anadromous fish, such as the American shad and the blueback herring, travel from the high salinity waters of the lower bay or Atlantic Ocean to spawn in the Chesapeake Bay watershed's freshwater rivers and streams.

A listing of fish species that occur in the study area is provided in the USFWS Planning Aid Report, Appendix A. Common anadromous species found in the Hampton Roads and other estuarine waters in the study area include: alewife (*Alosa pseudoharengus)*, blueback herring (*Alosa aestivalis*), shad (*Alosa sapidissima* and *A. mediocris*), striped bass (*Morone saxitilis*), and white perch (*Morone americana*). The alewife, blueback herring, and shad species have spawning and nursery areas upstream in the James River and other coastal tributaries and use the Hampton Roads for passage between upstream and coastal habitats (Klauda et al., 1991a, 1991b). The onset of alewife spawning migrations is typically from early to mid- March through April. The primary spawning runs of blueback herring begin in early April about three to four weeks after the peak alewife runs (Klauda et al., 1991a). Spawning runs for American shad typically begin in mid-February to early March, peak during April, and are over by early June. Hickory shad spawning runs may precede American shad runs and typically begin during March and April. Peak spawning activity occurs between late April and early June (Klauda et al., 1991b). Striped bass and white perch also have spawning and nursery areas upstream in the James River and other coastal tributaries (Setzler-Hamilton, 1991a, 1991b). Striped bass and white perch typically are found in Hampton Roads only during March and April (Land et al, 1995).

The Elizabeth River is an important nursery for many commercial and recreational species including spot, Atlantic croaker, Atlantic menhaden, weakfish, striped bass, black seabass, and summer flounder. The river is also important as feeding area for adult bluefish, weakfish, spot, and Atlantic croaker. Anadromous fish such as the American shad, alewife, and the blueback herring travel from the high salinity waters of the lower bay or Atlantic Ocean into the Elizabeth River for spawning. The most intensive use for spawning is by forage fish, including the bay anchovy and Atlantic silverside (Priest, 1981).

According to data obtained from the VMRC for 1994 and 1995, major commercial fisheries on the Elizabeth River, based on estimated harvest, include blue crab, Atlantic croaker, and American eel. Other

commercial fisheries of much less significance in the harvest include such species as striped bass, bluefish, and grey sea trout. Gear used for this harvest include pots, gill nets, and haul seines.

It is believed that striped bass, American shad, and river herring run up the Elizabeth River in the spring after storm events that provide sufficient freshwater flow in the watershed. No major spawning of anadromous fishes occurs in the river. If any spawning does take place, eggs likely do not hatch due to the presence of brackish water.

Hedgepeth et al. (in Priest, 1981) concluded that temperature is the major factor determining the winter distribution of fishes, while food availability is the major factor controlling the summer distribution of fishes. They concluded that three major finfish uses of the Elizabeth River and lower James River are: 1) nursery grounds for juvenile spot, Atlantic croaker, alewife, blueback herring, American shad, striped bass, and weakfish; 2) adult feeding grounds for spot, Atlantic croaker, weakfish, summer flounder; and 3) spawning grounds for important forage species such as bay anchovy and Atlantic silverside.

Birdsong et al. (1984) investigated finfish seasonality and utilization of Hampton Roads and the Norfolk Harbor entrance channel, with an additional discussion of fishes of the Elizabeth River. Through trawl surveys at eight stations, along with a gillnet station off Ocean View and a pound net station east of Lynnhaven, the researchers identified 104 species of fishes. Stations 5 (east of CIDMMA, west of the ship channel in the mouth of the Elizabeth River) and 6 (Mainstem Elizabeth River off Lamberts Point, west of the ship channel) were located in the present study area. Based on results from the trawl surveys, the top five dominants for Station 5 included, in order, bay anchovy, spot, weakfish, menhaden, and spotted hake. For Station 6, top five dominant included, in order, bay anchovy, spot, Atlantic croaker, spotted hake, and hogchoker.

As part of an evaluation of Essential Fish Habitat (EFH) for the proposed Pinners Point Connector, VDOT contracted with VIMS to conduct sampling of the Elizabeth River approximately 1 mile southwest of Craney Island. The sampling started in November 1999 and was performed approximately every 6 weeks until May 2000. In order to evaluate the summer months, data from the VIMS trawl survey (1979 to 1985) were utilized. All stations were located within a 1.5-mile radius of the mouth of the Western Branch of the Elizabeth River (Figure III-5). A total of 91 trawls were made in the assessment area (35 present and 51 historic). The EFH species of concern made up a very small fraction of the total fish caught (>0.01 percent). The area is typically inhabited by sciaenids, such as spot (*Leiostomus xanthurus*), Atlantic croaker (*Micropogonias undulates*), and weakfish (*Cynoscion regalis*). Other species that comprised over 1 percent of the total catch include: hogchoker (*Trinectes maculates*), spotted hake (*Urophycis regia*), and Atlantic silverside (*Menida menida*). However, the most abundant species at over 50 percent of the total catch were bay anchovies (*Anchoa mitchilli*).

Geer et al. (2000) and Lowery (2000), based on results from trawl surveys from 1978 to 2000, found the top five dominants in the vicinity of CIDMMA included, in order, bay anchovy, spot, Atlantic croaker, hogchoker, and weakfish. These 5 species accounted for approximately 93 percent of catch. Blue crabs

accounted for 0.28 percent of the total catch in this area of the Elizabeth River or about 184 crabs caught in 91 trawls (35 present trawls – Year 2000, and 51 historic trawls – Years 1979 to 1985).

III.1.4.2 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act of 1976 (MSA) established 8 Regional Fishery Management Councils (FMC's) responsible for the protection of marine fisheries. A 1996 amendment to the Act instituted a new mandate to identify and provide protection to important marine and anadromous fisheries habitat EFH. FMC's, with assistance from NMFS, are required to delineate EFH in fisheries management plans for all Federally-managed fisheries in order to conserve and enhance those habitats. EFH may be applied to individual fish species or to an assemblage of species. EFH is defined in the MSA as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The term "fish" means finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds.

The MSA specifies that each Federal agency shall consult with NMFS when proposing any activity that may have adverse impacts on designated EFH. The proposed project area is part of a 10' x 10' square of latitude and longitude that includes the waters of the lower Chesapeake Bay that support the following species with a Fishery Management Plan (FMP): windowpane flounder (*Scopthalmus aquosus)*, bluefish (*Pomatomus saltatrix)*, Atlantic butterfish (*Peprilus triacanthus)*, summer flounder (*Paralicthys dentatus)*, black sea bass (*Centropristus striata)*, king mackerel (*Scomberomorus cavalla)*, Spanish mackerel (*Scomberomorus maculatus*), cobia (*Rachycentron canadum*), red drum (*Sciaenops occelatus*), dusky shark (*Charcharinus obscurus*), sandbar shark (*Charcharinus plumbeus*), little skate (Raja erinacea), winter skate (Raja ocellata), and clearnose skate (Raja eglanteria). Life stages of these species that occur in the 10' x 10' square investigated are shown in Table III-4 below. Additional evaluation of these species is included in the descriptions following.

Table III-5. SUMMARY OF ESSENTIAL FISH HABITAT (EFH) DESIGNATION

10' x 10' Square Coordinates

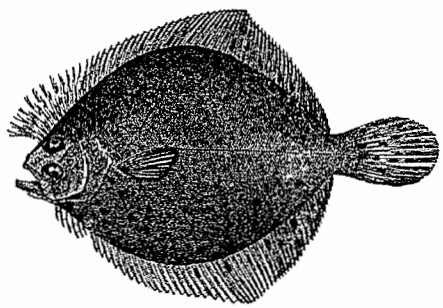
Boundary	North	East	South	West
Coordinate	37° 0.00' N	76° 20.0' W	36° 50.0' N	76° 30.0' W

Species	Eggs	Larvae	Juveniles	Adults
windowpane flounder *(Scopthalmus aquosus)*				X
bluefish *(Pomatomus saltatrix)*			X	X
Atlantic butterfish *(Peprilus triacanthus)*	X	X	X	X
summer flounder *(Paralicthys dentatus)*		X	X	X
black sea bass *(Centropristus striata)*	n/a		X	X
king mackerel *(Scomberomorus cavalla)*	X	X	X	X
Spanish mackerel *(Scomberomorus maculatus)*	X	X	X	X
cobia *(Rachycentron canadum)*	X	X	X	X
red drum *(Sciaenops occelatus)*	X	X	X	X
dusky shark *(Charcharinus obscurus)*		X		
sandbar shark *(Charcharinus plumbeus)*		X	X	X
sandbar shark *(Charcharinus plumbeus)*		HAPC	HAPC	HAPC
winter skate (Raja ocellata)			X	X
little skate (Raja erinacea)			X	X
clearnose skate (Raja eglanteria)			X	X

Source: National Marine Fisheries Service: "Summary of EFH Designation" posted on the internet at http://www.nero.noaa.gov/hcd/STATES4/virginia/virginia/36507620.html and EFH Designations for New England Skate Complex posted at http://www.nero.noaa.gov/hcd/skateefhmaps.htm.

The following information was taken from the NMFS EFH Source Documents unless otherwise indicated.

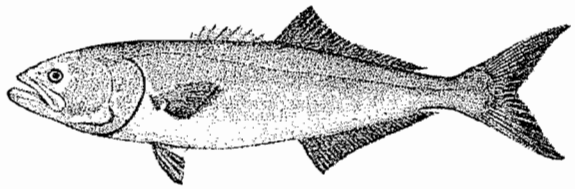
Windowpane Flounder (*Scopthalmus aquosus*)



The proposed expansion cell and access channel lie within an area designated as EFH for juvenile and adult windowpane flounder. Juveniles and adults prey on polychaetes and small crustaceans, especially mysids. Juveniles are often eaten by adults of their own species, and both juveniles and adults are eaten by other species including spiny dogfish. Juveniles and

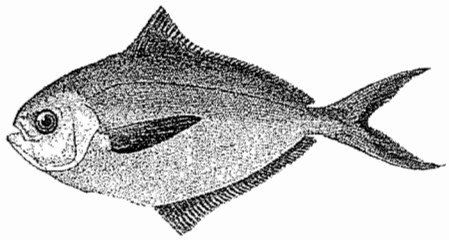
adults are generally found in fine sandy sediments in salinities ranging from 15-33 ppt and DO ranging from 2-13 mg/L. Both juveniles and adults are also found in a wide range of temperatures from 5° C to 24°C and at depths less than 50m. Preferred salinity, DO, temperature and depth of the windowpane flounder are present in the proposed project area, however, substrate of the proposed expansion and access channel is dominated by muddy clays which are not characteristic of windowpane habitat. Therefore, this species is not expected to occur in the project area.

Bluefish (*Pomatomus saltatrix*)



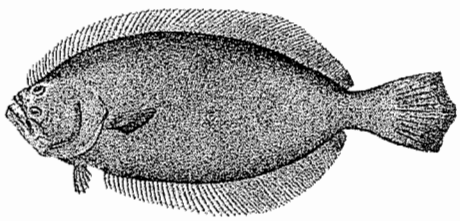
The proposed expansion and access channel lie within an area designated as EFH for juvenile and adult bluefish. Juveniles and adults occur in estuaries, bays, and the coastal ocean where juveniles are less common. Both juveniles and adults prefer warmer temperatures (above 14-16°C and migrate south of Cape Hatteras in the winter months. Juveniles are generally found in salinities ranging from 23 to 33 ppt, but can intrude on salinities as low as 3 ppt. Adults are generally found in areas characterized with oceanic salinities. Salinity at the proposed expansion and access channel range from 16 to 23. Based on this information, juvenile bluefish may be present in the project area.

Atlantic Butterfish (*Peprilus triacanthus*)



The proposed expansion and access channel lies within an area designated as EFH for eggs, larvae, juvenile, and adult butterfish. Eggs and larvae are common in the mixing zone of the Chesapeake Bay. Eggs are planktonic while larvae are more nektonic than planktonic. Juvenile and adult butterfish are pelagic and overwinter along the 100 fathom contour of the continental shelf from late autumn through early spring. Juveniles and adults are common in the high salinity and mixing zones of estuaries from Massachusetts Bay to the mid-Atlantic during warmer months. All life stages are found in a wide range of salinities, temperatures, and depths, and may be present in the proposed project area.

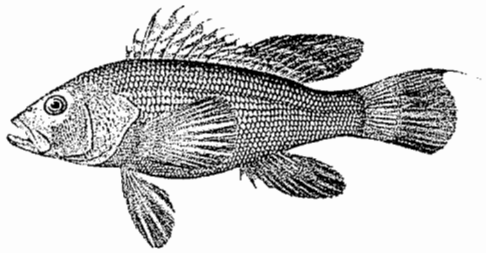
Summer Flounder (*Paralicthys denatus*)



The proposed expansion and access channel lie within an area designated as EFH for larvae, juvenile, and adult summer flounder. Larval and juvenile summer flounder commonly found in a wide variety of habitats with the juveniles preferring a sandy/mixed substrate over a mud/silt

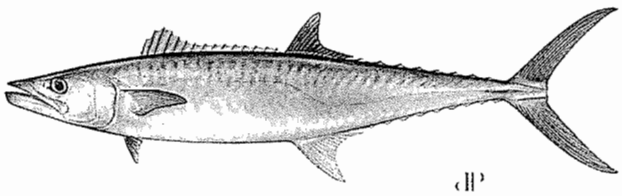
substrate. Adults are most commonly found in sandy substrates but can be found in a variety of substrates with both mud and sand substrates, including marsh creeks, seagrass beds, and sand flats. Larval, juvenile and adult summer flounder may be present in the proposed project area.

Black Sea Bass (*Centropristus striata*)

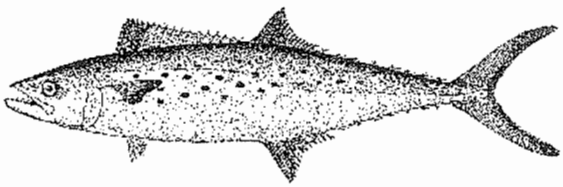


The proposed expansion and access channel lie within an area designated as EFH for juvenile and adult black sea bass. Juveniles occur in a wide variety of temperatures and depths. The estuarine nursery habitat is shallow, hard bottom with structure. These include shellfish, sponge, amphipod tubes, and sea grass beds. Older juveniles tend to stay in shallower waters (<10m), but not in the shallow shoals and marsh fringe favored by young-of-the-year (YOY). Older juveniles use channels and bridge abutments. Adult black sea bass are generally found around structures. They remain near structures during the day, but can move away at dawn to feed on open bottom. Juvenile and adult black sea bass may be present in the proposed project area around existing rip-rap banks surrounding CIDMMA.

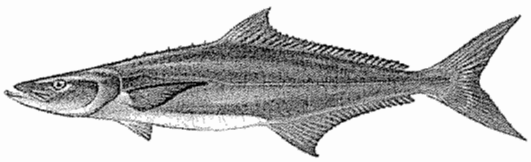
King Mackerel (*Scomberomorus cavalla*)



Spanish Mackerel (*Scomberomorus maculates*)



Cobia (*Rachycentron canadum*)



The proposed expansion site and access channel lie

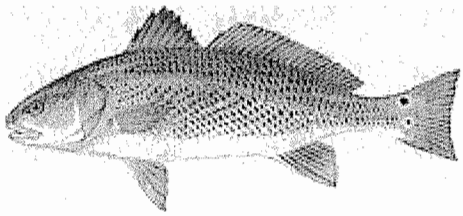
within an area designated as EFH for the highly migratory species king and Spanish mackerel and cobia.

Essential fish habitat for coastal migratory pelagic species includes sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters, from the surf to the shelf break zone, but from the Gulf Stream shoreward, including *Sargassum.* In addition, all coastal inlets, all state-designated nursery habitats of particular importance to coastal migratory pelagics.

For cobia, essential fish habitat also includes high salinity bays, estuaries, and seagrass habitat. The Gulf Stream is an essential fish habitat because it provides a mechanism to disperse coastal migratory pelagic larvae.

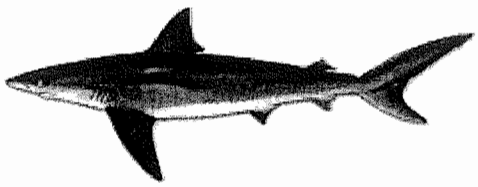
For king and Spanish mackerel and cobia, essential fish habitat occurs in the South Atlantic and Mid-Atlantic Bights. These three species are coastal migratory pelagic species, and would not be expected in the shallow, moderately saline mouth of the Elizabeth River. These species are not expected to occur in the proposed project area.

Red Drum (*Sciaenops occelatus*)



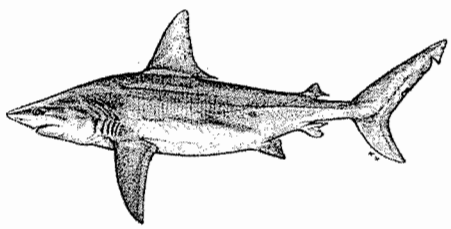
The proposed expansion and access channel lie within an area designated as EFH for eggs, larvae, juvenile, and adult red drum. Essential fish habitat includes all of the following habitats to a depth of 50 meters offshore: tidal freshwater; estuarine emergent vegetated wetlands (flooded saltmarshes, brackish marsh, tidal creeks); estuarine scrub/shrub (mangrove fringe); submerged rooted vascular plants (sea grasses); oyster reefs and shell banks; unconsolidated bottom (soft sediments); ocean high salinity surf zones; and artificial reefs. The area covered includes Virginia through the Florida Keys. Eggs, larvae, juvenile and adult red drum may be present in the proposed project area around existing rip-rap banks surrounding CIDMMA.

Dusky Shark (*Charcharinus obscurus*)



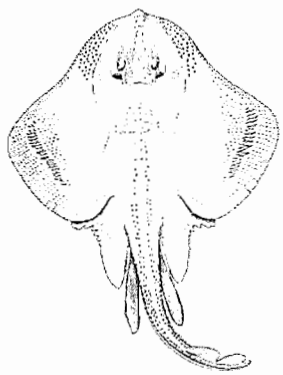
The juvenile dusky shark is designated as a highly migratory species having EFH in the proposed expansion area and access channel. Adults of this species tend to avoid areas of low salinity and rarely enter estuaries. The young occur in very shallow coastal water (nurseries) in estuaries and bays from New Jersey to Cape Hatteras (Florida Museum of Natural History, 2005). Juvenile dusky sharks may be present in the proposed project area.

Sandbar Shark (*Charcharinus plumbeus*)



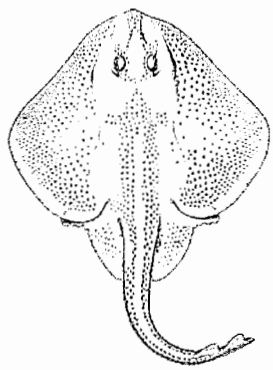
The proposed expansion cell and access channel are located within an area designated as both EFH and Habitat Area of Particular Concern (HAPC) for the sandbar shark. The sandbar shark is an important commercial species in the Chesapeake Bay which is home to one of this species' largest spawning grounds. The sandbar shark is a highly migratory species, therefore juveniles and adults would not likely be impacted by the proposed expansion cell and access channel. Important nursery and pupping grounds have been identified in shallow areas and the mouth of Great Bay, NJ, lower and middle Delaware Bay, lower Chesapeake Bay, MD and near the Outer Banks, NC, in areas of Pamlico Sound adjacent to Hatteras and Ocracoke Islands and offshore those islands. Research by Grubbs (2001) used longline and tracking data collected in the lower Chesapeake Bay, VA to more accurately describe EFH for the sandbar shark in this area. Grubbs found that the highest abundance of juvenile C plumbeus was predicted where salinity was greater than 20.5 ppt and depth was greater than 5.5 meters. The proposed expansion cell and access channel range in depth from approximately 8 to 20 feet and has an average annual salinity of 20.2 ppt. According to Grubbs, "...the primary and secondary nursery areas include the outer mouth of the York river but very little of the James River located closer to the mouth. This may be explained by the higher volume of freshwater discharge and increased industrial and agricultural runoff typical of the lower James." Based on this research, it is unlikely that the area to be disturbed by the proposed expansion cell and access channel are commonly used as pupping grounds and/or juvenile habitat.

Winter Skate (*Leucoraja ocellata*)



The proposed expansion cell and access channel lie within an area designated as EFH for juvenile and adult winter skate. Both juveniles and adults are generally found in higher salinity waters than those found in the proposed project area. Although some juveniles are found at salinities less than the 20.2 ppt in the project area, most juveniles and adults are found at salinities in the high 20s and low 30s ppt. In addition, winter skate are most commonly found on sand bottom. Based on relatively low salinity and clay/mud bottom at, it is unlikely that the winter skate would occur at the proposed expansion cell and access channel.

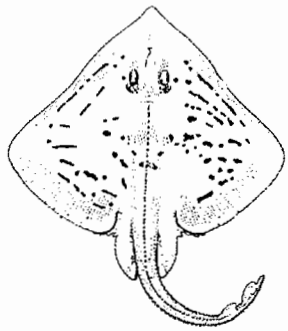
Little Skate (*Leucoraja erinacaea*)



The proposed expansion cell and access channel lie within an area designated as EFH for juvenile and adult little skate. Both juveniles and adults are generally found in higher salinity waters than those found in the proposed project area. Although some juveniles are found at salinities less than the 20.2 ppt in the project area, most juveniles and adults are found at salinities from the mid 20s to the low 30s ppt. In addition, little skate are most commonly found on sand and transitional bottom. Based on relatively low salinity and

clay/mud bottom at, it is unlikely that the little skate would occur at the proposed expansion cell and access channel.

Clearnose Skate (*Raja eglanteria*)



The proposed expansion cell and access channel lie within an area designated as EFH for juvenile and adult clearnose skate. Both juveniles and adults are generally found in higher salinity waters than those found in the proposed project area. In Chesapeake waters most clearnose skate are found at salinities ≥ 22 ppt. The 1988-1999 VIMS trawl surveys of the Chesapeake Bay show that juvenile and adults appeared throughout the Bay during all four seasons, but rarely appeared in the tributaries. Therefore, it is unlikely that the clearnose skate would occur at the proposed expansion cell and access channel.

EFH at Expansion Site and Access Channel Areas

Based on known habitat at the proposed expansion cell and access channel, the EFH species listed in this 10' x 10' square that may occur at the site would likely be limited to bluefish, summer flounder, dusky shark, black sea bass, Atlantic butterfish, and red drum. Based on the significantly degraded nature of the mouth of the Elizabeth River, habitat EFH in the proposed site area is likely to be of lesser quality than other less anthropogenically impacted areas of the Bay. In addition, "Geer et. al. (2000) and Lowery (2000), found that, based on results from trawl surveys from 1978 to 2000, the top five dominant fishes in the vicinity of Craney Island included, in order of dominance, bay anchovy, spot, Atlantic croaker, hogchoker, and weakfish. These five species accounted for approximately 93 percent of catch. Blue crabs accounted for 0.28 percent of the total catch in this area of the Elizabeth River or about 184 crabs caught in 91 trawls (USCOE 2002). Based on this information it is apparent that the area in the vicinity of Craney Island does has not supported significant habitat for those species listed as having EFH in the area since at least 1978.

Habitat Areas of Particular Concern (HAPC)

The NMFS designated a "habitat area of particular concern" (HAPC) for the sandbar shark but not for any other Atlantic highly migratory species (HMS) due to a general lack of scientific information detailing HMS-habitat associations. The larger area within which the project site is located has been identified as one of these areas; however, there are no management or fisheries restrictions in place in or around the project area at this time.

The lower James River is included within an area of the lower Chesapeake Bay that is designated as a HAPC for the sandbar shark. This designation denotes EFH that is particularly important to the long-term productivity of the species and/or is particularly vulnerable to degradation. The intent of the designation is to focus greater attention on conservation efforts. Females move into the lower bay during the summer (Springer, 1960). They typically bear 8 to 12 young and depart the bay shortly thereafter apparently

without feeding. The young average approximately 24 inches at birth. They feed on a variety of fish and crustaceans, but blue crabs are a particularly important food item (Medved and Marshall, 1981). They remain in the bay until the onset of winter, when they migrate to warmer waters off the coast and/or southward. They may return to estuary mouths and coastal bays in the mid-Atlantic region the next year in late spring. The sandbar shark uses the lower Chesapeake Bay as a "pupping ground," where females give birth to live young. The lower James River and nearby areas near the mouth of the Chesapeake Bay cover approximately 29,500 acres of open water, and the total HAPC for the sandbar shark in the lower Chesapeake Bay is approximately 89,000 acres of open water.

Grubbs (2001) developed habitat models to define EFH for the sandbar shark in the lower Chesapeake. According to Grubbs, "all of the models identified the lower western portion of the Chesapeake Bay as suitable nursery habitat, yet the CPUE data indicated very low abundance of juvenile *C. plumbeus* in this region. This is the most urbanized region of the lower estuary and is subject to intense urban and agricultural run-off through the James River. It is hypothesized that these factors have severely degraded otherwise suitable nursery habitat in the region."

III.1.4.3 Crabs

Crab populations within the Chesapeake Bay vary in life stage and gender as a function of habitat and season. Females typically spawn in the spring in the southern portion of the Chesapeake Bay. Larvae are carried offshore by the currents, where they develop during the summer. Post-larval stages and juveniles that remained offshore from previous years return to the Chesapeake Bay in late summer and fall. Juveniles and adults that overwintered in the Chesapeake Bay disperse upstream into tidal rivers and the northern part of the Chesapeake Bay. In the fall, most crabs move into the southern part of the Chesapeake Bay, where they hibernate on the bottom during the winter. Some number of individuals do not move as far south as the majority and hibernate within Hampton Roads. In particular, low densities of male blue crabs overwinter in Hampton Roads and the lower James River (Van Heukelem, 1991). High densities of both male and female crabs are reported for the waters surrounding CIDMMA during the summer.

Trawl surveys by Land et al. (1995) in the Hampton Roads, Chesapeake Bay, and James River showed that low densities of overwintering male blue crabs in Hampton Roads and the James River during January and February. Beginning in March, blue crabs of both genders can be found in Hampton Roads and by April are abundant in the James River (Land et al., 1995). Overwintering blue crabs, predominantly mature females, are found in the lower bay in basins generally deeper than 30 feet (9 meters) (Van Heukelem, 1991). Mature and nearly-mature females also may be found in the deep waters of rivers. However, Marshall (1974) is cited as reporting juvenile blue crabs using the shallow waters around CIDMMA in the colder months and larval forms in summer and fall.

Through VAC 20-752-10 *et seq.*, as amended, VMRC established the Hampton Roads Blue Crab Sanctuary and Virginia Blue Crab Sanctuary. The Hampton Roads Blue Crab Sanctuary is an area in Hampton Roads consisting of all tidal waters inshore and upstream of a line drawn between the extreme south and north ends of the westbound span of the Hampton Roads Bridge-Tunnel (Figure III-6). In May

2002, after a lengthy public hearing and discussion, VMRC voted to expand the existing deep-water blue crab sanctuary in the Chesapeake Bay from 661 square miles to more than 900 square miles. Dredging for crabs is not permitted at any time within these areas, and it is unlawful to conduct commercial or recreational crabbing within the Virginia Blue Crab Sanctuary from June 1 through September 15. The purpose of the regulation is to protect female crabs in response to reduced abundance in the blue crab stock and increased fishing pressure on this resource. This action offered protection to about 70 percent of the egg-bearing female crabs during the annual spawning season and brings Virginia to more than the 15 percent harvest reduction quota requested by the Bi-State Blue Crab Advisory Commission. The 15 percent harvest reduction goal was to be in place by 2003.

III.1.4.4 Submerged Aquatic Vegetation (SAV)

SAV refers to vascular plants that live and grow below the water surface. There are approximately 23 species of SAV found in Chesapeake Bay and its tidal tributaries. Species distributions are mainly determined by their salinity tolerance. Eelgrass *(Zostera marina*) is found in salinities of 10-35 parts per thousand (ppt). Eelgrass is the only species of SAV species found in Hampton Roads. Eelgrass, unlike other Chesapeake Bay SAV, is a true "seagrass" and is found in salinities of 10 to 35 ppt (Hurley, 1990).

According to the 2004 Aerial Flight update (Orth, 2004), the nearest beds to CIDMMA are found along the north shore of Hampton Roads Harbor between Newport News Creek and Salter Creek, approximately 4 nautical miles (northeast) from the existing CIDMMA (Figures III-7 and III-8). Year 2004 area estimates for those beds were approximately 15.3 acres. A SAV Distribution Map was not produced for the study site due to the absence of SAV beds within the Norfolk North USGS Quadrangle (Orth, 2004).

III.1.4.5 Benthos

Numerous studies of the noncommercial and commercial benthic community have been conducted within the vicinity of CIDMMA over the past several decades. Three commercially-important benthic species are found within the lower James and Elizabeth River project area, the hard clam (*Mercenaria mercenaria*), the blue crab (*Callinectes sapidus*), and the oyster (*Crassostrea virginica*).

Boesch (1971) concluded that the dominant macrobenthic species of the Hampton Roads area were generally similar to those found in the lower Chesapeake Bay but that the overall benthic associations were different from those found outside the CBR. Commercial and non-commercial benthos near CIDMMA were quantified by Dauer and Ewing in August, October, and November 1985 (Dauer and Ewing, 1986). A companion study to determine distribution of sediment types was conducted in August 1985. Two broad strata were defined – a near shore silty sand habitat and an offshore mud habitat (high silt-clay content). The silty sand habitat was restricted primarily to within 50 yards of the shoreline of CIDMMA.

For the non-commercial benthic sampling effort, six stations were allocated within the near shore stratum and six within the offshore stratum. Two stations within each stratum were placed on the east, north, and west sides of CIDMMA. All non-commercial benthos sampled were sieved on a 0.5 millimeters screen

and were sorted, identified, and enumerated. For the commercial benthos, 5 clam dredge hauls of 5 minutes were collected on August 25, 1985 and on October 25, 1985. Total individuals collected in 5-minute tows with a commercial dredge are shown in the following table. All commercial species were identified and counted, and the maximum length of each individual measured and recorded (see the following table).

The data acquired by Dauer and Ewing (1986) were compared to Site Group 4 of the Norfolk Harbor and Channels Deepening impact study conducted by Dauer and documented in "Macrobenthic communities of the lower Chesapeake Bay, DACW65-81-C-0051, Work Order No. 51, October 1984." Site Group 4 was geographically closest to CIDMMA. Statistically, there were no major differences between the near shore and offshore samples of CIDMMA, and, therefore, for the rank analysis comparison, all stations were combined. The similarity of the ranked dominants of the two studies indicates that both studies sampled the same general benthic community. The top 5 dominants in both studies were the same and a rank correlation analysis of the dominant species resulted in an r value of 0.751 (t-value = 7.218, p value less than 0.001). Both studies were dominated by species that are usually characterized as ubiquitous in all types of sediments (i.e., the polychaete [*Paraprionospio pinnata*], the cumacean [*Acteocina canaliculata*]) or as euryhaline opportunists (i.e., the polychaetes *Glycinde solitaria*, *Nereis succinea*, *Streblospio benedicti*). Dauer and Ewing (1986) also demonstrated a similarity between the communities in two studies using a Principal Components Analysis Model.

Table III-6. SUMMARY OF DREDGES FOR COMMERCIAL BENTHIC SPECIES

STATION	SPECIES		
	Hard Shell Clam	Oyster	Blue Crab
A.[1]			
I – West Side CIDMMA	0	0	0
II – Northwest Side CIDMMA	1 (7.2)	7 (8.3)	0
III – North Side CIDMMA	14 (7.3)	1 (9.7)	0
IV – Northeast Side CIDMMA	2 (6.6)	0	0
V – East Side CIDMMA e	1 (7.4)	18 (6.9)	0
B.[2]			
I – West Side CIDMMA	2 (10.3)	0	1 (12.5)
II – Northwest Side CIDMMA	0	0	1 (14.0)
III – North Side CIDMMA	7 (7.7)	0	1 (12.5)
IV – Northeast Side CIDMMA	6 (7.6)	0	1 (12.0)
V – East Side CIDMMA	2 (7.8)	0	0

(1) Samples collected on 8 August 1985
(2) Samples collected on 25 October 1985

Shown above are the Total Individuals Collected in 5 Minute Tows with a Commercial Dredge. In Parentheses is the Average Size in centimeters (cm). (Dauer and Ewing, 1986). VIMS conducted a sediment profile sampling at 24 stations in the James River along the north and west perimeter of CIDMMA in November 1988 (Gapcynski and Diaz, as cited in Appendix E, Environmental Information Report, Norfolk Harbor and Channels, Virginia, Long-term Disposal [Inner Harbor]). The 24-station grid was divided into 7 transects of 3 to 4 stations each, arrayed north and west from the existing dike to evaluate potential north and west expansion alternatives. Benthic profile photographs were analyzed for depth of penetration, apparent redox-potential discontinuity (RPD), sediment type, and evidence of biological activity. The depth of the RPD can be used as an indication of the extent of oxygenation of the sediments. Most biological activity occurs above the RPD layer by surface dwelling organisms. Fewer organisms are found in the deoxygenated sediments where tubes extending to surface provide oxygen requirements.

Results of the sediment profiling investigations showed that the inshore station (Group 1) sediments consisted of very soft muds and clays that had an appearance similar to dredged material. These stations were closest to the existing CIDMMA dikes. Sediments from the middle stations, located between Group 1 stations and the proposed expansion boundary, represented a transition zone to more natural conditions, with more natural sands and silts. Sediments from the offshore stations (beyond the proposed expansion boundary) reflected natural sand and silt conditions typical for this part of the James River.

Evidence of biological activity showed some interesting trends, as activity seemed to increase with distance from the existing CIDMMA. The average RPD depths increased with distance from the existing dikes: for Station 1 (inshore station closest to existing dikes) RPD depth averaged 1.0 cm +/- 0.1, for Station 2 (middle stations, located between Group 1 and the proposed expansion boundary) RPD depth averaged 2.1cm +/- 1.4, and for Station 3 (off shore stations located outside the proposed north/west expansion boundary RPD depth averaged 3.1 cm +/- 1.8). Gapcynski and Diaz (1988) concluded that the bottom sediments immediately adjacent to the dike seem to have been modified by the operation of CIDMMA. Sediments outside of the proposed extension seem to be unaffected and are typical for this area of the James River. Sediments in Group 2 seem to be transitional; with some appearing to have been impacted while others appear natural, as in Group 3. An eastward expansion was not included in this study, although one might expect similar results. The zone of influence from the operations of CIDMMA operations may extend beyond areas sampled during this investigation.

Benthic communities depend, to a large extent, upon sediment type. Byrne et al. (1982) conducted a study of the sediment types in the Hampton Roads area. Their study indicated that sandy substrates dominate the area known as Hampton Flats and the area along the Riverview shoreline west of CIDMMA. Muddy or mixed substrates dominate the areas to the west, north, and east of CIDMMA. Dauer and Ewing (1986) and Gapcynski and Diaz (1989) conducted benthic surveys in the immediate vicinity of CIDMMA. Dauer and Ewing identified a near shore (within 150 feet) silty sand habitat and an offshore mud habitat with a high silt-clay content. Their stations extended a maximum of 2,000 feet from CIDMMA. Gapcynski and Diaz, whose sample sites extended up to 8,200 feet from CIDMMA, described 3 bottom types. They identified an inshore zone with very soft muds and clays, a middle zone

of muds and silts, and an offshore zone of sand and silt. These studies, conducted within 3 years of each other, yielded different descriptions of sediment texture adjacent to CIDMMA and can be attributed to construction activity described below. According to Appendix E, Environmental Information Report, Norfolk Harbor and Channels, Virginia, Long-term Disposal (Inner Harbor), the three sediment studies (Byrne et al., 1982; Dauer and Ewing, 1986; and Gapcynski and Diaz, 1989) found similar distribution of sediment types in the vicinity of CIDMMA, with near shore areas dominated by finer materials and offshore areas having higher percentages of coarse materials (i.e., sand).

The Dauer and Ewing study found a near shore silty sand habitat that corresponded with the highest densities of benthic organisms, while the Gapcynski and Diaz study identified an inshore zone of very soft mud and clay that transitioned to muds and silts and finally to sand and silt offshore. In the Gapcynski and Diaz study, biological activity increased with greater distance from CIDMMA. Essentially, the differences between the two studies can be attributed to the placement of dredged material from the Newport News navigation channel over an area approximately 1,000 feet wide around the north and west sides of CIDMMA, which occurred in 1988/1989. This dredged material disposal, undertaken to stabilize the dikes at CIDMMA, probably changed the bottom topography and sediment type of the area. According to the USFWS planning aid report (1989), since benthic organisms usually recolonize disturbed areas within a year, it is anticipated that the area around CIDMMA would have regained its normal benthic community. No additional benthic studies have been identified in the literature covering the period since the Gapcynski and Diaz study to validate this hypothesis. Other areas have been studied following disturbance, i.e., sand mining at Thimble Shoal, demonstrating that the benthic community can rebound in a matter of months.

The results of the commercial clam dredge survey (Dauer and Ewing, 1986) showed the greatest concentrations of hard clam (*Mercenaria mercenaria*) on the north to northeast side of CIDMMA (see the previous table). There were also some patchy areas with oyster clumps. Data from this study are very similar to previous results (Dauer, 1984).

The Chesapeake Bay Long-Term Benthic Monitoring Program began evaluating benthic community health bay-wide in 1984. Monitoring efforts measure water quality, sediment texture, and the abundance and richness of benthic invertebrate communities. The program has been supported by a partnership among Maryland's Department of Natural Resources (MD DNR), VDEQ, and the USEPA CBP. Forty-eight sites are monitored annually by the Benthic Monitoring Program in areas targeted for pollution abatement and other management actions to assess whether the benthic community condition is changing.

The Benthic Index of Biotic Integrity (B-IBI) is used by the Chesapeake Bay Benthic Monitoring Program, which is conducted by the MD DNR and by VDEQ. The program contains two primary elements: (1) a fixed site monitoring effort directed at identifying trends in benthic community condition, and (2) a probability-based sampling effort intended to estimate the area of the Chesapeake Bay and its major tributaries with benthic communities meeting the CBP Benthic Community Restoration Goals (Ranasinghe et al., 1994). Further information about the benthic monitoring program can be found on the World Wide Web at www.baybenthos.versar.com.

The Chesapeake Bay B-IBI is calculated by scoring each of several attributes of benthic community structure and function (abundance, biomass, Shannon diversity, etc.) according to thresholds established from reference data distributions. The scores (on a 1 to 5 scale) are then averaged across attributes to form the index. Samples with index values of 3.0 or more are considered to have good benthic communities indicative of good habitat quality.

A study by Dauer (2000; 2001; and 2002) of the macrobenthic communities of the Elizabeth River watershed was initiated in summer 1999 and continued through a third year of sampling in 2001. The three objectives of the Benthic Biological Monitoring Program of the Elizabeth River watershed include the following: (1) To characterize the health of the tidal waters of the Elizabeth River watershed as indicated by the structure of the benthic communities; (2) To conduct trend analyses on long-term data at 14 fixed-point stations to relate temporal trends in the benthic communities to changes in water and/or sediment quality, and trend analyses will be updated annually as new data are available; and (3) To produce a historical database that will allow annual evaluations of biotic impacts by comparing trends in status within probability-based strata and trends at fixed-point stations to changes in water and/or sediment quality.

In the 1999 Elizabeth River survey, five primary strata were characterized, including: the Mainstem of the Elizabeth River, the Southern Branch, Western Branch, and Eastern Branch, as well as the Lafayette River. In 2000 a single stratum, the entire Elizabeth River watershed was sampled with 25 random samples.

The condition of each stratum was compared to the results for all Virginia tidal waters for 1999, based upon the random sampling of 100 sites as part of the on-going Virginia Benthic Monitoring Program. In 1999, tidal waters in Virginia averaged 30 percent degraded benthic bottom. All 5 strata for the Elizabeth River were higher than this value: 52 percent for the Mainstem of the river, 64 percent for the Eastern Branch, 72 percent for the Western Branch, 92 percent for the Southern Branch, and 64 percent for the Lafayette River. In general, for all Elizabeth River strata, species diversity and biomass were below reference condition levels while abundance values were within reference condition levels. Community composition was unbalanced with levels of pollution indicative species above, and levels of pollution sensitive species below reference conditions. In 2000, the estimate of benthic bottom not meeting the benthic restoration goals was 72 percent, and in 1999, it was 64 percent (Dauer, 2000, 2001).

Comparison of the results for the Elizabeth River watershed to the Chesapeake Bay Benthic Restoration Goals shows that the macrobenthic communities of the Elizabeth River can be characterized as having lower than expected species diversity and biomass. Although abundance levels were generally higher than the Chesapeake Bay reference conditions, the species composition included pollution indicative species higher than reference conditions, while pollution sensitive species levels were lower than reference conditions (Dauer, 2000). The following table presents B-IBI information for stations located within the footprint of the proposed eastward expansion of CIDMMA.

Table III-7. B-IBI STATIONS LOCATED EAST OF CIDMMA (WITHIN FOOTPRINT OF PROPOSED EAST EXPANSION)

Station	B-IBI Score
Monitoring Year 1999 (July 2000 Report)	
Z02	3.33
Z04	2.33
Z05	4.0
Z06	3.0
Z07	2.0
Z08	2.0
Z10	2.33
Monitoring Year 2001 (Oct. 2002 Report)	
08Z01	2.7
08Z03	3.3
08Z30	3.3

Site Degraded = B-IBI score less than 3.0.
Site meets Goals = B-IBI score greater than or equal to 3.0.

The USACE, Norfolk District, funded VIMS to conduct a study of the impact of the eastward expansion of the CIDMMA on the abundance, biomass, and diversity of benthic species (Seitz and Lipcius, 2002). Sampling was accomplished at 41 deep sites (greater than 4 feet deep) in the CIDMMA area, 40 other deep sites (deep zones) in the general area of the CIDMMA and Lafayette River system, and 40 shallow (less than 4 feet deep) subtidal sites (shallow zone) in the area. Based on these data, the overall abundance and standing stock, respectively, for each of those habitats was generated, and then the potential loss of biomass due to the eastward expansion of the CIDMMA was estimated as a percentage of the abundance and biomass of the entire CIDMMA-Lafayette River system. From the abundance and biomass loss estimates, estimates for mitigation options were developed (Seitz and Lipcius, 2002).

The following conclusions were generated from this VIMS study (Seitz and Lipcius, 2002):

- The area of the CIDMMA eastward expansion had significantly lower bivalve density, diversity, and abundance than the adjacent deep-water habitats or shallow-water habitats in the Craney Island-Lafayette River (CI-LR) system. Bivalve density was significantly lower in the 'Craney Island' and 'Deep' zones than in the 'Shallow' zone. Bivalve density in shallow-water habitats was nearly 10-fold higher than that in the area to the east of the CIDMMA. Diversity in terms of species richness was lowest in the "Craney Island" zone, which was significantly lower than that in 'Deep' habitats. Only four species of bivalves

were collected in the "Craney Island" zone, whereas seven species were collected in the adjacent deep habitats, and nine species were in the shallow zones.

- The CIDMMA eastward expansion zone also had significantly lower mean bivalve biomass than the shallow-water habitats in the CI-LR system. Biomass in the 'Deep' zone was lower than in the shallow-water habitats and higher but not significantly different from that in the 'Craney Island' zone. Since bivalve density in shallow-water habitats was nearly 10-fold higher than that in the CIDMMA expansion area, and the mean bivalve size was larger, the resultant biomass was much greater. The clams that comprised the biomass in the shallow zone were typically large individuals of *Macoma balthica* and *Tagelus plebeius*. Although some *Tagelus* and *Mercenaria* were present in the 'Craney Island' zone, they were usually smaller individuals (juveniles) with low biomass.

- Within the CI-LR system, it was estimated that there were approximately 445 million bivalves. Of these, only about 5 percent (19 of 445 million) resided within the CIDMMA eastward expansion area. Bivalve biomass within the expansion area also constituted a small fraction of the biomass within the general area. Within the CI-LR system, it was estimated that total bivalve biomass was approximately 37,986 kg ash free dry weight. Of the total biomass, only about 0.56 percent (215 of 37,986 kg) was represented in the CIDMMA expansion area. Because of this extremely low bivalve biomass and because the bivalves were very small juveniles, the CIDMMA expansion area is not likely to be a significant feeding ground for the blue crab or demersal fish.

III.1.4.6 Clams

Mann (2002) sampled 24 stations (28 attempted) within a 452-acre area directly adjacent to the east side of CIDMMA as part of a field estimate of clam standing stock in Hampton Roads in 2001 (Figure III-9, Table III-7). Each station was sampled with a hydraulic patent tong with coverage of 1 square meter. The entire tong contents for each station were retrieved and returned to the cull board of the vessel, as this often is in excess of 50 kilograms (kg) of material, including substrate. After preliminary sorting, all molluscs were separated by species, counted, and measured. In addition to hard clam (*Mercenaria mercenaria*), data were also collected on distribution and demographics of the razor clam (*Tagelus plebeius* and *Ensis directus*), the angel wing clam (*Cyrtopleura costata*), and the soft shell clams (*Mya arenaria*). The only invertebrate found in 24 stations was a single hard clam (R. Mann and J. Harding, 2002).

These findings are consistent with the Dauer and Ewing studies mentioned previously, where the plots to the north of CIDMMA show greater concentrations of clams (USACE, 1990). As discussed in the VDOT Third Crossing Draft Environmental Impact Statement (DEIS), hard clams constitute a major fishery in Hampton Roads during the summer (VMRC, 1985). Clams are capable of living in a variety of sediment types; however, higher abundances are found in coarse-grained sediments. VMRC's Jim Wesson is cited for providing low abundance figures for CIDMMA/mouth of the Elizabeth River in the VDOT Third Crossing DEIS. The DEIS states that "...Hard clams constitute a major fishery in Hampton Roads during the summer (VMRC, 1995). Clams are capable of living in a variety of sediment types, but higher

abundances are found in coarse-grained sediments. Mean population densities of hard clam vary throughout Hampton Roads (Figure III-10). The highest density area is located within and on the sides of the shipping channel. This area contains 32,000 to 37,000 clams per hectare (13,000 to 15,000 clams per acre). The lowest density area is around CIDMMA and the mouth of the Elizabeth River. This area contains 0 to 1,200 clams per hectare (0 to 500 clams per acre) (Wesson, 1995)."

III.1.4.7 Oysters

The oyster population and associated industry has been declining in the project areas due to the presence of two organisms, *Perkinsus marinus* (Dermo) and *Haplosporidium nelsoni* (MSX) and by overharvest, loss of habitat, and poor water quality. Both are found in areas of fairly high salinity (over 15 ppt) and in warm waters. Additionally, Hampton Roads is a shellfish condemnation area, where shellfish must first be relayed to approved waters for depuration (purging) for 15 days before marketing. Relaying is only allowed when the water temperature is above 10 °C (50 degrees Fahrenheit [°F]). Harvesting of shellfish is prohibited in both the Elizabeth and Lafayette Rivers (VDEQ, 1994). The James River remains an important seed source for oysters and currently provides about 90 percent of the state total (USACE Inner Harbor, 1990). The James River once was an important seed source for oysters that were distributed throughout the lower bay tributaries. These populations have also suffered significant declines in recent years.

The oyster is generally found in relatively shallow areas that have adequate substrate for attachment. Although once were an important commercial fishery, harvestable oyster populations have dropped to their lowest level in history. The only harvestable oyster population left in the study area is located upstream of the James River Bridge (Mann, 1996). Since 1999, 20 acres of oyster reefs and grounds have been restored throughout the Elizabeth River (Figure III-11), where no productive reefs have existed for decades.

The oyster population and associated industry have been declining in the project areas due to the presence of two disease organisms, *Perkinsus marinus* (Dermo) and *Haplosporidium nelsoni* (MSX), and due to overharvest, loss of habitat, and poor water quality. Both disease organisms are found in areas of fairly high salinity (over 15 ppt) and in warm waters. Additionally, Hampton Roads is a shellfish condemnation area, where shellfish may be relayed elsewhere for depuration prior to marketing. Harvesting of shellfish is prohibited in both the Elizabeth and Lafayette Rivers (VDEQ, 1994). The James River remains an important seed source for oysters and currently amounts to about 90 percent of the state total (USACE Inner Harbor, 1990).

Table III-8. VIMS HARD CLAM STOCK ASSESSMENT (Mann, 2002)

Basin	Area	Year sampled	Acreage	Number of patent tong grabs	Number of live hard clams	Number of hard clam boxes	Number of live hard clams per sq. m	Estimated number of live clams in area
James River	1	2001	894.5	113	14	0	0.12	448501
	2	2001	925.4	116	21	0	0.18	677991
	3	2001	790.2	50	0	0	0	0
	4	2001	1159.4	145	54	0	0.37	1747400
	5	2001	1200.5	150	229	30	1.53	7417193
	6	2001	1926.8	242	76	9	0.31	2448883
	7	2001	1098.9	69	0	0	0	0
	8	2001	749.5	47	4	0	0.09	258147
	9	2001	632.8	79	71	9	0.9	2301606
	10	2001	805.5	50	8	0	0.16	521577
	11	2001	644.2	80	74	0	0.93	2411547
	12	2001	844.3	53	35	3	0.66	2256432
	13	2001	895.8	112	58	3	0.52	1877389
	14	2001	725.6	91	45	0	0.49	1452117
	15	2001	597.2	74	13	3	0.18	424585
	16	2001	1126.4	141	149	5	1.06	4817181
	17	2001	102.7	13	15	0	1.15	479570
	18	2001	1248.7	78	0	0	0	0
	19	2001	681.8	85	712	4	8.38	23112731
	20	2001	902.7	57	17	0	0.3	1089559
	21	2001	1118.9	70	20	1	0.29	1293768
	22	2001	731.3	92	241	3	2.62	7752790
	23	2001	986.5	123	358	0	2.91	11620056
	24	2001	722.6	45	70	1	1.56	4549008
	25	2001	1253.4	157	469	3	2.99	15152911
	26	2001	741.5	47	46	0	0.98	2937003
	27	2001	1567.5	196	442	2	2.26	14305629
	28	2001	711.7	45	27	0	0.6	1728150
	29	2001	544	34	9	0	0.26	582768
	30	2001	452.3	28	1	0	0.04	65374
	31	2001	649.5	46	29	0	0.63	1657115
	32	2001	1209.7	41	0	0	0	0
	33	2001	466.4	58	33	0	0.57	1073934

Table III-8. VIMS HARD CLAM STOCK ASSESSMENT (Mann, 2002)
(Cont'd)

Basin	Area	Year sampled	Acreage	Number of patent tong grabs	Number of live hard clams	Number of hard clam boxes	Number of live hard clams per sq. m	Estimated number of live clams in area
James River	34	2001	645.2	81	39	0	0.48	1257208
(continued)	35	2002	1280.2	123	99	8	0.8	4170055
	36	2002	813.2	70	45	2	0.64	2115664
	37	2002	717.31	70	98	4	1.4	4064118
	38	2002	727.72	67	81	0	1.21	3560459
	39	2001	112.2	16	12	0	0.75	340555
	40	2001	74.99	9	17	0	1.89	573249
	41	2001	672.99	40	21	0	0.53	1429885
	42	2001	362.7	41	14	0	0.34	501216
	43	2001	367.7	38	9	0	0.24	352440
	44	2001	38.1	7	1	0	0.14	22027
TOTAL			34920.51	3389	3776	90		134847788
MEAN							0.94	
GRAND TOTAL			77488.55	7473	4715	146.56		183396816
GRAND MEAN							0.56	

Public oyster grounds (Baylor grounds) are present within the vicinity of CIDMMA, namely Public Oyster Ground Number 1 (Norfolk County), which surrounds the existing CIDMMA on the west, north, and east sides. Public Oyster Grounds Numbers 2 and 3 are found in the mouth of the Elizabeth River near CIDMMA. These oyster grounds are depicted on project map shown in Figure II-12. The presence of MSX has effectively eliminated oysters from these public grounds. Since 1999, in cooperative efforts between VMRC, the Chesapeake Bay Foundation, and other local sponsors, approximately 20 acres of oyster reefs and grounds have been restored throughout the Elizabeth River, where no productive reefs have existed for decades (Figure III-11). The closest oyster reef restoration site lies approximately 1.5 miles east of the proposed expansion, and four other oyster restoration sites are also located within 4 miles of the proposed expansion.

III.1.4.8 Non-Native Invasive Species

An exotic species of mollusk recently introduced in Hampton Roads is the rapa whelk. VIMS is currently studying the biology and distribution of this non-native species. The following information is quoted from the VIMS web site at http://www.vims.edu/mollusc/research/merapven.htm.

"Rapa whelks (Rapana venosa) are predatory snails that eat a variety of molluscs. They often attack bivalves (oysters, clams, mussels) by rasping around the region where the two valves meet, rather than boring a distinct hole. The related species Rapana bezoar, is also a generalist predator on molluscs, attacks other shallow burrowing molluscs by boring the edge of the shell. This is a characteristic that has been noted in collections of clam shells from Hampton Roads.

"Since the initial report of rapa whelks in Hampton Roads following collection of a specimen by members of the VIMS Trawl Survey Group, information has been distributed through the news media and by personal communication with a number of people in the fishing industry and academia. These activities have resulted in a number of calls to VIMS to report records of observation or collection and thereby increased our knowledge of the distribution of Rapana venosa in the lower Chesapeake Bay. Adult specimens as well as egg cases continue to be reported from locations in the lower Chesapeake Bay. Rapa whelk egg masses or groups of egg cases resemble small mats of yellow shag carpet and are quite distinctive and noticeably different from the egg cases of native snails."

III.1.4.9 Other Flora and Fauna

As a tidal estuary, the Chesapeake Bay and its tributaries support many phytoplankton and zooplankton varieties. Micro and macro-organisms in the planktonic community are numerous and include diatoms, dinoflagellates, forminifera, other plants, and algae. These organisms form the base of the food chain. Zooplankton refers to the community of floating, often microscopic, animals. Zooplankton includes copepods, larval marine worms, and larval barnacles.

III.1.5 WETLANDS AND UPLANDS

Wetlands are defined as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Where wetlands are adjacent to open water, they generally constitute the transition to upland (40 CFR § 230.41). Mud flats are broad, flat areas along the coast, in coastal rivers to the head of tidal influence, and in inland lakes, ponds, and riverine systems. Tidal mud flats are typically exposed at low tides and inundated at high tides with water at or near the surface or substrate (40 CFR § 230.42).

III.1.5.1 Wetlands

The largest tidal wetland complex in the city of Portsmouth is a 97.5-acre marsh associated with Hoffler Creek, which is located to the southwest of CIDMMA. This marsh is dominated by saltmarsh cordgrass (*Spartina alterniflora*), which is considered to be one of the most important species in coastal wetlands, contributing greatly to the estuarine food web. Craney Island Creek also supports a significant amount of marsh, totaling approximately 67 acres. Saltmarsh cordgrass is a dominant species of this system as well, although nearly a third of the marsh area is vegetated by reed grass (*Phragmites australis*), an aggressive,

less desirable species that typically invades disturbed marshes (Silberhorn and Dewing, 1989). There are numerous ditches and ponds within the study area.

The most recent National Wetlands Inventory map of CIDMMA is a draft (Figure III-13). Aerial photography is dated 1990, and the wetlands mapping is dated 1993. According to these maps, CIDMMA appears to be bounded primarily by upland (the dikes), yet a narrow zone of emergent, intertidal wetland is present to the interior of the eastern and the northeastern perimeter dikes, totaling approximately 74 acres. The interiors of the three partitions (cells) are mapped as areas of lacustrine, littoral, unconsolidated shore, seasonally flooded, diked/impounded, spoil. Several palustrine wetlands are mapped interior of the eastern dike, the largest single one encompassing approximately 20 acres. A palustrine emergent/scrub shrub wetland is present along the southern boundary, totaling approximately 20 acres.

Observations of the vascular plant community made during the 1987 perimeter dike stabilization of CIDMMA reveal a relatively uniform species composition, which is also described in Laist (1974). *Salicornia virginica* and *Chenopodium album* were the only species able to establish themselves on the fine sediments of the major portion of the mudplain. These plants, both halophytes in the family Chenopodiaceae, are extremely salt tolerant. The other dominants on the disposal area are grasses, particularly *Phragmites australis* and certain members of the family Asteraceae (USACE, 1987). In the 12 years since this survey was conducted, Phragmites, an aggressively invasive, species, has continued to spread.

III.1.5.2 Uplands

Vegetative communities that occur in the immediate area are upland woodland, scrubland, low grassland, tall grassland and mixed weeds, reed thickets, hydric ditch habitat, disturbed areas, as well as active fill and construction sites. Low grassland constitutes the most common vegetation type, and these communities are comprised mainly of commercial blends of grasses, such as bermuda, fescue, rye, etc. Other grasses are present, including goosegrass, crabgrass, sweet clover, curly dock, evening primrose, and poor man's pepper. Tall grassland communities include species, such as horseweed, ragweed, cocklebur, clover, and alfalfa. Several areas contain mostly pure tall stands of monotypic grasses. Blackberry is common along the fencerows and in disturbed areas, as are elderberry and hackweed. Upland woodland species include a variety of arboreal species, such as hackberry, black cherry, loblolly pine, sassafras, red cedar, chinaberry, and mimosa. Disturbed lands typically support large stands of reed grass, saltbush, cocklebur, jimpson weed, and bitter-weed.

III.1.6 SANCTUARIES AND REFUGES

Sanctuaries and refuges are defined as areas designated under Federal, state, or local authority to be managed principally for the preservation and use of fish and wildlife resources. This definition is consistent with the Clean Water Act (CWA) Section 404 (b)(1) Guidelines that address potential impacts on sanctuaries and refuges (40 CFR § 230.40).

The following table identifies Federally-designated wildlife refuges in the project vicinity, state-designated wildlife management areas and natural area preserves, and local preserves. The table also provides the locality and approximate distance from the proposed port facility.

Table III-9. SANCTUARIES AND REFUGES

Refuge/Preserve	Locality	Distance from Proposed Project (miles)
National		
Great Dismal Swamp National Wildlife Refuge	City of Chesapeake	15
Plum Tree Island National Wildlife Refuge	City of Poquoson	18
Back Bay National Wildlife Refuge	City of Virginia Beach	30
Fisherman Island Wildlife Refuge	Northampton County	35
State		
Ragged Island Wildlife Management Area	Isle of Wight County	10
North Landing River Natural Area Preserve	City of Virginia Beach	20
Northwest River Natural Area Preserve	City of Chesapeake	30
Princess Anne Wildlife Management Area	City of Virginia Beach	35
Hog Island Wildlife Management Area	Surry County	36
Local		
Hoffler Creek Wildlife Preserve	City of Portsmouth	2.5
Grandview Nature Preserve	City of Hampton	16

III.1.7 TRANSPORTATION

III 1.7.1 Transportation Impact Study Area

The Transportation Impact Study Area (TISA) is composed of the roadways that would likely be impacted by vehicular traffic generated by the project. The TISA for this study was defined as those regionally-significant roadway segments that presently accommodate the movement of freight into and out of the Hampton Roads region and would provide trucks and worker vehicles with access to the CIDMMA terminal (Figure III-14).

III.1.7.2 Highways

Interstate 64 (I-64) - The I-64 Hampton Roads Bridge-Tunnel currently carries two travel lanes in each directional tube. The westbound tunnel has an internal height of 13.6 feet, which poses some restriction

on trucks using the tunnel. The eastbound tunnel has an internal height of 14.6 feet, allowing unrestricted use by trucks.

On the Peninsula, I-64 west of the Hampton Roads Bridge-Tunnel is currently under construction and will eventually carry three lanes in each direction to VA Route 143 (Jefferson Avenue). Beyond VA Route 143 to the west, I-64 carries two lanes of traffic in each direction. A major investment study of I-64 along the 75-mile corridor from Richmond to Hampton and Newport News was conducted. The Locally Preferred Alternative for I-64 includes three lanes and one concurrent High Occupancy Vehicle (HOV) lane in each direction from I-664 to Route 199 near Grove (Exit 242).

On the Southside, I-64 carries two lanes of traffic in each direction to the I-564 interchange; from there it carries three lanes in each direction as well as two HOV lanes. Near Battlefield Boulevard in Chesapeake, the highway narrows to two lanes in each direction.

Interstate 664 (I-664) - The I-664 Monitor Merrimac Memorial Bridge-Tunnel contains two travel lanes within each directional tube (total of four travel lanes). The internal height of the tunnels is 14.6 feet, which is sufficient to accommodate all trucks. I-664 carries three lanes in each direction north of the Monitor-Merrimac Memorial Bridge-Tunnel to its intersection with I-64. South of the Bridge-Tunnel, I-664 carries two lanes in each direction to its terminus with I-264 and I-64 in Chesapeake.

U.S. 13 - U.S. 13, also known as Carolina Road, in Suffolk is primarily a four-lane highway providing access to and from the Hampton Roads area and North Carolina. South of Whaleyville Boulevard, the highway narrows to two lanes. Existing average daily total (ADT) ranges from approximately 3,300 vehicles near the North Carolina border to 16,700 vehicles south of Route 58.

U.S. Route 17 - U.S. Route 17, also known as George Washington Highway, in Chesapeake County is a two-lane road south of Willowood and then widens to four lanes to the Military Highway. Existing ADT levels range from 14,500 vehicles at Portsmouth Boulevard to 30,660 vehicles at the Chesapeake line. From the Portsmouth city line southward, ADT levels decline to 8,525 vehicles at the North Carolina line. The FY 2001-2004 Transportation Improvement Plan (TIP) includes a project to widen the segment of U.S. Route 17 south of Dominion Boulevard from 2 lanes to 4 lanes.

U.S. Route 58 - Route 58, also known as Holland Road, is a 4-lane highway providing access to the Hampton Roads region from areas southwest of Portsmouth. Existing ADT levels range from 19,000 to 24,000 vehicles. There are no known improvements planned for this roadway.

U.S. Route 460 - U.S. Route 460, also known as Pruden Boulevard, is a 4-lane roadway providing access to the Hampton Roads region from locations to the west. The 2021 Regional Transportation Plan recommends widening the section of the roadway west of the Suffolk Bypass to 6 lanes. Existing ADT levels range from 12,000 to 18,350 vehicles.

VA Route 168 – Part of VA Route 168 includes the Chesapeake Expressway, which is a new 4-lane facility that was opened in May 2000. The southern portion of the alignment follows the route of the Centerville Turnpike. The 2001-2004 TIP and 2021 Long Range Plan include programmed and planned improvements to widen Route 168 leading to I-64.

III.1.7.3 Planned and Programmed Improvements

Improvements are currently underway along I-64 on the Peninsula. They include the construction of one concurrent HOV lane in each direction from the Hampton Roads Center Parkway Interchange (Exit 261) to the I-664 Interchange (Exit 264), which is scheduled to be completed by the summer of 2004 (VDOT, 2002).

The *Hampton Roads Transportation Improvement Program* (FY 2001–2004) and the *Hampton Roads 2021 Regional Transportation Plan* outline a number of programmed and proposed roadway capacity improvements. Several of these improvements will relieve congestion along routes that are presently used by trucks transporting goods into and out of the region. The following table lists improvements to these routes and others.

III.1.7.4 Railroads

The Port of Virginia is served by four freight railroads – CSX Transportation, the Norfolk Southern Railway, the Norfolk and Portsmouth Belt Line Railroad, and the Eastern Shore Railroad. CSX serves Portsmouth, and Norfolk Southern serves the lower Hampton Roads area, including the U.S. Naval Base and Lambert's Point in Norfolk. Norfolk Southern provides direct links between the Southside and major consumer centers throughout the U.S. It has direct connections with the Eastern Shore Railroad and the Norfolk and Portsmouth Belt Line Railroad. Intermodal service includes a double-stack service six days a week. General cargo facilities at Norfolk Southern are concentrated in the Lambert's Point area. Norfolk Southern also provides direct rail service on containers to NIT for international containerized shipments. Container-on-flat-car and trailer-on-flat-car facilities are designated as ramp points at NIT. Double stack rail cars are also handled by the facility.

Table III-10. PLANNED AND PROGRAMMED HIGHWAY IMPROVEMENTS

Route	Segment	Existing lanes	Future lanes	Timeframe
Peninsula				
I-64	Jefferson Ave. to James Co. Line	4	6	2021 Plan
I-64	I-664 to VA 199	0	2-lane HOV	FY 2001 - 2004
U.S. Route 17	Rt. 614 to SE York River Gloucester Co.	4	6	FY 2001 - 2004
U.S. Route 17	SE York River to Rt. 314 Gloucester Co.	4	6	2021 Plan
Southside				
U.S. 13	Virginia Beach	4	4	
U.S. Route 58	Holland Road	4	4	
U.S. Route 460	Suffolk line to Suffolk Bypass Isle of Wight Co.	4	6	2021 Plan
U.S. 13	Suffolk	4	4	
U.S. Route 17	Dominion Blvd. NC State Line	2	4	FY 2001 – 2006?
VA Route 168	Chesapeake Expressway (new)	0	4	2001
Third Crossing	Suffolk CL to Norfolk CL	0	4	2014
CIDMMA Connector	Third Crossing to Western Freeway	0	4	2014

CL= city line.

Sources: Hampton Roads Regional Transportation Improvement Program FY 2001–2004. Hampton Roads 2021 Regional Transportation Plan, 2001.

The Norfolk and Portsmouth Belt Line Railroad connects with all rail lines entering Norfolk, Portsmouth, and Chesapeake. The Belt Line serves a large number of manufacturing industries located beyond the waterfront; it does most of the interchange switching between Norfolk Southern, CSX, and the Eastern Shore Railroad. Norfolk is the southern rail terminal of the Eastern Shore Railroad. Freight cars are transported across the Chesapeake Bay on two-car floats of 25 and 17 car capacity 24 hours a day between Cape Charles and Norfolk, enroute to and from most of the U.S. and Canada. At Norfolk, the Little Creek Yard classifies rail cars for daily delivery to Norfolk Southern, CSX, and Norfolk and Portsmouth Belt Line railroads. The Little Creek rail yard also expedites the handling of north-south bridge traffic originating or terminating in the Port of Norfolk and the Norfolk switching district (Hampton Roads Maritime Association [HRMA], 2001).

The existing rail network in the study area is shown on Figure III-15. There is an existing rail connection between the CSX Railroad and the U.S. Navy's Craney Island Fuel Depot, which is located on the

southern end of CIDMMA, near the Brandon Square area of Portsmouth. The rail line runs in an east-west direction paralleling VA Route 164 from Lovett Point to Cedar Lane, where it then turns southwest toward Suffolk.

III.1.7.5 Federal Navigation Channels and Anchorages

Access to and from the Hampton Roads area and the Atlantic Ocean is provided via the Atlantic Ocean Channel, which connects deep water in the Chesapeake Bay to deep water in the Atlantic Ocean (a distance of about 10 miles, Figure II-2). The channel is not currently maintenance dredged for navigation, as water depths are apparently sufficient for existing vessel traffic (USACE, April 2002). The inbound channel is slated for improvements in January 2006, and it is authorized to a depth of 60 feet and 1,300 feet wide.

The Norfolk Harbor Channel and Newport News Channel are the focal points for commercial marine transportation in the Hampton Roads system. Both of these channels are accessed from the Chesapeake Bay via the Thimble Shoal Channel and from Hampton Roads through ancillary channels.

The Thimble Shoal Channel is 1,000 feet wide and approximately 13 miles long. The channel is maintained to a depth of 50 feet deep. Authorized improvements for Thimble Shoal Channel provide for deepening to 55 feet (HRMA, 2001).

Norfolk Harbor Channel extends from Hampton Roads into the Southside cities of Norfolk, Portsmouth, and Chesapeake via the Elizabeth River. Between deep water in Hampton Roads and Lambert's Point, the channel is 800 feet to 1,250 feet wide and 50 feet deep. Authorized improvements provided for deepening the Norfolk Channel to 55 feet in depth between Hampton Roads Bridge-Tunnel and Lambert's Point. A channel 40 feet in depth extends from the coal piers to the Norfolk Southern Railway Bridge on the Southern Branch (HRMA, 2001).

The Newport News Channel extends about 7 miles from Hampton Roads to Newport News. The channel is 50 feet deep and over 800 feet wide. Authorized improvements for the Channel provide for deepening it to 55 feet.

There are several deep draft anchorages in Hampton Roads. Two of the anchorages are at Sewell's Point, and both have an authorized depth of 45 feet. Two more anchorages, located at Newport News, are both 45 feet in depth. Additional anchorages exist in the protected water of the Chesapeake Bay at Cape Charles and Lynnhaven. These two anchorages, which are situated near the entrance to the Hampton Roads Harbor, range up to 47 feet in depth; they can accommodate approximately 120 vessels. Additionally, the inner harbor anchorages, which are lower in depth, can accommodate up to 40 vessels. A deep draft anchorage with an authorized depth of 55 feet has also recently been completed opposite the city of Hampton.

Areas adjacent to the Norfolk Harbor Channel are important commercial transportation destinations. Barges (or tows) and oceangoing vessels, including container ships, general cargo ships, dry and liquid

bulk ships, and workboats carry cargo through the Hampton Roads system to cargo terminals and other marine facilities.

III.1.7.6 Public and Private Terminals

The Port of Hampton Roads includes numerous public and private port facilities that are grouped in five major areas: Newport News, Norfolk, southwest Norfolk, the Eastern Branch of the Elizabeth River, and the Southern Branch of the Elizabeth River. Shipping, freight rail, and trucking are all integral parts of the port economy. Port-related facilities include container terminals, coal terminals, grain handling terminals, oil handling facilities, and storage warehouses.

Public terminals owned by VPA include the NNMT, NIT, and PMT. NIT is the largest container terminal in the port with over 5,000 feet of container berths. All terminals are served by one or more freight rail lines (HRMA, 2001). The Port of Hampton Roads is the second largest on the east coast in total tonnage of international waterborne commerce, with over 38 million short tons of cargo being handled in Hampton Roads in the year 2000.

III.1.7.7 Traffic

Trucking - With the exception of imported coal, most domestic freight is moved into and out of Hampton Roads via truck. The Hampton Roads Planning District Commission (HRPDC) Intermodal Management System Regional Freight Movement report noted that the major roadways used by trucks traveling to and from the region are I-64 in James City County; U.S. Route 17 in Gloucester County; U.S. Route 13 in Virginia Beach on the Chesapeake Bay Bridge-Tunnel; U.S. Route 460 in Isle of Wight County; U.S. Route 58 and U.S. Route 13 in Suffolk; and U.S. Route 17 and VA Route 168 in Chesapeake (HRPDC, 1998).

Data from 1995 presented in the report and reproduced in Table III-10 reveal that 80 percent of the truck traffic entering and leaving the region travels along I-64, U.S. Route 460, and VA Route 168. The data also show that U.S. Route 460 had a higher percentage of trucks to daily traffic than I-64 (16 percent vs. 8.8 percent, respectively), but I-64 carried a much higher total number of trucks into and out of the region than U.S. Route 460 or any other route. Finally, roadways connecting Hampton Roads to North Carolina, which include U.S. Route 13, U.S. Route 17, and VA Route 168, are estimated to account for more than 23 percent of all freight transported by truck into and out of the region (HRPDC, 1998).

Rail Traffic - Data compiled by the HRPDC in 1995 indicate that 27.7 percent of freight (excluding coal) imported by Hampton Roads and 18.8 percent of freight (excluding coal) exported by Hampton Roads was transported by rail.

Vessel Traffic - The current total number of commercial vessel calls at the port is shown in Table III-11. As shown, vessel calls at Hampton Roads have fluctuated from 2,589 in 1993 to a high of 2,781 in 1995, followed by a decrease to 2,545 in 1999. Container vessel traffic during the period 1993 to 2001, however, has steadily increased from 1,151 in 1993 to 1,729 in 2001, which translates to a 50-percent increase in overall container vessel traffic (HRMA, 2002). Total one-way vessel traffic from commercial,

military, commercial fishing, and tugs at Hampton Roads is estimated at 6,000 trips per year (HRMA, 2002). A review of the commercial vessel traffic data shows that container traffic comprised approximately 70 percent of the total cargo vessel traffic in the year 2001. By comparison, in 1993 container vessel traffic made up about 45 percent of total commercial traffic calling on Hampton Roads.

Table III-11. ESTIMATED YEAR 2018 NO ACTION TRUCK TRAFFIC

Roadway	Daily traffic (1)	Truck percentage (2)	Estimated daily truck count	Estimated share of truck traffic at the gateways
I-64 in Newport News	98,000	8.8	8,600	45.1
U.S. Route 17 from Gloucester	46,200	2.4	1,100	3.7
U.S. Route 13/Chesapeake Bay Bridge-Tunnel	11,500	12.6	1,450	5.2
U.S. Route 460 in Suffolk	32,400	16.0	5,200	17.5
U.S. Route 58 in Suffolk	28,000	12.0	3,400	5.4
U.S. Route 13 from North Carolina	14,900	16.0	2,400	4.0
U.S. Route 17 from North Carolina	15,875	8.5	1,350	3.6
VA Route 168 from North Carolina	26,900	10.7	2,900	15.4
	Estimated Total Daily Truck Traffic at the Regional Gateways		26,400	

(1) Daily traffic extrapolated from 1995 Freight Movement report using growth between 2006 and 2021 ADT reported in the 2021 Congestion Management System (CMS) report.

(2) Truck percentage from 1995 Freight Movement report by HRPDC.

Sources: Regional Freight Movement report, HRPDC, 1998 CMS for Hampton Roads, Virginia 2001, Technical Appendix, HRPDC, June 2001

Table III-12. VESSEL CALLS AT HAMPTON ROADS 1993 - 2001

	2001	2000	1999	1998	1997	1996	1995	1994	1993
General cargo	86	101	64	107	142	128	132	164	209
Container/ RORO	1,729	1,867	1,548	1,588	1,446	1,431	1,454	1,257	1,151
Lash	0	0	0	0	0	1	10	24	29
Coal	259	298	454	469	500	540	485	423	446
Bulk	122	129	141	145	193	205	281	255	235
Combo cargo	101	133	156	160	168	120	197	156	216
Passenger	6	5	6	2	4	3	4	9	10
Tanker	146	151	142	119	144	142	138	170	167
All other	27	15	34	25	35	102	80	130	126
Total	2,476	2,699	2,545	2,565	2,632	2,669	2,781	2,588	2,589

Note: RORO = roll-on-roll-off.
Source: The Port of Hampton Roads Annual, 2002 (HRMA).

III.1.8 UTILITIES

The proposed container terminal will require utility services for water, wastewater disposal, power, and telecommunications. This section characterizes each of these needs and the ability of local utilities to meet them based on existing and planned infrastructure. In general, existing utilities are expected to be able to meet the projected requirements. Little utility infrastructure currently exists on CIDMMA, so it will be necessary to add additional infrastructure to extend utilities (power lines, phone/cable lines, water mains, sanitary sewer lines, etc.) from the part of the city of Portsmouth south of CIDMMA to the vicinity of the proposed project.

III.1.8.1 Water Supply

At full build out, water supply requirements for the proposed container terminal are estimated to be about 70,000 gallons per day (gpd), based on usage at the comparably-sized NIT. The demand will consist of standard commercial/office uses, irrigation for landscaping, and washing of vehicles and equipment. A minimum fireflow of 4,550 gallons per minute at 20 pounds per square inch residual would also be required.

The city of Portsmouth is the primary water supplier for the area of the proposed project. Coordination with the city regarding the estimated water requirements of the port have shown that adequate capacity exists within the city's water supply to serve the port; However, the current infrastructure (i.e., pipe size and water pressure) in the area adjacent to the proposed port is not adequate and would have to be upgraded. Portsmouth's Department of Public Utilities/Public Works has indicated that hydraulic modeling will need to be performed to make a determination of the proper size and pressure once VPA's

preliminary engineering design of the proposed port has identified the specific requirements for fire flow and pressure.

III.1.8.2 Wastewater

At full build out, wastewater treatment requirements for the proposed container terminal are estimated to be about 18,000 gpd, based on usage at the comparably-sized NIT. This will mostly consist of domestic-type wastewater from sinks and toilets, as well as wash water from wash racks. No other industrial wastewater will be generated at the terminal, and the facility will not accept wastewater discharges from ships. The Hampton Roads Sanitation District (HRSD) is the utility that provides wastewater treatment services in the region of the proposed project and currently treats wastewater from existing VPA container terminals. HRSD has stated in writing (April 2002) that its sanitary sewer interceptors serving the area where the port would be located have ample capacity to collect the projected flow and that the Nansemond Wastewater Treatment Plant has more than sufficient capacity to treat the project flow.

III.1.8.3 Energy

Power requirements for Phase I of the CIDMMA container terminal are estimated to be about 400 kilowatts, whereas power requirements at full build-out are estimated to be about 35 megawatts. Much of this power demand will be for operation of cranes and for lighting. Dominion Virginia Power is the primary provider of electric service in the region and has provided a written statement that electrical service is available to the project location (Dominion Virginia Power, April 2002). The existing Craney Island Substation can provide power to meet the requirements of Phase I, although some upgrades (i.e., a new transformer) will likely be required to meet the electricity demand at full build-out. The terminal is likely to have backup electric generators for emergency use.

Virginia Natural Gas provides natural gas services in the region. Additional infrastructure would be required to extend gas lines from the city of Portsmouth to the CIDMMA container terminal. Gas requirements for the terminal and secondary development are likely to be relatively small.

III.1.8.4 Telecommunications

Telecommunication services in the region are provided by several companies, including Verizon and Cox Digital Telephone. Cable and internet services are provided by Cox Digital Cable. As with other utilities, the new container terminal would require new cable lines and possibly radio/microwave relay towers. Telecommunications companies could provide services with no adverse impacts on the existing system.

III.1.9 WASTE MANAGEMENT

III.1.9.1 Solid Waste Disposal

The active solid waste and recycling efforts utilized in the project area are summarized in this section. The summary includes items such as public and private landfills and waste facilities, facility capacity, potential facility closure dates, and recycling services. The purpose is to describe anticipated solid waste and recycling services to be utilized upon the development of the proposed site.

The Southeastern Public Service Authority (SPSA) serves several regions within Hampton Roads, VA, including Portsmouth. SPSA is the main waste handler for the city of Portsmouth. Currently, the Regional Landfill, located in Suffolk, handles solid waste for SPSA. In addition, SPSA maintains a Refuse Derived Fuel (RDF) Plant, which is responsible for converting waste to energy.

The regional landfill facility (Permit No. 417) is maintained by SPSA, and it provides service for Portsmouth, as well as other Hampton Roads areas. The Regional Landfill receives approximately 1,500 tons of solid waste per day. SPSA handled 1,098,322 tons of solid waste during FY 2000/2001, and of that total, 589,335 tons were disposed at the Regional Landfill. Currently, the Regional Landfill disposes of solid waste into Cell V, which is expected to have 8 to 10 years of remaining disposal capacity, with an anticipated closure date of 2008 or 2010. In addition, SPSA will develop a sixth cell at the landfill that is anticipated to provide an additional 8- to 10-year disposal capacity.

The RDF Plant (Permit No. 455) is maintained by SPSA, which provides service for Portsmouth, as well as other South Hampton Roads areas. The RDF Plant is a recovery facility that converts waste into energy. This facility processes approximately 57 percent of the SPSA waste. Approximately 2,000 tons per day of waste is converted into steam or electricity. The city of Portsmouth delivers most of its waste directly to this facility.

SPSA also provides Portsmouth's recycling services. SPSA collects recyclables in two streams:

- Paper Items
- Co-mingled Items

During its last fiscal year, SPSA collected 201,405 tons of recyclable materials. In addition, SPSA maintains a waste tire recycling facility. Tire shred is recycled for such uses as tire derived fuel and alternative daily cover.

III.1.9.2 Hazardous Waste and Materials

Hazardous materials are typically transported as cargo through marine terminals, including the three VPA Hampton Roads terminals. Hazardous materials, as defined by the U.S. Department of Transportation (USDOT), include any material that is "capable of posing an unreasonable risk to health, safety, or property when transported in commerce." USDOT establishes hazardous material guidelines regarding the handling and transportation of materials for cargo terminals, and USDOT guidelines are issued under Title 49 CFR. These guidelines include such items as the identification and classification of hazardous materials; the types and quantities of shipments allowed; and the appropriate labeling and handling of hazardous materials transported.

According to the Virginia International Terminals, approximately 3 percent per year of container cargo classified as hazardous materials is anticipated to pass through the terminal. Typically 9,000,000 tons per year of cargo pass though the port; therefore, approximately 270,000 tons of the cargo are hazardous. These materials may include any of the following, as classified by USDOT:

- Hazard Class 1 – Explosives
- Hazard Class 2 – Compressed gases
- Hazard Class 3 – Flammable liquids
- Hazard Class 4 – Flammable solids
- Hazard Class 5 – Oxidizers
- Hazard Class 6 – Poisons
- Hazard Class 7 – Radioactive materials
- Hazard Class 8 – Corrosive Liquids
- Hazard Class 9 – Miscellaneous

III.1.9.3 Generation, Storage, and Disposal of Hazardous and Petroleum Wastes

Hazardous wastes, classified by the Resource Conservation and Recovery Act (RCRA), are materials that may pose a potential hazard to human health or the environment due to quantity, concentration, chemical characteristics, or physical characteristics. This applies to discarded or spent materials that are listed in 40 CFR 261.31-.34 and/or that exhibit one of the following characteristics: ignitable, corrosive, reactive, or toxic. Typically, the hazardous wastes generated at the cargo facilities reflect the daily operations conducted at the site, i.e., normal maintenance activities and custodial activities. Generally, used oils are contained in 55-gallon drums and recycled. In addition, fumigants utilized on site are returned to the suppliers. The typical areas where hazardous wastes may be generated or stored are shown in the following table.

The three VPA Hampton Roads terminals are classified by RCRA as "conditionally exempt small quantity generators" of hazardous waste. The CIDMMA terminal will also be classified as a conditionally-exempt small quantity generator. This classification is defined as a facility that generates no more than 100 kg of non-acute hazardous waste in a month, no more than 1 kg of acute hazardous waste per month, and no more than 100 kg of residue from cleaning up spills of acute hazardous waste per month. As shown in the following table, the anticipated waste materials generated or stored at the port facility include used oil, oil filters, absorbent materials, hydraulic fluids, or spent cleaning materials utilized for port-related equipment and vehicles.

Table III-13. POSSIBLE AREAS CONTAINING HAZARDOUS MATERIALS OR WASTE

AREA	FUNCTION OF AREA	MATERIAL/ ACTIVITY
Maintenance facility	Maintaining and repairing port-related equipment and vehicles	Lubricating oils, waste oils, petroleum-based materials
Fueling facility	Fuel storage for refueling port-related equipment and vehicles	AST/UST's containing waste oil, diesel, or gasoline
Drum storage area	Staging area for waste	Drums containing used oil, recovered fuel, or spent absorbent materials
General yard area	Staging area for loading/unloading cargo	Refueling and maintenance materials required for equipment and vehicles
Crane operations and Straddle Carrier Area	Area for loading/unloading ships	Refueling and maintenance materials required for equipment and vehicles

AST/UST's = above ground storage tanks/underground storage tanks.

Accidental spills of petroleum products associated with the daily operations, as mentioned above, may occur at the terminal facility. Typically, one to two incidents per month are anticipated. These incidents generally involve small to moderate quantities (1-50 gallons) of diesel fuel, motor oil, or hydraulic fluid. Effective cleanups including proper containment, recovery, and disposal occur immediately following the release.

III.1.9.4 CIDMMA

A records review was conducted to evaluate the past and present environmental condition of the CIDMMA expansion site and its surroundings. A listing of Federal and state environmental databases identifying sites located in the vicinity of the project area was obtained from Environmental Data Resources, Inc. (EDR), a private database management firm. The databases include files on former and current facilities that generate, treat, store, or dispose of hazardous materials and other regulated substances.

Thirty-two Federal, state, and local databases were searched for facilities that are known to contain potential environmental conditions, and a total of 71 records were identified. All databases were searched

in accordance with the American Society of Testing and Materials standards; however, due to the location of the target site from neighboring facilities, an additional 2 miles beyond the standard radius was searched for each database.

Due to the absence of an exact address for the proposed CIDMMA terminal, the database search included the Craney Island Fuel Depot and its associated facilities as a part of the "target site." Therefore, the target site is inadvertently listed on the Emergency Response Notification System (ERNS), Leaking Underground Storage Tanks (LUST), and Leaking Petroleum Storage Tanks (LTANKS) databases.

The following summarizes the findings of the EDR database review. The summary information is relative to facilities that are located within 2 miles of the subject property. However, the facilities located within one-quarter of a mile from the subject property would be expected to have the highest potential for impact.

The EDR database review indicates that no past or present facilities that use hazardous materials or other regulated substances exist on the target site. However, the Craney Island Fuel Depot and its associated facilities, located south and southwest of the site, were listed in several databases. Within a 1/2-mile radius from the site, 20 LUST and LTANKS cases and 25 ERNS cases were identified. Sixteen of the LUST and LTANKS cases listed were reported as closed cases and do not appear to be significant sources of environmental impact. However, 32 ERNS cases were identified, but no information was given regarding the date and nature of the releases. Depending on the severity and the containment measures taken, the releases may pose a potential concern for the site. However, the VDEQ Tidewater Region was contacted for more information regarding the ERNS cases at CIDMMA. Although two cases were reported recently (2001), both releases were reported to be minor, including a spill at a pump station and a break in the oil/water separator decant line. Most cases occurring at the CIDMMA facility were reportedly minor releases involving piping problems.

Several sites, located between 1/2 mile and 1 mile were also reported on the ERNS database. The facilities listed are also Craney Island Fuel Depot sites. As described above, the releases occurring on the Craney Island Fuel Depot facilities were reported to be minor cases. The Craney Island Fuel Depot was reported in the Resource Conservation Recovery Information System – Small Quantity Generator (RCRIS-SQG) and Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) databases. CIDMMA was also listed as a RCRIS-SQG (VAR000006569). No violations were reported for either of these sites on the RCRIS-SQG database. The CERCLIS database notes that a preliminary assessment was completed for the Fuel Depot facility in 1991. This facility is currently not on the National Priority List; however, potential environmental impact could result from this facility.

Numerous facilities located greater than 1 mile from the subject site were noted in the ERNS, LUST, LTANKS, Underground Storage Tank, Aboveground Storage Tank, RCRIS-SQG, RCIRS-Large Quantity Generator, and CERCLIS-No Further Remedial Action Planned databases. However, these sites are not

located in close proximity and are not expected to pose significant environmental impact to the subject site.

III.1.10 LAND USE

Areas for the existing land uses discussion as part of the CIDMMA study area include the nearby areas of Portsmouth, as well as portions of Chesapeake and Suffolk in which the proposed VDOT rail corridor would be located. For this land use evaluation, the primary CIDMMA study area has been defined by the Elizabeth River to the east, the VA Route 164 corridor to the south, the city of Portsmouth westerly border to the west, and Hampton Roads Harbor to the north.

Existing land use in the study area was derived from 2001 land use mapping presented in the Multi-Resolution Land Characteristics Consortium (USEPA 2001) and is shown on Figure III-16. Land uses in the CIDMMA study area are described below.

III.10.1 Residential Uses

Residential uses include low- and medium-density single-family residential development and multi-family residential areas. These areas include Brandon Square, Windmill Shores, Southampton, Edgefield, Merrifields, Twin Pines, Peachtree, Churchland West, Edgewood Park, Castle Heights, and River Point in the city of Portsmouth. Residential areas in the city of Chesapeake include Dunedin, Wellington, Clover Meadows, Cricket Hollow, Hunters Cove at New Boone Farm, and Taylorwood Estates along the I-664 corridor.

Residential uses in the city of Portsmouth are concentrated in the area southwest of CIDMMA, north of VA Route 164, as well as on either side of Cedar Lane, south of VA Route 164. Multi-family residential uses are found immediately adjacent to CIDMMA and the Twin Pines Road/VA Route 164 interchange. Residential uses in the northern area of the city of Chesapeake include single-family residential neighborhoods at varying densities in the area to the south of U.S. Route 17 and east of I-664.

III.1.10.2 Commercial Uses

Commercial uses in the study area include a variety of commercial and office buildings along Churchland Boulevard (U.S. Route 17), Towne Point Road, and VA Route 164, adjacent the city of Suffolk line. One commercial use is the Churchland Shopping Center along U.S. Route 17 in the Churchland section of Portsmouth, and another commercial use includes the Churchland Square Shopping Center along the south side of U.S. Route 17 in the city of Chesapeake.

III.1.10.3 Industrial and Institutional Uses

Industrial uses are located along the Route 58 and VA Route 164 corridors in areas zoned M-1 and M-2. A variety of public schools are situated within the study area, including Churchland Academy Elementary School, Churchland Middle School, and Churchland High School, located to the east and west of Cedar Lane south of CIDMMA. Other institutional uses include the existing CIDMMA and operations of the U.S. Coast Guard (USCG) and U.S. Navy to the south of CIDMMA.

III.1.10.4 Open Space and Conservation Areas

Open space in the study area includes Churchland Park in the city of Portsmouth along Cedar Lane at the intersection with River Shore Road to the south of CIDMMA. Other open spaces in the study area include Dunedin Park, located about 1 mile southeast of the I-664/VA Route 164 interchange in the city of Chesapeake.

III.1.10.5 Zoning

CIDMMA is located in a U.S. Government (USG) zoning district. The USG is a district exclusively for military installations owned by the USG (City of Portsmouth, 2002). The area to the south of CIDMMA, between the USCG and Western Freeway (VA Route 164), is designated primarily as M-2 Heavy Manufacturing and M-1 Light Manufacturing. The M-2 is primarily a district for manufacturing, assembling, and fabricating activities, including large scale or specialized industrial operations. A variety of commercial and industrial uses are permitted in the M-2 district. The M-1 district is primarily a district for wholesale activities, warehouses, and light industrial operations that are not obnoxious or offensive by virtue of dust, odor, smoke, fumes, or noise.

The area to the southwest of CIDMMA, west of Cedar Lane, is designated for residential use. Most of the area is situated in districts that are primarily intended for single-family detached dwellings on lots of varying sizes. The residential area immediately adjacent the southwest corner of CIDMMA is RM-75, which is primarily a district for multifamily structures but allows single-family and two-family dwellings.

A relatively small area bordering the Norfolk Road interchange on VA Route 164 is vacant and designated M-1 and Planned Office Park (POP), which borders residential districts primarily designated for single-family and multifamily residential uses. The POP district is primarily intended for well-planned and tightly-controlled office park development, at a scale compatible with residential development. The POP district also allows other uses that include transportation of freight.

III.1.10.6 Local Plans

The city of Portsmouth General Land Use Plan provides no designation for the future use of CIDMMA. The USACE 50-year plan is to continue to use the current limits of CIDMMA for dredged material management. Moreover, the eastward expansion of CIDMMA, which would be the site of the proposed terminal facility, is not designated for any land use, since this area is presently under water. The city's Vision 2005 plan, however, designates CIDMMA and areas bordering the Elizabeth River near it as the "Working Waterfront." The vision for this area is to maintain an active "working waterfront" and encourage development of vacant tracts and redevelopment. This vision is intended to guide Portsmouth's comprehensive planning process for this area.

The area immediately south of the active CIDMMA is designated for public/quasi-public land use. The western portion of this area is presently the site of the U.S. Navy's fuel depot operations. Two areas – one bordering Craney Island Creek and a second, which is the site of Churchland Park, are designated for "parks & open space." The area south of Craney Island Creek that is bordered by VA Route 164 and the Elizabeth River is designated for industrial uses.

The Windmill Shores area of Portsmouth is designated for Medium Density Residential (up to 16 units/acre net) uses, while the much larger area encompassing Southampton and areas to the south and west are designated for single-family residential uses.

III.1.11 NOISE

When an object vibrates, it releases energy and creates sound waves, which produces noise. The sound wave energy moves through a medium such as air until it reaches the eardrum and is heard. The higher energy sound waves produce louder sounds. Sound energy is reduced along its path to the ear by various factors, such as absorption by the air and by absorption/reflection by buildings, trees, vegetation, and other various obstacles and groundcover.

Noise measures are expressed by the term "sound pressure level" (SPL), which is the logarithmic ratio of the sound pressure to a reference pressure. SPL is expressed as a dimensionless unit of power, the decibel (dB). The human ear has a limited detection of sound, and does not respond uniformly to all frequencies. Therefore, in most noise analyses, the SPL is weighted to correspond to human hearing. This adjustment is known as the A-weighted decibel (dBA) (Canter, 1977). The ability of the average human ear to perceive relative increases in noise level and a reference scale with common sound levels are presented in Table III-13 below.

Table III-14. DECIBEL CHANGES AND LOUDNESS

Change (dBA)	Relative loudness
0	Reference
3	Barely perceptible change
5	Readily perceptible change
10	Half or twice as loud
20	1/4 or 4 times as loud
30	1/8 or 8 times as loud
Source: Based on Highway Traffic Noise Analysis and Abatement – Policy and Guidance. (FHA, June 1995.)	

There are many different noise monitoring statistics that can be used to describe "community noise" levels. The noise levels within a community fluctuate over time, primarily due to variations and intensity of the noise sources. A single measurement of sound level is not a sufficient descriptor, as it will miss peaks and may provide a misrepresentation of noise levels over time. Several statistical measurements

are used to describe the temporal characteristics of the acoustical environment. One such measurement is the Day-Night average, which averages noise levels over the daytime hours (7 a.m.-10 p.m.) and nighttime hours (10 p.m.-7 a.m.), with a 10-dB penalty added to the nighttime noise levels. This statistic was considered in this study; however, it was not used, as it would provide a skewed average, since the heavy truck traffic would end before 7 p.m. When averaged, the quieter nighttime would mask the louder truck traffic during the day. Equivalent Sound Level (Leq) is a measurement of the average sound level over a given period of time. The most suitable metric of sound level for the project was chosen to be the 24-hour maximum 1-hour $Leq_{(h)}$, which is the maximum time-weighted average SPL recorded over a 1-hour period during a given day. The weighted average takes into consideration that sound is measured on a logarithmic scale so that two sounds or more sounds are added as follows:

$$SPL_{(total)} = 10\log_{10}\left(10^{\frac{SPL_1}{10}} + 10^{\frac{SPL_2}{10}} + \cdots + 10^{\frac{SPL_n}{10}}\right)$$

The use of the $Leq_{(h)}$ ensures that louder sounds are not "undervalued" in the statistic as they would be in normal arithmetic average (i.e., if over a 1-hour period the SPL was 70 dBA for the first half hour and 90 dBA over the second, the $Leq_{(h)}$ would be 87 dBA rather than an arithmetic average of 80 dBA, which is almost twice as loud).

Other statistical sound level measurements, such as L10 and L90, are sometimes used to indicate noise levels that are exceeded by 10 and 90 percent of the sample interval, respectively (Thumann and Miller, 1990).

III.1.11.1 Ambient Noise Monitoring

Noise monitoring for existing conditions at CIDMMA and the surrounding communities was conducted during March 2002. Data were collected from 7 monitoring points on CIDMMA on March 6, 10, 25, and 26. Three additional monitoring locations were selected off of CIDMMA, in the surrounding Edgefield and Merrifields residential communities of Portsmouth to determine current ambient noise levels in potentially affected areas. The noise monitoring data were collected from the residential communities on March 20 and 27. All of the monitoring locations are shown in Figure III-17.

Existing ambient noise levels were monitored at all 10 locations using a Bruel & Kjaer 2236/2238 Precision Integrating Sound Level Meter. The meter was calibrated at the beginning of each day using a Bruel and Kjaer Sound Level Calibrator Type 4231 prior to monitoring. The meter measured background noise in dBA using the noise descriptors: $Leq_{(h)}$, L_{10}, L_{90}, Min(L), and Max(L). The meter was also set to measure the instantaneous SPL every second during the sampling period. At each monitoring location, the sound level meter was mounted to a tripod positioned 3 feet above grade and at least 10 feet from any reflective surface. Noise monitoring occurred for 24 hours in separate 12-hour sampling sessions. Monitoring occurred between the hours of 8 a.m. and 10 p.m., as well as 10 p.m. and 8 a.m., respectively. Data were collected in 15 minutes intervals each hour to obtain a representative background noise level for the represented hour. Data recorded from the meter included: start/end time, sampling range, Min (L), Max (L), L10, L90, Leq, and additional comments.

Table III-14 presents noise levels, in Leq, monitored on CIDMMA over a 24-hour period during both night and day time. The data show that noise levels are affected during daytime hours by grade/fill operations associated with dredging activities on CIDMMA. Dredging activities began on CIDMMA at approximately 8 a.m. Operations were busiest between the hours of 10 a.m. and 4 p.m., with a short break around the hour of 12 p.m., when workers would stop for lunch. During these operational hours, noise levels ranged from 43 dBA to 68 dBA. When dredging activities ceased for the day, at about 6 p.m., noise levels dropped to a range of 35 dBA to 60 dBA during the evening and early morning. The highest recorded $Leq_{(h)}$ was observed at station number 7 located near the middle of Craney Island and was attributed to truck traffic.

Table III-14 also presents noise levels, in dBA $Leq_{(h)}$, monitoring throughout the residential communities surrounding CIDMMA between the hours of 8 a.m. and 8 p.m. The data show that noise levels are affected by routine traffic and higher levels correspond to typical peak travel times in the morning, noon, and evening. The noise monitoring was performed within the communities on March 27, 2002. On this particular day, students had a half-day and left school property around noon. It is expected that on a normal school day results would be slightly different. Noise levels peaked when school traffic was heavy – peaking between 8 a.m. and 9 a.m. and between noon and 1 p.m., when students and teachers arrived and departed school property. It should be noted that on a normal school day traffic would be heavy when school ends at about 3 p.m. Noise levels ranged from 45 dBA to 65 dBA during school hours. Once school was out and the parking lots were empty, noise levels dropped to a range of 40 dBA to 59 dBA during the evening and early morning.

Table III-15. DAYTIME AMBIENT NOISE MONITORING

	Time Interval	Location Leq(h) Reading (dBA)									
		Craney Island							Residential Community		
		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
Day	0800	50.4	57.6	56.7	50.4	43.7	43.3	52.8	64.2	60.4	62.4
	0900	53.8	58.4	59.5	49.1	46.3	47.6	54.1	54.7	45.2	54.7
	1000	55.4	61.7	56.6	50.6	60.1	49.3	66.7	50.9	45.5	52.0
	1100	54.7	60.1	53.2	51.2	62.5	49.3	52.1	51.8	42.2	---
	1200	50.0	54.0	50.7	57.4	---	---	57.8	64.2	46.3	55.0
	1300	58.9	61.3	61.0	54.1	56.3	50.9	60.3	45.9	54.8	62.6
	1400	62.3	61.0	---	47.8	54.3	51.5	51.3	46.8	46.2	49.7
	1500	60.9	55.9	59.1	52.4	55.0	57.1	54.2	51.4	51.9	53.2
	1600	59.6	61.9	62.6	47.2	49.2	49.4	49.4	47.6	47.9	54.5
	1700	52.2	51.0	---	---	---	---	56.1	48.4	51.6	50.7
	1800	50.7	53.7	53.1	50.9	54.2	53.4	49.2	48.9	51.0	48.1
	1900	51.3	49.3	49.7	50.9	55.1	52.7	50.7	49.1	51.1	47.6
	2000	46.8	45.8	48.9	48.3	54.3	52.5	48.3	48.6	50.5	46.4
	$Leq_{(h)\ day\ max}$	62.3	61.9	53.1	50.9	55.1	53.4	66.7	64.2	60.4	62.6
Night	2100	47.6	46.7	49.6	46.7	55.0	52.7	44.2	48.3	50.1	45.3
	2200	47.8	47.2	47.5	47.5	39.8	41.9	60.4	53.0	44.3	49.5
	2300	46.9	47.5	45.9	47.2	39.9	---	60.4	43.4	44.5	---
	2400	44.8	54.2	51.9	48.0	41.1	39.1	45.5	42.2	41.3	---
	0100	42.3	43.8	54.7	45.7	38.4	40.2	---	45.7	---	43.4
	0200	43.3	43.7	43.3	---	---	36.6	42.2	41.3	40.0	40.0
	0300	44.1	45.8	49.6	44.9	40.1	40.1	42.8	40.8	41.4	41.8
	0400	46.8	44.5	53.4	49.8	34.9	45.4	43.2	43.2	40.7	43.8
	0500	47.2	46.8	54.5	52.9	43.7	42.9	43.4	45.6	41.8	54.8
	0600	48.5	44.6	55.2	51.7	42.8	43.1	45.2	56.3	54.3	56.2
	0700	49.3	42.3	56.1	51.3	43.4	43.0	46.3	59.2	56.7	57.1
	$Leq_{(h)\ night\ max}$	49.3	54.2	56.1	52.9	55.0	52.7	60.4	59.2	56.7	57.1
24hr-MAX $Leq_{(h)}$		**62.3**	**61.9**	**62.6**	**57.4**	**62.5**	**57.1**	**66.7**	**64.2**	**60.4**	**62.6**

Note: --- signifies a rain delay, no data

Table III-15. DAYTIME AMBIENT NOISE MONITORING
(Cont'd)

Time Interval	Locational Leq Reading (dBA)									
	Craney Island							Residential Community		
	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
0800	50.4	57.6	56.7	50.4	43.7	43.3	52.8	64.2	60.4	62.4
0900	53.8	58.4	59.5	49.1	46.3	47.6	54.1	54.7	45.2	54.7
1000	55.4	61.7	56.6	50.6	60.1	49.3	66.7	50.9	45.5	52.0
1100	54.7	60.1	53.2	51.2	62.5	49.3	52.1	51.8	42.2	---
1200	50.0	54.0	50.7	57.4	---	---	57.8	64.2	46.3	55.0
1300	58.9	61.3	61.0	54.1	56.3	50.9	60.3	45.9	54.8	62.6
1400	62.3	61.0	---	47.8	54.3	51.5	51.3	46.8	46.2	49.7
1500	60.9	55.9	59.1	52.4	55.0	57.1	54.2	51.4	51.9	53.2
1600	59.6	61.9	62.6	47.2	49.2	49.4	49.4	47.6	47.9	54.5
1700	52.2	51.0	---	---	---	---	56.1	48.4	51.6	50.7
1800	50.7	53.7	53.1	50.9	54.2	53.4	49.2	48.9	51.0	48.1
1900	51.3	49.3	49.7	50.9	55.1	52.7	50.7	49.1	51.1	47.6
2000	46.8	45.8	48.9	48.3	54.3	52.5	48.3	48.6	50.5	46.4

Notes: --- Rain delay, no data.

III.1.11.2 Noise Regulations

Currently, there are no Commonwealth of Virginia noise limits or regulations. The city of Portsmouth does not have a noise ordinance to guide in the evaluation of the acceptability of noise levels on various receiving land use categories.

The first comprehensive Federal legislation for abating noise emissions from a broad range of sources was the Noise Control Act of 1972 and its amendment in 1978. The general objective of these laws is to promote an environment free from noise that jeopardizes human health or welfare. USEPA has also established noise guidelines that parallel the objectives of the Noise Control Act. These guidelines recommend noise limits for indoor and outdoor noise levels. In general, an average noise level over a 24-hour period of 70 dBA is listed as the threshold for hearing loss. In a residential area, an outside 24-hour average sound level of 55 dBA is recommended (USEPA, 1974). As regulated by the Act, noise impacts are primarily governed at the local level. FHA has established noise abatement criteria based on hourly Leq measurements for various land-uses, as presented in Table III-15.

Table III-16. FEDERAL HIGHWAY ADMINISTRATION NOISE ABATEMENT CRITERIA

Activity category	$L_{eq}(h)$	Description of Activity Category
A	57 (exterior)	Land for which serenity and quiet are of extraordinary significance and serve an important public need, as well as where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (exterior)	Picnic areas, recreation areas, playgrounds, active, sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	---	Undeveloped lands.
E	55 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Note: The Leq and L10 designations represent hourly A-weighted sound levels expressed in decibels (dBA).
Source: USDOT, FHWA 1974.

1.11.3 Receptors

Some land uses are considered sensitive to noise. Sensitive receptors are land uses associated with indoor and/or outdoor activities that may be subject to stress and/or significant interference from noise. These sensitive land uses often include residential dwellings, mobile homes, hotels, motels, educational facilities, and libraries. Industrial and commercial land uses are generally not considered sensitive to ambient noise.

Residences, apartment complexes, townhouses, parks, recreation areas, playgrounds, schools, and churches dominate the communities that border CIDMMA to the southwest. FHA categorizes these land use types as "Activity Category B," according to its noise abatement criteria presented in the Table III-15. The observed noise levels presented in Table III-14 and in Figure III-17 indicate that noise levels in the vicinity of Craney Island presently fall within the guideline.

The closest sensitive receptors to the proposed terminal location are the residential neighborhood of Edgewater in Norfolk, approximately 8,000 feet (1.5 miles) to the east across the Elizabeth River, and Churchland High School and Churchland Park (expansive recreational area), both located in Portsmouth, approximately 9,000 feet (1.7 miles) to the southwest. The Edgefield and Merrifields subdivisions and Rivermill Townhouses are located in Portsmouth about 10,000 to 11,000 feet (approximately 2 miles) southwest of the proposed terminal boundary.

III.1.12 VISUAL AND AESTHETIC RESOURCES

III.1.12.1 Sensitive Receptors

Sensitive receptors in the project vicinity include the residential communities of Windmill Shores, Rivermill, Edgefield, and Merrifields, located southwest of the proposed port facility. Rivershore Baptist Church, the only church in the project vicinity, is located in the Windmill Shores community. Four schools are also located in the project vicinity just northeast of the residential communities, and include Churchland Primary, Churchland Middle School, Churchland High School, and Churchland Academy. Churchland Park, an expansive recreational area, is located immediately southeast of the U.S. Navy Craney Island Fuel Depot. Existing vegetation on CIDMMA and the Navy Fuel Depot property currently blocks the viewshed of the proposed port facility from these sensitive receptors. No cemeteries were identified in the project vicinity. Waterfront properties located immediately west of CIDMMA may have a partial to unobstructed view of the proposed port facility. However, the Monitor Merrimac Bridge-Tunnel and CIDMMA currently impact existing views from these residences.

Another sensitive receptor is the residential neighborhood of Edgewater located 1.5 miles east of the proposed port facility in the city of Norfolk. The Elizabeth River separates the neighborhood from the proposed port; therefore, the view from waterfront residences in this neighborhood is relatively unobstructed. Most of the Edgewater properties contain large trees that would partially obstruct the view of the port facility; however, the lack of foliage in the fall and winter would provide a less obstructed view of the port facility. The current viewshed for the Edgewater community includes NIT, Lambert's Point Coal Terminals, U.S. Navy Craney Island Fuel Depot and CIDMMA. The view of the CIDMMA would change from an unvegetated dredge material containment area, to an industrial facility including bulkheads, wharves, vessel berths, containers, and cranes.

III.1.13 RECREATIONAL AND COMMERCIAL USE OF WATERS

III.1.13.1 Commercial Shipping

Hampton Roads is the water body through which the waters of the James, Nansemond, and Elizabeth Rivers pass into Chesapeake Bay. One of the best natural harbors in the world, it has been a major anchorage point since colonial times and has extensive harbor facilities and shipyards. The cities of Newport News and Hampton are located on the north shore, Norfolk and Portsmouth on the south. The Port of Hampton Roads is one of the busiest U.S. seaports. Hampton Roads has long been important to the U.S. Navy; Norfolk is headquarters for the Atlantic Fleet. Due to current security concerns, Naval Station Norfolk cannot provide information on military ship movements; however, several battle groups do deploy routinely from the Naval Station located in Norfolk.

Ships entering Hampton Roads from the sea follow the Thimble Shoal Channel into the waters of Hampton Roads. They can then use the Newport News Channel, which extends approximately 7 miles westward from Hampton Roads to Newport News, or the Norfolk Harbor Reach, which extends from the Hampton Roads Bridge-Tunnel into the southside cities of Norfolk, Portsmouth, and Chesapeake. The Craney Island Reach of Hampton Roads provides access to the Elizabeth River. Heavy industry and bulk

cargo terminals are accessed through Hampton Roads and associated secondary channels. Areas adjacent to the shipping channels are important commercial transportation destinations.

In 2000, vessel calls at U.S. ports accounted for about 10 percent of vessel calls at world ports (Office of Statistical and Economic Analysis, 2000). There were 5,000 total vessel calls at Hampton Roads in the year 2000. Vessel types that call at Hampton Roads ports include tankers, dry bulk, container, RORO, chemical tankers, and gas carriers. Hampton Roads area ports include Chesapeake, Hampton Roads, Hopewell, Lynnhaven Roads, Newport News, Norfolk, Portsmouth, Richmond, and Yorktown.

Containership calls at U.S. ports increased by 5.7 percent from 1998 to 2000; however, containership capacity calling at U.S. ports increased by 12.1 percent as average vessel size increased by 5.9 percent over this same period. In recent years, the Port of Virginia has experienced average annual growth rates in containerized cargo of over 6 percent. The most recent forecast for containerized cargo at The Port of Virginia predicts a growth rate between 3.5 percent and 4.7 percent, or an average rate of 4.1 percent per year.

III.1.13.2 Commercial Fishing

Commercial fishing in the Hampton Roads area supports the seafood harvest and production industry in the surrounding region. The Elizabeth River and waters surrounding the proposed port facility produce commercially-important species, including blue crab and Atlantic croaker. A moderate amount of commercial fishing for spot, croaker, and striped bass, including the use of gill nets and haul seines, occurs in the area adjacent to the proposed port facility (VMRC, April 2002). Blue crabs are harvested for the local seafood market and are exported from the Chesapeake Bay area as well.

Oysters were once an important part of the commercial fishery in the Hampton Roads area. However, harvestable oyster populations have dropped to their lowest levels in history. At the peak of Virginia's oyster harvesting heyday in the early 1900's, annual catches exceeded 9 million bushels. By 1958, landings were about 4 million bushels. Total oyster landings for the 1997/1998 season were just 14,295 bushels, only 1 percent of what was harvested 35 years ago (VDEQ, 2002). The harvest for 2000/2001 was slightly higher; however, the harvest for the 2001/2002 season is slightly lower due to the drought than the harvest reported for the 1997/1998 season (VMRC, April 2002a). This historical oyster decline is due to overharvesting and the presence of two disease organisms, *Perkinsus marinus* (Dermo) and *Haplosporidium nelsoni* (MSX) in addition to the oyster drill (*Urosalpinx cinera*, *Eupleura caudata*). In recent years, reports have indicated that oyster drill abundance is again increasing in Virginia waters after Hurricane Agnes reduced the populations in 1972. The oyster drill, combined with the recent discovery of the veined rapa whelk (*Rapana venosa*), has serious consequences for the commercial oyster fishery as well as Virginia's on-going oyster restoration efforts. Both species of oyster drill are more abundant in downriver habitats with salinities ranging from 15 to 25 ppt (Southworth et al., 2000). The most viable oyster populations left in the project vicinity occur in the lower James River, upstream of the James River Bridge (VMRC, April 2002). Since 1999, cooperative efforts between VMRC, the Chesapeake Bay Foundation, and other local sponsors have restored approximately 20 acres of oyster reefs and grounds

throughout the Elizabeth River. The nearest reef to the proposed project vicinity is near Craney Island Creek, close to the tank farm (VMRC, April 2002).

According to the Virginia State Department of Health, Division of Shellfish Sanitation, the area around CIDMMA is part of condemned shellfish area number 7 (see Figure III-18). The areas to the north, east, and west of CIDMMA are part of the Hampton Roads Shellfish Relay Area. The Relay Area is considered to have a polluted bottom and, in order to utilize shellfish that are harvested, they must be moved to a clean area for depuration for a period of 15 days prior to use (VMRC, April 2002). The area to the south of CIDMMA in the Elizabeth River is condemned to shellfishing.

The rapa whelk has also heavily impacted clam populations. Rapa whelks are native to the Sea of Japan and were discovered in the lower Chesapeake Bay in 1984. Evidence suggests that these animals were introduced into the region through ship ballast waters (Mann, 1999). Continuing efforts to map the whelk's distribution in the lower Chesapeake Bay indicate no new range extensions and a relatively constant population in the lower James River, Hampton Bar, and Ocean View/Little Creek regions (Mann and Harding, 2000).

Blue crabs are present in Hampton Roads from March through December. Analysis of long-term juvenile and adult fishery-independent surveys conducted in the Chesapeake Bay indicates that blue crab abundance is below average and declining in recent years. The current status of the stock was compared to thresholds and targets endorsed by regional management agencies. The 3-year (1998-2000) average commercial baywide harvest of 60 million pounds is below the long-term (1968-2000) average of about 75 million pounds. The 2000 baywide harvest of 50.8 million pounds is below average and is the lowest since the Maryland commercial crab reporting system changed in 1981 (FY 2000 Blue Crab Advisory Report).

A blue crab management area was established July 1, 1998, in response to reduced abundance in the blue crab stock and increased fishing pressure on the resource (Figure III-5). Management covers an area between the Hampton Roads Bridge-Tunnel and the Monitor Merrimac Memorial Bridge-Tunnel. Dredging for crabs within this area is prohibited at all times.

Commercial crabbers most heavily use the area near CIDMMA in spring and early fall. Depending upon the particular season, there may be 12 to 15 crab boats in the area and hundreds of crab pots scattered about the area (VMRC, March 2002).

III.1.13.3 Recreational Boating and Fishing

Recreational boaters from the surrounding areas use many areas within the Hampton Roads Harbor for a variety of purposes. Numerous sailing communities with marinas and boat ramps border the project area. Recreational fishermen and pleasure boaters often cross or navigate the above-described channels to reach their destinations. The Elizabeth River contains fisheries for recreational estuarine and marine species including Atlantic croaker, grey seatrout, striped bass, summer flounder, and bluefish. Data kept by VDGIF for recreational boating in the Hampton Roads area are summarized in Table III-16.

A review of USCG records indicates that there are 15 documented vessels (i.e., vessels weighing in at 5 net tons or greater) having Hampton Roads registered as their hailing port.

Table III-17. REGISTERED BOATS IN HAMPTON ROADS AREA (1)

Northampton County	1,641
Accomack County	4,500
City of Norfolk	4,660
City of Virginia Beach	12,416
City of Newport News	3,624
City of Hampton	4,237
City of Suffolk	3,261
City of Chesapeake	6,049
City of Portsmouth	3,109
City of Poquoson	1,453
Total	44,950

(1) Source of information: VDGIF Boater Registration (2001 Registry).

III.1.14 ECONOMICS

III.1.14.1 Affected Environment

The geographic region of influence or impact study area for economics is the Hampton Roads region. This area includes the South Hampton Roads communities of Chesapeake, Norfolk, Portsmouth, Suffolk, and Virginia Beach; the Lower Peninsula area consisting of Hampton, James City County, Newport News, Poquoson, Williamsburg, and York County; Gloucester County on the Middle Peninsula; and the non-metro areas of Franklin, Isle of Wight County, Southampton County, and Surry County.

Economic activity in the region is distributed across the service, manufacturing, retail trade, and government portions of the regional economy. The Hampton Roads region is economically-dependent on the defense sector, with expenditures and obligations totaling more than $5.3 billion (in constant 1982-1984 dollars) in 2000 (HRPDC, 2001). Total military employment in the Hampton Roads region is reported at 109,049, which is one of the largest concentrations of military personnel in the world (HRPDC, 2001).

Shipbuilding has been a mainstay of the regional economy for decades, but its contribution has lessened during the past decade as a result of Department of Defense budget cuts, which reduced an ambitious U.S. Navy ship construction program by almost one-half. Additionally, commercial shipbuilding suffered a substantial decline in the 1980's from foreign competition. The result was a decline in employment at Norfolk Naval Shipyard from 12,500 to 7,000 employees between 1988 and 2001 and at Newport News Shipbuilding from 30,000 to 17,200 employees between 1985 and 2001.

Long-term forecasts for the region indicate continued growth of both population and employment but at rates less than experienced in the past decades. As reported in the following table, total employment (civilian and military) in Portsmouth is projected to increase by 7.5 percent from 52,913 in 1999 to 56,900 in the year 2021 (HRPDC, 2001). In comparison, total employment in the Hampton Roads region, excluding Gloucester County and Rural Southeastern Virginia, is anticipated to increase by 21 percent from 911,253 in 1999 to 1,103,600 in the year 2021.

A review of the data presented in the Table III-17 indicates that 25 percent of the 911,253 civilian and military jobs in the region are located in Virginia Beach. Civilian unemployment in the region in March 2003 varied from 2.2 percent to 7.9 percent, with the highest rate in Williamsburg (HRPDC, 2001).

III.1.14.2 Economic Impact of Virginia Port Authority

Data collected by the American Association of Port Authorities reveals that The Port of Virginia (Hampton Roads) was the eighth busiest container port in the U.S. This activity and the movement of other cargo through the port makes it a hub of regional economic activity, generating many jobs and providing a significant source of revenue for the city and counties in the Hampton Roads region. A recent study, completed by the Regional Studies Institute of Old Dominion University and released in 2001, assesses the economic impacts of port activities on the Hampton Roads region. Other information regarding the economic impact of VPA terminals is included in a study completed in 1999 by Martin Associates. The following sections summarize the results of these studies.

Based on results of the study completed for VPA, activities at VPA terminals generated 8,525 jobs in 1998. These jobs are with the International Longshoremen's Association, terminal operators, stevedores, trucking firms, railroads, steamship agents, freight forwarders, customs house brokers, warehousemen, Federal Government agencies, towing companies, pilot organizations, and marine construction companies. The majority (more than 80 percent) of these jobs are held by residents of Norfolk, Virginia Beach, Chesapeake, Portsmouth, Newport News, and Hampton (Figure III-19).

An additional 4,636 jobs are induced or jobs supported by the local purchases made by the 8,525 individuals who are directly employed by port activities. These jobs are with local grocery stores, retail outlets, restaurants, transportation services, local government services, schools, hospitals, etc. An additional 1,534 jobs are indirectly generated at firms dependent on the purchase of office supplies, equipment, utilities, communications, maintenance and repair services, transportation services, professional services, and other goods and services from local businesses. Expenditures by VPA for local goods and services were reported at $24 million, while total purchases by firms dependent on VPA's marine terminals reached $49.6 million in 1998.

In addition to the direct, induced, and indirect job impacts of the port, an additional 149,563 jobs in Virginia are related to the movement of cargo at VPA's marine terminals. These jobs are held by employees of firms exporting and importing cargo through the terminals and include businesses such as manufacturers and chemical companies, as well as wholesale and retail outlets for beverages, furniture, and agricultural equipment.

Businesses providing maritime services at VPA's terminals are reported to have received $762.5 million of revenue in 1998. This revenue does not include the value of the cargo that moved through the marine terminals. Of the $762.5 million in revenue, $49.6 million was used for local purchases by those firms directly dependent upon port activity.

The 8,525 individuals directly employed as a result of VPA terminal activities received $278.2 million in personal wage and salary income in 1998. Local purchases made by these individuals created additional jobs that generated an additional $266.1 million in income and consumption expenditures in the Commonwealth.

Activities at VPA terminals are reported to have resulted in $60.7 million in state and local tax revenues in 1998, and the Federal Government reportedly collected $286 million of customs receipts from cargo handled at VPA terminals. About $30.3 million of tax receipts were generated at the city and county levels of government, and it is estimated that about 80 percent of the local taxes were collected by those jurisdictions in immediate proximity to the port terminals (Martin Associates, 1999).

Overall, more than 164,000 people are employed either through direct, induced, and indirect job impacts of the port or through jobs related to the movement of cargo at VPA's marine terminals, generating approximately $4 billion in wages and more than $500 million in taxes annually (HRMA, 2002).

Table III-18. EXISTING AND FORECASTED EMPLOYMENT

Locality	1999	2005	2011	2021
Chesapeake	101,165	121,028	145,600	156,100
Norfolk	225,297	241,511	235,700	236,900
Portsmouth	52,913	57,519	55,900	56,900
Suffolk	25,833	33,320	38,700	46,100
Virginia Beach	231,994	238,497	259,900	276,100
Hampton	83,555	83,513	85,700	87,100
James City Co.	47,974	32,625	35,900	40,200
Newport News	116,969	126,564	136,600	141,700
Poquoson			2,500	2,700
Williamsburg			24,900	27,400
York County	25,553	26,746	30,900	32,400
Total	911,253	961,323	1,052,300	1,103,600

Source: 2001 HRPDC Economic Outlook; Conformity Documentation, Appendix B-1; HRPDC, 2002.

Notes: Data in 1999 and 2005 for James City County includes Williamsburg. Data in 1999 and 2005 for York County includes Poquoson. Data for 1999 is from the 2001 HRPDC Economic Outlook; data for 2005 was provided byHRPDC in April 2002 and represents an update of data in the Conformity Documentation; data for 2011 and 2021 is from the Conformity Documentation.

III.1.15 ENVIRONMENTAL JUSTICE

Executive Order (EO) 12898, Environmental Justice, was issued by President Clinton on February 11, 1994. Objectives of the EO, as it pertains to this evaluation, include development of Federal agency implementation strategies; identification of low-income and minority populations where proposed Federal actions have disproportionately high and adverse human health and environmental effects; and participation of low-income and minority populations. Accompanying EO 12898 was a Presidential Transmittal Memorandum that referenced existing Federal statutes and regulations to be used in conjunction with EO 12898. The memorandum addressed the use of the policies and procedures of the National Environmental Policy Act (NEPA). Specifically, the memorandum indicates that, "Each Federal agency shall analyze the environmental effects, including human health, economic and social effects, of Federal actions, including effects on minority communities and low-income communities, when such analysis is required by the National Environmental Policy Act of 1969 [NEPA], 42 U.S.C. section 4321 et. seq."

III.1.15.1 Affected Environment

A social analysis was conducted for communities within the city of Portsmouth that may be affected by the proposed CIDMMA expansion. This analysis was performed to evaluate the potential for environmental justice impacts resulting from the proposed port facility. The project area was defined as

those communities in the city of Portsmouth that lie adjacent to the CIDMMA or those north of the Western Branch of the Elizabeth River, which were within 4 miles of the proposed expansion area. These communities were defined by either census tract or block group boundary and included Census Tracts 2130.01, 2130.02, and 2131.04, as well as Block Groups 1 and 2 of Census Tract 2131.03 (Figure III-20).

To analyze the economic and social effects of the proposed action, a demographic profile was developed for each community using information from both the 1990 and 2000 U.S. Census (Table III-18). Included in these profiles were their demographic and employment characteristics, specifically, race, poverty level, median household income and unemployment rate. To further analyze the impact of the expansion on these communities, their demographic profiles were compared to the entire city of Portsmouth, the Norfolk-Virginia Beach-Newport News MSA, and the Commonwealth of Virginia. The Norfolk-Virginia Beach-Newport News MSA constituted the service area of the proposed port and consisted of the counties of Gloucester, Isle of Wight, James City, Mathews, Surry, and York, along with the cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, Poquoson, Suffolk, Virginia Beach, and Williamsburg.
Of the five communities closest to the project site, four had a percentage of minority population below the level for the city of Portsmouth (Census Tracts 2130.01, 2130.02, and Block Groups 1 and 2 of Census Tract 2131.03) and all but one (Census Tract 2131.04) had a minority percentage below 50 percent of the total population (Table III-19). Minority races included in the 2000 Census were identified as Black, American Indian and Alaska Native, Asian, Native Hawaiian and other Pacific Islander, other, or individuals of two or more races. The minority population in four of the five census tracts exceeded the level for the Commonwealth of Virginia; however, two of the four were within 10 percent of the state level.

Of the five communities analyzed, all had poverty levels below 8 percent, and all had percentages of poverty stricken individuals that were below the city of Portsmouth, MSA, and commonwealth levels. Only one community (Census Tract 2130.02) had a median age above that of the Commonwealth, and each community except one (Block Group 1 of Census Tract 2131.03) had a median income above that of the Commonwealth of Virginia.

Table III-19. SOCIOECONOMIC CHARACTERISTICS OF AFFECTED JURISDICTIONS (1) (2)

Jurisdiction	Total Pop.	Median Age (Years)(3)	Sex %		Non-White Population (%)	Poverty Pop. (%)	Median Household Income	Unemployment Rate (%)
			Male	Female				
Census Tract 2130.01								
1990(4)	4,648	-	48.1	51.9	12.7	2.4	30,581	2.8
2000	7,718	29	61.7	38.3	31.0	3.6	52,944	1.3
Census Tract 2130.02								
1990(5)	4,648	-	49.1	50.9	9.8	3.2	39,845	1.4
2000	4,282	46	46.5	53.5	17.5	4.1	46,997	2.8
Census Tract 2131.03 Block Group 1								
1990(6)	-	-	-	-	-	-	-	-
2000	3,051	31	47.1	52.9	48.2	7.1	40,909	3.7
Census Tract 2131.03 Block Group 2								
1990(7)	3,242	-	50.3	49.7	22.2	2.0	41,023	1.7
2000	4,143	32	49.9	50.1	36.7	2.2	48,701	2.6
Census Tract 2131.04								
1990(6)	-	-	-	-	-	-	-	-
2000	3,173	31	48.9	51.1	71.3	7.3	51,728	2.3
Portsmouth								
1990	103,907	-	47.6	52.4	48.7	17.2	24,601	3.8
2000	100,565	35	48.3	51.7	54.2	16.2	33,742	4.3
Norfolk-Virginia Beach-Newport News MSA								
1990	1,435,653	-	49.0	51.0	29.3	10.6	31,060	2.5
2000	1,558,180	35	48.7	51.3	32.1	10.2	44,360	4.6
Commonwealth of Virginia								
1990	6,187,358	-	49.0	51.0	22.6	9.8	33,328	2.3
2000	7,078,515	36	49.0	51.0	27.7	9.6	46,677	2.7

Sources: (1) Year 2000 Census Data obtained from U.S. Census Bureau, 2000 Census.

(2) Year 1990 Census Data obtained from U.S. Census Bureau, 1990 Census.

(3) Median age values not available for 1990 Census Data.

(4) Combined from 1990 Census Tract 2130, Block Groups 1, 2, and 9.

(5) Combined from 1990 Census Tract 2130, Block Groups 3, 4, and 5.

(6) Census boundaries not available for 1990 Census Data.

(7) Derived from 1990 Census Tract 2131.02, Block Group BG2.

Table III-20. ETHNIC DISTRIBUTION OF POPULATIONS IN STUDY AREA AND COMPARISON AREAS, CENSUS 2000

	Percent of Total Population by Ethnic Origin				
Area	White	Black	Asian	Other	Hispanic Origin
Census Tract 2130.01	69.0	25.0	2.1	3.9	4.3
Census Tract 2130.02	82.5	14.6	1.1	1.8	1.5
Census Tract 2131.03 Block Group 1	51.8	42.4	1.1	4.8	2.8
Census Tract 2131.03 Block Group 2	63.3	31.1	1.9	3.7	3.1
Census Tract 2131.04	28.7	67.1	1.0	3.2	2.3
City of Portsmouth	45.8	50.6	0.8	2.8	1.7
Norfolk-Virginia Beach-Newport News MSA	68.2	27.1	1.8	2.8	2.1
Virginia	72.3	19.6	3.7	4.4	4.7

Source: U.S. Census Bureau, 2000 Census

The number of minority residents in the three communities where information is available (Census Tract 2130.01, Census Tract 2130.02, and Block Group 2 of Census Tract 2131.03), the city of Portsmouth, the Norfolk-Virginia Beach-Newport News MSA, and the Commonwealth of Virginia had increased since the estimates reported in the 1990 Census (Table III-18). The number of residents in poverty increased for the same census tracts, while the numbers decreased for the city of Portsmouth, the MSA, and Commonwealth of Virginia between the 1990 and 2000 Census. The median household income increased for each jurisdiction, with one community (Census Tract 2130.01) showing a greater than $20,000 per year increase. Finally, the unemployment rate increased for each community within the project area (where information is available), the city of Portsmouth, the MSA, and the Commonwealth of Virginia between the 1990 and 2000 Census.

III.1.16 PUBLIC SAFETY

III.1.16.1 Emergency Planning

Emergency planning for the Hampton Roads area is coordinated at Federal, state, and local levels. Region III of the Federal Emergency Management Agency (FEMA) works in partnership with the Commonwealth of Virginia's emergency management agencies to prepare for and respond to disasters. The Virginia Department of Emergency Management (VDEM) is a state agency that works closely with local government emergency managers, other state agencies, voluntary organizations, and Federal

agencies such as the FEMA to ensure a comprehensive, efficient, and effective response to emergencies and disasters throughout Virginia.

HRPDC serves as a resource to support local and regional strategies that will complement existing emergency management programs in cities and counties throughout Hampton Roads. HRPDC has developed a Hampton Roads Emergency Information System and Geographic Information System that allow for the secure sharing of data and plans concerning resources, shelters, hazardous material information, and locations with all emergency operations centers within the region.

The Portsmouth Office of Emergency Management is responsible for the Emergency Preparedness program for the city of Portsmouth. Portsmouth has emergency preparedness plans in place for numerous situations including, hurricanes, family disaster, terrorism, and emergency medical dispatching.

III.1.16.2 Emergency Services

III.1.16.2.1 Fire Protection

Currently, the Portsmouth Fire Department provides fire protection service in the vicinity of the proposed port facility. The Portsmouth Fire Department can mobilize 220 full-time professional firefighters from 9 fire stations with a citywide overall response time of 4 minutes. Portsmouth fire stations are equipped with engine companies, ladder companies, HazMat vehicles, and ambulances. Staffs are trained for fires, HazMat, emergency medical, disaster, and terrorist situations. Station 3 houses the department's hazardous materials team, which is the lead team of the Southside Regional Hazardous Materials Team. Local agreements are in place with the Chesapeake, Norfolk, and Virginia Beach Fire Departments for provision of additional help. Chesapeake has a foam truck, and Norfolk and Virginia Beach have technical rescue teams.

III.1.16.2.2 Law Enforcement

The city of Portsmouth Police Department would be the primary law enforcement agency in the proposed port project area with 250 officers. The Police Department operates several special units within the force including a SWAT Team, Narcotics Unit, Traffic Unit, Animal Control Unit, and Detective Bureau. Through a Mutual Aid Agreement, the Portsmouth Police Department can obtain additional assistance from the cities of Suffolk, Chesapeake, Norfolk, and Virginia Beach. In emergency situations these officers would have concurrent jurisdiction. The city of Norfolk has over 700 officers, Chesapeake has a staff of 466, Virginia Beach has 777 officers, and Suffolk has 139 officers.

Through special legislation that was passed in the late 1970's, VPA formed its own Police Department. VPA Police force consists of 69 sworn, state-certified officers. Port Authority Police are present at all VPA ports 24 hours per day, 7 days per week, and provide law enforcement and security services. Port Authority Police conduct inspections of gate arrivals and departures, as well as meet all arriving ships.

III.1.16.2.3 Emergency Medical Services

Emergency Medical Services (EMS) in the Hampton Roads area are provided by 69 private and public state-licensed EMS agencies. The Tidewater EMS (TEMS) region includes the Eastern Shore (Northampton and Accomack Counties); the South Hampton Roads counties of Isle of Wight and Southampton; and the cities of Chesapeake, Franklin, Portsmouth, Norfolk, Suffolk, and Virginia Beach. Approximately 1 million people reside within the region's 2,700-square-mile area.

The 911-telephone number provides access to EMS. Ground ambulances, supplemented by aircraft and watercraft, provide transportation of personnel and patients. There are over 2,500 highly-trained persons involved in the delivery of EMS in Tidewater. Fifteen hospitals in Hampton Roads are served by TEMS. Severe trauma patients are taken to the Sentara Norfolk General Hospital, the only Level I Trauma Center in the Hampton Roads area. The Sentara Nightingale Regional Air Ambulance serves a 125-mile radius from its base at Sentara Norfolk General Hospital, and the Air Ambulance has the ability to serve 56 hospitals in the region. The Portsmouth Fire Department's Medic 6 Unit provides EMS in the city of Portsmouth. This unit responds to over 200 calls each month.

III.1.16.2.4 Hurricane Evacuation

In 1992, USACE, FEMA, and VDEM conducted the Virginia Hurricane Evacuation Study, resulting in a Technical Data Report containing information valuable to emergency planners and coordinators, and allowing them to effectively respond to a hurricane affecting the Hampton Roads area.

The transportation analysis estimated clearance times and defined the evacuation road network. Clearance times identified for the city of Portsmouth based on the category of hurricane are listed in the following table.

Table III-21. CITY OF PORTSMOUTH HURRICANE CLEARANCE TIMES

Storm category	Type of response	Low seasonal occupancy (hours)	High seasonal occupancy (hours)
1	Rapid	3¼	3¼
	Medium	6¼	6¼
	Slow	9¼	9¼
2-3	Rapid	3¼	3½
	Medium	6¼	6¼
	Slow	9¼	9¼
4	Rapid	5	5½
	Medium	6¼	6½
	Slow	9¼	9¼

The following evacuation routes have been established for the city of Portsmouth:

- Individuals residing north of I-264 are encouraged to use U.S. Route 17 North to Route 258/32 South in Isle of Wight County; and Route 337 West and I-664 North, to U.S. Route 17 North then to Route 10 West toward Smithfield.
- Individuals residing south of I-264 are encouraged to use U.S. Route 58 (Airline Blvd.) to U.S. Route 58/460 West toward Suffolk.

III.1.17 HISTORIC AND ARCHAEOLOGICAL RESOURCES

Cultural resources are prehistoric and historic sites, structures, districts, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. In accordance with Section 106 of the National Historic Preservation Act (16 U.S.C. 470f), the area of potential effect is the geographic area or areas within which an undertaking may cause changes in the character or use of historic properties, if any such properties exist (36 CFR § 800.2).

The NHPA requires that the head of any Federal department or independent agency having authority to license any undertaking shall, prior to the issuance of the license, take into account the effect of the undertaking on any district, site, building, structure, or object that is included in, or eligible for inclusion, in the NRHP (see generally 36 CFR § 800). The National Register is the official Federal list of cultural resources significant to American history and pre-history, architecture, archaeology, engineering, and culture. The National Register includes all prehistoric and historic units of the National Park System, National Historic Landmarks recognized by the Secretary of the Interior, and properties nominated by State Historic Preservation Officers (SHPO's), Federal agencies and others that have been approved for listing by the National Park Service. Only properties included in, or eligible for inclusion in, the NRHP are subject to protection or consideration by a Federal agency.

In Virginia, the Director of the VDHR functions as the SHPO and is responsible for conducting review of projects involving Federal action to assure their compliance with Section 106. The SHPO designates cultural properties as archaeological and architectural resources. Archaeological resources are further categorized as prehistoric and historic sites. Prehistoric sites may date from as early as circa (ca.) 10,000 B.C. to ca. A.D. 1600 and consist of Native American sites; historic sites may date from ca. A.D. 1600 to present. Architectural sites include structures and objects dating back at least 50 years and/or are unique enough to be considered culturally-significant.

There is evidence of Native American occupation in Virginia beginning about 12,000 years ago, and continuing to the present time. The earliest identifiable groups, known as "Paleoindians," apparently lived in groups of extended kin. They pursued a variety of game animals and probably foraged the limited vegetable resources of the boreal forest. During this period, the climate was sub-arctic because of the advance of continental glaciers. The glaciers tied up a significant portion of the world's water budget, and, as a result, sea level was about 100 meters lower than at present. The shoreline of the Atlantic Ocean was well to the east, near the edge of the continental shelf. The Susquehanna River, carrying totally

freshwater, flowed east through the area of what is now the Chesapeake Bay; its tributaries, the Potomac, York, James and Elizabeth Rivers, were also freshwater rivers.

From this point, sea level rose fairly rapidly until about 6,000 years ago, drowning the fresh water rivers and creating the complex estuary called the Chesapeake Bay. At that time sea level was 6 or 7 meters below the present level. The climate had also warmed considerably as the glaciers retreated, creating a new set of environmental conditions to which the Native Americans adapted by exploiting new food resources, including the abundant shellfish and finfish of the estuaries. This resulted in changes in the material culture, which are also reflected in the archaeological record, and the beginning of the period known as the Archaic. Because sea level was still lower than at present, the people of that era may have been living and exploiting estuarine resources on banks of the estuary that are now fully submerged. This creates the possibility that there may be submerged prehistoric archaeological sites below the water line along the Elizabeth River.

From Archaic times forward the rate of sea level rise slowed, and the climate stabilized somewhat. Native American populations grew and expanded their food-getting activities. By about 3,000 years ago, they were making pottery, and by about 1,000 years ago, they had begun to cultivate plants such as corn and squash. They continued to use the rich resources of the Chesapeake Bay and may have engaged in a seasonal movement from the shoreline to the interior. This period is known as the Woodland period. There are numerous terrestrial prehistoric sites in the vicinity of the study area from the Archaic and Woodland periods that clearly indicate the presence of Native Americans during these time periods, but a portion of the living and exploitation patterns may be located below the present water level of the estuaries.

The first permanent European settlement in the southeastern Virginia region did not take place until 1607 with the English settlement at Jamestown. From this settlement the English colonists spread throughout the Chesapeake Bay area, particularly along the rivers and close to the mouth of the Bay. Tobacco was introduced into the colony about 1612 and quickly became the colony's main export crop. The emphasis on tobacco tended to keep the colony from growing other crops or developing additional major industries.

Shipbuilding in Virginia began in the 1620's with the construction of small vessels for trade along the rivers and the Chesapeake Bay. The General Assembly offered various incentives to encourage the colonists to build larger vessels that would make the colony less dependent on British vessels. Ferryboats began to be constructed to serve the demand for public transportation across several waterways. One of the earliest was a ferry between Norfolk and Portsmouth constructed in 1636 and operated as a private enterprise by Adam Thoroughgood.

By 1728, Norfolk, which was officially established in 1705, had already become a significant port. Shipbuilding began to be a more important part of Virginia's economy in this century, and Norfolk shipyards were the leading shipbuilders in the colony. Between 1763 and 1774, the Norfolk shipyards built approximately 180 vessels, which consisted of sloops, schooners, ships, brigs, and snows. In 1767,

the Gosport Navy Shipyard was built in Portsmouth and quickly began an important industry for that city, which had been founded in 1752.

Despite the ships that were being constructed in the Virginia shipyards, the U.S. had a very small navy compared to the British navy when the Revolutionary War started. The British also dominated the trade routes from the Chesapeake Bay southward. The British used its navy to choke American commerce and trade, putting great pressure on colonial maritime activity. The Chesapeake Bay region was the choke point between Cape Charles and Cape Henry. In 1776, the British burned Norfolk, almost totally destroying it. In response to this action and others at the beginning of the war, the Continental Congress and various colonial governments established naval forces and enlisted the help of privateers to harass British shipping. The naval actions that occurred in Virginia's waters resulted in numerous combat losses as well as intentional sinkings in order to create obstructions or prevent vessels from falling into enemy hands. Although the British Navy could not be defeated by the colonial forces alone, these forces did succeed in harassing British shipping and intercepting supplies intended for the British Army. However, when the French forces and their fleet came to the aid of the U.S., the war finally came to an end in 1781 at Yorktown.

Because of its strategic location, the Hampton Roads area again became directly involved in the hostilities when the War of 1812 broke out. The British objectives of controlling the Chesapeake Bay and restricting the area's waterborne transportation and trade were similar to those of the Revolution. The British succeeded in blockading the bay, severely reducing the region's commerce. In 1813 they attacked Craney Island in order to establish a position from which to attack the Gosport Navy Yard, to attack the towns of the area, and to capture or destroy the U.S.S. *Constellation*, which lay at anchor in the Southern Branch of the Elizabeth River. This initial attack failed, and shortly thereafter the British attacked Newport News and Hampton, where they committed a number of atrocities. Both Fort Monroe and Fort Wool were built in the following years to enhance the defense of these cities.

The growth of the region accelerated after the War of 1812. Shipping from all of the bay ports increased, and the growth of Baltimore at the northern end of the bay increased traffic. Steamboats were introduced in the Norfolk area after War of 1812 and gradually replaced sailing ships for both passengers and freight. After the 1820's steamboat service rapidly expanded along the bay. It was in this time period also that railways were introduced to the area. During the 1850's an extensive railway network was developed throughout the state, which continued to expand after the Civil War, helping to fuel the area's growth in the late 19th century.

The Hampton Roads area again became a battleground during the Civil War. Federal forces attempted to destroy the Gosport Navy Yard before abandoning it to the Confederates, but were not completely successful in their attempt. The Confederates raised four former Union vessels and began to convert the *Merrimack* into an ironclad. In March 1862 the famous battle between the C.S.S. *Virginia* (formerly *Merrimack*) and the U.S.S. *Monitor* took place in the Hampton Roads Harbor. In May 1862 the Confederates evacuated from Norfolk and burned the *Virginia* to avoid its capture by the Union forces. Although the Confederate evacuation of Hampton Roads ended the open confrontations between the two

sides, Hampton Roads remained a base for Union forces conducting operations against Confederate forces on the upper James River.

Although the region's economy was devastated by the Civil War, the region experienced a slow but steady recovery. The growth of the inland coal industry stimulated shipbuilding, which expanded to meet the increased demand for cargo vessels needed to transport coal. Other industries grew as a direct result of the coal industry, manufacturing everything needed to bring coal from the mountains to the shipping terminals.

The growth of the military also contributed to the overall area's growth at the end of the 19th century. Between 1889 and 1892 the country's first battleship was built at the Norfolk Navy Yard at Gosport, and between 1919 and 1922 the aircraft carrier U.S.S. *Langley* was built there. In 1917, the U.S. Navy established a major base in Norfolk, and throughout the two World Wars the region grew because of this military connection.

Within the past 20 years there have been several investigations of areas within the Hampton Roads harbor for the presence of historical resources. While it is likely that there are intact prehistoric archaeological sites in submerged areas along the former freshwater drainages such as the Elizabeth River, the methods and techniques of underwater archaeology are not now sufficiently refined to easily identify these resources. In July 1986, personnel from the Norfolk District conducted a remote sensing survey in the vicinity of the CIDMMA that resulted in the identification of three targets for further investigation. These targets were later identified as modern ferrous debris. In 1989, the Norfolk District conducted remote sensing surveys in the areas immediately to the north and to the west of CIDMMA as part of the Norfolk Harbor and Channels Long-Term Dredged Material Management Study. This survey covered the areas to the north and west of CIDMMA, which were under consideration in this study as options for an expanded CIDMMA. The survey found over 300 targets, none of which were identified as being culturally significant or requiring additional investigation. An investigation for the Hampton Roads Naval Museum resulted in the identification of the sites where the remains of three vessels associated with the Civil War are located, specifically the U.S.S. *Cumberland,* C.S.S. *Florida,* and C.S.S. *Virginia*, (Watts, 1987). In 1999, a remote sensing survey of several potential alignments for a third crossing of the Hampton Roads waterway was carried out (Cox, 1999). This survey found 78 targets, 30 of which were classified as potential cultural resources. No additional investigations of these targets have been done to date.

Since the area to the east of CIDMMA had not been surveyed previously for the presence of cultural resources, a remote sensing survey of this area was carried out as part of the current study. This survey, which took place in September 2000 under contract to Pan-American Consultants, Inc., resulted in the identification of over 400 anomalies. However, none of these targets was considered potentially significant in terms of historic resources, and, thus, no further work was recommended. The reports that resulted from this work have been coordinated with VHDR.

VDHR was consulted regarding the location of previously-recorded archaeological and architectural resources within the project area and within a 1-mile radius of the project site (VDHR, March 2002;

VDHR correspondence included in appendices). No archaeological or architectural historic resources were identified within the proposed port facility footprint. Also, no archaeological sites were identified within the 1-mile radius of the proposed port facility.

Several architectural resources were identified within a 1-mile radius of the proposed port facility. The architectural resources identified by VDHR include three sites in the City of Norfolk: Maritime Terminals Nos. 6, 7, and 8 at the Norfolk Naval Base; the Norfolk and Western Grain Elevator Complex located at the Sewells Point Terminal, just south of the Norfolk Naval Base; and Norfolk International Terminals. The Norfolk and Western Grain Elevator Complex was constructed in the early 1920's and consisted of a large grain elevator or "headhouse," a gantry, silos, railroad tracts, pier and warehouses. The Sewells Point Terminal is typical of industrial construction during this time and does not possess significant design associations that would meet Criterion C of the eligibility criteria for inclusion on the National Register of Historic Places (VDHR, June 2001). Other architectural resources identified within a one-mile radius of the project site include the following sites located in the City of Portsmouth, just south of the project area: Craney Island Fuel Terminal in the Norfolk Harbor and five buildings located on the Craney Island Naval Fuel Depot. According to VDHR, none of these sites appear to have been evaluated for eligibility for inclusion on the National Register of Historic Places (VDHR, March 2002). The sites are surrounded by naval and industrial development to include Naval Station Norfolk, Norfolk International Terminals, Portsmouth Marine Terminal, Lambert's Point Coal Terminals, and the U.S. Naval Supply Center. Most of these architectural resources are currently used to support industrial or military activities.

III.1.18 SECONDARY GROWTH

III.1.18.1 Population Growth

During the 1980's and 1990's, the population of the city of Portsmouth continued to decline from 104,577 in 1980 to 100,565 in 2000 (see Table III-21). This moderate decline in population, averaging -0.3 percent per year in the 1990's, contrasts with a 0.8 percent average annual increase in population in the entire Hampton Roads region. This negative population growth in Portsmouth and other central cities such as Norfolk has been attributed, to some extent, to out-migration. Within the region, the population movement has been away from the central cities to the fast-growing suburbs of Chesapeake, Suffolk, and Isle of Wight County on the Southside, and to James City County and York County on the Lower Peninsula.

Forecasts from HRPDC indicate that the region's population and employment growth will be slower in the future, as diminished military spending and employment reduce growth in per capita income. The most recent population projections for the region are included in the CMS Conformity Determination report for the Hampton Roads Ozone Maintenance Area. This report includes population projections for the years 2005, 2011, and 2021. HRPDC developed the socioeconomic information used in the conformity analysis using the REMI model. The REMI model was used to forecast control totals, which the HRPDC then allocated to the local level, and these allocations were then reviewed by each locality and adjusted as appropriate.

The results of the forecasted population growth are presented in the Table III-22 and illustrated in Figure III-21. As shown in the previous table, the population of Portsmouth is projected to decline between the years 2000 and 2011. An increase in Portsmouth's population is projected between the years 2011 and 2021; however, the population projected for the year 2021 is less than both the anticipated population in the year 2005 and 2000 population of 100,565.

Table III-22. HAMPTON ROADS POPULATION GROWTH

	CENSUS POPULATION			GROWTH (%)	
Locality	1980	1990	2000	1980 - 1990	1990 - 2000
Chesapeake	114,486	151,982	199,184	32.8	31.1
Norfolk	266,979	261,250	234,403	-2.1	-10.3
Portsmouth	104,577	103,910	100,565	-0.6	-3.2
Suffolk	47,621	52,143	63,667	9.5	22.1
Virginia Beach	262,199	393,089	425,257	49.9	8.2
Hampton	122,617	133,811	146,437	9.1	9.4
James City County	22,239	34,970	48,102	57.2	37.6
Newport News	144,903	171,439	180,150	18.3	5.1
Poquoson	8,726	11,005	11,566	26.1	5.1
Williamsburg	10,294	11,409	11,998	10.8	5.2
York County	35,463	42,434	56,297	19.7	32.7
TOTAL	1,140,104	1,367,442	1,477,626	19.9	8.1

Source: HRPDC, 2001.

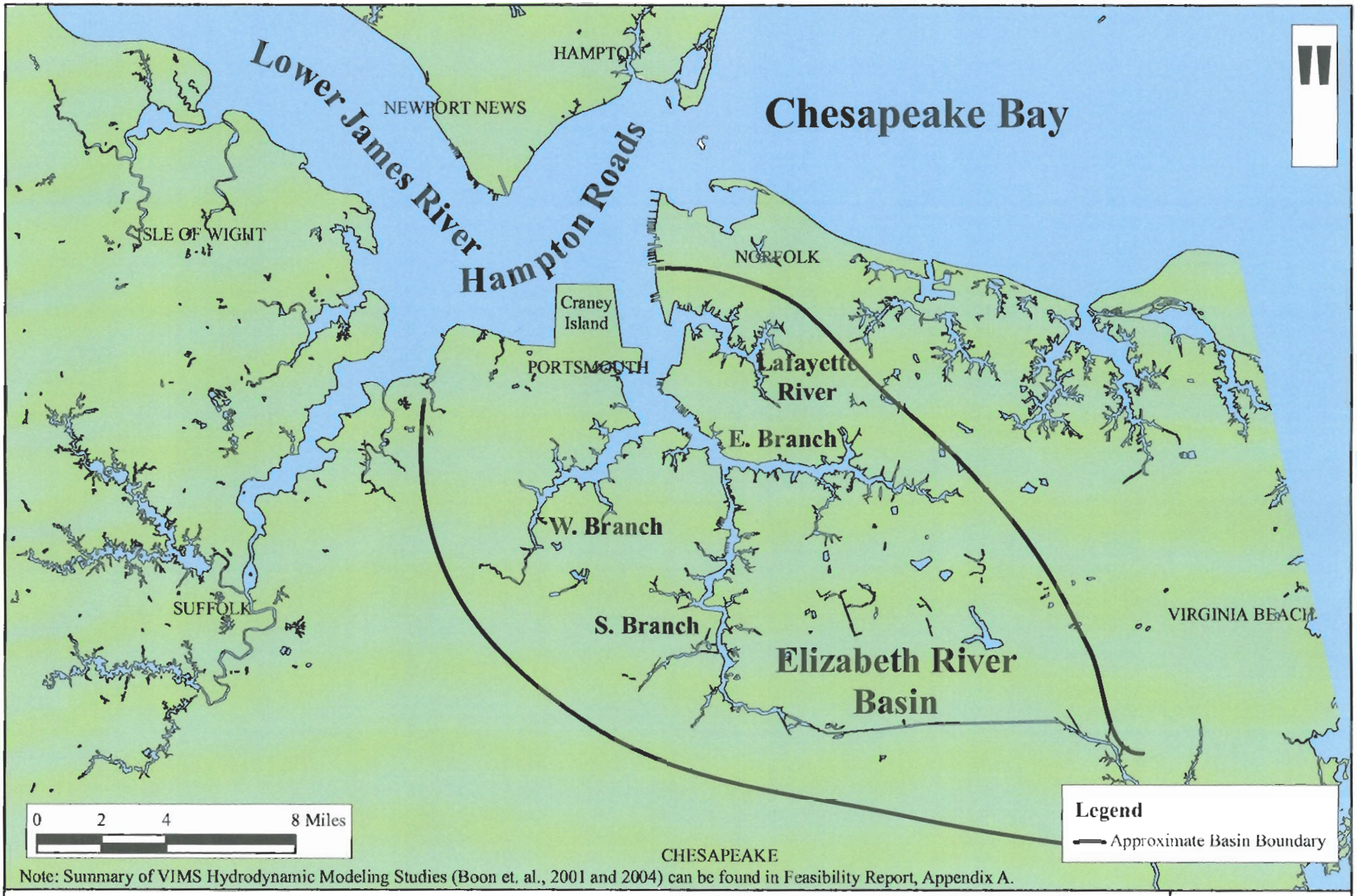
Table III-23. FORECASTED POPULATION GROWTH

Locality	2000	2005	2011	2021
Chesapeake	199,184	211,686	235,600	251,600
Norfolk	234,403	236,489	226,600	227,700
Portsmouth	100,565	99,187	97,300	98,500
Suffolk	63,667	72,442	80,300	95,300
Virginia Beach	425,257	450,046	472,900	498,700
Hampton	146,437	138,583	140,500	145,700
James City Co.	48,102	55,242	63,400	72,700
Newport News	180,150	188,082	195,300	211,000
Poquoson	11,566	13,645	14,700	15,900
Williamsburg	11,998	13,081	13,700	14,600
York County	56,297	57,118	63,000	70,500
Total	1,477,626	1,535,601	1,603,300	1,702,200

Note: Data for 2000 is from the 2001 HRPDC Economic Outlook; data for 2005 was provided by the HRPDC in April 2002 and represents an update of data in the Conformity Documentation; data for 2011 and 2021 is from the Conformity Documentation.

Source: CMS Conformity Documentation, Appendix B-1, HRPDC, 2001; HRPDC, 2002.

Figures



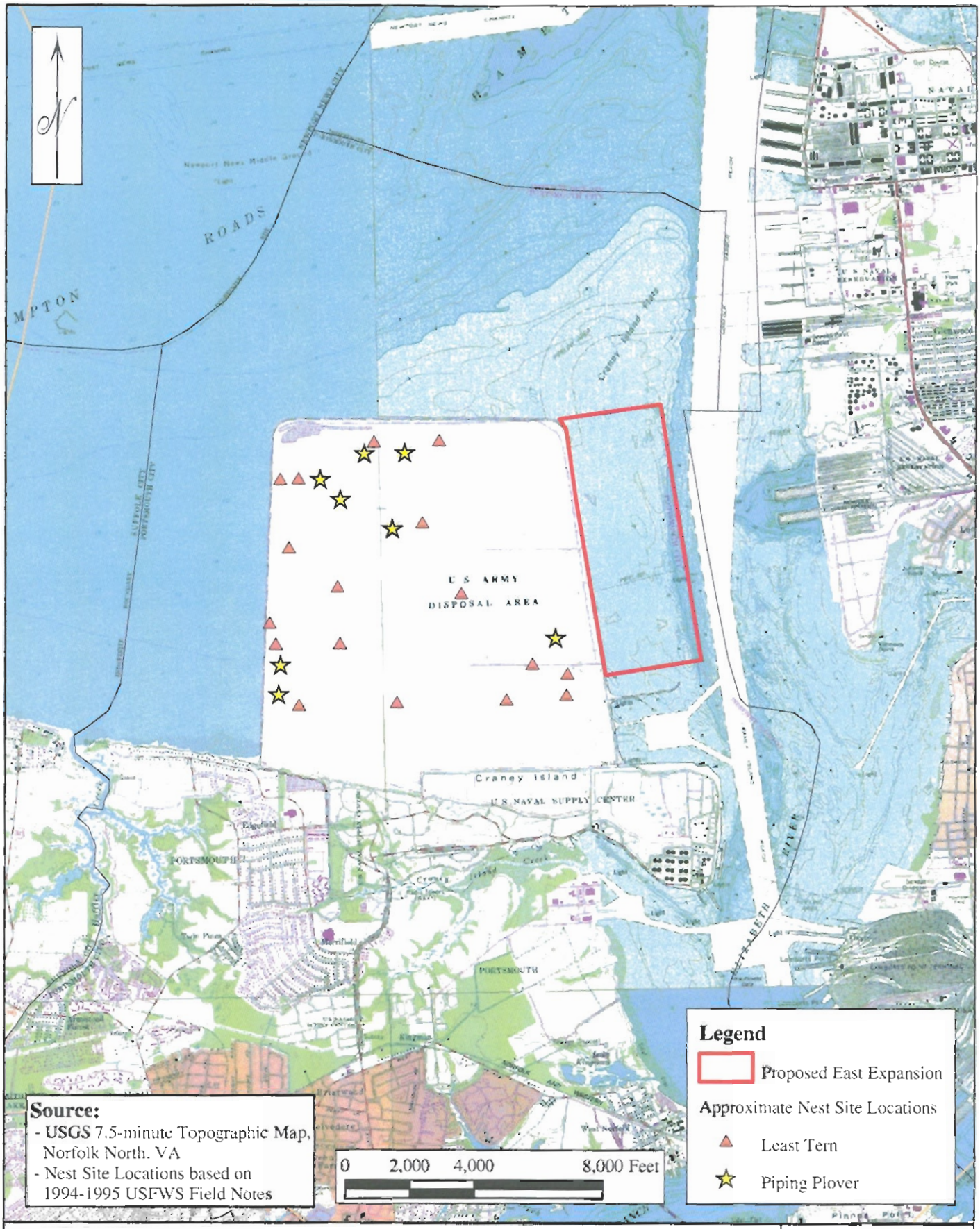
Note: Summary of VIMS Hydrodynamic Modeling Studies (Boon et. al., 2001 and 2004) can be found in Feasibility Report, Appendix A.

THE ELIZABETH RIVER BASIN

Figure III-1

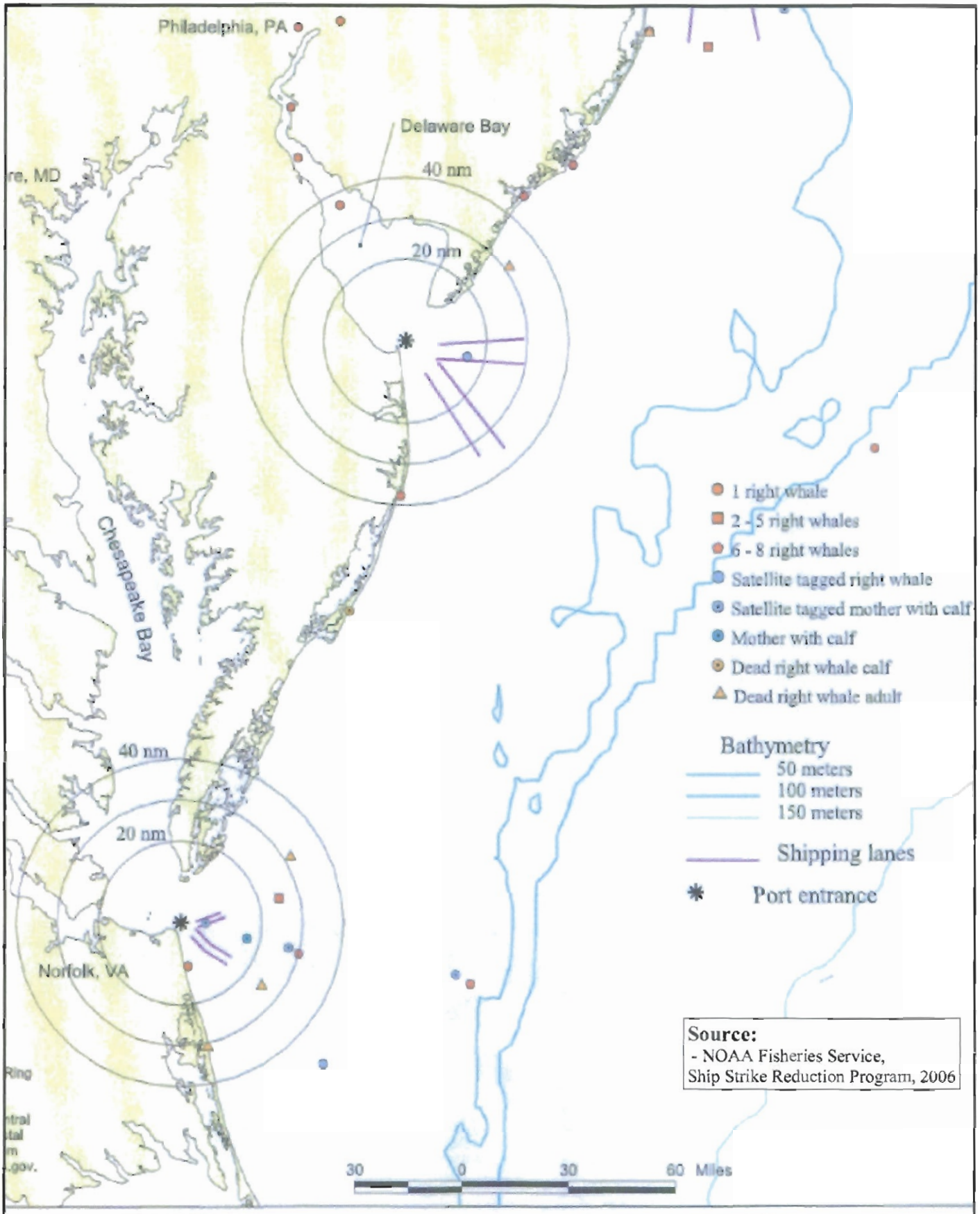
HAMPTON ROADS
OZONE NON-ATTAINMENT AREA

Figure III-2



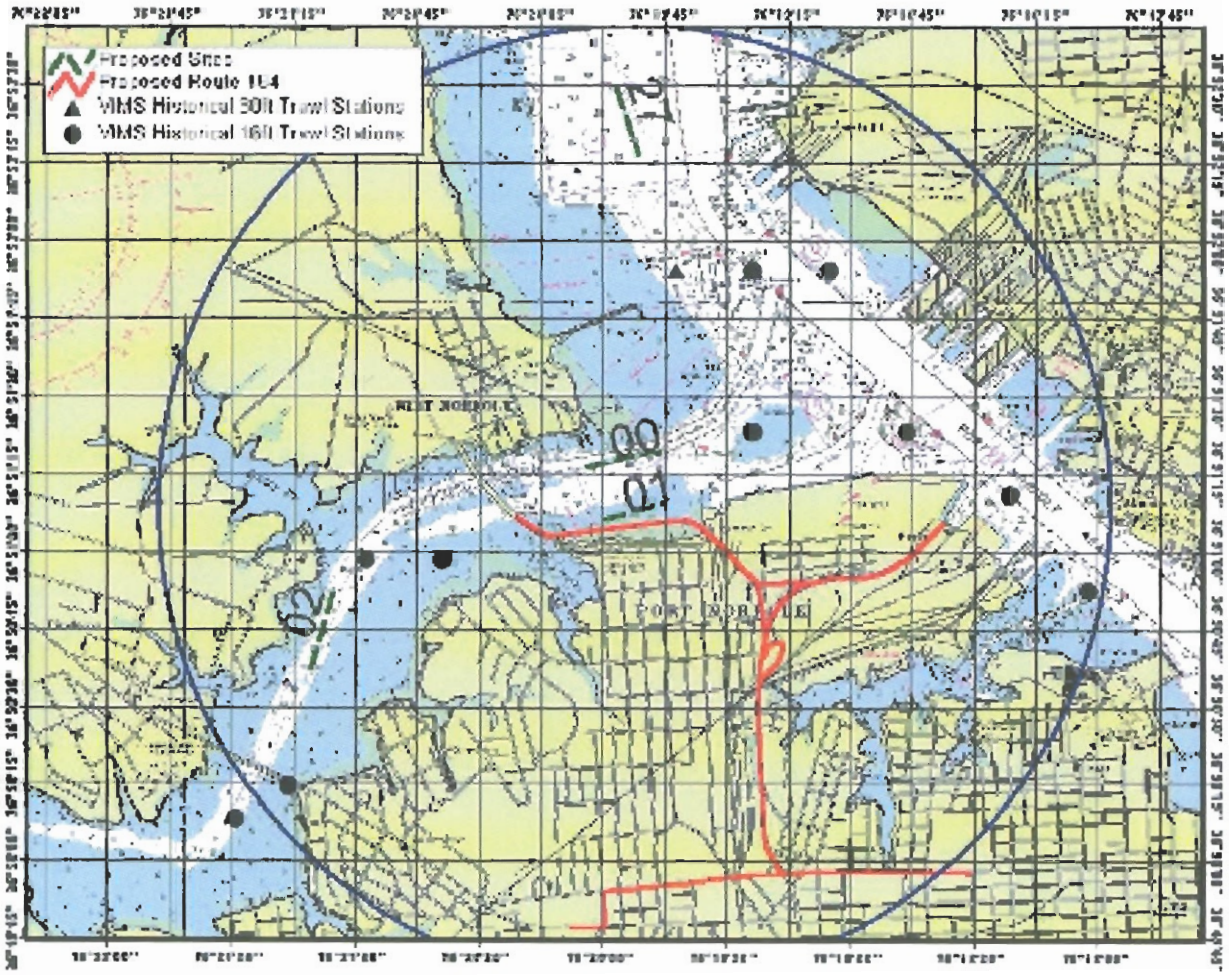
PIPING PLOVER AND LEAST TERN NEST SITES

Figure III-3



MID-ATLANTIC RIGHT WHALE SIGHTINGS

Figure III-4

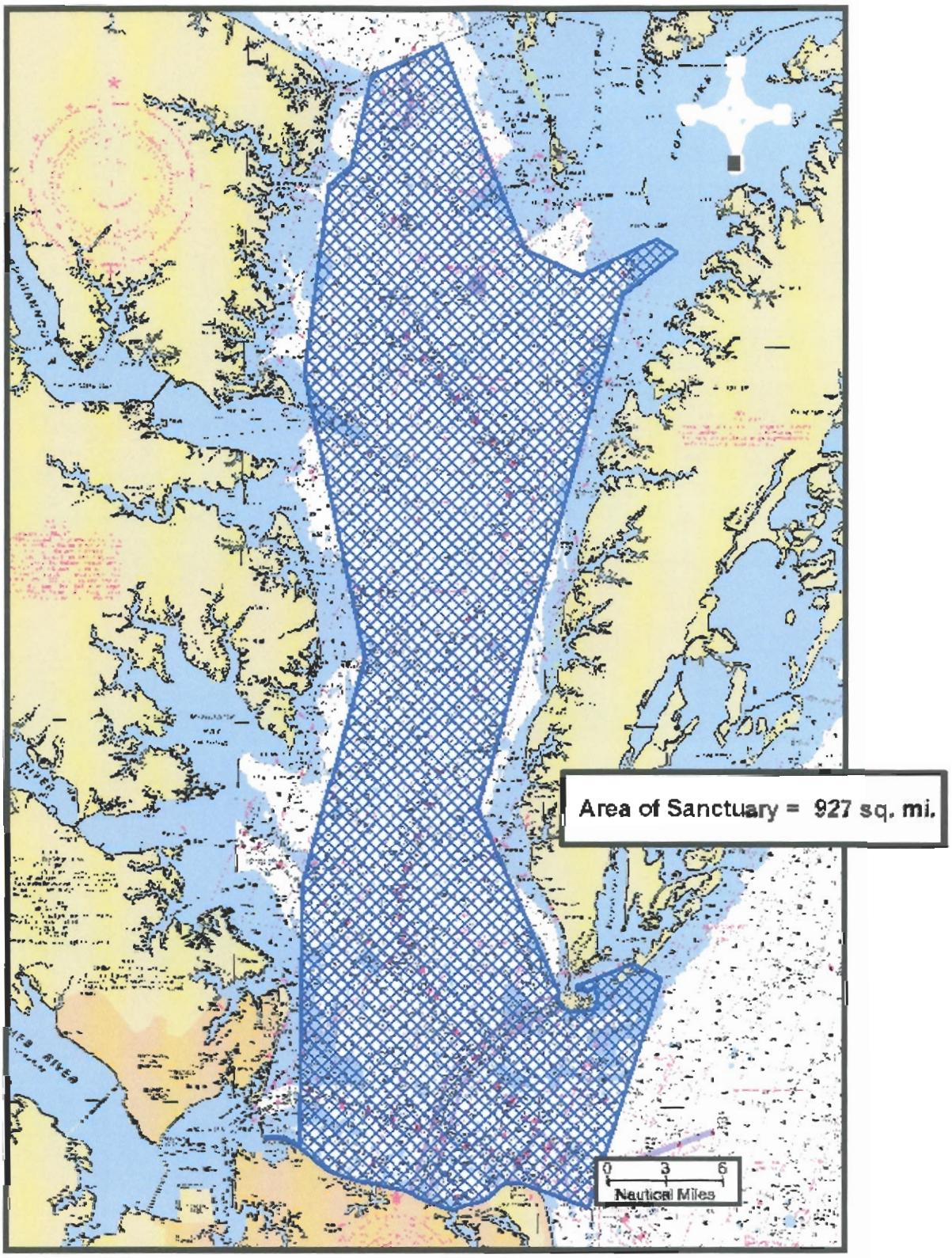


Source:
- Essential Fish Habitat Assessment for the Route 164 Pinners Point Connector, Patrick Geer, VIMS, 2000

TRAWL LOCATIONS AROUND ROUTE I-64 CONNECTOR

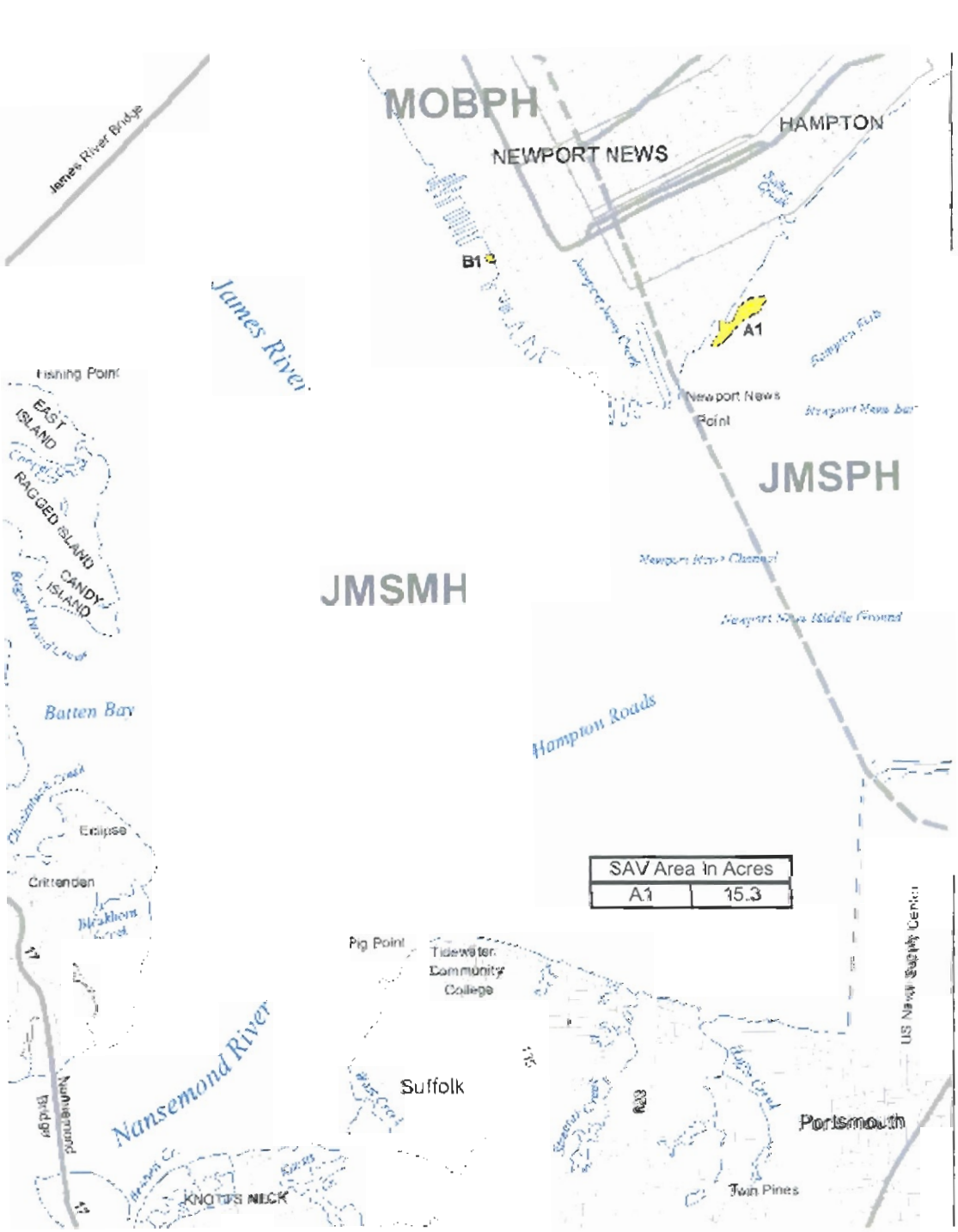
Figure III-5

Commercial and recreational crabbing prohibited in sanctuary
from June 1 - September 15



VIRGINIA BLUE CRAB SANCTUARY

Figure III-6



Hectares of SAV: 12.16
Date Flown: 6/21/10/07

1,000 0 1,000 2,000 Meters

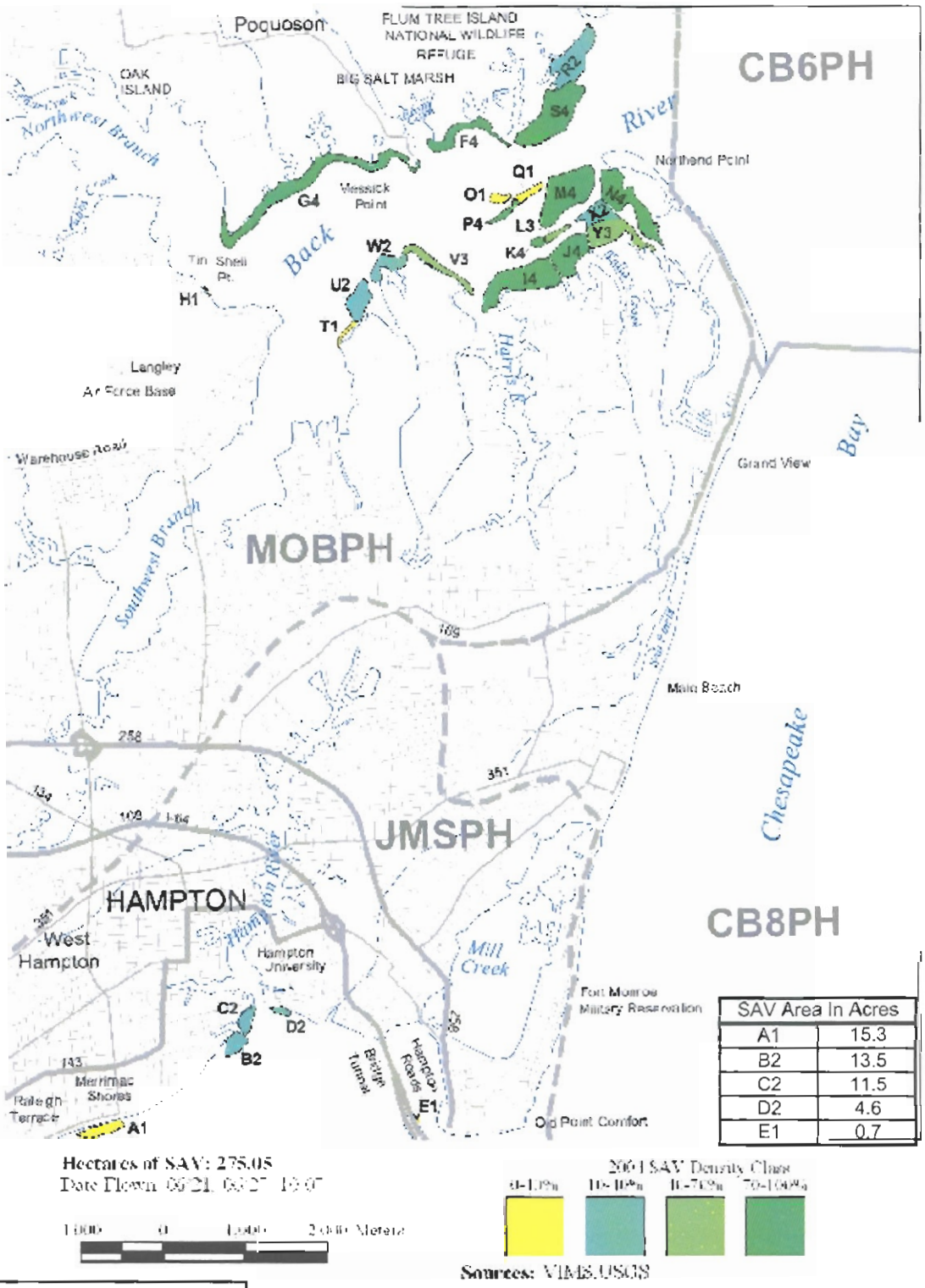
2004 SAV Density Class
0-10% 0-40% 40-70% 70-100%

Sources: VIMS USGS

Source:
- USGS 7.5-minute Topographic Quad, Newport News, South

SUBMERGED AQUATIC VEGETATION 2004

Figure III-7

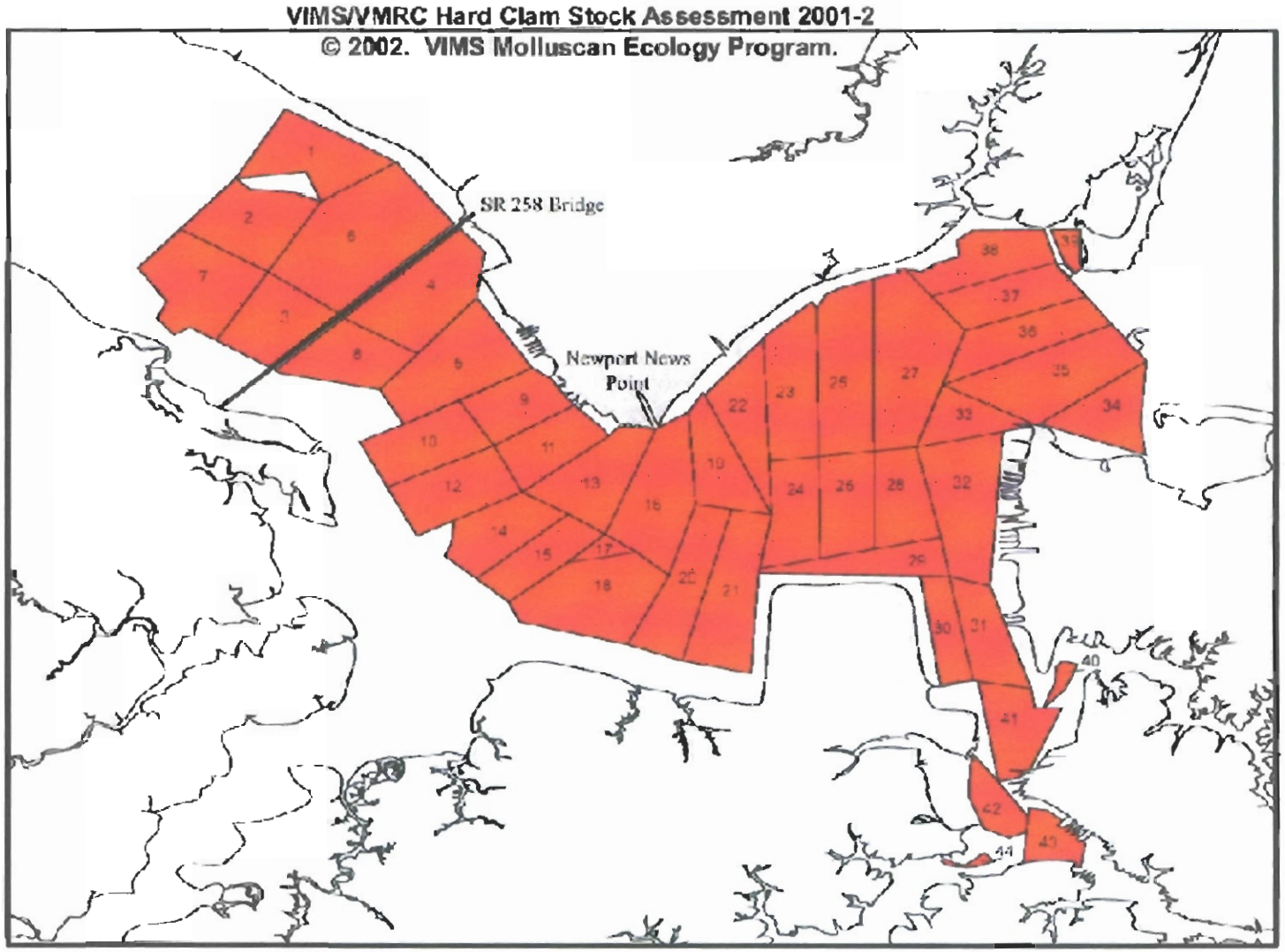


SAV Area In Acres	
A1	15.3
B2	13.5
C2	11.5
D2	4.6
E1	0.7

Source:
- USGS 7.5-minute Topographic Quad, Hampton, VA

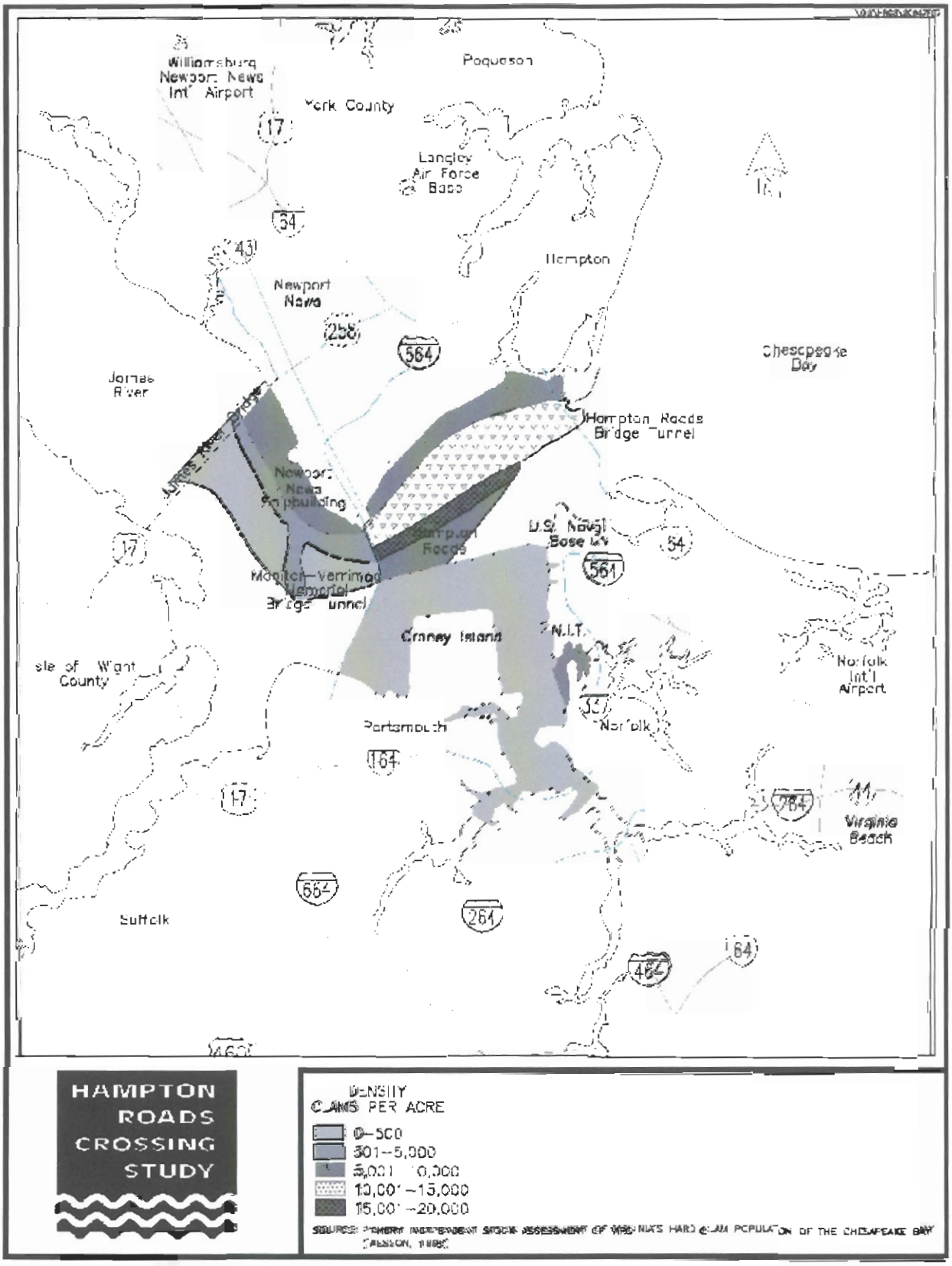
SUBMERGED AQUATIC VEGETATION 2004

Figure III-8



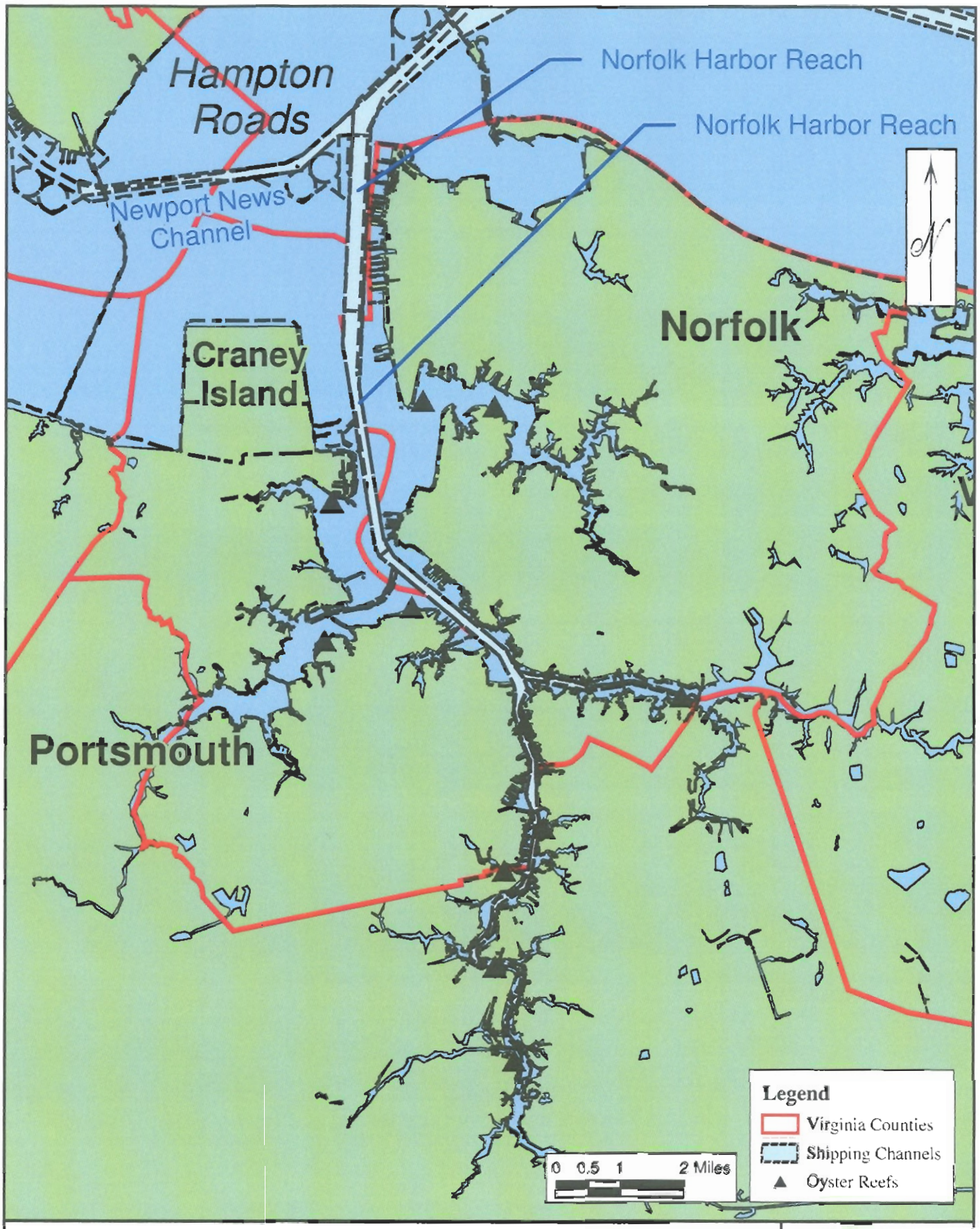
HARD CLAM STOCK ASSESSMENT

Figure III-9



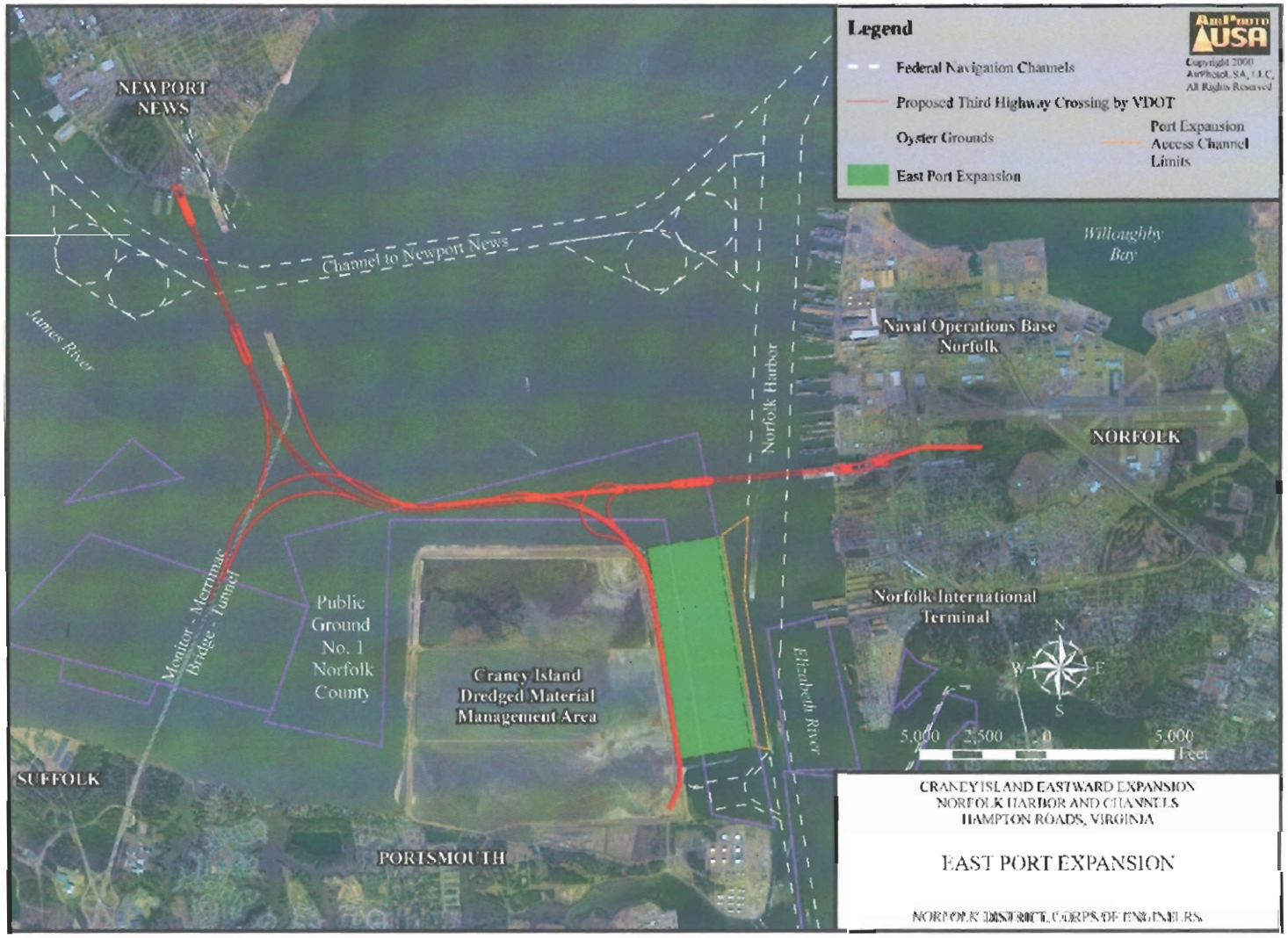
POPULATION DENSITIES OF HARD CLAMS

Figure III-10



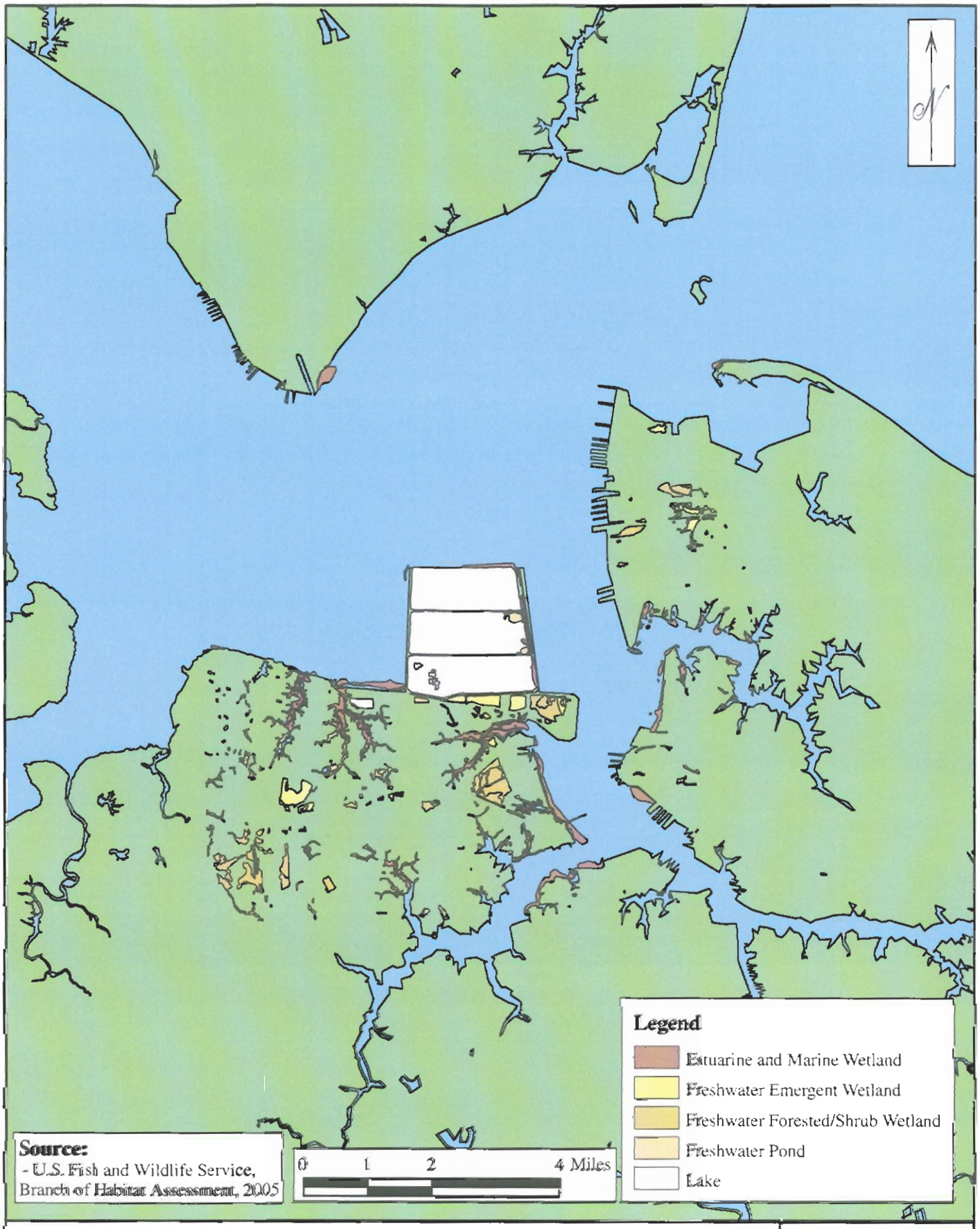
ELIZABETH RIVER OYSTER REEFS

Figure III-11



PUBLIC OYSTER GROUND NUMBER 1

Figure III-12

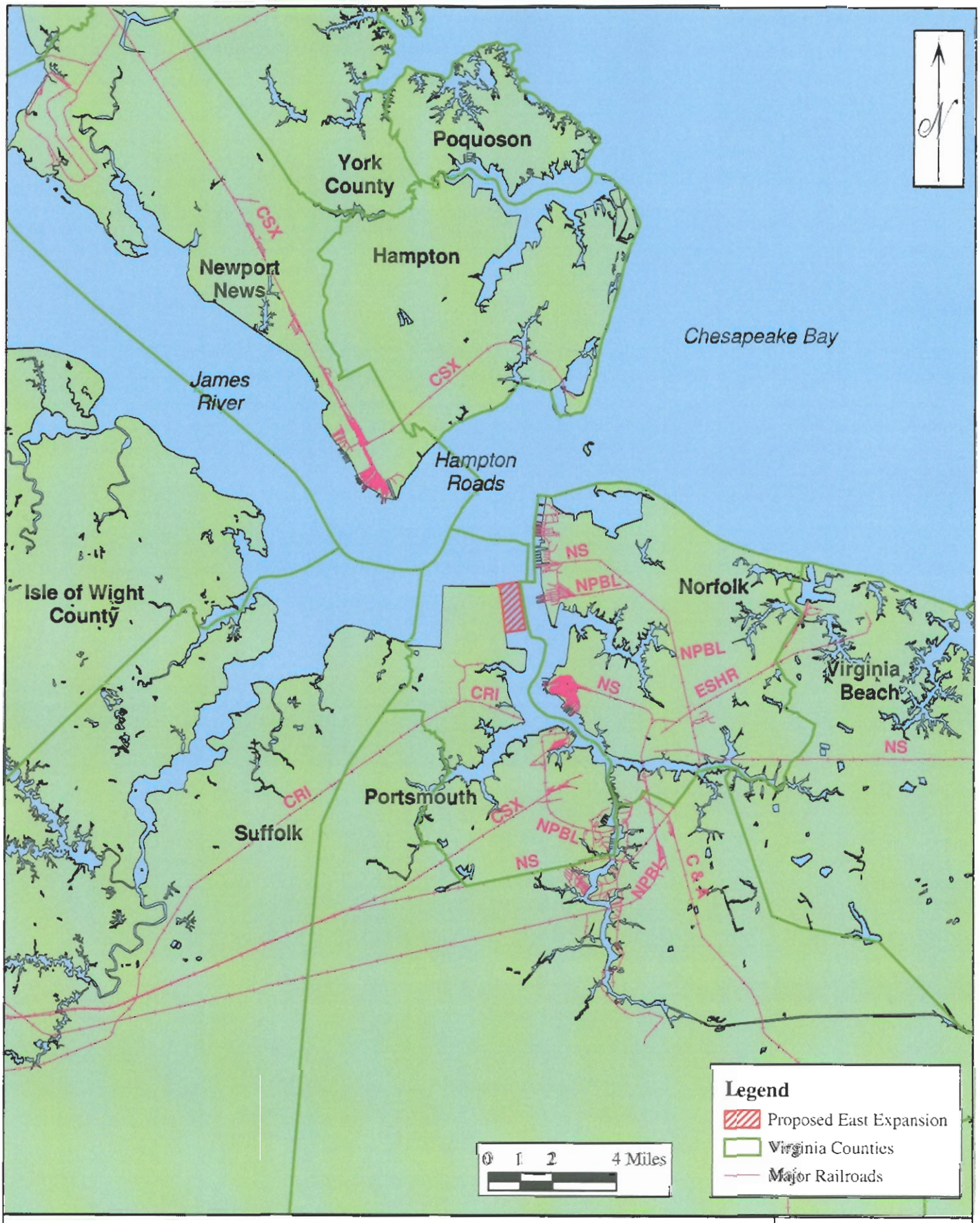


NATIONAL WETLANDS INVENTORY MAP

Figure III-13

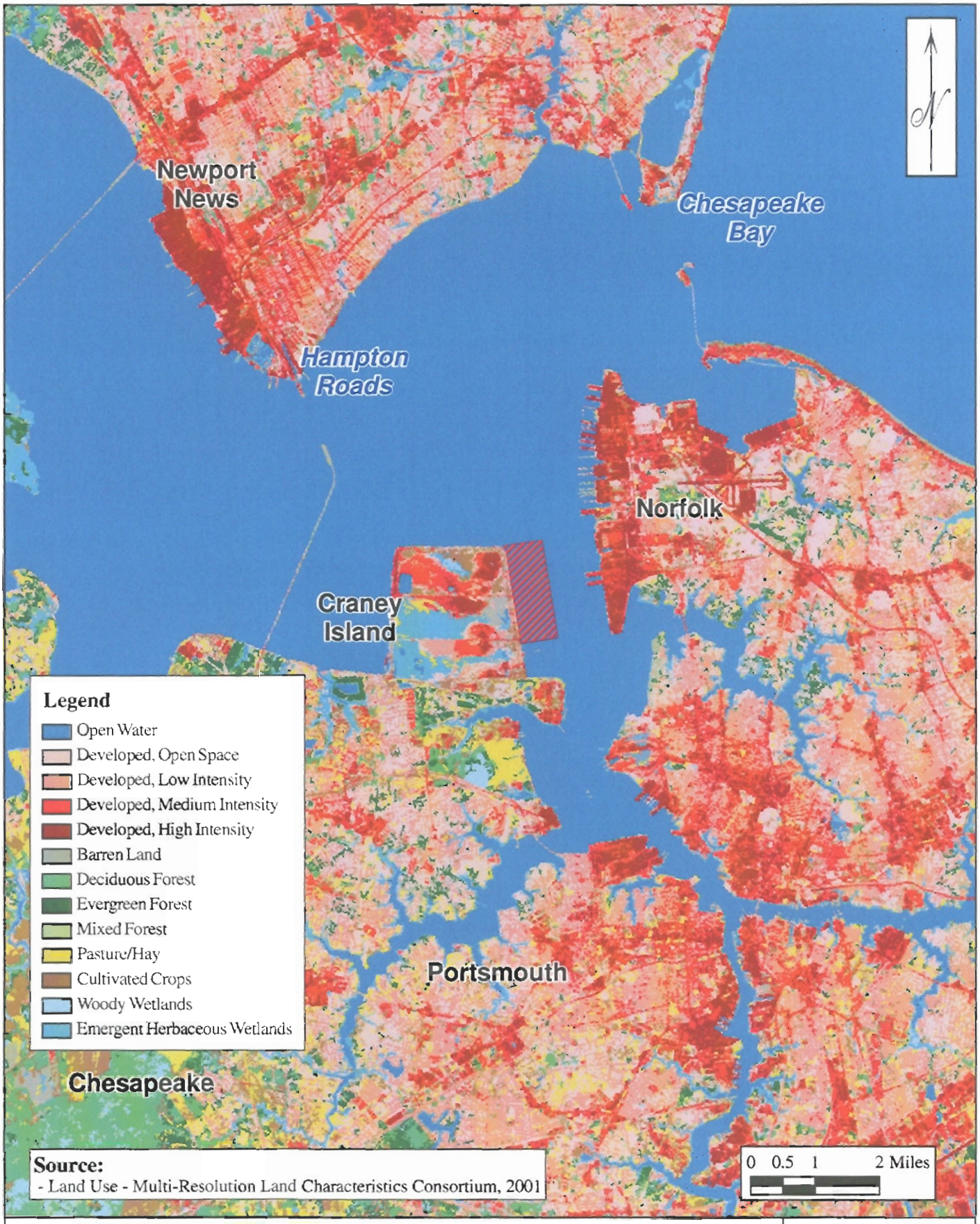
MAJOR HIGHWAYS

Figure III-14



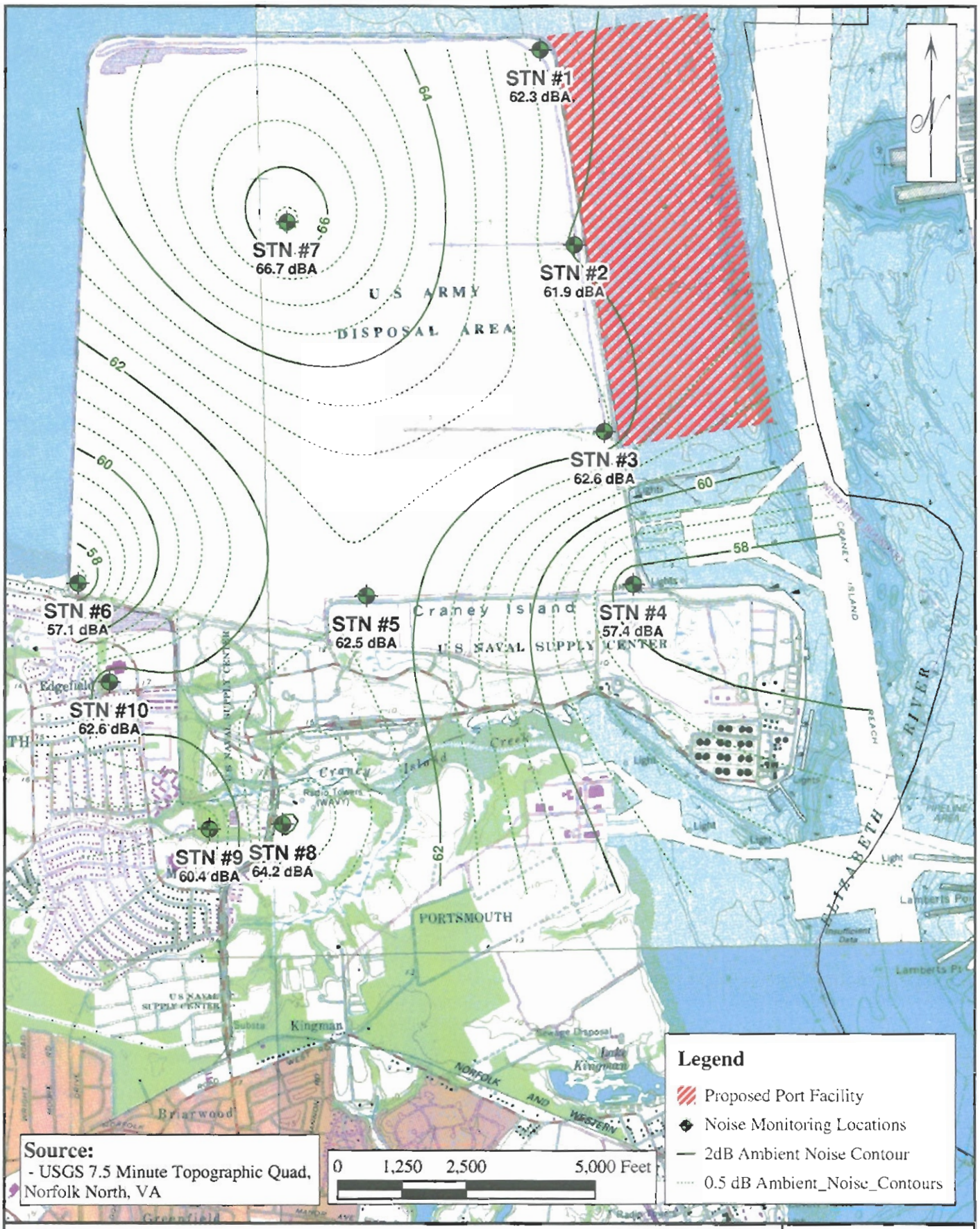
MAJOR RAILROADS

Figure III-15



LAND USE MAP

Figure III-16

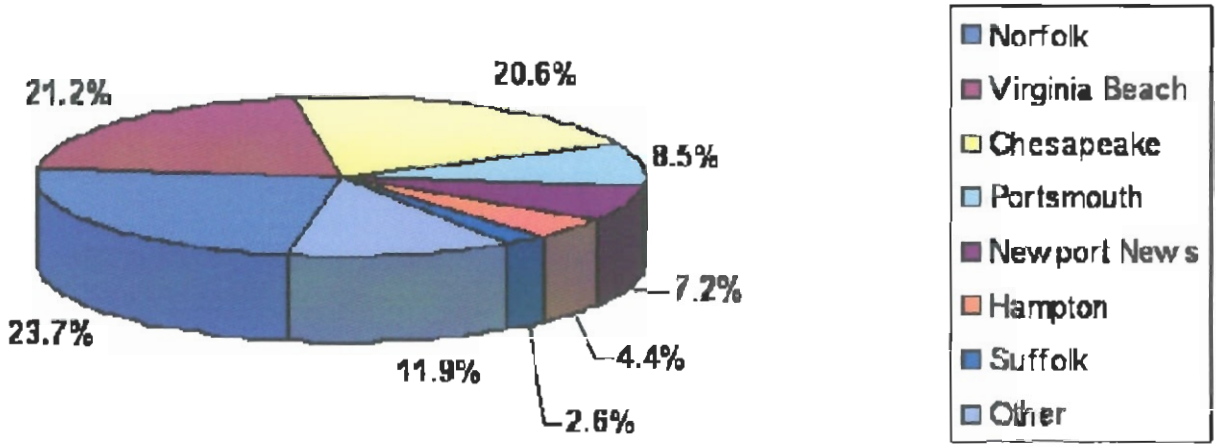


AMBIENT NOISE MONITORING LOCATIONS AND RESULTS

Figure III-17

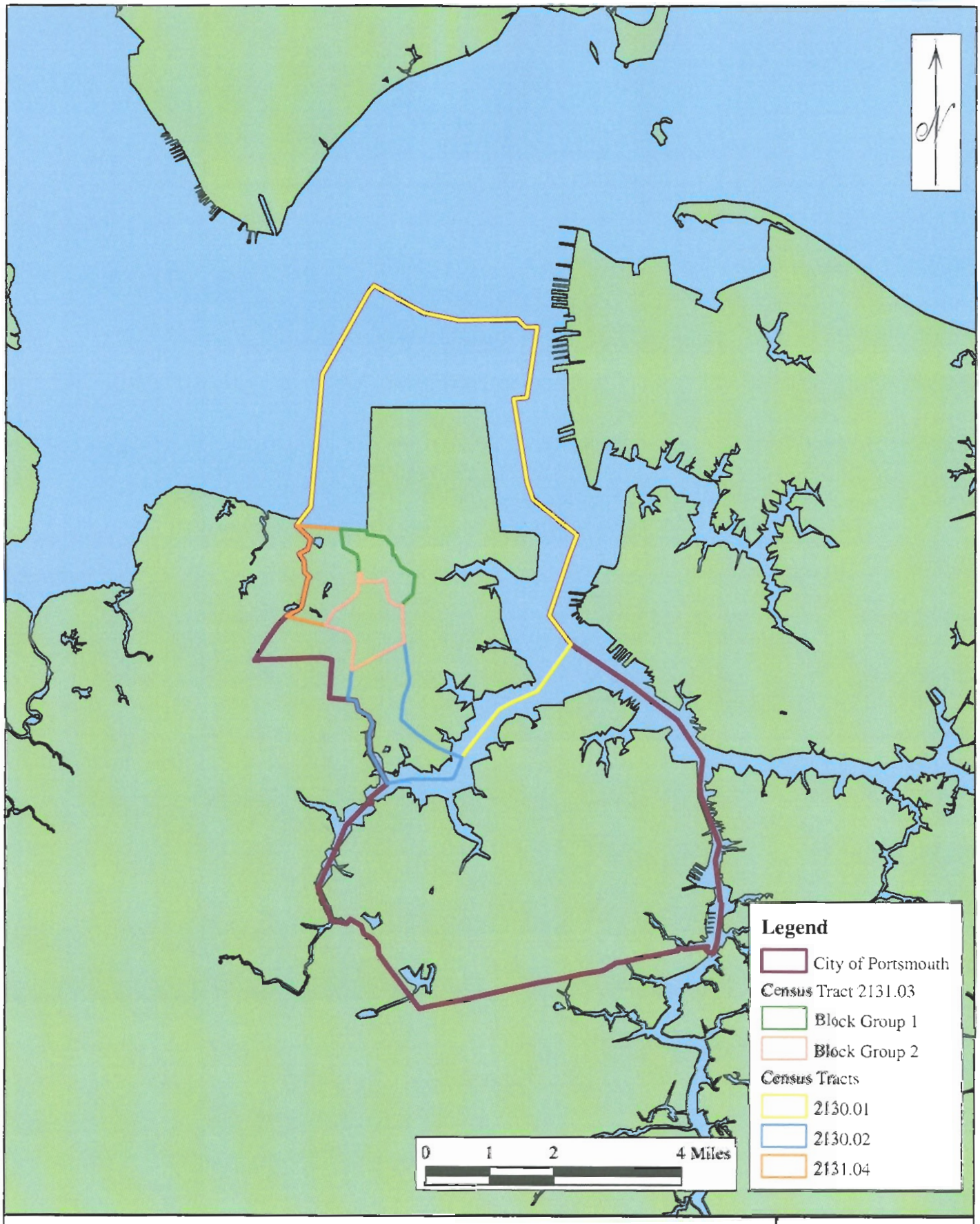
CONDEMNED SHELLFISH AREA NO. 7

Figure III-18



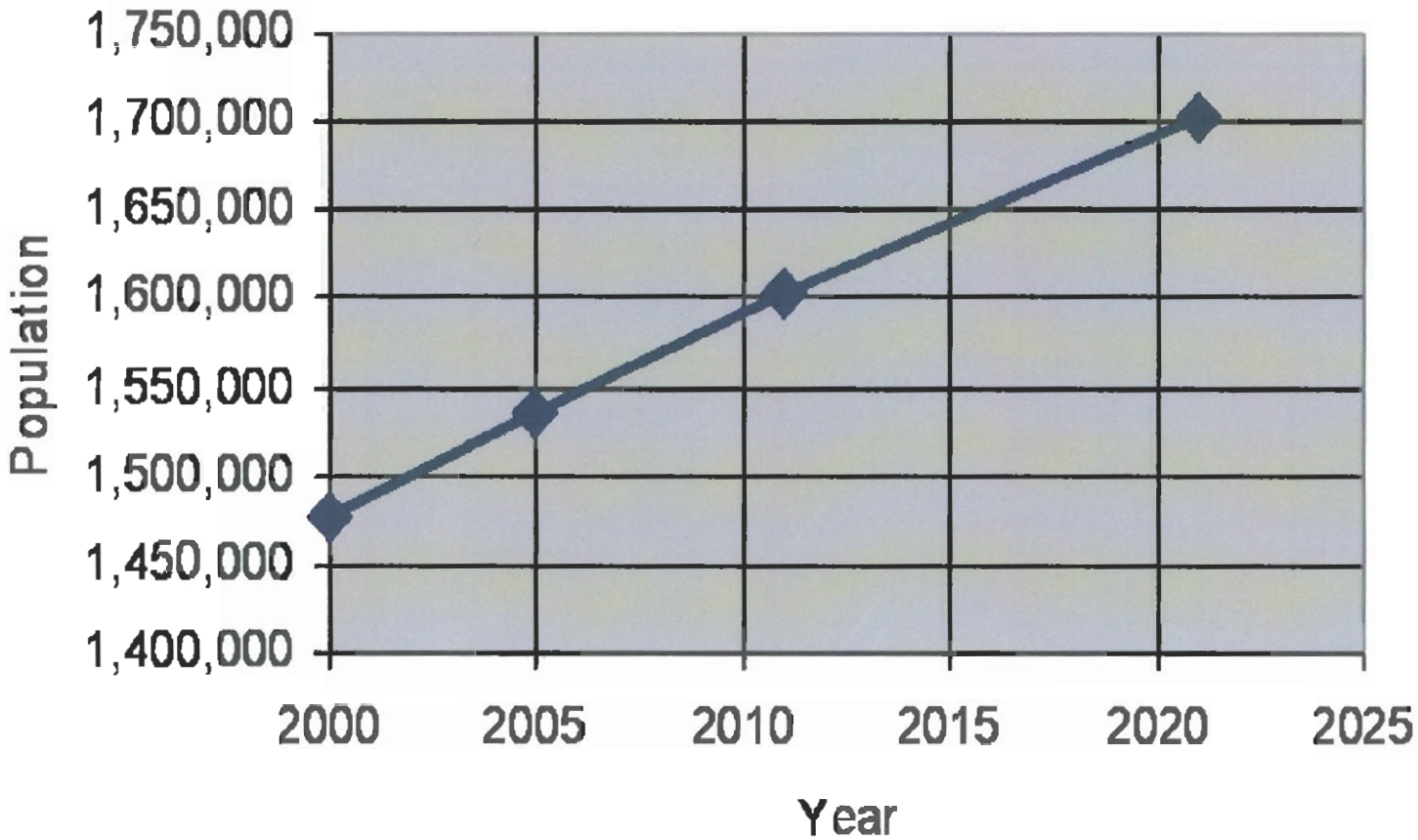
WORK FORCE POPULATION BY LOCATION

Figure III-19



ENVIRONMENTAL JUSTICE

Figure III-20



HAMPTON ROADS FORECASTED POPULATION GROWTH

Figure III-21

Environmental Consequences

ENVIRONMENTAL CONSEQUENCES

This section of the EIS evaluates the environmental impacts of the Recommended Plan, an eastward expansion of the CIDMMA and port development on the constructed cell. Environmental impacts include direct impacts, which are caused by the action and occur at the same time and place, and indirect impacts, which are caused by the action and are later in time, but are still reasonably foreseeable (40 CFR 1508). The environmental consequences related to port development and operation are also addressed although, at this time, specific design details of the proposed port facilities have not been developed. Cumulative impacts are also addressed in this section.

As required by Section 102(2)(C) of the NEPA (1969), Environmental Impact Statements have to be prepared for major Federal actions. Every effort is made in the document to discuss and disclose all major points of view on the environmental impacts of the alternatives, using the best available scientific information in the analysis of potential impacts. Per the Council on Environmental Quality's regulations (40 CFR Part 1502.9[c] and the Department of the Army's Final Rule on Environmental Analysis of Army Actions (32 CFR Part 651.5[g]), supplemental NEPA documentation is required when there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts. The USACE and the VPA recognize that the level of detail regarding engineering design and construction/operation of the new cell and terminal will increase during PED preparation and, therefore, have committed to the preparation of a Supplemental EIS (SEIS), which will incorporate the new information. Per 32 CFR Part 651.24, the SEIS will be processed in the same way as the original EIS.

IV.1.1 HYDRODYNAMICS AND WATER QUALITY

The degree to which a development project in tidal waters will impact water quality can be evaluated by considering two factors (Hershner et al., VIMS, 2002):

1. The increase in nutrient or toxics-loadings in the water column generated by the project. If pollutant loads will increase as a result of the project, there is a potential for degradation of local conditions. The degree of degradation will be dependent on existing conditions and the relative change in loads caused by the project.

2. The alteration of circulation patterns caused by the project. In general, if the project design will result in locally-increased retention times or increased water column stratification, the potential for degraded water quality conditions exists. Again, the degree of hydrodynamic change will influence the potential for degradation. In the case of the proposed expansion of CIDMMA, there are three areas of potential concern for water quality impacts: the Elizabeth River, Hampton Roads, and the near shore area west of CIDMMA.

IV.1.1.1 Hydrodynamic Modeling

Several hydrodynamic modeling studies were undertaken to evaluate the potential impacts of alternative CIDMMA expansion plans on the Lower James River, Hampton Roads Harbor, and the Elizabeth River. These studies were conducted by VIMS, and a Technical Review Committee was established to monitor

the progress of the modeling effort and perform an independent review of the analyses and results. This committee was comprised of members of the Norfolk District, USACE, hydraulics and hydrology staff, the Coastal and Hydraulics Laboratory's Estuarine Engineering Branch of the USACE ERDC, Old Dominion University Center for Coastal Physical Oceanography, consultants for the VPA, and the citizens group Elizabeth River Project (ERP).

Two detailed reports entitled "Three Dimensional Hydrodynamic Modeling Study Craney Island Eastward Expansion, Lower James River and Elizabeth River, Virginia" and "Additional Assessments of the Craney Island Eastward Expansion in the Elizabeth River and Hampton Roads - Hydrodynamic Model Results" are available on the VIMS web site (http://www.vims.edu/physical/projects/craney/). Appendix A of the Feasibility Report also provides the complete reports and a summary of the hydrodynamic modeling studies.
Of the four expansion alternatives initially tested, global analysis revealed that the northward expansion and the northeast expansion produced noticeable percentile changes in water surface elevation, current magnitude, salinity, and bottom sedimentation potential. Westward expansion produced a lesser degree of change, and eastward expansion produced only minor changes in the immediate vicinity of CIDMMA.

Northward expansion produced strong westerly surface and bottom currents in the berthing channel on the north side that were believed responsible for a significant increase in bottom salinity noted west of CIDMMA and extending to the Nansemond River entrance. Local analysis revealed no appreciable change in flushing ability in either the Elizabeth River Basin or the Lafayette River for any of the alternatives tested. Northward expansion, however, produced noticeable changes in simulated residual currents within the Elizabeth River and in areas between Newport News Point and CIDMMA. A tidal front near Newport News Point and a large tidal eddy over Hampton Flats appear to be affected by expansions to the north and northeast.

It was concluded that any expansion to the north would have greater impacts on the physical and hydrodynamic features of the Hampton Roads and Elizabeth River system than the other alternatives. Thus, the more detailed hydrodynamic modeling was limited to eastern and western expansions (or combinations thereof).

The more detailed hydrodynamic modeling included an eastward expansion and an eastward expansion in combination with a modified westward expansion. The westward expansion was modified from that previously modeled to create a more hydrodynamically efficient shape.

As was observed in the initial modeling run, the more detailed analysis indicated little change from the Base Condition for the eastward expansion. Changes for the combination eastward and westward expansion alternative were slightly greater than those observed for the eastward expansion alone, but were less than those observed for the westward expansion alone.

The conclusion of the initial modeling study indicated that there would be no significant effects to water circulation, sedimentation, salinity, currents, and tidal flushing from the Elizabeth River with an eastward expansion of the CIDMMA. As part of the modeling study, several directional expansion scenarios were evaluated, and the eastward expansion demonstrated the least effects.

Subsequent to the initial hydrodynamic modeling, two issues arose that indicated additional hydrodynamic assessments of the eastward expansion alternative would be appropriate and beneficial. The first issue was a proposal for a new APM (Maersk) Terminal located south of CIDMMA, which evolved from non-existent, to a conceptual idea, to a reality that is under construction at the present time. Thus, additional hydrodynamic modeling was accomplished to evaluate the cumulative effects of the CIDMMA and the channel and berthing area deepening associated with the Maersk Terminal. This was accomplished by incorporating the necessary changes associated with the Maersk Terminal into the eastward expansion alternative model and comparing the results to the original base condition.

A global analysis of the additional hydrodynamic assessments was conducted similar to those previously described. From the additional assessments, it was observed that both the Maersk Terminal dredging and the berthing of ships by itself and both port facilities together had minimal impact on either the surface elevation or sedimentation potential. It was further observed that the berthing of ships at CIDMMA, if considered permanent as opposed to the actual transient nature of the ships, exhibits a localized effect on the salinity distribution and the velocity distribution. Flushing analyses revealed that neither the flushing of the Southern Branch, nor that of the entire Elizabeth River system showed any detectable adverse response from the combined effects of the CIDMMA and the Maersk Terminal dredging with ships docked at all berths.

In order to assess the impacts of dredging and ship berthing during extreme conditions (high wind and high and low precipitation events), more detailed hydrodynamic modeling was conducted testing the cumulative impact of the CIDMMA expansion, the dredging of the Maersk Terminal area, and the berthing of ships.

As in the initial analyses, little change was noted when compared to the hydrodynamic effects of the eastward expansion alone. When comparing the results to those of the eastward expansion in combination with the modified westward expansion, the changes were slightly greater in salinity, but less for all of the other parameters. It was noted, however, that the changes in salinity for either the eastward expansion or the eastward expansion, in combination with the modified westward expansion, are well within the naturally occurring salinity variations of the system; i.e., the changes in salinity observed in the model represent as small as 1 percent of the natural salinity variability that has been measured and observed.

IV.1.1.2 Water Quality

IV.1.1.2.1 Dredging for Access Channel and Cell Construction

The primary adverse effect on water quality from dredging and cell construction will be the temporary increase in turbidity and total suspended solids (TSS) from the incidental release of sediments. Approximately 19 million cubic yards of material will be removed using a combination of bucket dredges, hydraulic dredges, or similar equipment. Dredging will provide channels for navigational access to the east expansion cell; approximately 10 percent of the material will be placed in CIDMMA with the remainder of the Norfolk Ocean Placement Site.

Section 404 of the Clean Water Act (33 U.S. Code §1344[a]) requires that construction activities that involve the deposition of dredged or fill material into "waters of the United States, including wetlands,"

must receive authorization for such activities. The USACE has responsibility in issuing permits pursuant to Section 404 and/or Section 10 of the Rivers and Harbors Act of 1899 (33 U.S. Code § 403). However, by regulation, a USACE Section 404 and/or Section 10 permit is not required for USACE Civil Works projects (33 CFR 323.3[b] and 33 CFR 322.3 [c]). A Section 404 (b) (1) evaluation was prepared for the proposed project and appears as Appendix H.

Dredging Plan and Anticipated Offsite Impacts

The eastern expansion of CIDMMA would involve several phases of dredging and cell construction. Pre-dredging along the main dike is anticipated to be completed by a combination of mechanical, hydraulic, and cutter-head dredges. Sediment samples taken in the proposed dredging areas consist predominantly of clayey material with some sandy lenses. Sediment and water quality analyses of the proposed dredge areas have not been performed to date; however, such analyses will be performed during the PED Phase since the proposed design/construction methods and materials may change.

Approximately 15.4 million cubic yards (MCY) of sediment over 122 acres will be removed as part of the pre-dredging to a depth of 60 feet MLLW to construct the foundation for the main dike. The predominantly clayey material to be dredged is likely undisturbed with contaminant transport through layers unlikely. However, it is thought that by placing the upper few feet of material in CIDMMA, all remaining material will be suitable for ocean placement. Although, it is unknown what percent of material going into CIDMMA will be suitable for ocean placement, it is anticipated that 10 percent is a conservative upper limit. As such, approximately 10 percent of the dredged material (1.5 MCY) will be placed at CIDMMA, while the remaining 90 percent (13.8 MCY) will be removed to the Norfolk Offshore placement site.

An access channel between the federal navigation channel (Norfolk Harbor and Craney Island Reaches) dredging, and the proposed wharf will be constructed to allow for dike construction and ship traffic to the terminal. The access channel would be approximately 500 feet through the central part and flared at the north end where it adjoins the federal channel. The dredging depth will be to 50 feet below MLLW with an additional 2 feet advance maintenance dredging. The estimated dredge volume for the construction of the access channel is anticipated to be 3.7 MCY with the first 10 percent (0.37 MCY) placed at CIDMMA and the remaining 90 percent (3.33 MCY) of the material removed to the Norfolk Ocean placement site. Maintenance material within the existing channel template was not included in the estimated quantities.

The Norfolk Ocean placement site was designated by the USEPA in July 1993. It is designated to receive dredged material from the lower Chesapeake Bay. The estimated capacity at that time (as stated in the May 12, 1993 Federal Register) was 250 MCY placed "...over the next 50 years." The site has received little use, only by the Navy and, at most, several MCY. There is still enormous capacity at the site, and the proposed total 19.1 MCY from the new access channel (3.3 MCY), and expansion footprint (13.8 MCY) would easily be accommodated within the existing authorization. To ensure that undue adverse water quality impacts from the placement of dredged materials at the Norfolk Ocean site do not occur, materials will be evaluated in compliance with the site's management and monitoring plan and with the USEPA's Ocean Dumping Regulations and Criteria. If required, an alternate location for material unsuitable for ocean placement, most likely CIDMMA, will be determined.

In order to construct the dikes, sand will be dredged from offshore borrow areas. Once transported to the eastward expansion site, the material will be offloaded using a self-contained offshore transfer station buoy ("SCOTS" buoy). The Atlantic Ocean Channel will be used as the primary source of material for dike construction, while Thimble Shoal and Cape Henry Channels will be used as the secondary and tertiary material sources, respectively. The total amount of sand fill required is estimated to be 19.5 MCY (in-place at dikes), broken down as shown in Table IV-1.

Quantities indicated in Table IV-1 below include additional material required for anticipated displacement of the soft clay foundation and loss of material outside the dike footprint. To provide protection to the dikes from erosion, slopes will be protected with riprap. Construction of the entire eastern cell is expected to last approximately 5 years.

Table IV-1. VOLUME OF REQUIRED FILL FOR EASTWARD EXPANSION		
Phase 1 – 220 acre cell		
Dike	Length (linear feet)	Volume (MCY)
Main	3,000	5.3
South	2,800	1.5
Division	2,800	1.5
Phases 2 to 4 –remaining 380 acres of cell		
Continue Main Dike	5,500	9.7
North Dike	2,800	1.5
Total Cell Construction	16,000	19.5

(NOTE: a single hopper dredge is capable of 10,000 cubic yards in a day)

The Atlantic Ocean, Thimble Shoal, and Cape Henry Channels have been authorized by Congress to be dredged to depths of 60, 55, and 50 feet respectively. The dredging of material from the Thimble Shoals and Atlantic Channels for construction of the CIDMMA expansion cell is not inconsistent with the current authorization for activities in these channels, as dredging will not be conducted below the depth authorized for each specific channel. In addition, these channels would be dredged to maximum authorized depth regardless of CIDMMA expansion and/or port development. This does not constitute a renewal, review, or substantial revision of the current authorized scope of these channels; therefore, no additional impacts will occur at the fill source material sites.

Anticipated Onsite Impacts

A typical dredging related sediment plume may extend a few hundred meters (approximately 1-quarter-mile) downstream from *active* dredging areas (Priest, 1981). The low ambient current velocities and tidal effects in the vicinity of the site may reduce the plume migration to less than the typical distance (Maersk,

EA). The type of dredge equipment used will have a great impact on the suspended sediment concentrations. A study of pipeline dredging operations reported total suspended solids (TSS) concentrations of 12 - 871 mg/L, depending on the dredging equipment used (43-70 mg/L for a pipeline, 12-282 mg.L for a clamshell, and 74-871 mg/L for a hopper dredge), whereas the long-term, depth-averaged background suspended sediment concentration in the Elizabeth River near the dredge area is approximately 20 mg/l, and the short-term, storm-induced suspended sediment concentrations can be as high as 76 mg/l on a depth-averaged basis and 127 mg/l near the bottom (Maersk EA). Therefore, with proper precautions taken, the increase in suspended sediments associated with the dredging activities is likely to be on the order of the background concentration in the Elizabeth River, within the natural short-term variability in the background concentrations associated with advective pumping into the Elizabeth River from the James River, and a result of prop wash from the passing of large ships.

The construction of the eastward expansion dikes is anticipated to produce a much smaller sediment plume than the dredging portion of development, as the fill will be composed of much coarser grained material that is less likely to suspended and/or remain in suspension. The contaminant load of the sediments is anticipated to be negligible as this material has been used in the past without concern for a variety of applications including beach nourishment projects.

A dredge plan will be developed during the PED Phase to minimize the potential effects of a suspended sediment plume during the construction of the foundation, access channel, and cell dikes. The dredging will be accomplished using equipment that minimizes turbidity plumes to the greatest extent practical. The Elizabeth River system adjacent to the project site recovers rapidly and dredge-induced suspended sediment concentrations are expected to decrease rapidly following the termination of dredging operations.

The primary adverse effect on water quality would be the increase in turbidity and total suspended solids from the re-suspension of sediments during dredging, cell construction, and wharf construction. This condition would persist for the duration of construction for the cell, access channel, and wharf. Since construction has a finite length and dredging would not be occurring continuously over the construction period, the condition is considered to be temporary. Some reduction in DO levels, due to releases of organic materials to the water column, are anticipated. However, the anticipated increase in suspended sediment and the reduction in DO are expected to fall within the range experienced by the Elizabeth River under natural climatic events and hydrodynamic conditions.

Elevated contaminant levels in the sediment are not anticipated. Pre-dredging testing of the sediments during PED will be performed to ascertain sediment contamination and develop appropriate mitigation (avoidance and minimization) measures. If the sediments are contaminated, potential releases of toxic levels of trace materials, along with synthetic organic contaminants, could occur during dredging. Mitigation for turbidity increases will involve maximizing the use of a hydraulic cutterhead or hopper dredges to the extent practicable. This is intended to minimize and localize the generation of turbidity and settleable solids.

Another potential water quality impact is related to releases of water from the confined material expansion cell itself, and the associated consequences on water quality in the area around the CIDMMA. The proposed eastward expansion containment area will be designed to retain dredged material solids,

while allowing the clarified carrier water to be released from the containment area through spillboxes. Four spillboxes are anticipated, two at the division dike, and two along the north dike. The Phase 1 cell will be rapidly filled during the first year. Excess water and suspended solids will discharge from the division dike spill boxes and be retained in the remaining 2/3 (approx. 380 acres) to provide maximum settling time for suspended solids. Coarse material (i.e., sands) falls from this slurry relatively quickly, near the location of the dredge inlet pipe. Fine-grained material (silt and clay) continues to flow through the containment area where the solids are allowed to settle out. As the solids settle out, clarified water will pass over the spillbox weir as return water. The spillbox structure and weir regulate the release of the clarified water by allowing adjustments to be made to the depth of the ponded water within the containment area. Detailed design of the spillbox and weir will take into consideration influent rates of the dredge material, nature of the dredged material, hydraulic efficiency of the area, etc. A water quality assessment will be conducted during the PED Phase to ensure that any effluent discharged meets prescribed water quality standards.

Nutrient loads and/or other pollutants introduced to surface waters as a consequence of CIDMMA expansion will be mitigated (avoid and minimize) by the location, design, and monitored efficiency of the surface runoff control structures built into CIDMMA. For the area to the east of CIDMMA, the existing 3-D hydrodynamic modeling does not suggest an increase in residence time or an increase in stratification under any of the potential project designs. Therefore, the degree to which the Recommended Plan will impact water quality is expected to be relatively minor and short-term.

As reported by Priest (1981), most of the information on TSS generated from dredging activities has focused on the site of open water disposal or pipeline discharge, not the cutterhead itself. However, analysis of cutterhead dredging projects by Barnard (1978) indicates that TSS plumes generated by such dredges are normally near the bottom, measuring a few hundred mg/L for a few hundred meters downcurrent. Priest (1981) cites data from Boon and Byrne (1975) from the hydraulic dredging of Hampton Bar, Virginia. The dredge produced a typical surface plume concentration of 20–40 mg/l during maximum current conditions. Concentrations within 400 yards of the dredge were 50 mg/l and higher. Background levels were 5-15 mg/L. During flood tide, a visible plume approximately 400 x 4000 yards was produced. Boon and Thomas (1975) reported TSS concentrations generated from a construction project associated with the second Hampton Roads Bridge-Tunnel. TSS concentrations of 15-30 mg/l were reported in the surface plume produced by a hydraulic dredge at distances of less than 1000 feet. Background levels were 3-9 mg/l. Therefore, dredging will produce increases in TSS concentrations over background levels, although conditions are not anticipated to be extreme or to extend beyond the area immediately surrounding the dredge operations.

A Clean Water Act, Section 404 (b) (1) Evaluation has been completed for the proposed construction activities and appears in EIS, Appendix H.

IV.1.1.2.2 Terminal Development

Construction

Construction of the CIDMMA container terminal would take place in four major phases during 5-year construction periods at various stages of the planning horizon. Construction for each phase would involve grading, excavating, trenching, and landscaping. Container terminal construction would not

include dredging activities in the harbor. Dredging is planned as part of the proposed CIDMMA eastward expansion, and some dredging would be completed regardless of port development. Dredging of the berthing and access channels has three purposes. The obvious purpose is to allow cargo vessels access to the wharf once the terminal is constructed. Another purpose is to allow the construction equipment access to the site. This would be access for the dredges and barges that would take material out of the area as well as bring it in for dike construction. The other purpose is to ensure that there is no impact to the cross-sectional area of the Elizabeth River. Hydrodynamic modeling in the PED Phase will be conducted to determine how much initial dredging in the access channel and berthing area is needed to accomplish this. The remainder of the berthing and access channel would be dredged as the facility is ready to begin operations. The primary water quality concern from land-based construction is erosion of disturbed lands and transport of sediment into the Norfolk Harbor.

Water quality impacts from construction would be mitigated by erosion and sediments (E&S) controls and best management practices implemented at the site, in accordance with state regulations. An erosion and sediment control plan (ESCP) would be developed as required by the Virginia Erosion and Sediment Control Regulations (4VAC50-30) administered by the VDCR. This document specifies measures that will be used to control E&S during construction, such as silt fencing, temporary sedimentation ponds, rip rap, vegetative stabilization, etc., and must be prepared in accordance with the *Virginia Erosion and Sediment Control Plan Handbook* published by VDCR.

All construction activities at the proposed facility that disturb more than 1 acre would also require a Virginia Pollution Discharge Elimination System (VPDES) permit to discharge stormwater, in accordance with VDEQ regulations and the CWA. This would require the development of a Stormwater Pollution Prevention Plan (SWP3) that identifies potential sources of pollution and management practices to control those sources. BMP's are required to be inspected at least once every 14 calendar days and within 48 hours of a storm event that is 0.5 inch or greater.

Stormwater Runoff

The proposed CIDMMA container terminal has the potential to impact the water quality of Norfolk Harbor by the runoff of contaminants originating from vehicular traffic, mechanical equipment, container storage areas, and maintenance areas. Primary contaminants of concern include phosphorus, nitrogen, sediment, oil and grease, and metals. Water quality impacts would be mitigated by comprehensive stormwater quality management planning and the implementation of both structural and non-structural BMP's, in accordance with state regulations. Several different state agencies administer regulations designed to protect water quality from stormwater impacts, such as the VPDES program (VDEQ), Virginia's Stormwater Management Regulations (VDCR), and the Chesapeake Bay Preservation Act (CBLAD). Virginia's Stormwater Management Regulations (4VAC3-20) are intended to provide uniform guidelines for stormwater quality management planning among these agencies and programs. The following provides an overview of these programs and their application to the proposed terminal.

VPDES Program

The CIDMMA container terminal would have to obtain a VPDES permit to discharge stormwater to the Norfolk Harbor. The general VPDES stormwater permit for water transportation facilities includes monitoring thresholds for three constituents:

- Total recoverable aluminum: 750 μg/L
- Total recoverable iron: 1 mg/L
- Total recoverable zinc: 120 μg /L

VPA has initiated several projects aimed at improving stormwater quality, including the installation of manufactured stormwater treatment devices in selected areas, a recent study to evaluate the effectiveness of those devices, and a recent study to identify sources of metals at three container terminals. The results of these efforts will aid stormwater management planning at the Craney Island terminal.

The VPDES permit would require the development of a facility-wide SWP3 that would describe/identify:

- All potential pollutant sources
- A pollution prevention team
- Drainage areas, directions, and outfalls
- Documentation of spills and leaks
- Summary of existing monitoring data
- Measures and controls to prevent stormwater pollution, including;
  - Good housekeeping
  - Preventative maintenance
  - Inspection programs
  - Spill prevention and response procedures
  - Employee training
  - Record keeping

- An annual comprehensive site compliance evaluation

Chesapeake Bay Preservation Act and Virginia Stormwater Management Regulations

These related programs will require stormwater management planning and BMP implementation to mitigate for potential water quality impacts caused by the increased impervious area and reduction of the shoreline buffer. The "Bay Act," passed by the Virginia General Assembly in 1988, required local governments in Tidewater Virginia to develop regulations to protect water quality. The CBLAD approves local ordinances and administers similar regulations for state projects. The Bay Act and related local ordinances define Chesapeake Bay Preservation Areas and performance standards to reduce or prevent increases in nonpoint source pollution. Virginia's Stormwater Management Law (Title 10.1, Chapter 6, Article 1.1 of the Code of Virginia) and Stormwater Management Regulations (4VAC3-20) set uniform requirements for stormwater quality management programs administered by the VDCR, CBLAD, VDEQ, and localities.

The eastward expansion of Craney Island would take place on open water that is not currently under the jurisdiction of the Bay Act or the Chesapeake Bay Preservation Area Designation and Management Regulations (9 VAC 10-20-10 et seq.), which implement the Act. However, subsequent development of the 580-acre expansion would be required to comply with the Act and the Regulations. Specifically, development of the marine terminal facility would have to comply with stormwater management criteria that meet the water quality protection provisions of the Virginia Stormwater Management Regulations.

As a state project, the proposed terminal will not require direct approval from the local host jurisdiction for its development plans. However, Virginia's Stormwater Management Regulations require that state projects comply with local stormwater management programs to the maximum extent practicable or to demonstrate that the local program technical requirements are not practical for the project. The city of Portsmouth administers a stormwater quality management program through its Chesapeake Bay Preservation Area Overlay Ordinance, which is based on the guidelines of the Chesapeake Bay Preservation Act. The city's requirements are consistent with those of the Virginia Stormwater Management Regulations and are not more stringent.

The Bay Act defines two types of Chesapeake Bay Preservation Areas that would apply to the proposed project: (1) a resource protection area (RPA) that consists of a 100-foot buffer directly adjacent to wetlands and shores, and (2) a resource management area (RMA) composed of an area measuring 530 feet landward from the RPA. As a water-dependent use, development of the proposed facility would not require a vegetated buffer adjacent to the shoreline. However, the facility would have to employ BMP's to (1) mitigate water quality impacts caused by the reduction of such a buffer, and (2) offset increases in nonpoint source pollution caused the by new development. Mitigation/offset of pollutant loading would involve the construction of stormwater treatment devices on the proposed terminal but could also involve buffers or BMP's elsewhere in the Elizabeth River Basin. Because the development of the proposed port facility will exceed 2,500 square feet of land disturbance, the Bay Act would require a *plan of development* that includes the following elements:

1. A *site plan*.

2. An *environmental site assessment* that delineates wetlands, shores, and other sensitive environmental features.

3. A *landscaping plan* that shows the location, size, and description of all existing and proposed plant material.

4. A *stormwater management plan* that identifies the locations and design of all stormwater-control devices, non-structural stormwater-control practices, and pre- and post-development nonpoint source pollutant calculations, in accordance with the Virginia Stormwater Management Regulations.

5. An *ESCP* as described in Section 1.1.

6. A *water quality impact assessment* that identifies all potential impacts (and associated mitigation measures) of the proposed development on water quality, lands, and natural resources within the RPA.

The Virginia Stormwater Management Regulations provide developers with the option of complying with either performance-based or technology-based criteria to protect water quality. Performance-based criteria would stipulate no net increase in nonpoint source pollution from the new development and a 10-percent reduction in nonpoint source pollution from redevelopment. The technology-based criteria require specific BMP's to achieve target pollutant removal efficiencies that vary according to the percent impervious cover of the project. Although developers have the option of complying with either criteria,

the technology-based criteria are more often applied to highly impervious sites such as the proposed terminal.

The ability of the proposed development to comply with both performance-based and technology-based stormwater criteria was evaluated as described below. This analysis is a preliminary evaluation based on conservative (worst-case) assumptions regarding imperviousness and pollutant loading at the CIDMMA container terminal.

With regard to performance-based criteria, the proposed project would be considered "new development." If VPA chose to use these criteria as the basis for stormwater quality management planning, compliance would be evaluated by estimation of pre- and post-development loads of total phosphorus, associated removal requirements (in lbs/year), and required BMP efficiency. Added to this removal requirement would be an additional removal requirement resulting from the absence of the 100-foot vegetated buffer. The stormwater quality management plan and water quality impact assessment would have to demonstrate by use of engineering calculations that selected BMP's would meet the removal requirement.

Pre- and post-development loads from the proposed facility were estimated using the Simple Method (Schueler, 1987) in accordance with the *Virginia Stormwater Management Handbook*, guidance from CBLAD, and methodology employed by the city of Portsmouth Department of Public Works. The Simple Method uses the following formula to estimate annual stormwater pollutant loads:

$$L = \square_U (P * P_J * R_V * C * A * 2.72 / 12)$$

Where: L = Annual pollutant load, lbs
P = Annual precipitation, inches
P_J = Ratio of storms producing runoff (typically assumed to be 0.9)
R_V = Runoff coefficient
C_U = Event mean concentration of pollutant, mg/L
A_U = Drainage area, acres

The runoff coefficient may be estimated as:

$$R_{VU} = 0.05 + 0.009 * I$$

Where: I = Percent imperviousness of land

Substituting this relation into the basic formula and applying the values for P and P_J used by the city of Portsmouth, the equation becomes:

$$L = 9.18 * [0.05 + (0.009 * I)] * C * A$$

It is the practice of CBLAD and VDCR to assume a pre-development percent imperviousness (I) of 16 for pre-development conditions, based on average land conditions in the Chesapeake Bay watershed. However, the city of Portsmouth uses a pre-development percent imperviousness of 19 for the portion of the Elizabeth River watershed in which the proposed project would be built. The value was used in this

analysis (Table IV-2) because it is based on a more local watershed characterization. Based on existing VPA terminal facilities, the post-development imperviousness of the proposed 575-acre terminal was estimated to be 95 percent.

Table IV-2. PRELIMINARY EVALUATION OF PERFORMANCE-BASED CRITERIA TO PROTECT WATER QUALITY AT THE PROPOSED CRANEY ISLAND CONTAINER TERMINAL

Parameter	Pre-development	Post-development
Worksheet input		
Site area, acres	575	575
Imperviousness, percent	19	95
Total phosphorus, mg/L	1.08	1.08
Buffer width, feet	100	0
Worksheet results		
Net increase in phosphorus load due to new development, lbs/year		3,941
Phosphorus removal requirement due to absence of buffer, lbs/year		8.1
Total BMP removal requirement, lbs/year		3,949
Estimated BMP removal efficiency target, percent		76

CBLAD and VDCR use total phosphorus as the 'keystone' pollutant for which to evaluate pre- and post-development loadings, i.e., mitigation measures for total phosphorus are assumed to mitigate for other pollutants such as sediment. The event mean concentration (C) of total phosphorus was assumed to be 1.08 mg/L in accordance with CBLAD assumptions for highly impervious land, a value that was derived from Schueler's (1987) tabulation of 'C' values representative of "older urban areas." The Simple Method was also used to estimate pre- and post-development loads of total nitrogen, biological oxygen demand (BOD), and zinc, using C values representative of "older urban areas" (Table IV-3) as compiled by Schueler (1987). These assumed concentrations are conservative (high) in that they would be expected for areas subject to high traffic volumes and the accumulation of debris.

Table IV-3. NET INCREASE IN LOADS FOR REPRESENTATIVE CONSTITUENTS ESTIMATED USING THE SIMPLE METHOD

Constituent	Assumed pollutant concentration (1) (mg/L)	Net Increase without BMP's (lbs/year)
Total nitrogen	13.6	46,647
Total phosphorus	1.08	3,950
BOD	11.9	43,442
Zinc	0.397	1,457

(1) From Table 1.1 of Schueler, 1987, *Controlling Urban Runoff*, Metropolitan Washington Council of Governments Manual. Representative of "older urban areas."

In accordance with CBLAD methodology, a separate calculation was used to estimate the increased phosphorus load from absence of the 100-foot vegetated buffer, assuming that the full buffer would remove 40 percent of nutrients from a 200-foot-wide region landward of the buffer. To make the analysis conservative, it was assumed that the proposed facility would have no vegetated buffer, although some vegetated buffer might exist.

Results of the preliminary analysis (Table IV-3) indicate that, under the performance-based criteria, the proposed facility could potentially have to implement BMP's to remove about 4,000 lbs of phosphorus per year. The predicted net increase in load for phosphorus and other constituents (Table IV-3) is conservative (high) due to the relatively high concentrations (C) assumed. The estimated BMP removal efficiency target of 76 percent is dominated by the net increase loads due to the addition of impervious area, as evidenced by the fact that the removal requirement due to absence of the vegetated buffer is less than 1 percent of the total projected removal requirement under performance-based criteria. More refined facility design information and pollutant loading analysis could result in a different estimated target for BMP removal efficiency.

Technology-Based Criteria

The technology-based criteria of the Virginia Stormwater Management Regulations (Table IV-4) set strict design standards for specific types of BMP's as a function of the percent imperviousness of the post-development site. The proposed container terminal would fall in the 67-100 percent imperviousness category, requiring BMP's that are capable of removing 65 percent of total phosphorus.

Table IV-4. TECHNOLOGY-BASED CRITERIA OF THE VIRGINIA STORMWATER MANAGEMENT REGULATIONS (1)

Water quality BMP	Target phosphorus removal efficiency (%)	Impervious cover (%)
Vegetated filter strip	10	16-21
Grassed swale	15	
Constructed wetlands	30	22-37
Extended detention (2 x WQ Vol)	35	
Retention basin I (3 x WQ Vol)	40	
Bioretention basin	50	38-66
Bioretention filter	50	
Extended dentention-enhanced	50	
Retention basin II (4 x WQ volume)	50	
Infiltration (1 x WQ Vol)	50	
Sand filter	65	67-100
Infiltration (2 x WQ Vol)	65	
Retention basin III (4 x WQ Vol w/ aquatic bench)	65	

(1) Innovative or alternate BMP's not included in this table (or those that target pollutants other than phosphorus) may be allowed at the discretion of the local program administrator or VDCR.

Summary of BMP/Treatment Requirements

The preliminary analysis presented above demonstrates that, as at most highly impervious sites, technology-based criteria would set the minimum standard for pollutant removal at the CIDMMA container terminal. Compliance with the Virginia Stormwater Management Regulations would be achieved by the implementation of any of several different types BMP's that the state recognizes as removing at least 65 percent of total phosphorus. Although the technology-based criteria are more likely to be applied, the facility could also comply with performance-based criteria by the use of BMP's in series, retrofitting off-site areas with BMP's to offset increases at the project site, participating in regional BMP's, and implementing source reduction programs (CBLAD, April 2002).

Existing VPA container terminals use a variety of structural BMP's to treat stormwater at selected locations, such as extended detention basins and manufactured devices (i.e., Vortechs® System, Aqua-Guard®). VPA has constructed innovative BMP's such as an under-wharf detention basin. Studies have recently been completed to identify the origin of stormwater contaminants at container terminals and measure the efficiency of the manufactured devices at removing a variety of contaminants. As previously stated, the results of these studies are expected to aid in the stormwater quality management planning for the proposed facility.

In summary, stormwater quality is a significant regulatory issue that will require comprehensive planning during all phases of the proposed development. However, regulatory requirements will be met (and environmental impacts avoided) by a comprehensive stormwater management plan that provides appropriate BMP technology and is designed to achieve a high level of treatment for the facility.

IV.1.1.2.3 Accidental Spills

Various types of petroleum-based oils and hazardous materials will be used, transported, and stored at the CIDMMA container terminal, such as fuels and lubricants for on-site trucks. In addition, various types of cargo will be handled and stored at the facility, some of which may impact surface waters if spilled. In practice, significant spills of oil and hazardous materials are uncommon at existing VPA container terminals. For example, the SWP3's for NIT, PMT, and NNMT indicate only two reportable (greater than 25 gallon) spills of toxic or hazardous substances during the last 3 years, neither of which reached navigable waters. More common are containers that leak non-hazardous substances such as food products (VIT, April 2002).

Environmental impacts from spills may be prevented by adherence to Federal and state regulations that require that the facility develop and implement plans to prevent and control accident spills of petroleum oils and other hazardous substances.

Oil Spill Contingency Planning

Because the proposed facility is likely to have more than 1,320 gallons of above-ground oil storage, a Spill Prevention, Control, and Countermeasures Plan (SPCCP) will be required under Federal regulations related to oil spill contingency planning (40 CFR 112). The SPCCP addresses only oil and includes the following information:

- Facility spill history
- Potential spill volumes, rates, and directions
- Containment and diversionary structures
- Facility drainage
- Bulk storage tanks and associated spill prevention devices/measures
- Oil transfer operations
- Fuel loading/unloading procedures
- Security
- Personnel training in spill prevention procedures

40 CFR 112 requires appropriate containment and/or diversionary equipment to prevent spilled oil from reaching navigable waters, including secondary containment for all bulk storage tanks. It also requires periodic testing and inspection of all oil storage and transfer equipment, as well as the training of personnel in spill response procedures. Spill response procedures for existing VPA container terminals are also summarized in the Section 23 of the VIT Safety Manual, entitled "Hazardous Material Release Response Procedure."

Like existing VPA container terminals, the CIDMMA container terminal would not require a facility response plan under 40 CFR 112 or USCG regulations related to transfer of oil and hazardous material (33 CFR 154), because it would meet the "no substantial harm" criteria of those regulations. Specifically,

the facility would not perform overwater transfers of oil, nor have a total oil storage capacity of more than 1 million gallons.

Stormwater Pollution Prevention

As described in Section 2.1, a facility-wide SWP3 will be required by the facility's VPDES permit, and must list all potential contaminant sources and identify both structural and non-structural management practices to prevent spills from any potential contaminant, including hazardous materials and waste.

Cargo Handling

The CIDMMA container terminal would be classified as a "designated waterfront facility" under USCG regulations related to handling of dangerous cargos (40 CFR 126), and, thus, would require a general permit for the handling of dangerous cargo (including certain hazardous materials as listed in 33 CFR 126.7) in bulk, portable tanks, or containers. The general permit (33 CFR 126.27) specifies conditions for the storage, handling, and labeling of dangerous cargo to prevent fire or other hazards. These regulations are primarily intended to promote health and safety but would also help prevent impacts to water quality by spills of hazardous substances.

Spills from Ships

At full Build-Out, the CIDMMA container terminal will increase shipping traffic in the Hampton Roads Harbor System by about 19 vessel calls per week. This would represent a maximum increase in shipping traffic of about 20 percent from the baseline value of 5,000 vessel calls per year reported for the Hampton Roads Harbor System in 2000 (Office of Statistical and Economic Analysis). Although the increased traffic nominally increases the risk for potential maritime collisions, ship to ship computer aided simulations and modeling conducted by the U.S. Merchant Marine Academy show that the impact to navigation from the Recommended Plan is negligible. Accordingly, hazardous material or fuel spills related to maritime collisions are not expected to increase as a result of the Eastward Expansion. According to the Virginia Pilots Association, no collisions involving container ships have occurred in the Hampton Roads Harbor, so the baseline risk is small. The increased shipping will consist of commercial container ships, not tankers. Only about 2 to 3 percent of the containers currently handled at VPA terminals are placarded as containing hazardous materials (VIT, December 2004).

In the event of an incident, the Marine Environmental Response Unit of the USCG is the primary responder and will respond according to the following plans:

- National Oil and Hazardous Substances Pollution Contingency Plan (see http://www.nrc.uscg.mil/ncp.htm).
- Regional Contingency Plan of the USCG Regional Response Team III covering the states of West Virginia, Maryland, Delaware, Pennsylvania, and Virginia, as well as the District of Columbia (see http://www.uscg.mil/lantarea/rrt/rcp/ homepage.html).
- Captain of the Port (COTP) Virginia Coastal Area Contingency Plan (maintained by the USCG Marine Safety Office—Hampton Roads).

Refueling of Ships

Most container ships that dock at VPA terminals do not refuel in the Hampton Roads area. However, a small percentage of container ships do take on fuel while moored at the Norfolk Harbor Anchorage.

Although the projected increase in ship traffic would nominally increase the risk of refueling-related spills, the actual risk is expected to be small. No fuel will be transferred from the container terminal to ships. Refueling operations from barges to ships must be performed in accordance with USCG regulations related to oil transfers (33 CFR 154), which include equipment, planning, and procedural requirements for the prevention and containment of spills. The Virginia Pilots Association reports that refueling operations involving container ships have caused no reportable spills in the Hampton Roads area (Virginia Pilots Association, November 2004).

IV.1.1.2.4 Ship Operations/Overboard Waste

The Federal Water Pollution Control Act of 1972 (FWPCA) and the CWA as amended of 1987 were both established to restore and maintain the chemical, physical, and biological integrity of U.S. territorial waters. Environmental impacts from ship-derived wastes are prevented by adherence to Federal regulations that prohibit the discharge or release of oil, oily wastes, noxious liquid substances, garbage, municipal, or commercial waste in U.S. territorial waters, as summarized in 40 CFR 151. These regulations prohibit the discharge of oily bilge water in ports and harbors in accordance with the International Convention on the Prevention of Pollution from Ships (MARPOL).

No discharges of wastewater, bilgewater, or other wastes to the Norfolk Harbor would be permitted from ships at the proposed container terminal. Similarly, the facility would not accept wastewater or bilge water from the ships to the sanitary sewer. Shipping lines would have the option of paying a contractor to pump out ship-derived wastes into a tanker truck and dispose of them elsewhere.

Federal regulations (40 CFR 151) also include management guidelines and reporting requirements for clean ballast water. This issue is related to the introduction of exotic species and is addressed in Section 1.6.

IV.1.1.2.5 Wave Action/Erosion and Hydrodynamics

Dredging associated with the Recommended Plan is expected to enlarge the physical cross sectional area of the mouth of the Elizabeth River channel resulting in minimal increases in surface and bottom current velocity as verified by 3-D hydrodynamic modeling. According to modeling results, the magnitude of increase is below that of other modeled expansion alternatives (USACE, 2005). Channel widening and deepening is not intended to offset the loss of open water associated with the expansion. During the hydrodynamic modeling, it was observed that redirection of the weakened flow from the wide shallow margins near the mouth of the Elizabeth River to the widened and deepened berthing area adjacent to the main channel provided an increased conveyance during flood and ebb. The hydrodynamic modeling response captured this phenomena and predicted that flushing (residence time) of the Elizabeth River system would actually be improved with the Craney Island Eastward Expansion, since the increase in residual transport would more than offset the loss in tidal prism.

The project will result in an increase in the shipping traffic in the Norfolk Harbor and, thus, an increase in the frequency of displacement waves. Although these effects could increase the potential for shoreline erosion, actual impacts are expected to be minimal, because the affected shoreline in the Norfolk Harbor, including the proposed terminal, would be protected by manmade structures. The eastern shoreline is already stabilized by manmade structures of the Norfolk Naval Base and NIT.

IV.1.1.2.6 Ballast Water

The proposed project would increase shipping traffic and, therefore, has the potential to increase the chance for introduction of nuisance or exotic species into the Hampton Roads area by way of ship ballast water and, to a lesser extent, cargo. Mitigation measures for reducing the risk of exotic species introduction include strict adherence to applicable Federal, state, and international laws and implementation of voluntary guidelines regarding exchange of ballast water.

Ballast water is the most likely pathway for the introduction and spread of exotic species. As required by the National Invasive Species Act of 1996, Federal (40 CFR 151 Subpart C) and Virginia (4 VAC 20-398-30 Voluntary Ballast Water Management Guidelines) regulations were developed to establish voluntary ballast water management guidelines and mandatory reporting requirements for the release of ballast water. According to the Virginia guidelines, vessels carrying ballast water that was loaded in an area outside the U.S. Exclusive Economic Zone (EEZ) are requested to employ at least one of the following ballast water management practices:

1. Exchange ballast water beyond the EEZ, in an area at least 200 nautical miles from shore and in waters greater than 2,000 meters in depth, before entering Virginia's territorial waters.
2. Retain the ballast water on board the vessel.
3. Use an alternative environmentally sound method of ballast water management that has been approved by the USCG.
4. Discharge ballast water to an approved reception facility.
5. Under extraordinary circumstances, conduct a ballast water exchange within an area agreed to by the COTP.
6. Ships are advised to avoid the uptake of ballast water from areas with marine sanctuaries and preserves.
7. Ships are also asked to clean ballast tanks regularly to remove sediments and to avoid exchanging ballast waters in areas where propellers may stir up the bottom sediment.

In addition, the operator of commercial vessels must file a Ballast Water Control Report form with the VMRC, either within 72 hours of a ballast water discharge into Virginia waters or prior to the departure of the vessel from Virginia waters if ballast water was not discharged.

The U.S. Coast Guard has recently published a final rule entitled "Mandatory Ballast Water Management Program for U.S. Waters." This final rule became effective on September 27, 2004. This rule was published after the Coast Guard determined that the voluntary Ballast Water Management program was inadequate.

In May 2005, the U.S. District Court ruled that USEPA must regulate all ballast water discharges in U.S. ocean ports and the Great Lakes. USEPA's decision whether to appeal the ruling is pending. If it is determined that USEPA will be required to issue new regulations regarding ballast water, the impact of those regulations on Virginia waters will be addressed in a Supplemental EIS to be prepared when preliminary engineering design information becomes available.

In practice, most vessels currently abide by the voluntary ballast water management guidelines, and ballast water exchange is not conducted at VPA container terminals (VIT, December 2004). The proposed container facility is not expected to result in an unacceptable risk of exotic species introduction.

IV.1.1.2.7 Sediment Suspension

The passage of ships can suspend bottom sediments in shallow waters and reduce the light available to SAV or visual aquatic feeders. However, the 50-foot-deep Federal Navigation and terminal access channels should provide sufficient clearance to minimize sediment suspension in the harbor. Considering the high volume of ship traffic that already traverses the Norfolk Harbor, the proposed facility is not expected to significantly increase sediment suspension.

IV.1.2 AIR QUALITY

This section provides an assessment of air quality impacts related to dredging and construction of the CIDMMA east cell and to operation of the proposed container terminal facility. Background air quality information, including air quality standards and regulations, existing regional conditions, and regional emissions inventory projections are presented in Section III.

IV.1.2.1 Estimated Air Emissions from Dredging and Dike Construction at CIDMMA

This section provides an assessment of air quality impacts related to dredging and construction of the CIDMMA east cell. Background air quality information, including air quality standards and regulations, existing regional conditions, and regional emissions inventory projections are presented in Section III.

Mitigation measures that could be used to reduce emissions include either, or a combination of, increased usage of low sulfur fuels for diesel dredges, and electrification of diesel-powered dredges. Further, a conformity analysis for air quality compliance with pertinent ambient standards has been conducted to determine potential required mitigation measures.

Operation of heavy construction equipment would generate associated exhaust fumes in the immediate vicinity of the construction activity. However, a significant adverse air quality impact is not expected. Some minor volatilization of contaminants would occur during the dredging and handling of dredged material. Canopy cover measures would significantly reduce volatilization of contaminants during handling and transport.

Construction activities associated with the proposed east expansion of CIDMMA are planned to include dredging operations and dike construction. Since these construction activities will require the use of large diesel-fired engines, air pollutant emissions estimates have been completed for these operations. The location of the east expansion is within the Hampton Roads ozone nonattainment area. As such, emissions of ozone precursor pollutants, nitrogen oxides (NO_x) and volatile organic compounds (VOCs), have been estimated for the planned construction activities.

The purpose of the planned dredging operation is to provide an access channel and foundation for the proposed east expansion dikes and, ultimately, the terminal facilities. Additionally, four dikes will be constructed as part of the project. The dredging and dike construction operations are estimated to be completed over a 5-year construction period starting in 2008 and ending in 2012 - 2013.

To estimate emissions from the planned dredging and dike construction activities, information related to equipment requirements, engine sizes, and anticipated construction schedule with estimated equipment operating hours was provided by USACE and Moffat & Nichol. This information was used in conjunction with USEPA emission standards for diesel engines to develop air emission estimates. Annual emission estimates were calculated for each of the five years of anticipated construction. The emission estimates include emissions from the following emission sources:

- Dredges (pipeline and mechanical)
- Tugs (tow and work tugs)
- Dump scows, derricks, crew boats, fuel barges, & other marine based equipment
- On-road haul trucks

For marine equipment (dredges, tugs, and other equipment) with engines rated at 50 horsepower or higher, emission estimates are based on USEPA emission standards for marine diesel engines. These standards have been promulgated in the Code of Federal Regulations (CFR) under 40 CFR 94.8(a)(2). For marine equipment with engines rated at less than 50 horsepower, USEPA emission standards for nonroad compression ignition engines promulgated under 40 CFR 89.112, Table III-3 were used. Emissions from the land-based truck hauling are based on emission standards for heavy duty highway compression ignition (diesel) engines. Table IV-5 shows a summary of the annual emission estimates for the dredging and dike construction activities. Since USEPA diesel emission standards are primarily based on combined factors for NO_x and VOCs, with VOCs designated as non-methane hydrocarbons (NMHC), the emission estimates are presented as the sum of NO_x and NMHC emissions.

Table IV-5. CIDMMA EAST EXPANSION EMISSION ESTIMATES FOR DREDGING AND DIKE CONSTRUCTION

Year of Construction	Estimated Calendar Year	NO_x + NMHC Emissions (tons/yr)
1	2008	18.8
2	2009	1089.5
3	2010	1013.5
4	2011	1022.1
5	2012	638.2

IV.1.2.2 General Conformity – CIDMMA Expansion

The CIDMMA east expansion project constitutes a non-transportation federal action within the Hampton Roads ozone nonattainment area. Construction activities will generate emissions of air pollutants.. Provisions of the general conformity regulation are potentially applicable to federal projects locating within nonattainment and maintenance areas. To determine if a conformity determination is required, an emissions inventory of VOC and NO_x emissions has been completed. For the 2009-2012 build-out, estimated NO_x emissions exceed the 100 tons per year threshold level prescribed by the general conformity regulation. For the 2012 Build Out condition (dredging and cell construction), both VOC and NO_x emission estimates exceed the 100 tons per year threshold. Consequently, general conformity issues must be addressed in order to obtain approval to develop the facility. Appropriate air quality permits may be required prior to initiating construction, and, if needed, will be obtained prior to any proposed construction taking place. Compliance with general conformity requirements can be accomplished by the following approaches:

Estimated dredging and cell construction emissions can be "offset" by obtaining emissions reductions within the Hampton Roads ozone nonattainment area. Emissions associated with dredging and cell construction can be incorporated into an approved SIP for the nonattainment area.

Based on information obtained from VDEQ, the process of developing a new SIP for the Hampton Roads ozone nonattainment area is expected to occur in 2006-2007. To comply with general conformity requirements and to incorporate the construction and operational phases of the proposed project as part of new and future SIPs for the Hampton Roads area, VPA representatives will coordinate with the VDEQ. This process is in the very early stages and mitigation measures that may be required have not yet been defined. Coordination will continue throughout the planning, construction, and operational phases to ensure the project does not impede VDEQ SIP planning and regional efforts to attain and maintain compliance with applicable ambient air quality standards. Additional NEPA documentation will be developed as part of a supplemental EIS to be prepared in conjunction with the development of preliminary engineering and design data. This additional document is expected to include updated air emissions data and communicate that air quality related requirements are being satisfied.

Other mitigation measures that could be used to reduce emissions include either, or a combination of, watering to reduce construction dusts, increased usage of low sulfur fuels for diesel dredges, and electrification of diesel-powered dredges. Other technologies considered include; fuel emulsions, engine retrofits, particulate filters, oxidation catalysts, selective catalytic reduction technology, and other emerging technologies.

IV.1.2.3 Craney Island Terminal Emissions Inventory

The operations at the planned terminal facility will generate emissions of air pollutants. Emissions estimates related to terminal operations have been completed for the ozone precursor pollutants, NO_x and VOC's. Emissions were quantified for these pollutants since the terminal is proposed for location within the Hampton Roads ozone maintenance area. To estimate the quantity of VOC and NO_x emissions from onsite and offsite terminal activities, an emissions inventory has been developed. Emission estimates have been completed for two conditions; the Phase I condition in 2017 and the Build-Out condition in 2050. Methods prescribed by current USEPA guidance for emission inventory development were used to prepare the emissions estimates.

Recognizing the long planning horizon associated with this project (Phase I and Phase II port operations are not anticipated until 2017 and 2050, respectively), the estimated air pollutant emissions that are based on currently available emissions data and models for marine vessels, non-road engines, on-road vehicles (trucks), and locomotives, should be considered preliminary estimates and are believed to overstate actual facility related emissions that will occur during the operation of the port. Actual long-term emissions from the port should be lower than the documented emissions due to future advances in engine efficiency, pollution control technologies, and fuel quality. Future refinement of the emissions estimates for the operational phases of the port are expected to be documented in a supplemental EIS to be prepared in conjunction with the development of preliminary engineering and design data.

Construction emissions have been estimated for dredging and dike construction activities for the eastward expansion of Craney Island. These estimates are provided in Section 1.2.1. Construction related emissions relative to subsequent development of the container terminal facility on the expanded Craney Island will be temporary and are expected to be substantially lower than the documented emissions estimates for dredging and dike construction. Construction activities will result in short-term, temporary impacts at intermittent periods over the course of the phased terminal development process. The primary air quality impact that can occur during construction is the generation of particulate matter/fugitive dust emissions from material handling, excavation, and earth moving activities, as well as wind erosion of exposed surfaces and storage piles. Also, exhaust emissions will be generated from the combustion of fuel in mobile construction equipment. All contractors will be required to comply with state regulations to minimize the release of air pollutants during construction. Information relative to construction equipment, operating schedules, and engine sizes for the construction of the container terminal will not be defined until PED data are available. As appropriate, emissions estimates will be developed for the terminal construction in a supplemental emissions estimate.

The role of a container terminal is to move containerized cargo into and out of a port. There are various sources of air emissions related to the operation of such a facility. Both onsite and offsite emissions are generated by these sources. Onsite emissions are emissions occurring inside the terminal site boundary and offsite emissions are those occurring outside the facility but within the Hampton Roads regional area. The primary sources of emissions related to terminal facilities are attributed to mobile sources. Mobile sources include self-propelled vehicles and equipment powered by internal combustion engines. These sources include marine vessels, motor vehicles (trucks), locomotives, and non-road container handling equipment. The emission inventory developed for the terminal facility includes contributions from these emissions sources. The following table presents a listing of the major emission sources associated with the planned terminal facility.

Table IV-6. CONTAINER TERMINAL OPERATIONAL EMISSIONS SOURCES		
Emission source	Function	Location of emissions
Marine vessels	Transport containers to/from terminal	Onsite/Offsite
Heavy-duty diesel trucks	Transport containers to/from terminal	Offsite (1)
Privately-owned vehicles	Transport employees to/from facility	Offsite (1)
Switch locomotives	Maneuver partial trains around terminal and regional switch yards	Onsite/Offsite
Line-haul locomotives	Pull long trains to/from facility	Offsite (1)
Container handling equipment cranes (electric) Straddle carriers	 Lift containers on/off container ships Transport containers around terminal	 No Emissions Onsite
(1) Emissions will predominantly occur offsite. Lower quantities of emissions will occur onsite.		

Marine Vessels

Containers will be transported between the planned terminal facility and other ports via container ships. Emissions from container ships (marine vessel emissions) include both onsite and offsite emissions that occur during the arrival, loading/unloading, and departure of container ships. Offsite emissions occur while the vessels are under propulsion during arrival and departure. Therefore, offsite marine vessel emissions will occur during the transit of vessels through the Chesapeake Bay and Elizabeth River to and from the planned terminal facility. Emissions occur onsite while vessels are docked or are adjacent to the wharf for loading and unloading.

A container ship is powered by propulsion engines and commonly employs auxiliary steam boilers and electrical generators. Emissions from the propulsion engines are offsite emissions and do not occur while the container vessel is loading/unloading. The auxiliary boilers generate both onsite and offsite emissions as they are operated during navigation and while docked during loading/unloading to provide electrical and accessory power for hot water, space heating, as well as propulsion engine preheating for start-up on departure.

Depending on factors including weather conditions, vessel traffic, fuel prices, and ship captain preferences, other smaller marine vessels may be used to assist container ships. These other vessels could include tugboats for docking assistance and bunker barges for refueling. Therefore, identifying the number of tugboats, bunker barges, and other assist boats that may be associated with terminal operations is highly speculative. Emissions from these other vessels are not expected to be significant and were not included in the emissions inventory.

Diesel Trucks/Privately-Owned Vehicles

The transport of containers to and from the terminal facility will be accomplished primarily by heavy-duty diesel trucks. In addition to the heavy-duty diesel trucks, the other significant on-road vehicles

associated with terminals are privately-owned vehicles. These vehicles are used to transport employees and visitors to and from the facility, thereby producing onsite and offsite emissions.

Locomotives

Trains are the secondary means of transporting containers to and from the terminal facility. Both line haul and switch locomotives are typically used to transport containers. Line haul locomotives are used to pull long trains to and from the facility. Generally line haul trains employ three or more locomotives to pull long trains. Switch locomotives are typically smaller locomotives used to move partial trains around a switchyard as part of container loading and unloading operations and are sometimes used to stack/unstack partial trains when line haul trains arrive or prepare for departure.

Container Handling Equipment

Once container vessels are berthed, containers are moved between the wharf and the container yard during loading and unloading of the container ships. Container handling equipment is considered a non-road source of emissions and its operation is limited to the terminal facility. Therefore, these sources produce onsite emissions exclusively.

Container movement is accomplished using specialized equipment, including cranes and straddle carriers. Cranes are used to transfer containers to and from container ships. Straddle carriers will be the primary means of moving the containers around the terminal's container yard and for stacking/unstacking containers. Electrical cranes are planned for use at the terminal and are, therefore, not a source of emissions. However, straddle carriers are powered by diesel engines, which generate air pollutant emissions from fuel combustion. Onsite emissions from the operation of straddle carriers were included in the emissions inventory.

Other Sources of Emissions

A limited number of small stationary sources that would be required to support port operations are expected. For example, small parts washers and touchup painting operations are likely. Because of the limited use and small size of these sources, they are considered insignificant and will not require an air quality permit. Emergency generators, which are comparably larger stationary sources of air emissions, are used to produce electricity during power outages. However, since these units will be operated on a very limited basis under extreme circumstances, emissions from these units were not evaluated.

IV.1.2.4 Emissions Estimation Methodology

Estimates of onsite and offsite pollutant emissions from the planned terminal operations described above have been completed. The first step in the estimation process involves identifying recognized emission factors and related models. Next, appropriate operational data anticipated for each source are used in conjunction with the identified emission factors and models to develop emission estimates.

Marine Vessels

The marine vessel emission factors were developed based on USEPA's "Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data," USEPA 420-R-00-002, February 2000. Emissions estimates from both the propulsion engines and the auxiliaries were developed during cruise, slow cruise, and maneuvering for travel within the Chesapeake Bay and Elizabeth River. In addition, emissions from

the auxiliary boilers were calculated to account for emissions generated while the ships are docked at the terminal facility. The emission factors are based on the following general equation:

Emission rate (g/kw-hr) = a (Fractional Load)$^{-x}$ + b

The variables a, x, and b are found in Table 5-1 in the USEPA report for each pollutant. The fractional loads are based on the speed of the vessels and are obtained from Tables 4-6 and 5-2 of the USEPA report. The fractional load for cruise, slow cruise, and maneuvering are 80, 30, and 15 percent, respectively. Operational projections used to develop the emissions estimates are based on vessel size and call schedules provided by Moffatt & Nichol Engineers on behalf of the VPA (Moffatt & Nichol Engineers, April 2002). Average cruise speed, vessel dead weight tonnage (DWT), and rated hp values were obtained based on information from the USEPA document.

Diesel Trucks/Privately Owned Vehicles

On-road emission factors for NO_x and VOC's were developed using USEPA's MOBILE5b computer model and Hampton Roads specific input factors supplied by VDEQ to estimate emissions from heavy duty diesel trucks and privately-owned vehicles associated with terminal activities. Emission rates were estimated assuming summer conditions. This was done in recognition that VOC and NO_x pollutant impacts on ambient levels of ozone are most severe during summertime weather conditions. Model inputs include such parameters as vehicle speed, vehicle operating conditions (the thermal states of the vehicular traffic), and ambient temperature. Speeds for the roadways and the proposed facility were based on the functional type (interstate, local roads) and location (urban or rural) of the particular road. Other MOBILE5b input assumptions (i.e., control flag settings, inspection and maintenance [I/M] program records, ATP and pressure and purge records) were based on the latest modeling information provided by VDEQ. Registration vehicle distributions were provided by VDEQ for the Hampton Roads area. Table IV-7 provides a summary of the MOBILE5b parameters used to estimate the on-road emission factors.

On-road vehicle emissions were estimated based on various parameters designed to simulate the movement of travel associated with terminal facility operations within the Hampton Roads area. The majority of port cargo will be transported to and from the terminal via heavy-duty diesel vehicles (HDDV). The projected total container throughput for the planned facility was used to determine the terminal truck traffic projections. These estimates, provided by Moffatt & Nichol Engineers on behalf of the VPA, report the peak and average daily number of truck trips projected (Moffatt & Nichol Engineers, April 2002). The number of truck trips was assigned to roadway segments within the Hampton Roads regional area. These traffic assignments were provided based on a trip generation analysis for the regional area, which assumed that the HDDV would travel along interstate routes to and from the facility. Other mobile sources associated with the port operations include the traveling of employee workers. These employees would largely use privately owned vehicles, or light-duty gasoline vehicles (LDGV), to transport themselves to and from the facility. The employees were conservatively assumed to travel on local roads surrounding the facility. Emission factors for on-road vehicles are expressed in terms of grams per vehicle mile traveled (g/vmt).

Emission factors for on-road vehicles are expressed in terms of g/vmt. The emission factors that were obtained from the MOBILE5b model were then multiplied by the distance each vehicle was assumed to travel to and from the facility. This is known as the vehicle miles traveled (VMT). The VMT for heavy-

duty diesel container trucks with destinations outside of the Hampton Roads area were estimated for each roadway segment to the edge of the regional area. An estimate of how much cargo would be exported or originate outside of the region was assumed. Based on VPA import/export statistics, it was assumed that about 75 percent of the cargo would be destined for or originate from outside the Hampton Roads area, and about 25 percent of the cargo would be destined for or originate from within the Hampton Roads area. For the cargo that is delivered within the Hampton Roads area an average trip length equivalent to half the regional distance was conservatively assumed. Employees were assumed to travel a distance of 15 miles to and from the facility. This is based on an employee trip assignment distributing the majority of travel to the Norfolk vicinity. Additionally, idling emissions, expressed in units of grams per hour were also determined from the MOBILE5b model. For the HDDV, an idling time of 15 minutes per truck trip was assumed. For the employees, an idling time of 5 minutes per trip was assumed. Total emissions for VOC's and NO_x were calculated considering both the free flow and idling emission components for both the employee vehicles and terminal truck traffic.

Locomotives

Train movements are made up of line haul and switching activities and separate emission factors are used for each operation. Both line haul and switch locomotive emission factors were developed based on USEPA's "Emission Factors for Locomotives," USEPA 420-F-97-051, December 1997. The locomotive emission factors are expressed as grams/brake hp-hour (g/bhp-hr). Since the planned terminal facility is not expected to begin operations until 2017, Tier 2 emission factors for locomotive engines manufactured in 2005 and later were used. Locomotive emissions estimates were developed based on hp ratings, activity schedules, and the identified emission factors. Assumptions used to develop the locomotive emission rates include the following:

- Rated hp values of 3,000-hp and 1,500-hp for the line haul and switch locomotives, respectively.
- Three engines per line haul train and one engine per switch locomotive.
- 1.5 hours per line haul and 5.0 hours per switch train activity estimates.
- Carrying capacity of 400 TEU's per 6,000 foot train.
- Trains will transport 466 TEU's per day at initiation of Phase I in 2017 and 2,685 TEU's per day at Build-Out in 2050 based on projections provided by Moffat & Nichol Engineers on behalf of the VPA (Moffatt & Nichol Engineers, April 2002).

Table IV-7. MOBILE 5B INPUT PARAMETERS	
Parameter	Input
Region	Low altitude
Vehicle speed	Urban interstate = 50.9 mph Local roads = 25.0 mph
Vehicle thermal operating conditions	20.6 / 27.3 / 20.6 {cold non-catalytic/hot catalytic/cold catalytic}
Ambient temperature (summer conditions – ozone season)	Minimum = 74□F Maximum = 95□F Average = 84.9□F
Year(s) analyzed	2017 and 2050
Tampering rates	MOBILE5b default
I/M	No
Anti-tampering program	No
Vehicle registration distributions	Provided by VDEQ; based on 1999 data
Vehicle emission rates	Input alternate basic exhaust emission rates applied to HDDV for NO_x emissions (provided by VDEQ in 2002 for this assessment)
Reformulated gas	Credit Taken
Exhaust emission factors	No correction factors

Container Handling Equipment

Emission factors for terminal container handling equipment are published in USEPA's "Nonroad Engine and Vehicle Emission Study-Report," USEPA 460/3-91-02, November 1991. However, emission standards for nonroad engines were promulgated by USEPA under 40 CFR Part 89.112 and are applicable to engines with model years beginning in 1996. Emissions estimates were developed for the diesel powered straddle carriers to be used at the proposed container terminal based on the 40 CFR Part 89.112 standards. The estimated emissions for the straddle carriers are considered conservatively high, given that USEPA is expected to establish more stringent standards for nonroad diesel engines within the next 5 years. Emission factors were not identified for cranes since the VPA plans to use electrically powered cranes.

Emissions from the straddle carriers were estimated based on applying the emission standards for nonroad engines to projected operational data assuming that the units would be operated continuously during the period that the terminal gates are expected to be open (11 hours daily, Monday-Friday). An engine hp rating of 330-hp was assumed based on discussions and information available from straddle carrier suppliers. The projected number of straddle carriers to be operated at the terminal was provided by Moffatt & Nichol Engineers on behalf of the VPA (Moffatt & Nichol Engineers, April 2002).

IV.1.2.5 Craney Island Terminal Emissions Summary

Air pollutant emissions estimates of VOC's and NO_x have been developed for the planned terminal facility. Both onsite and offsite emissions are included in the completed emission inventory for the planned terminal facility. Emission estimates were made based on current methodologies prescribed in available USEPA guidance. The emission estimates do not account for future technological improvements in engine performance and emissions control and pending emissions standards to be promulgated by USEPA that will be more stringent than the currently applicable standards. For example, new USEPA emission standards for nonroad diesel equipment and locomotives will become applicable in future years and USEPA is expected to require the use of lower polluting fuels. In addition, the VPA has an equipment purchasing policy that requires vendors of nonroad equipment (straddle carriers) to provide engines meeting more stringent on-road emissions standards. Consequently, the emission estimates for the planned terminal facility are considered conservative estimates and are assumed to overstate actual emissions that will be generated by facility operations.

Emission inventory summary tables are presented as Table IV-8 for the 2017 Phase I condition and as Table IV-9 for the 2050 Build-Out condition. Both annual (tons/year) and daily (tons/day) emissions have been estimated. The annual estimates reflect emissions corresponding to annual activity projections (marine vessel calls per year, truck trips per year, etc.) The daily emissions values are based on peak daily estimates of terminal related activity.

Table IV-8. CRANEY ISLAND TERMINAL EMISSIONS ESTIMATES FOR 2017 PHASE I CONDITION

Source	VOC		NO_x	
	tons/yr	tons/day	tons/yr	tons/day
Marine vessels	8.6	0.03	566.3	1.86
Trucks/on-road vehicles	20.9	0.10	80.0	0.40
Locomotives	3.5	0.014	57.3	0.24
Container handling equipment	49.8	0.20	343.6	1.35
Totals	82.8	0.3	1,047.2	3.9

Table IV-9. CRANEY ISLAND TERMINAL EMISSIONS ESTIMATES FOR 2050 BUILD-OUT CONDITION				
	VOC		NO_x	
Source	tons/yr	tons/day	tons/yr	tons/day
Marine vessels	17.8	0.06	1,133.1	3.73
Trucks/on-road vehicles	46.4	0.23	337.5	1.70
Locomotives	20.0	0.082	330.2	1.36
Container handling equipment	122.0	0.48	841.5	3.31
Totals	206.2	0.9	2,642.3	10.1

A direct comparison of estimated terminal emissions and regional emission inventory projections cannot be made because a regional projection beyond 2008 is not available for the Hampton Roads region. Notwithstanding this, Phase I terminal emissions are compared with the 2008 Hampton Roads projected emissions inventory in Table IV-10 and in Figure IV-1. As shown, the estimated 2017 Phase I terminal emissions represents a 0.14 percent increase in regional VOC emissions and 1.7 percent increase in regional NO_x emissions based on the 2008 projections for Hampton Roads.

Table IV-10. COMPARISON OF HAMPTON ROADS EMISSIONS INVENTORY AND CRANEY ISLAND TERMINAL EMISSIONS			
Pollutant	2008 Projected Inventory for Hampton Roads (tons/day)	2017 Craney Island Terminal Emissions	
		(tons/day)	% of 2008 Hampton Roads Inventory
VOC's	208.5	0.3	0.14
NO_x	227.2	3.9	1.7

A comparison of terminal related truck/on-road vehicle emissions estimates with regional on-road projections based on the Hampton Roads Crossing (HRC) Study is shown in Table IV-11. On-road emissions projections for the Hampton Roads regional area are included in the HRC Study for the year 2018 (VDOT, 2001). As shown in Table IV-10, the estimated 2017 Phase I Craney Island terminal on-road emissions represent a 0.2 percent increase in regional on-road VOC emissions and a 0.6 percent increase in regional on-road NO_x emissions.

Table IV-11. COMPARISON OF HAMPTON ROADS CROSSING STUDY EMISSIONS AND CRANEY ISLAND TERMINAL TRUCK/ON-ROAD EMISSIONS ESTIMATES

Pollutant	2018 HRC Study Emissions (tons/day)	2017 Craney Island Truck/On-Road Emissions	
		(tons/day)	% of 2018 HRC Study Emissions
VOC's	53.28	0.10	0.2
NO_x	70.14	0.40	0.6

IV.1.2.6 General Conformity - Terminal

The Craney Island terminal project constitutes a non-transportation Federal action within the Hampton Roads ozone nonattainment area. Provisions of the general conformity regulation are potentially applicable to Federal projects locating within nonattainment and maintenance areas. To determine if a conformity determination is required, an emissions inventory of VOC and NO_x emissions has been completed for the terminal. For the 2017 Phase I Condition, estimated NO_x emissions from the planned terminal facility exceed the 100 tons per year threshold level prescribed by the general conformity regulation. For the 2050 Build-Out condition, both VOC and NO_x emission estimates exceed the 100 tons per year threshold. Consequently, general conformity issues must be addressed in order to obtain approval to develop the facility. Compliance with general conformity requirements can be accomplished by the following approaches:

- Estimated terminal facility emissions can be "offset" by obtaining emissions reductions within the Hampton Roads ozone nonattainment area.
- Emissions associated with the terminal can be incorporated into an approved SIP for the nonattainment area.

In addition, it is anticipated that existing air emission reduction programs in place at VPA's three marine terminals will carry over to the proposed Craney Island Terminal. Presently, VIT operator of VPA's existing marine terminals, has a policy that requires all newly-purchased and replacement cargo handling and non-road equipment have the lowest emission rating available. This policy has been in effect since 2000. Also, VIT has implemented a chassis pool system to improve the efficiency of truck operations and reduce the duration of time trucks spend at the port facility for loading and unloading cargo. VPA and VIT will continue to evaluate BMP's and will consider future participation in the SmartWay initiatives and other programs to reduce emissions from idling and port operations. Preliminary results from a 2005 air emissions inventory show air emissions levels at VPA's three marine terminals have remained constant or declined in the last five years as cargo volumes have significantly increased suggesting that VIT's policy has been effective in minimizing impacts to regional air quality.

Based on information obtained from VDEQ, the process of developing a new SIP for the Hampton Roads ozone nonattainment area is expected to occur in 2006-2007. To comply with general conformity requirements and to incorporate the construction and operational phases of the proposed project as part of new and future SIPs for the Hampton Roads area, VPA representatives will coordinate with VDEQ. This process is in the very early stages, and mitigation measures that may be required have not yet been defined. Coordination will continue throughout the planning, construction, and operational phases to ensure the project does not impede VDEQ SIP planning and regional efforts to attain and maintain compliance with applicable ambient air quality standards. Additional NEPA documentation will be developed as part of a supplemental EIS to be prepared in conjunction with the development of PED data. This additional document is expected to include updated air emissions data and communicate that air quality related requirements are being satisfied.

IV.1.3 PROTECTED SPECIES AND CRITICAL HABITAT

IV.1.3.1 CIDMMA Expansion /Terminal Development

IV.1.3.1.1 Sea Turtles

In order to obtain material for dike construction at the site of the proposed east cell expansion, sand may be dredged from offshore channel areas by hopper dredge. The Atlantic Ocean Channel is designated as the primary source of material for dike construction, with Thimble Shoal and Cape Henry Channels as secondary sources. The total amount of required sand fill is estimated to be 19.5 million CY.

An Endangered Species Act, Section 7 consultation has been completed for hopper dredging in the Atlantic Ocean Channel and the Thimble Shoal Channel. This included both maintenance dredging and deepening in these channels. A Biological Opinion was completed by the National Marine Fisheries Service (NMFS) on April 25, 2002. Correspondence with NMFS Northeast Region received during the scoping process indicated that, if the hydraulic pipeline method of dredging is used, "...NMFS has previously determined that this method will not affect sea turtles." However, sand borrow by hopper dredge for dike construction has the potential to affect endangered and threatened sea turtles by incidental take. By implementing the proactive and preventive avoidance mitigation measures as recommended in the NMFS Biological Opinion, cumulative impacts to endangered and threatened sea turtles are not expected. Similar measures are recommended in Biological Opinion rendered for Cape Henry Channel. Further consultation with NMFS may be required during the PED Phase when more specific design information is developed on volumes and locations of suitable sand.

No potential sea turtle nesting sites (under the purview of USFWS) would be affected by the proposed construction activities.

The NMFS provided a letter to the USACE dated October 7, 2005 concerning Endangered Species Act (ESA) section 7 consultation on the effects of the proposed CIDMMA east expansion project on listed species. NMFS noted with particular importance that the proposed expansion may affect sea turtle foraging habitat, and that increases in shipping traffic may increase potential vessel encounters with marine mammals, including the endangered Northern Right Whale (see marine mammals section below).

Several studies of the proposed east expansion site indicate that there is little foraging habitat available for sea turtles at this location and conclude that the potential for sea turtle foraging is limited. These studies are referenced in Section III of the FEIS (Affected Environment). The sparseness of bivalves and crustaceans (typical loggerhead prey preference) is demonstrated by benthic studies conducted within the east expansion footprint (Seitz et al., 2002; Mann, 2002). Also presented in the DEIS are studies by Dauer (2002) that convincingly point out the generally degraded nature of benthic communities in the Elizabeth River. Bivalves, such as the hard clam (*Mercenaria mercenaria)*, the Baltic clam (*Macoma balthica)*, and the stout razor clam (*Tagelus plebeius),* which are dominant and representative members of healthy Chesapeake Bay benthic communities, are generally absent from the expansion footprint.

Mann (2002) sampled 24 stations (28 attempted) within a 452-acre area directly adjacent to the east side of CIDMMA as part of a field estimate of clam standing stock in Hampton Roads in 2001 (DEIS, Figure III-8, Table III-7). Each station was sampled with a hydraulic patent tong with coverage of 1-square meter. After preliminary sorting, all molluscs were separated by species, counted, and measured. In addition to hard clam (*Mercenaria mercenaria*), data were also collected on distribution and demographics of the razor clam (*Tagelus plebeius* and *Ensis directus*), the angel wing clam (*Cyrtopleura costata*), and the soft shell clams (*Mya arenaria*). The only bivalve found in 24 stations was a single hard clam. Seitz et al., (2002) concluded from field investigations that "...because of this extremely low bivalve biomass and because bivalves were very small juveniles, the Craney Island (expansion) area is not likely to be a significant feeding ground for the blue crab or demersal fish."

The total absence of SAV's at the site of the proposed expansion has been documented by Orth (2004) during the time period 1974 to 2004. Additionally, this portion of the Elizabeth River falls within an "SAV exclusion zone" where wave energy, sediment type, or other factors preclude SAV growth (Batiuk et al., 2000). SAV's are where Kemp's ridleys would typically forage in Chesapeake Bay (Musick and Limpus, 1997) and where green turtles typically feed on sea grasses and benthic algae (Bjorndal, 1997).

Because of the total absence of SAV's, and the degraded nature of benthic populations, including sea turtle's prey base of bivalves and crustaceans, the USACE has concluded that the expansion footprint is not a significant foraging area for sea turtles. The USACE transmitted a letter to NMFS dated January 5, 2006 indicating that USACE had made a "not likely to affect" determination and requested NMFS concurrence with this conclusion.

To evaluate the potential for impacts to sea turtles from the proposed project, current data on sea turtle strandings were obtained from VIMS (Mansfield, 2006). Since 1979, out of approximately 5,500 strandings in the lower bay, only about 150 were documented in the Lower James River. Six to eight strandings have occurred per year between the Monitor-Merrimack and Hampton Roads Bridge-Tunnels between which CIDMMA lies. According to Mansfield et al. (2002), in 2001, 65 sea turtles were stranded in the southern portion of the Chesapeake Bay out of 395 total strandings. This total includes the Eastern Shore area, where the majority of the strandings occurred. In the lower James River/Hampton Roads Harbor area, only nine sea turtle strandings were recorded. The only stranding near CIDMMA occurred a few hundred yards west of CIDMMA, and the other eight sea turtle strandings occurred east of the mouth of the Elizabeth River in the lower Chesapeake Bay and vicinity. Although strandings may have been documented in this area, these turtles may not have died in the area. A majority of the strandings in the Lower Bay occur near the southern tip of the Eastern Shore and in the Virginia Beach

area between the Hampton Roads Bridge-Tunnel and Back Bay, North Carolina. Strong tidal currents could cause carcasses to drift from these areas into the lower James River (K. Mansfield, VIMS, personal communication, 2006). Based on this information, there appears to be a low probability of impacts to sea turtles in the immediate vicinity of the proposed port facility. Any potential interaction with vessels would be more likely to occur in shipping channels in the southern Chesapeake Bay, areas that are already heavily trafficked.

IV.1.3.1.2 Bald Eagles

One bald eagle nest was identified in 2002 approximately 2.5 miles east-southeast of the proposed port facility within Hoffler Creek Wildlife Preserve, but was destroyed during Hurricane Isabel in September 2003. Eagles are most vulnerable to disturbance early in the nesting period, i.e., during courtship, nest building, egg laying, incubation, and brooding (roughly the first 12 weeks of the nesting cycle). Disturbance during this critical period may lead to nest abandonment and/or chilled or overheated eggs or young (USFWS, 1987). The largest recommended buffer zone around eagle nest sites in the CBR has a radius of 1,320 feet (1/4 mile). Even if eagles should eventually return to occupy this nest site, it is unlikely that any noise resulting from construction and operation activities will impact nesting at this location given its 2.5 mile distance from the proposed expansion site.

IV.1.3.1.3 Piping Plover/Least Tern

The first confirmed nesting pair of Piping Plover at Craney Island was reported in 1989. Observations of breeding pairs in 1994 and 1995 found that nests were placed mostly on the island's western side (5 nests) with one nest on the northern shore and one on the eastern side of the island on the eastern side of the center cell. No nesting pairs have been observed since 1997. Least tern nests have been documented on the east dike of CIDMMA. According to Dr. Ruth Beck (College of William and Mary), least terns are more tolerant of human activity than other tern species and therefore may not be easily deterred from the site. Development of the east cell and the new port facility is not expected to impact any nest sites at CIDMMA. Phase I of port construction would commence as soon as an eastward expansion to support this area is complete; therefore, no nesting or feeding habitat would be impacted during the initial phase of port development. After Phase I of the port facility is constructed and in operation, it is unlikely that the birds would colonize the expansion area due to the high degree of mechanical and human disturbance associated with operation of the port facility. Therefore, ultimate Build-Out of the proposed port facility is not expected to impact piping plover habitat. As these birds are highly mobile and can easily avoid construction activities, no accidental takings during the construction process would be expected. VDGIF recommends project coordination with the state and the USFWS to avoid impacts to the piping plover. USFWS indicates that "...Piping plover (*Charadrius melodus*), which is Federally-listed as a threatened species, nested at Craney Island from 1989 to 1997. The habitat conditions currently appear marginal for this species, and an active management program would probably be needed to attract these birds to the site in the future" (USFWS Planning Aid Report, EIS, Appendix A).

IV.1.3.1.4 Marine Mammals

According to the Virginia Marine Science Museum, dolphins and Atlantic right whales are sometimes involved in collisions with commercial, military, and recreational vessels each year throughout the CBR. Encounters with harbor porpoises are less common.

With regard to the presence of North Atlantic Right Whale in the Chesapeake Bay region and the potential for impacts associated with vessel traffic, the nearshore and inshore shipping channels into the Chesapeake Bay are accessed by thousands of military, commercial, and recreational vessels entering the Port Hampton Roads and the Port of Baltimore. The U.S. Navy is required to report whale sightings in these areas, and commercial vessels participate in voluntary reporting when traveling in this region. As mentioned in Section III, sightings data are maintained by the NOAA and reported to mariners by the U.S. Coast Guard.

Given that the frequency of whale sightings in the shipping channel is very low (two sighted in 28 years) and that navigation safety regulations require vessels to travel within the designated channels, the potential for vessels strikes as a result of the construction of the eastward expansion and the future operation of a marine terminal at this location is believed to be negligible. Section III, Figure III-4 depicts the spatial distribution of whale sightings. The USACE has concluded, therefore, that increases in vessel traffic related to the proposed east expansion and container terminal project are not likely to affect listed marine mammals. This conclusion was provided by the USACE to the NMFS in a letter dated January 5, 2006, and the USACE requested concurrence with this conclusion.

It is noteworthy that the non-Federal sponsor of this project, VPA, is presently a member of the Northeast Implementation Team (NEIT) for the Recovery of the North Atlantic Right Whale. The NEIT focuses exclusively on North Atlantic right whale ship strike reduction and supports of the NOAA Ship Strike Reduction Strategy Working Group.

IV.1.3.1.5 Conclusions

No other impacts to Federally- or state-listed endangered or threatened species, species of concern, or other species cited by the VDCR and VDGIF are anticipated from cell construction or terminal development/operation. The initial phase of port development would commence immediately following island development. Mechanical and manmade activities associated with port operation would likely deter these species from inhabiting the adjacent island expansion areas. Following port Build-Out, none of the species mentioned in Part III are likely to inhabit the port facility. Existing nesting and feeding areas on the CIDMMA should not be impacted. Agency coordination will be conducted to ensure impacts to these species are avoided.

IV.1.4 AQUATIC BIOTA

IV.1.4.1 CIDMMA Expansion

IV.1.4.1.1 Fish and Essential Fish Habitat

The Elizabeth River has been designated as a Confirmed Anadromous Fish Use Area (CAFUA), according to VDGIF. Designated anadromous fish spawning and nursery grounds occur 15-20 miles up the James River from the proposed project area. Salinities in the Elizabeth River in the area of the proposed expansion range from 16-22 ppt. Salinities of the tidal-fresh water areas of the lowest reaches of the CAFUA range from 0-0.5 ppt. Therefore, use of the proposed project area by anadromous fish, including Atlantic sturgeon, would only be as part of a migration corridor. Only a small area of the Lower James and Elizabeth River mouth at the location of the proposed access channel may experience temporary increased turbidity during dredging activities. Due to the size of the Elizabeth River and

Lower James River mouths, this small area of minimal impact is not anticipated to hinder migration of anadromous fishes.

The 1996 amendments to the MSA require Federal agencies to consult with NMFS regarding the potential effects of the action on essential fish habitat (EFH), which is defined as those waters and substrates necessary to Federally-managed fish for spawning, breeding, feeding, or growth to maturity. Step 1 of the consultation process was accomplished by notifying NMFS that this EIS was being prepared (meeting with NMFS on September 25, 2002). Step 2 is the preparation of an EFH Assessment by the Federal agency proposing the action. The EFH Assessment includes: (1) a description of the proposed action; (2) an analysis of the effects of the action on EFH and associated species; (3) the Federal agency's views regarding the effects of the action on EFH; and (4) a discussion of proposed mitigation, if applicable. Step 3 of the consultation process is completed after NMFS reviews the draft EIS for which NMFS and other agencies who have interests provide EFH conservation recommendations during the established comment period. Comments on the EFH impacts have been provide by NMFS, who suggested a *Complete EFH Assessment* for the project. The fourth and final step in the consultation process is the Federal agency's response to the EFH Conservation Recommendations. The following information represents a combination of Steps 2 -4. Analysis of effects are based on information reviewed for the EFH species of concern, information presented is based on comments to the Draft EIS provided by NMFS and other interested agencies, and response to EFH Conservation Recommendations by the Norfolk District USACE are also represented.

(1) Description of proposed action: The project will involve the dredging of a 52-foot-deep access channel. There will be a permanent loss of open water and benthic habitat within the 580-acre cell footprint (See EIS, Section II).

(2) Analysis of the effects of the action on EFH: Proposed project area is part of a 10-foot x 10-foot-square of latitude and longitude designated by the NMFS as EFH for egg, larvae, juveniles and/or adults life stages of 14 species. EIS, Section III describes the species and at which life stage EFH has been determined by the NMFS in the vicinity of the project. According to trawl data, of these species, only summer flounder have been found in significant numbers in the area (59 collected in trawls conducted 1978 through 2000). Flounder are mobile species that likely will relocate as the expansion cell is filled and access channel is dredged. In addition, existing silt/clay/sand bottom at the proposed project site will be dredged, exposing a clean sand bottom preferred by flounder. Red drum were confirmed in 1 of 3 beach seines conducted by VIMS at the future Maersk terminal south of proposed project area in 2002. Suspended sediment associated with dredging and dike construction may temporarily increase turbidity and re-suspend contaminants in sediments. Impacts of suspended sediments include impaired avoidance due to reduced visibility and impaired respiration due to gill clogging. However, suspended sediment is expected to be localized and temporary, and, therefore, is not anticipated to significantly impact EFH species that, although unlikely, may be in the project area.

This project would result in removal of 580 acres of benthic habitat that could supply food source to EFH species. The benthic community at the CIDMMA expansion area includes benthic invertebrates such as *Neries succinea*, *Sabellaira vulgaris*, and *Ampelisca abdita*. Steimle et al. (2000) report that *Amplisca abdita* is particularly important to the diets of winter flounder,

windowpane, juvenile scup, juvenile weakfish, striped searobins, juvenile black sea bass, and juvenile silver hake, all of which have been documented to occur around CIDMMA. However, studies by Dauer and Ewing (1986) and Dauer (2000, 2002) show that bivalves comprise less than 10 percent of the infaunal community biomass, and the community is actually dominated by small polychaete worms.

It is notable that one species, the sandbar shark (*Charcharinus plumbeus*), is designated as having a Habitat Area of Particular Concern (HAPC), which is described in regulations as a subset of EFH that is rare; particularly susceptible to human-induced degradation, especially ecologically important; or located in an environmentally-stressed area.. The total HAPC for the sandbar shark in the lower Chesapeake Bay is approximately 89,000 acres of open water, including the lower James River and Hampton Roads, which constitutes approximately 33 percent or 29,500 acres of the total. The permanent loss of aquatic habitat within the 580-acre cell footprint represents less than one percent of the total HAPC area. Short-term increases in turbidity and settlement associated with dredging may be detrimental to sensitive eggs, larvae, and juvenile life stages in the localized area; however, the increase in suspended sediment associated with the dredging activities is on the order of background concentrations in the Elizabeth River and within natural short-term variability of background concentrations.

The Atlantic Ocean Channel, Thimble Shoals Channel, and Cape Henry Channel are proposed as sources of material for fill of the CIDMMA expansion. The Atlantic Ocean Channel and the Thimble Shoals Channels have been authorized to be dredged to depths of 60 and 55 feet respectively. The deepening of these channels has been conducted in increments since the initial NEPA review was approved in 1982 The NEPA review for dredging of these channels was conducted prior to enactment of the MSA; therefore, EFH consultations were not completed. According to NMFS (2005), "in accordance with 50 CFR 660.920 (a) an EFH consultation is not required for actions that were completed prior to the approval of the EFH designations by the Secretary of the Department of Commerce. However, consultation is required for renewals, reviews, or substantial revisions of the action if the renewal, review, or revision may adversely affect EFH." The dredging of material from the Thimble Shoals and Atlantic Channels for construction of the CIDMMA expansion cell is not inconsistent with the current authorization for activities in these channels, as dredging will not be conducted below the depth authorized for each specific channel. In addition, these channels would be dredged to maximum authorized depth regardless of CIDMMA expansion and/or port development. In the past, dredging of these channels has been conducted incrementally due to funding. Dredging associated with the proposed project will be conducted at a more rapid rate than in the past but will not be inconsistent with the currently authorized scope. This does not constitute a renewal, review, or substantial revision of the current authorized scope. Therefore, EFH consultation would not be required for dredging of the Atlantic and Thimble Shoals Channels to 60 and 55 feet respectively.

A Limited Reevaluation Report dated October 2002 was submitted to NMFS to notify of the intent to continue with incremental dredging from 45 to 50 feet in the Thimble Shoals and Atlantic Channels. The USACE determined that no subaqueous habitat would be lost, that the project would not have an adverse effect on EFH, and, therefore, expanded EFH consultation would not be required. NMFS (Mr. John Nichols) provided a verbal response via telephone to the USACE (Ms. Michele Cleland, September 19, 2001) indicating that the project did not have such

significant impacts that conservation would be required. The current proposed channel dredging is not expected to have any impacts inconsistent with those associated with the previous incremental deepening. Incremental deepening was performed, not based on scope, but on available funding for dredging operation.

The Norfolk Disposal Site (NDS) was designated by USEPA in July 1993. It is designated to receive dredged material from the lower Chesapeake Bay. The estimated capacity at that time (as stated in the May 12, 1993 Federal Register) was 250 MCY placed "...over the next 50 years." The site has received little use, only by the Navy, and, at most, several MCY. There is still enormous capacity at the site, and the proposed 19.1 MCY from the new access channel and expansion footprint would easily be accommodated within the existing authorization. Therefore, EFH consultation would not be required for disposal of dredge material at the NDS.

(3) Department of the Army's views regarding the effects of the action on EFH: Based on the rarity of EFH species in the site area it is likely that, due to degraded habitat and anthropogenic impacts, there is little or no EFH in the proposed site area. Adverse effects on EFH species, if any, due to construction, will largely be temporary and minimal, with some permanent effects related to loss of bottom area and open water in the cell footprint. It is highly unlikely that any adverse effects will be caused from dredging activities due to the nektonic mobility of the EFH designated species. As much as 18 acres (840,000 square feet) of rip-rap placed on the dikes surrounding the expansion areas is likely to attract species that are normally associated with reef structures, species that are commonly found around estuarine inlets, and species that seasonally migrate along the coast (Van Dolah et al., 1987). Van Dolah's (1987) study of quarrystone jetties at Murrels Inlet, South Carolina, found that the jetties served as nursery habitat for a variety of fish species and that numerous fishes derived trophic support directly from the biota associated with the structures or indirectly by preying upon smaller forage fishes which congregated around the rock structure. The study also noted increased recreational fishing around the inlet jetties in which anglers sought red drum, flounder, spot, bluefish, king mackerel, black sea bass, and smooth dogfish, all of which are similar species found in the study area. A growing amount of evidence is accumulating suggesting that rip-rap structures are indeed a viable habitat not only for attachment of epifaunal species but also for infaunal species subtidal to the rip-rap (Seitz et al., in review) and fish species (Seitz et al., in review; Carroll et al., 2003). Seitz et al. found that infaunal benthic abundance and diversity were significantly higher in subtidal habitats adjacent to rip-rap than those adjacent to bulkhead shorelines, and, furthermore, epibenthic fish density (as sampled by trawling) and diversity tended to be higher adjacent to rip-rap than bulkhead shorelines. Some of the fish species that frequented habitats adjacent to rip-rap in the York and Lafayette Rivers included spot, croaker, silver perch, and anchovies (Seitz et al., in review). Similar effects of these studies are expected in the project area. Rip rap may also provide habitat for the black sea bass and red drum that are generally found near submerged structure. The rip-rap will provide a nursery habitat for prey species of all of the 6 species identified as possibly having EFH in the proposed project area.

(4) Discussion of proposed mitigation: Every measure will be pursued to avoid and minimize effects on EFH. Compensation for benthic and open water habitat lost will involve sediment remediation, wetlands restoration, and oyster restoration, which will provide fisheries habitat benefits to EFH designated species. The assessment of the impacts of the project based on the rarity of EFH species in the site area and proposed mitigation led to a determination that it will not have a substantial adverse effect on EFH. No significant adverse impacts on fish species are anticipated. However, proposed project mitigation includes over $50 million in tidal marsh creation, oyster reef creation, and sediment remediation as part of a mitigation package that will provide significant fishery benefits to mitigate effects on EFH. This mitigation, especially the $33 million to be used to remediate extremely polluted sediments of the Elizabeth River, required to compensate for impacts to severely to marginally degraded benthic habitat, should more than adequately mitigate for impacts to EFH. The 55.6 acres of tidal marsh creation and 20 acres of 3-dimensional oyster reef creation, with seeding of disease resistant-oysters, provide additional mitigation for impacts to EFH.

Existing estuarine and marine EFH within the proposed project area would be subject to minimal impacts as a result of port development and operation. High-energy wakes from large vessels have the potential to increase shoreline erosion. However, in this case, impacts resulting from wave action should be minimal, since the affected shoreline in the Norfolk Harbor, including the proposed terminal, would be protected by manmade structures. The eastern shoreline is already stabilized by manmade structures of the Norfolk Naval Base and NIT. In addition, water quality may be affected by localized increases in turbidity and total suspended solids during dredging, cell construction, and wharf construction. Because dredging has a finite length and would not occur continuously over the construction period, the condition is considered temporary. The potential impacts on water quality form constructing these facilities is discussed in Section IV. 1.1.2. The anticipated increase in suspended sediment is expected to fall within the range experienced by the Elizabeth River under natural climatic events and hydrodynamic conditions. Because of the localized and temporary nature of water column turbulence and the adaptation of resident fish species to naturally elevated levels of suspended sediments, feeding success of sight-feeding fish is not expected to be impacted to any appreciable extent.

Species of fish that are important to the bay ecosystem but are not Federally-managed and/or listed as having EFH are also present in the proposed project area. These fish may include some of the 295 fish species known to occur in the bay. A complex trophic web is supported by the large diversity of fishes in the Chesapeake. However, the proposed project lies in an area that has been significantly impacted by anthropogenic sources resulting in degraded water quality and habitat. This area represents a small portion of the bay. In addition, this area has been significantly degraded and does not likely provide significant habitat for large numbers of fish that play integral roles in the trophic stability of the bay ecosystem.

Hedgepeth et al. (in Priest 1981) concluded that 3 major finfish uses of the Elizabeth River and lower James River are: (1) nursery ground for juvenile spot, croaker, alewife, blueback herring, American shad, striped bass, and weakfish; (2) adult feeding grounds for spot, croaker, weakfish, summer flounder; and (3) spawning grounds for important forage species, such as bay anchovy and Atlantic silverside. Compensation for benthic and open water habitat lost will involve sediment remediation, wetlands

restoration, and oyster restoration, which will provide fisheries habitat benefits to EFH designated species.

The loss of 580 acres of aquatic habitat related to the expansion of the CIDMMA and the subsequent port facility development and its effects of on a wide variety of aquatic resources is discussed at length in this document. The mitigation plan (Appendix B Mitigation Analysis) which includes wetlands restoration, sediment clean-up, and oyster restoration, was developed over 3 years with multiple stakeholders to provide compensatory mitigation for these impacts and losses. The mitigation plan components provide restored and improved nursery areas and habitat for forage species as well as managed species. In addition, two of the species that may have EFH in the proposed project area (black sea bass and red drum) will likely benefit from the extensive rip-rap placed on the dike walls. Further documentation on the proposed rip-rap habitat created as a result of dike construction is provided in Section 1.4.1.3 below.

IV.1.4.1.2 Submerged Aquatic Vegetation

The proposed CIDMMA eastward expansion lies almost entirely within an SAV Exclusion Zone (CBP, March 2002). A SAV exclusion zone is an area defined as never supporting SAV historically nor able to support SAV now or in the future. A small part of the northern portion of the proposed eastward expansion does lies outside the SAV Exclusion Zone. This area does not lie within the Tier III SAV distribution goal, which represents a return of SAV to its historical distribution in the Chesapeake Bay, to a depth of 6 feet in areas capable of supporting SAV growth (CBP, 1992). The water depth in the area is about 12 feet deep. Within the Chesapeake Bay, SAV currently cannot grow below 3 feet deep in most areas and is not found growing in 12 feet of water near the mouths of the James and Elizabeth Rivers, which are known for their high TSS and limited light penetration. SAV has not been found in the area historically and, based on TSS and water depth, will not be found in the project area in the future.

According to the 2004 Aerial Flight update (Orth, 2004), the nearest SAV beds to CIDMMA are found along the north shore of Hampton Roads Harbor between Newport News Creek and Salter Creek, approximately 4 nautical miles (northeast) from the existing CIDMMA (Figures III-6 and III-7). Year 2004 area estimates for those beds were approximately 15.3 acres. There are no SAV beds located near the proposed port facility. Therefore, no impacts to SAV are anticipated either as a result of dredging, cell construction, or port development or operation.

IV.1.4.1.3 Benthos

Public oyster grounds (Baylor Grounds) are located within the vicinity of CIDMMA, namely Public Oyster Ground Number 1 (Norfolk County), which surrounds the existing CIDMMA on the west, north, and east sides. Public Oyster Grounds Numbers 2 and 3 are found in the mouth of the Elizabeth River near CIDMMA. These oyster grounds are depicted in Figure III-10. Approximately 200 acres of designated Baylor Grounds would be covered by the expansion cell; however, the impact on oysters would be negligible because these oyster grounds have not been productive for many years.

A typical dredging related sediment plume may extend a few hundred meters (approximately 1-quarter mile) downstream from *active* dredging areas (Priest, 1981). The low ambient current velocities and tidal effects in the vicinity of the site may reduce the plume migration to less than the typical distance (APM Terminals Virginia, Inc., 2005). The type of dredge equipment used will have a great impact on the

suspended sediment concentrations. As described in Section IV.1.1.2.1, with proper precautions taken, the increase in suspended sediments associated with the dredging activities is likely to be on the order of the background concentration in the Elizabeth River. Dredging practices appropriate for reducing sediment suspension and subsequent deposition on existing Elizabeth River oyster restoration sites will be utilized to prevent impacts to these established oyster reefs. These practices are discussed in Sections IV.1.1.2.1 and IV.1.1.2.2. No impacts are anticipated.

The USACE, Norfolk District, funded a VIMS study of the impact of the eastward expansion of the CIDMMA on the abundance, biomass, and diversity of benthic species (Seitz and Lipcius, 2002). They concluded that the area of the proposed Craney Island expansion had lower bivalve density, diversity, and abundance than the adjacent deep-water habitats or shallow-water habitats in the Craney Island-Lafayette River system. Bivalve biomass within the expansion area also constituted a small fraction of the biomass within the general area. Because of this extremely low bivalve biomass and because the sampled bivalves were very small juveniles, it was concluded from this study that the CIDMMA expansion area is not likely to be a significant feeding ground for the blue crab or demersal fish. Other studies by Dauer and Ewing (1986) and Dauer (2000; 2002) show that bivalves comprise less than 10 percent of the infaunal community biomass and that the community is actually dominated by small polychaete worms. Detailed information related to benthic sampling sites east of the CIDMMA and in the Lafayette River system, along with the sampling methodology, and analyses is available in EIS, Appendix E.

Past feeding studies have demonstrated that preferred prey of demersal fishes, including croaker, spot and hogchoker, are the larger benthic infauna such as nereid polychaetes, the Baltic clam and amphipods (Hines et al., 1990 from the report), which are absent from the Craney Island expansion habitats. It is possible that some demersal species, including spot, croaker, silver perch, gizzard shad, mullet, killfishes, blennies, gobies, skilletfish, hogchoker, blackcheek, tonguefish, winter flounder, mysids, shrimps, small crabs, and other motile epifaunal crustraceans, feed on some of the small benthic invertebrates present in the Craney Island expansion (USFWS, 2005); however, the biomass is so low that it is debatable whether this prey base is "suitable." Though caging studies by Virnstein (1977) in the York river showed increases in polychaetes and bivalves inside of predator-exlcusion cages, recent information on croaker feeding (Powers et al., 2005) provides other evidence that bivalves are part of a healthy diet for demersal fish. In the Neuse River estuary, croaker modified their diets from large amounts of bivalves during normoxic conditions in June to dominance by polychaetes and plant material during the physically stressful, anoxic period in September. Croaker are opportunistic feeders that modify their diet depending on prey availability (Currin et al., 1984; Hines et al., 1990), and the switch from bivalve prey in June to polychaetes and plant matter in September reflected the summertime decline of *Macoma* spp. due to anoxia, and was consistent with the loss of an important and preferred prey type (Powers et al., 2005). Moreover, results of two collaborative studies (Baird et al., 2004; Eby et al., 2005) indicated that the summertime declines in availability of benthic invertebrate prey have serious population consequences for demersal fishes as well as impacts on ecosystem processes. Eby et al. (2005) demonstrated that the physiological condition, individual growth rate and population growth of croaker and spot in the Neuse River Estuary were lower in the year of severe hypoxia (1997) than in two years of less intense summertime oxygen depletion in 1998 and 1999. Combining these results with those of Powers et al. implies that switching from bivalves to alternative prey resources including plant matter does not suffice to sustain high production of demersal fishes throughout the Neuse River Estuary. This conclusion is also

supported by the results of trophic mass-balance modeling demonstrating that production of the benthic infauna in the Neuse River Estuary was sufficient to support energy demands by demersal fishes and blue crabs before but not after the large-scale hypoxic event in July 1997 (Baird et al., 2004). Consequently, while there may be some feeding taking place, the Craney Island expansion site is not likely to be an important feeding ground for the blue crab and demersal fishes.

There will be a temporary loss and probable shift in benthic community structure associated with dredging the ship access channels to and from the terminal. This is not a permanent impact. Natural recovery of benthic infauna is expected to occur over a 5-year period; however, periodic maintenance dredging in isolated shoals will slow complete recovery of all of the affected bottom areas. Surficial sediment layers likely to contain some levels of contamination will be removed. Dredging is expected to expose cleaner sediments which may enhance benthic population health and survival.

There will be a loss of approximately 580 acres of estuarine bottom habitat used by fish, shellfish, crabs, and bottom dwelling organisms. In addition, a loss of about 580 acres of open water above the estuarine bottom habitat will also occur. Based on the Benthic Index of Biotic Integrity, the impact area is generally poor quality and exhibits degraded conditions. No commercially significant quantities of clams and oysters are in the impact area. In addition to the habitat loss, the biological productivity of the benthic macrofauna and meiofauna in the impact area will be lost, along with the zooplankton productivity in the water column. Mitigation of the loss of about 580 acres of open water will partially occur via the widening and deepening of adjacent berthing areas for the Terminal. Off-site and out-of-kind mitigation is proposed (EIS, Appendix B) to mitigate the effects of bottom habitat loss and open water effects to finfish, crabs, and bottom-dwelling organisms. Mitigation alternatives presented in the mitigation plan that have been developed to compensate for lost functional values include: oyster habitat restoration, wetland restoration, contaminated sediment remediation, riparian buffers/conservation areas, bird management, and shoreline stabilization.

As mentioned previously for certain fish species, rip-rap placed on the dikes is likely to attract other benthic species that are normally associated with reef structures. Many types of vertical structures provide the complex habitat architecture needed by a diverse group of invertebrates to survive and grow. An example is the invertebrate-fish community characteristic of oil rigs, which in some instances provide the only regional habitats for certain species of corals, other invertebrates, algae, and fish.

The "rough" structure provided by rip-rap on the exterior of the dikes at the proposed Craney Island expansion, especially given the large area of the dike surface, is likely to provide an extremely diverse and productive community, as well as serve as a substrate for oysters and as a nursery and feeding area for many fishes and invertebrates, including the blue crab. Other options may be investigated during PED to provide an ecologically-friendly surface on the dikes, thereby helping to offset a portion of the benthic habitat that is lost.

The constructed east expansion cell would result in approximately 50 square feet of rip-rap per foot of wharf below the water line. With this number that makes it about 840,000 square feet or over 18 acres of net gain. About half of this habitat would be above 20 feet MLW, the remainder below 20 feet MLW. The riprap that will cover the dike slope is a 3-dimensional structure that will provide valuable hard attachment substrate for epifaunal invertebrates along with nooks and crannies attractive to small motile

organisms, including crabs and fish. It is well documented that the impact area was once a hard bottom substrate (oyster shell/reef structure) and part of an extensive public oyster ground (Baylor Ground) in the Elizabeth and lower James River. With the demise of the oyster in the bay, primarily due to disease and overfishing, the oyster reef structure was removed and/or covered with soft substrate (sediment). Hard structure (such as oyster reefs) is a significantly depleted habitat in the Chesapeake Bay that provides a wealth of ecosystem functions, including habitat provision for blue crabs, benthic populations, and fish stocks that are now depleted. On the other hand, soft-bottom habitat is the dominant bottom type of the entire bay and, in fact, is the habitat type that is already enhanced through the extensive loss of oyster reef and shell bottom habitat.

Recent data show that alternative substrates (i.e., besides oyster shell) such as rip-rap (granite) and concrete structures promote the establishment of oyster populations (R. Lipcius, VIMS, personal communication, 2005). For example, recent findings from a concrete 3-dimensional reef in the Rappahannock River showed oyster densities that were higher than any restored reef (including the gold standard – 600 oysters/m^2 at Fisherman Island on the Eastern Shore). This reef offers significantly greater vertical complexity, reef stability, and substrate surface area than many restored reefs and, thus, may be a more realistic mimic of natural oyster reefs. The modular reef was neither seeded artificially nor harvested. The reef was colonized heavily by native oyster and mussel larvae that recruited successfully and survived in a thriving oyster reef community for the 4.5 years since reef deployment in 2000. Oyster and mussel biomass and density values were among the highest recorded for natural and restored oyster reefs.

Furthermore, new data from a project in Lynnhaven Bay (Lipcius and Burke, in progress) suggest that settlement of oyster spat is greater on rip-rap than other hard substrates, including natural oyster shell. In combination, these studies suggest that rip-rap structures on the Craney Island Expansion would indeed provide a viable "reef" not only for epibenthic invertebrate species, but also for mobile species.

IV.1.4.2 Other Flora and Fauna

The 55-foot deep water that would be adjacent to the proposed container terminal would provide sufficient clearance to minimize sediment suspension due to ship maneuvering. Therefore, significant increases in turbidity are not expected that could impact populations of phytoplankton, macro-algae, and zooplankton near the proposed port facility. Submerged portions of the wharf facility and rip-rapped areas associated with the port could benefit macro-algae and sessile animals by providing attachment sites, thereby allowing them to colonize these structures.

IV.1.4.3 Terminal Development

IV.1.4.3.1 Fish and Essential Fish Habitat

Existing estuarine and marine EFH as well as habitat associated with other native fishes without EFH designations within the proposed project area would be subject to minimal impacts as a result of port development and operation. High-energy wave trains from large vessels have the potential to increase shoreline erosion. However, in this case, impacts resulting from wave action should be minimal since the affected shoreline in the Norfolk Harbor, including the proposed terminal, would be protected by manmade structures. The eastern shoreline is already stabilized by manmade structures at the Naval Station Norfolk and NIT.

Two to three percent of the containers currently handled at VPA terminals are placarded as containing hazardous materials (VIT, December 2004). Events involving hazardous materials are uncommon, but are of concern due to the EFH in the area. Potential impacts will be reduced by the use of spill prevention and response plans, BMP's, and treatment of stormwater (see Part III, Section 1.0). Port development and operation is not expected to imperil any fish species or notably reduce species diversity within the fish community.

IV.1.4.3.2 Submerged Aquatic Vegetation

Eelgrass (*Zostera marina*) is found in salinities of 10-35 ppt and is the SAV species of most concern in Hampton Roads. According to the 2000 Aerial Flight update (Orth, 2004), the nearest beds to the proposed port facility are found along the north shore of Hampton Roads between Newport News Creek and Salter Creek, over 4 miles away from the proposed CIDMMA eastward expansion. Year 2004 area estimates for those beds were approximately 42 acres. There are no SAV beds located near the proposed port facility. Therefore, no impacts to this resource will occur either as a result of port development or operation.

IV.1.4.3.3 Benthos

Comparison of the results for the Elizabeth River watershed to the Chesapeake Bay Benthic Restoration Goals shows that the macrobenthic communities of the Elizabeth River can be characterized as having lower than expected species diversity and biomass, abundance levels generally higher than reference conditions, and species composition with levels of pollution indicative species higher than reference conditions and levels of pollution sensitive species lower than reference conditions (Dauer, 2001).

Port development and operation are not expected to cause long-term, adverse impacts to the benthic communities. Dredging activities will temporarily impact benthic communities; however, all dredging activities needed for port development and operation would be completed as part of the proposed CIDMMA eastward expansion and other proposed harbor channel improvements, not as a result of the proposed container terminal construction.

IV.1.4.3.4 Other Flora and Fauna

The 55-foot-deep channel adjacent to the proposed container terminal will provide sufficient clearance to minimize sediment suspension due to ship maneuvering. Therefore, significant increases in turbidity that could impact populations of phytoplankton, macro-algae, and zooplankton near the proposed port facility are not expected. Submerged portions of the wharf facility and rip-rapped areas associated with the port could benefit macro-algae and sessile animals by providing attachment sites, thereby allowing them to colonize these structures.

IV.1.5 WETLANDS AND SUBAQUEOUS BOTTOMS

The primary regulatory mechanism for the protection and management of the nation's waters and wetlands is Section 404 of the Clean Water Act (CWA), which is administered by the USACE according to regulations published in the Federal Register on July 25, 1975. Section 404 of the CWA regulates the discharge of dredged material, placement of fill material, or excavation within waters of the U.S. and authorizes the Secretary of the Army, through the Chief of Engineers, to issue permits for such actions. The USACE has determined that the CIDMMA eastward expansion project will not require permits

pursuant to Section 404 and/or Section 10 of the Rivers and Harbors Act of 1899 (33 U.S. Code § 403). The USACE does not permit its own Civil Works projects. A Section 404 (b) (1) Evaluation was conducted as part of the EIS and appears in Appendix H of the EIS.

A discussion of interrelated permits and activities required is provided below.

State

Virginia Department of Environmental Quality - Water Division

The VDEQ Water Protection Permit Program has determined that the CIDMMA eastern expansion project will require state permits under several provisions of Federal and Virginia law. Those authorities are described below.

Pursuant to Section 401 of the Clean Water Act (33 U.S. Code § 1341(1)), issuance or waiver of a state certification that the proposed discharge will not cause the violation of specified water quality standards is required for the issuance of the USACE permits. In Virginia, this function is administered by the State Water Control Board and the VDEQ Water Protection Permit Program under the 1989 Water Protection Permit law (Va. Code § 62.1-44.15:5). The Virginia permit program implements Section 401 of the CWA, and it imposes additional regulatory requirements as a matter of state law.

Virginia Marine Resources Commission

Pursuant to the Virginia Wetlands Act (Va. Code §§ 28.2-1300 et seq.), either the Virginia Marine Resources Commission (VMRC), or the local Wetlands Board, must grant a permit for any project which requires building in or disturbing any tidal wetland area in "Tidewater Virginia" (generally, east of Interstate 95). A permit must also be obtained from VMRC to encroach in, on, or over state-owned subaqueous bottoms pursuant to the Code of Virginia (Va. Code §§ 28.2-1200 et seq).

Federal Consistency Certification

Pursuant to the Coastal Zone Management Act of 1972, as amended, the project must be constructed and operated in a manner which is consistent with the Virginia Coastal Resources Management Program (VCRMP). All applicable permits and approvals listed under the enforceable programs of the VCRMP must be obtained.

Local

Erosion and Sediment Control

The Virginia Erosion and Sediment Control Law specifies minimum standards for control of soil erosion, sediment deposition, and non-agricultural runoff (Va. Code §§ 10.1-560 et seq.). The VDCR has responsibility for administration of this law at the state level, and it has promulgated regulations that provide a state erosion and sediment control plan that implements the statutory minimum standards. Localities must adopt a plan that is consistent with the state program and regulations for sediment and erosion control. Submittal of a sediment and erosion control plan would be required for approval by the city of Portsmouth.

Chesapeake Bay Preservation Act

The Chesapeake Bay Preservation Act requires localities in eastern Virginia to implement land use controls to improve the condition of Chesapeake Bay waters (Va. Code §§ 10.1-2100 et seq.). That Act is administered by the Chesapeake Bay Local Assistance Department. Localities designate Chesapeake Bay Preservation Areas (CBPA's) within their respective jurisdictions. All project activities occurring within the CBPA's would be required to comply with the appropriate land use controls. These controls are adopted by the localities and enforced through the local zoning process.

Stormwater Management

The Virginia Stormwater Management Act enables local governments to establish management plans and adopt ordinances that require control and treatment of stormwater runoff to prevent flooding and contamination of local waterways (Va. Code §§ 10.1-603.2 et seq.). The law gives the VDCR the authority to promulgate regulations that specify minimum technical criteria and administrative procedures for local stormwater management programs. Local programs must meet or exceed these minimum standards. Localities enact local stormwater management ordinances, and construction activities associated with the proposed project would be required to comply with the appropriate ordinances.

IV.1.5.1 Dredging and Cell Construction

As noted in Section III, some wetlands are located within the interior portion (cells) of the CIDMMA. These wetlands will not be impacted by the proposed east expansion. No wetlands are present between the existing perimeter dike and rip-rap shoreline at CIDMMA and the Norfolk Harbor Channel to the east. Therefore, no vegetated wetland impacts are anticipated within the east expansion footprint or the adjoining access channel areas.

Bottom habitat in the dredged area will be modified as the water depth will be increased from 3-4 meters (m) to approximately 16 m. This may alter the fish use of the area by potentially favoring pelagic adults in lieu of smaller juveniles. Crab harvesting activities would be precluded. The resident benthic invertebrate community in the dredged area will be temporarily eliminated until a new assemblage repopulates. Repopulation typically occurs within a few months to a year. However, the character of the new benthic habitat may be altered. Sediment scouring and deposition associated with ship propeller wash may impact the habitat suitability. In addition, future maintenance dredging of isolated shoals may result in additional periodic impacts to the benthic community.

IV.1.5.2 Terminal Development

No wetland impacts will occur during terminal construction since the port facility will be developed on a newly constructed dredged material containment cell. Also, no wetlands are located between the proposed terminal and Craney Island Reach; therefore, dredging activities required to provide access to the facility would not impact wetlands.

IV.1.5.2.1 Rail Spur and Road Access Corridors

Access roads for the port facility will connect to the proposed VDOT Craney Island Connector between the current CIDMMA and the proposed port facility. The access roads are within the proposed port facility footprint and the CIDMMA; therefore, the proposed access road corridors are not expected to impact existing wetlands at the CIDMMA.

A proposed rail corridor would connect the port facility to both the Norfolk Southern and CSX. The final rail corridor location has not been determined. However, as currently envisioned, the rail corridor would be located within the cleared ROW of VDOT's connector highway from CIDMMA to VA Route 164. The rail corridor would then continue west paralleling VA Route 164 to I-664, then continue south along I-664 to the Norfolk Southern and CSX railways in Suffolk. Road and rail corridor impacts were discussed in detail in the Hampton Roads Crossing Study FEIS (2000) and were summarized in the Craney Island Eastward Expansion FEIS (Section IV, paragraph 1.5). At this stage of the project, design has not progressed to the point of being able to quantify wetland impacts related to the road and rail expansions. Portions of the road and rail corridors could be realigned from current designs during PED to minimize wetland impacts. Complete wetland impacts, including compensatory mitigation where appropriate, will be presented in a Supplemental EIS..

For purposes of this analysis, it was assumed that VDOT would construct the access rail corridor from the port facility to the Norfolk Southern and CSX railways within existing road ROW's. Wetlands within the VDOT ROW's would be maintained as emergent or shrub-scrub wetlands; therefore, constructing the rail corridor within the ROW should result in impacts only to maintained emergent or shrub/scrub wetlands.

As part of the HRC Study FEIS, detailed wetland delineation was completed to include the connector highway from VA Route 164 to CIDMMA and the proposed I-664 expansion corridor from VA Route 164 to I-64 (VDOT, 2001). Table IV-11 provides an inventory of wetlands potentially impacted by the proposed CIDMMA connector highway and I-664 roadway expansion and, therefore, potentially impacted by the proposed rail corridor (see Figures IV-2 to IV-6).

Direct and indirect impacts to wetlands resulting from construction and operation of the proposed VDOT road corridors were evaluated. Indirect impacts include shifts in vegetative communities, E&S deposition, or hydrologic alterations.

Wetland impacts would occur from construction and operation of the rail corridor within the VDOT CIDMMA connector highway and the I-664 expansion corridor from the intersection of VA Route 164 to I-64. Wetland impacts will require the project proponents to submit a Joint Federal-State Permit Application that documents that the impacts have been avoided and minimized to the maximum extent practicable, and that remaining unavoidable impacts have been properly compensated. Impacts to wetland and subaqueous bottoms are described below. At this stage of the project, design has not progressed to the point of being able to quantify wetland impacts related to the road and rail expansions. Portions of the road and rail corridors could be realigned from current designs during PED to minimize wetland impacts. Complete wetland impacts, including compensatory mitigation where appropriate, will be presented in a Supplemental EIS. Proposed compensation for unavoidable losses of vegetated wetlands would be coordinated with appropriate Federal and state agencies. The wetland mitigation would provide for no net loss of wetland acreage and function.

The following potential mitigation measures could be implemented to compensate for wetland impacts from port facility development.

- Implementation of BMP's during clearing and construction (i.e., erosion control, stormwater runoff control, etc.);

- Implementation of construction techniques that minimize impacts, i.e., slope steepening (minimizes footprint area);
- Proper installation and use of drainage and crossing structures to minimize impacts to existing wetland hydrology, i.e., to avoid connection of currently isolated wetlands;
- Acquisition and development of management plans for existing, off-site wetlands for conservation easements/areas, including restoration of degraded wetlands;
- Creation and management plan development of off-site wetlands for conservation easements/areas.

Table IV-12. CRANEY ISLAND EASTWARD EXPANSION PROJECT POTENTIAL WETLAND IMPACTS - VDOT WETLAND INVENTORY

Wetland Type (1)	ID Number (2)	Type of Impact
PEM1A	6-2	Indirect (bridged)
E2EM1N	6-4	Indirect (bridged)
E2EM1N	6-5	Indirect (bridged)
PFO	7-2	Direct (encroach)
PFO	7-6	Direct (encroach)
PSS	7-7	Indirect (bridged)
E2EM1N	7-7	Indirect (bridged)
PEM	7-13	Direct (encroach)
PEM	9-2	N/A **
PFO	9-5	Direct (encroach)
E2EM	10-1	Indirect (bridged)
E2EM	11-1	Indirect (bridged)

Source: HRC Study FEIS (VDOT, 2001)

(1) Wetland classification based on U.S. Fish and Wildlife Service Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al., 1992).

(2) See Figures IV-2 to IV-6

The HRC Study FEIS evaluated functions and values for the wetlands impacted by the proposed VDOT CIDMMA connector highway and the I-664 corridor expansion (VDOT, 2001). The USACE Wetland Evaluation Technique (WET) 2.0 was utilized to assess the functions and values of the impacted wetlands (Adamus et al., 1987). WET estimates the probability that particular functions will occur in a wetland

area and provides insight into the importance of those functions. WET is a broad-based approach to wetland evaluation and is based on information about predictors of wetland functions to include: groundwater recharge/discharge, floodflow alteration, sediment stabilization, sediment/toxicant/nutrient retention, production export, wildlife diversity/abundance, aquatic diversity/abundance, and recreation and uniqueness/heritage. These wetland functions are defined in Table IV-13. The wetlands within the CIDMMA connector highway and I-664 corridor expansion were assigned a qualitative probability rating of high, moderate, or low for the wetlands capacity to provide a function. Table IV-14 provides WET results for the wetlands that may also be impacted by the proposed access rail corridor, if located within the roadway ROW. Estuarine wetlands were not evaluated by VDOT for groundwater recharge/discharge and floodflow alteration, due to differences in the hydrologic functions they provide (VDOT, 2001).

IV.1.5.2.2 Mudflats

The shoreline of the Elizabeth River in the project vicinity has been substantially impacted by industrial development. Few mudflats remain in the vicinity of the proposed port, and most of the remaining areas are inter-tidal mud flats that are protected from wind and wave erosion. An estuarine inter-tidal mud flat is located across the Elizabeth River from the proposed port facility. This mud flat is located at the mouth of the Lafayette River, approximately 1.25 miles east of Craney Island Reach. Wave action and sediment suspension may be generated by ship traffic associated with the port facility; however, due to the large reach between the channel and the mud flat, impacts are anticipated to be minimal to nonexistent.

The proposed rail spur crossing of Craney Island Creek would also cross an estuarine inter-tidal mud flat. A bridge would be constructed over the mud flat; therefore, direct impacts would occur at the location of the piers and indirect impacts, such as increased sedimentation, may result during bridge construction. Implementing best management practices during construction would minimize impacts to the mud flat.

IV.1.5.2.3 Subaqueous Bottom

As part of the CIDMMA expansion, predredging would be required to construct a structural dike to accommodate the adjacent navigation access channel. Consequently, dredging impacts to subaqueous bottom would not be completely attributable to port development.

The proposed 55-foot deep Federal channel to accommodate deep draft ships would provide sufficient clearance to minimize impacts from sediment suspension.

Pursuant to the Coastal Zone Management Act (CZMA), in 1986, the NOAAA approved the Virginia Coastal Resources Management Program (VCP). Accordingly, Federal activities that are reasonably likely to affect any land or water use or natural resources of Virginia's designated coastal resources management area must be consistent with the enforceable policies of the VCP. The consistency determination must fully address all the enforceable policies of the VCP that apply, or may apply, to the proposed project. The status of CZMA consistency is presented in Appendix F, Environmental Coordination Checklist.

Table IV-13. WETLAND EVALUATION TECHNIQUE (2.0) EVALUATION FACTORS

Freshwater Wetlands	Tidal Wetlands
Groundwater Discharge/Recharge Seeps and springs abundant; Located within a floodplain; Water permanence; Suitable substrate for infiltration; Amount of wetland edge; Persistent vegetation	**Sediment Stabilization - Shoreline Anchoring** Gradual bank slope; Heavy persistent vegetation; No signs of erosion; Lack of fetch and boat wake
Floodflow Alteration - Flood Storage Broad floodplain storage, abandon channels, and/or depressions; Frequently flooded; Shallow channel; Evidence of overbank flooding; Heavy woody vegetation	**Wildlife Diversity and Abundance** Visual observations of wildlife; Adjacent to tidal flats, channels, and forests; Saltgrass and/or saltbush communities present; Invasive and nuisance species not present
Sediment Stabilization Heavy persistent vegetation; Slow water velocities; No signs of erosion; Lack of fetch	**Production Export - Food Chain Support** Dense submergent vegetation; Long detention time; Detritus export unrestricted
Sediment /Toxicant/Nutrient Retention Heavy persistent vegetation (woody and herb); Located near source of sediment and toxicants; No signs of erosion or pollution; Size of wetland in relations to water volume; Long detention time; Sheet flow (vs. Channel flow); Shallow water depth (<2feet)	**Sediment /Toxicant/Nutrient Retention** Heavy persistent vegetation (woody and herbs); Located near source of sediment and toxicants; No sign of erosion or pollution; Size of wetland in relations to water volume; Long detention time; Sheet flow (vs. Channel Flow); Shallow water depth (<2 feet)
Production Export - Food Chain Support Dense submergent vegetation; Long hydroperiod; High primary productivity; Detritus export unrestricted	**Aquatic Diversity and Abundance** Visual observation of aquatic life; Tidal creeks, channels, and depressions present; High plant diversity and interspersion; No signs of pollution
Wildlife Diversity and Abundance Visual observations of wildlife; High plant diversity and interspersion; Multiple strata; Low human disturbance; Surrounding landscape forested	**Recreation and Uniqueness/Heritage** Ecologically rare wetland type for region; Public or private conservation area; Research of educational facility; Public parks (trails, boardwalks, etc.): Hunting and/or fishing opportunities available
Aquatic Diversity and Abundance Visual observations of aquatic life; Permanent open water (fish habitat); Seasonal ponding (amphibian habitat); High plant diversity and interspersion; Low human disturbance; No sign of pollution; Landscape undeveloped	
Recreation and Uniqueness Ecologically rare wetland type for region; Public or private conservation area; Research or educational facility; Public park (trails, boardwalks, etc.); Hunting and/or fishing opportunities	

Source: Hampton Roads Crossing Study FEIS (VDOT, 2001)

Table IV-14. VDOT WETLAND FUNCTIONS AND VALUES ASSESSMENT FOR WETLANDS ALONG PROPOSED CRANEY ISLAND CONNECTOR HIGHWAY AND SELECTED PORTIONS OF I-664

ID Number *	Wetland Type	Groundwater Recharge/ Discharge	Floodflow Alteration	Sediment Stabilization	Sediment/ Toxicant/ Nutrient Retention	Production Export	Wildlife Diversity/ Abundance	Aquatic Diversity/ Abundance	Recreation & Uniqueness/ Heritage
6-2	PEM1A	low	low	moderate	moderate	moderate	low	low	low
6-4	E2EM1N	N/A	N/A	high	high	high	moderate	moderate	low
6-5	E2EM1N	N/A	N/A	moderate	high	high	moderate	moderate	low
7-13	PEM2C	low	low	low	low	low	high/moderate	high/moderate	low
9-5	PFO1A	low	low	moderate	moderate	low	low	low	low
10-1	E2EM	-	-	high	moderate	high	moderate	moderate	low
11-1	E2EM1N	-	-	high	moderate	high	moderate	moderate	low

Source: Hampton Roads Crossing Study FEIS (VDOT, 2001)

* See Figures 5-1 to 5-5. Data were not collected for wetlands 7-2 (PFO), 7-6 (PFO), and 7-7 (E2EM1N, PSS). Information was not available for Wetland #9-2.

IV.1.6 SANCTUARIES AND REFUGES

Hoffler Creek Wildlife Preserve, located approximately 2.5 miles west of the proposed project area, consists of 142 acres of wetlands, dense forest, and a saltwater lake. The preserve is located on the shores of Hoffler Creek in northwest Churchland, within the city of Portsmouth. The preserve provides habitat for numerous native plant and animal species, both aquatic and terrestrial (Hoffler Creek Wildlife Foundation, 2002). The preserve is inland from the Hampton Roads Harbor, and, therefore, would not have a view of the proposed port facility. No impacts to this preserve are anticipated from port development or operation.

Compensatory mitigation will involve wetland and aquatic habitat protection and restoration at Ragged Island Wildlife Management Area, a state managed wildlife refuge located in the lower James River. Oyster restoration is proposed in Hoffler Creek, adjacent to the Hoffler Creek Wildlife Preserve. Details are provided in EIS, Appendix B.

Other sanctuaries and refuges located in the region are at least 10 miles away from the CIDMMA eastward expansion area. Therefore, port development and operations are not expected to impact these resources.

IV.1.7 TRANSPORTATION

The analysis of surface transportation impacts is based on the following assumptions:

- Craney Island Marine Terminal will be built, along with a connector road to Route 164 and connecting rail service to the Route 164 corridor.

- The third HRC may be completed in the next 10-20 years. It should be noted that this significant regional transportation initiative is complementary to the Craney Island terminal project, though it is not required for the success of the Craney Island terminal project.

- Trucks traveling into and out of the region would continue to follow the existing routes through the major gateways.

- Programmed and planned improvements along the major interstate and state highways most traveled by trucks into and out of the Hampton Roads region would be completed.

- Approximately 63 percent of the container freight handled by the Craney Island terminal would be transported by truck at initiation of Phase I in 2016, declining to 40 percent by projected Build-Out in 2050.

- The new rail corridor, which will be a VDOT project, is in the planning stages, and the route has not yet been finalized. However, it is currently envisioned, and this analysis assumes that the route and ultimate tie-in point will follow the cleared ROW's for the Craney Island Connector highway and existing VA Route 164 and I-664 corridors to the maximum extent possible. If the final rail corridor substantially deviates from this route, then the transportation impact analysis would be updated as part of supplemental NEPA documentation prepared by the VPA prior to port facility construction.

IV.1.7.1 Trip Generation

In order to determine the potential impacts of vehicular and vessel traffic associated with the operation of the new terminal, it is necessary to determine the future trip generation, i.e., the number of daily trips generated by the proposed project. The traffic forecasts for the proposed terminal were estimated by Moffatt & Nichol on behalf of the VPA in November, 2004. In making these projections, it was estimated that additional annual throughput of 300,000 TEU's (2017 - Phase I) to 2,500,000 TEU's (2050 – Build-Out) would be handled by VPA at the Craney Island terminal as shown in Table IV-15. Trip generation results for truck trips and total trips (trucks and employee trips) for Phase I through Build-Out conditions are also presented in Table IV-15.

The truck traffic projections assume that approximately 63 percent of the container freight handled by the Craney Island terminal would be transported by truck at initiation of Phase I in 2017, declining to 40 percent by projected Build-Out in 2050. The bulk of the remaining cargo would be transported to and from the terminal via railroads, and a small amount would be carried by barge. It was assumed that all truck traffic at the new terminal would be made up of trucks with three or more axles.

Another traffic increase that is expected for the area will be generated by the new APM/Maersk terminal. Although no previous study has been done to specifically quantify expected Maersk traffic, Moffatt & Nichol estimated truck trips in the same manner done for Craney Island Marine Terminal based on APM/Maersk capacity statements. The Maersk Terminal will be opened in two phases, in 2008 and 2010. Table IV-16 shows those estimates.

Estimates were conducted only through 2018, since reliable information was not available for expected long-term throughput changes. As is explained below, the year 2018 will be used as a consistent comparison point. Together, the proposed Craney Island Marine Terminal and the Maersk Terminal may generate 3,200 truck trips per day in 2018.

IV.1.7.2 Projected Daily Traffic

As shown in Tables IV-17 and IV-18, the proposed CIDMMA Terminal and the new APM/Maersk terminal are together expected to generate approximately 3,200 truck trips on average per day in 2018. That number is expected to increase and reach approximately 7,500 truck trips on average per day by Build-Out in 2050. However, as the percent of cargo that moves by rail increases, there will be gradual declines in the number of truck trips from the two terminals. Average day truck trips are anticipated to decrease to 6,000 by 2050. Total trips per day calculations are also included to count terminal employees arriving to and departing from the terminals, but truck trips are the focus of this analysis.

Table IV-15. CRANEY ISLAND TRUCK TRAFFIC ESTIMATES

Year	Annual Throughput (1) (TEU)	Average Day Truck Trips (2)	Total Trips
2017	300,000	858	1,502
2018	600,000	1,697	2,341
2019	600,000	1,678	2,322
2020	600,000	1,659	2,303
2021	600,000	1,640	2,284
2022	600,000	1,621	2,265
2023	782,500	2,089	2,833
2024	975,000	2,573	3,417
2025	1,350,000	3,519	4,563
2026	1,350,000	3,477	4,521
2027	1,725,000	4,388	5,632
2028	1,725,000	4,333	5,577
2029	1,900,000	4,713	6,057
2030	2,100,000	5,142	6,586
2031	2,300,000	5,559	7,103
2032	2,500,000	5,964	7,608
2033	2,500,000	5,884	7,528
2034	2,500,000	5,805	7,449
2035	2,500,000	5,726	7,370
2036	2,500,000	5,647	7,291
2037	2,500,000	5,568	7,212
2038	2,500,000	5,489	7,133
2039	2,500,000	5,410	7,054
2040	2,500,000	5,331	6,975
2041	2,500,000	5,252	6,896
2042	2,500,000	5,173	6,817
2043	2,500,000	5,093	6,737
2044	2,500,000	5,014	6,658
2045	2,500,000	4,935	6,579
2046	2,500,000	4,856	6,500
2047	2,500,000	4,777	6,421
2048	2,500,000	4,698	6,342
2049	2,500,000	4,619	6,263
2050	2,500,000	4,540	6,184

Source: Moffatt and Nichol, 2004

(1) Total annual CIT throughput. The throughput growth forecast is from 2004 and is limited by available capacity.

(2) Average daily truck trips are the total of truck arrivals and truck departures to and from the terminal.

Table IV-16. APM/MAERSK TERMINAL TRUCK TRAFFIC ESTIMATES

Year	Annual Throughput (TEU) (1)	Average Day Truck Trips (2)	Total Trips
2008	300,000	858	1,502
2009	300,000	849	1,493
2010	600,000	1,678	2,322
2011	600,000	1,659	2,303
2012	600,000	1,640	2,284
2013	600,000	1,621	2,265
2014	600,000	1,602	2,246
2015	600,000	1,583	2,227
2016	600,000	1,564	2,208
2017	600,000	1,545	2,189
2018	600,000	1,526	2,170

Source: Moffatt and Nichol, 2004

(1) Total annual APM/Maersk Terminal throughput. The throughput forecast is from published APM/Maersk statements.

(2) Average daily truck trips are the total of truck arrivals and truck departures to and from the terminal.

IV.1.7.3 2018 Traffic Forecasts and Levels of Service

The projections of future year background traffic, i.e., traffic not generated by the proposed project, were obtained from the "Hampton Roads Crossing Study" FEIS and the "Congestion Management System for Hampton Roads, Virginia 2001." The background traffic volumes in the year 2018 were interpolated for roads not evaluated in the HRC study by using the growth rates between the projected year 2006 and year 2021 volumes reported in the CMS report. The analysis of port traffic is based on the year 2018 conditions, rather than conditions in the year 2050 as VDOT plans roadway improvements using a 20-year planning horizon. Thus, the roadway and traffic conditions in the year 2050 are unknown at this time. Therefore, an analysis year of 2018 was chosen because programmed and planned improvements for this period are known, and potential impacts on these improvements from the Recommended Plan can be evaluated.

Table IV-17 illustrates the projected traffic volumes and the corresponding volume-over-capacity (V/C) ratios with and without the proposed Third Harbor Crossing project. The Third Harbor Crossing project would be built near CIDMMA, and although neither project is dependent on the other, the roadways included in the TISA are the same since they are used by trucks transporting freight into and out of the region. Figure II-9 shows the proximity of the Third Harbor Crossing, the proposed Craney Island terminal, and other planned VDOT projects. The V/C ratio for the No Action and Recommended Plan is based on the provision of additional travel lanes as proposed in the 2001 - 2004 TIP and 2021 RTP.

Table IV-18 presents a Level of Service (LOS) summary. For a specific road, the V/C ratio provides an analysis of the intensity or degree of congestion. The higher the V/C ratio, the more congestion can be

expected. V/C ratios translate to LOS categories A through F, which each provide a unique condition of traffic congestion. LOS D is the level or condition where favorable traffic operations are on the verge of becoming unfavorable. Levels of service E and F are considered unacceptable.

IV.1.7.4 Trip Distribution

The distribution of terminal trips on the roadway network is a key element in the assessment of traffic impacts from the proposed terminal. For this study, the distribution and assignment of trips to and from the study area roadways are based on information in the "Regional Freight Movement" report. The distribution of traffic generated by future workers employed at the Craney Island terminal is based on data on worker place of residence (Martin Associates, 1999).

IV.1.7.5 Roadways

An extensive analysis of existing, 2006, and 2021 roadway networks in the Hampton Roads region was completed by the HRPDC for the 2001 CMS report. The analysis of the future roadway network was based on the programmed and planned improvements included in the Hampton Roads TIP and 2021 RTP. The analysis identified several congestion problems associated with both existing and future roadway networks. Based on the results of the analysis, by the year 2021 Hampton Roads is anticipated to have similar congestion levels as those experienced today but with an expanded road network.

The analysis of future traffic conditions under the Recommended Plan was completed using similar methodology employed in the HRC Study. The average daily traffic volumes for the year 2018 under the HRC Candidate Build Alternative 9 were used as the baseline from which to assess impacts of the proposed project. For roads that were not analyzed in the HRC Study but were listed as being used for regional freight movement, the 1995 average daily traffic levels reported in the freight movement report were projected to 2018 by interpolating the CMS year 2021 ADT estimates. Truck and employee trips anticipated to be generated by the Recommended Plan were then added to the 2018 baseline, and the year 2018 volume over capacity ratios were computed for each of the major roadways that may be affected by the Recommended Plan.

If the Third Harbor Crossing is not constructed before 2017, it is anticipated that the new connector highway between the Craney Island terminal and VA Route 164 will be completed independently and prior to the construction start date for the Craney Island terminal. Thus, trucks and other vehicles will be able to follow the existing and planned major highway system in traveling to and from the Craney Island terminal during the construction period. As a result, no significant impacts on the local street network are anticipated during construction of the terminal.

Table IV-17. NO-BUILD AND PROPOSED ACTION ADT AND V/C RATIO

	No-Build (1)			Proposed Action		
	2018 ADT	2018 Pk Hr Per lane Vol. (2)	2018 Pk Hr V/C (3)	2018 ADT	2018 Pk Hr Per lane Vol.	2018 Pk Hr V/C
Crossings						
I-64 Hampton Roads Bridge-Tunnel	98,000	2,450	1.44	98,100	2,458	1.44
I-664 Monitor Merrimac Memorial Bridge-Tunnel	143,000	1,788	0.90	143,000	1,788	0.90
New Crossing (I-664 - VA 164 connection)	75,000	1,875	0.96	77,000	2,065	0.97
New Crossing (I-564 - VA 164 connection)	89,000	2,225	1.13	89,250	2,230	1.13
U.S. 17 James River Bridge	44,000	1,100	0.65	44,000	1,100	0.65
Increase in # of trips from No-Build Alternative	--			2,350		
Peninsula						
I-64 (I-664 to Mercury Blvd.)	163,000	2,038	0.91	164,000	2,050	0.91
I-664 (I-64 – Downtown Newport News)	136,000	1,700	0.67	137,000	1,713	0.76
Jefferson Avenue (I-664 – Mercury Blvd.)	33,000	550	0.63	33,000	550	0.63
Southside						
I-64 (I-564 – Rt. 44)	171,000	2,850	1.31	171,250	2,140	0.98
I-64 (I-464 – I-664)	107,000	1,783	0.79	107,500	1,791	0.80
VA 164 Connection	39,000	975	0.53	40,000	1,000	0.54
VA 164 Western Freeway (USCG – Bay Blvd.)	63,000	1,575	0.79	64,000	1,598	0.80
Rt. 264 (Newtown Rd. – Witchduck Rd.)	182,000	2,275	1.07	182,300	2,278	1.07
Hampton Blvd. (Lafayette River – Midtown Tunnel)	35,000	583	0.69	35,000	583	0.69
I-264 Downtown Tunnel	93,000	2,325	1.37	93,000	2,325	1.37
U.S. 58 Midtown Tunnel	41,000	2,050	1.28	41,000	2,050	1.28
U.S. 460	32,400	540	0.28	32,692	543	0.28
U.S. 58 to North Carolina	28,000	700	0.36	28,090	702	0.36
U.S. 17 to North Carolina	15,875	794	0.41	15,935	797	0.41
U.S. 13 to North Carolina	14,900	745	0.39	14,967	748	0.38
VA 168	26,900	673	0.35	27,200	677	0.35

(1) Year 2018 No Build data are from Hampton Roads Crossing Study FEIS Table 4-2 data on Candidate Build Alternative 9.
(2) Peak Hour Per Land Volumes = (ADT/number of lanes) * .10
(3) V/C (volume-over-capacity) ratio calculated for conventional lanes of traffic only, does not include projected HOV traffic volumes. Range of per lane capacity = 1,600 – 2,250 for interstate facilities, Midtown Tunnel, James River Bridge and VA Route 164.

Table IV-18. LEVEL OF SERVICE (LOS) CATEGORIES

LOS	V/C ratio range	Description
A	0.00 - 0.04	Free-flow operations
B	0.05 - 0.16	Reasonably free-flow operations
C	0.17 - 0.32	Stable operations
D	0.33 - 0.57	Borderline unstable
E	0.58 - 0.99	Extremely unstable
F	≥1.00	Breakdown

Source: AASHTO, 1994; HRPDC, 2001.

A review of the data presented in Table IV-17 reveals that adding 3,200 truck trips to most roadways will not change the anticipated roadway conditions. Both I-64 and VA Route 164 on the Southside are anticipated to handle slightly more traffic if the Craney Island terminal is built, but the overall LOS on these roadways is expected to be the same as it would be if Craney Island terminal is not built. Thus, no significant adverse impact on traffic conditions is anticipated from operation of the Craney Island terminal.

IV.1.7.6 Rail Traffic

Under the No Action alternative, rail traffic would increase slightly above present conditions to accommodate the projected container increase. Assuming an estimated maximum annual throughput of about 2.3 million TEU's, which could be accommodated by the existing VPA terminals (with planned improvements) and the planned Maersk terminal, an average of about two additional train trips per day would be anticipated. This estimate assumes that annual throughput of 2.3 million TEU's would be about 1.1 million TEU's more than current levels (based on Hampton Roads container forecast) and that 25 percent of the forecasted container increase is transported by rail.

The traffic forecasts for the proposed terminal were estimated by Moffatt & Nichol Engineers on behalf of the VPA (Moffatt & Nichol Engineers, 2002). In making these projections, it was estimated that additional annual throughput of 300,000 TEU's (2017 - Phase I) to 2,500,000 TEU's (2050 – Build-Out) would be handled by the Craney Island terminal. Daily rail projections show an increase in daily rail TEU's from 279 to 3,425 TEU's between initiation of Phase I (2017) and Build-Out (2050) conditions. The train traffic projections assume that approximately 34 percent of the container freight handled by the Craney Island terminal would be transported by rail at initiation of Phase I in 2017, increasing to 50 percent by projected Build-Out in 2050. The bulk of the remaining cargo would be transported to and from the terminal via trucks. For comparison, previous studies have estimated that approximately 25 percent of the cargo is transported into and out of the region by rail (HRPDC, 1998).

Estimating that one train is capable of transporting 400 TEU's, average train traffic would increase by 425 trains per year or by slightly more than one train per day at initiation of Phase I. The 400 TEU train capacity estimate is based on trip generation methods used in recent USACE studies conducted for the

Port of Charleston, South Carolina. Build-Out conditions at the Craney Island terminal would result in an estimated 2,450 additional train trips per year, or approximately 2,000 more trips than for Phase I. This increase would generate an average of five to six train trips per day above what is anticipated for Phase I. It is anticipated that the existing rail network will be able to accommodate this increase in rail traffic, particularly in view of the decrease in coal shipments attributable to a decline in the export of coal from the region to Europe and other countries (Old Dominion University, 2001).

IV.1.7.7 Navigation and Terminal Facilities

IV.1.7.7.1 Vessel Traffic

The Hampton Roads container forecast projects significant growth; however, the spatial distribution of this growth is unknown and cannot be projected. Under the No Action alternative, cargo vessel traffic would likely increase to accommodate TEU levels projected in the near-term. However, as discussed in the "Port Description" section, the combined capacity of the existing VPA terminals (with planned improvements) and the planned Maersk terminal would be exceeded by demand in the 2016 timeframe. Two scenarios are possible. Under the first scenario, which is considered unlikely, container vessels would enter the port and "park," assuming there is sufficient capacity available in one of the Federal anchorage areas in the Hampton Roads region, and remain there until a berth becomes available at one of the existing terminals. Under the second scenario, which is considered far more likely, shipping lines seeking to avoid delays in loading and unloading of cargo would call on other ports.

The traffic forecasts for the proposed terminal were estimated by Moffatt & Nichol Engineers on behalf of the VPA in November, 2004. Based on vessel call data associated with these forecasts, and using a capacity of 4,500 to 6,500 TEU's per vessel, the proposed project would result in an additional 470 vessel calls to the Port of Hampton Roads in 2018 when throughput is 600,000. By the year 2050 under Build-Out conditions and throughput of 2,500,000, some of these vessels will be replaced with "mega-ships" carrying 8,000+ TEU's in the Pacific Trade lanes. As a result, an additional 300 vessel calls are projected based on a capacity of 6,500 to 10,000 TEU's per vessel. Thus, it is projected that the Build-Out configuration of the Craney Island terminal would generate 770 vessel calls per year. This represents a 55-percent increase in current (year 2002) container/RORO vessel traffic. According to the Virginia Pilots, the anticipated increase in vessel traffic of from 9 to 15 weekly calls under Phase I and Build-Out, respectively, could be accommodated and would not be expected to significantly affect safety in the harbor (Virginia Pilots Association, April 2002a). In addition, the trends in recent years of reduced coal exports and larger cargo ship sizes are factors that should reduce cumulative effects on total vessel traffic in the Port of Hampton Roads.

IV.1.7.7.2 Terminal Facilities

As part of the VPA's implementation of its 2040 Master Plan, the existing terminals operated by the VPA are being improved to the extent practicable to increase their efficiency in handling and transporting cargo. In addition, the final phase of Maersk's proposed development will be completed and fully operational by 2007. As a result, the three upgraded and improved VPA terminals and the proposed Maersk terminal are expected to be able to accommodate the projected increase in container TEU's up to the year 2017. After this time, the capacity of these facilities would not be sufficient to meet the projected demand.

Under the proposed project, the three existing VPA terminals, the proposed Maersk terminal, and the proposed CIDMMA container terminal will continue to operate. Private terminals throughout Hampton Roads are expected to continue to operate much as they do today. Normal business transition of such facilities, such as expansion, may occur.

The analysis of impacts under the No Action and Recommended Plan indicates that, because of its proximity to existing or planned major interstate transportation routes (see Figure II-9), the construction and operation of the Craney Island terminal will have minimal impacts on local streets and major highways as a result of increased truck traffic. Specifically, local streets will not be significantly affected, as trucks traveling to and from the Craney Island terminal in the short-term during construction and in the long-term during operation will access the site from a new connector highway to VA Route 164 and from there to I-664 and I-64. Although the existing and planned highway improvements will improve conditions on major highways, some congestion will remain in the future with or without the Recommended Plan.

An average of six to seven additional trains per day would be needed to transport containers in and out of the Craney Island terminal under Build-Out conditions; however, significant impacts on existing railroads are not anticipated. It is anticipated that this projected rail capacity need will be fully addressed when developing the new rail corridor to connect the Craney Island terminal with existing rail lines.

At Build-Out of the proposed Craney Island terminal, it is projected that an additional 770 vessel calls per year would occur, or 15 vessels per week. This additional vessel traffic can be accommodated and is not expected to significantly affect safety in the harbor.

IV.1.8 UTILITIES

The proposed container terminal will require utility services for water, wastewater disposal, power, and telecommunications. This section characterizes each of these needs and the ability of local utilities to meet them based on existing and planned infrastructure. In general, existing utilities are expected to be able to meet the projected requirements. Little utility infrastructure currently exists on CIDMMA, so it will be necessary to add additional infrastructure to extend utilities (power lines, phone/cable lines, water mains, sanitary sewer lines, etc.) from the part of the city of Portsmouth south of CIDMMA to the vicinity of the proposed project. All such utility work will have environmental permitting requirements to protect wetlands, endangered species, water quality, etc. There will be temporary construction impacts associated with the utility expansion.

IV.1.8.1 Water Supply

At full Build-Out, water supply requirements for the proposed container terminal are estimated to be about 70,000 gpd, based on usage at the comparably-sized NIT. The demand will consist of standard commercial/office uses, irrigation for landscaping, and washing of vehicles and equipment. A minimum fireflow of 4,550 gpm at 20 psi residual would also be required.

The city of Portsmouth is the primary water supplier for the area of the proposed project. The city has stated that the Lake Kilby Water Treatment Facility has adequate treatment capacity to provide the projected water demand (City of Portsmouth, April 2002). The city also stated that the existing water distribution system is "unlikely" to meet fire flow and pressure requirements, although a hydraulic

modeling analysis would be necessary to make this determination. It is possible that a new elevated storage tank and associated pumps would be required to meet fire flow and pressure requirements. Additional infrastructure (water supply lines) would be required to deliver water from mains in the city of Portsmouth to the CIDMMA container terminal. Although additional infrastructure might be required, water supply demands could be met without adverse impacts to other water customers.

IV.1.8.2 Wastewater

At full Build-Out, wastewater treatment requirements for the proposed container terminal are estimated to be about 18,000 gpd, based on usage at the comparably-sized NIT. This will mostly consist of domestic-type wastewater from sinks and toilets, as well as wash water from wash racks. No other industrial wastewater will be generated at the terminal, and the facility will not accept wastewater discharges from ships.

The HRSD is the utility that provides wastewater treatment services in the region of the proposed project, and currently treats wastewater from existing VPA container terminals. It is the policy of HRSD to meet all wastewater treatment requirements in the Hampton Roads area by expansion of pipelines or treatment capacity if needed. HRSD has provided a letter stating that the HRSD interceptors in the Portsmouth area have ample capacity to handle the projected flow and that the Nansemond Wastewater Treatment Plant in Suffolk has more than enough capacity to treat the projected flow (HSRD, April 2002). New sanitary sewer lines would be required to convey wastewater from the container terminal to sanitary sewers owned by the city of Portsmouth, which would convey the wastewater to the closest HRSD interceptor.

IV.1.8.3 Energy

Power requirements for Phase I of the CIDMMA container terminal are estimated to be about 400 kW, whereas power requirements at full Build-Out are estimated to be about 35 MW. Much of this power demand will be for operation of cranes and for lighting. Dominion Virginia Power is the primary provider of electric service in the region and has provided a written statement that electrical service is available to the project location (Dominion Virginia Power, April 2002). The existing Craney Island Substation can provide power to meet the requirements of Phase I, although some upgrades (i.e., a new transformer) will likely be required to meet the electricity demand at full Build-Out. The terminal is likely to have backup electric generators for emergency use.

Virginia Natural Gas provides natural gas services in the region. Additional infrastructure would be required to extend gas lines from the city of Portsmouth to the CIDMMA container terminal. Gas requirements for the terminal and secondary development are likely to be relatively small.

IV.1.8.4 Telecommunications

Telecommunication services in the region are provided by several companies, including Verizon and Cox Digital Telephone. Cable and internet services are provided by Cox Digital Cable. As with other utilities, the new container terminal would require new cable lines and possibly radio/microwave relay towers. Telecommunications companies could provide services with no adverse impacts on the existing system.

IV.1.8.5 Relocation of Existing Utilities

A Navy fuel line that extends along the east side of the existing CIDMMA will have to be relocated for construction of the new cell. Planning for this action will occur during the PED Phase. An evaluation of

environmental impacts associated with the fuel line relocation will occur in collaboration with the Navy during project planning and design and appropriate permitting activities will be undertaken at that time. Compliance with State and Federal regulations for this activity will minimize the potential for adverse environmental impact.

IV.1.9 WASTE MANAGEMENT

IV.1.9.1 CIDMMA Expansion

IV.1.9.1.1 Solid Waste

Construction of the proposed expansion cell will not produce significant quantities of waste. Any solid waste resulting from cell construction will be disposed of according to applicable state and Federal regulations. Therefore, no impacts are expected.

IV.1.9.1.2 Hazardous Wastes and Materials

Hazardous materials or fuel products associated with the activities conducted during the construction phase of the CIDMMA east cell are expected to be minimal. Contractors involved with the construction activities will be required to prepare emergency response plans and waste management plans for any hazardous materials required during the Construction Phase, although no other hazardous materials are expected to be encountered during the construction phase of the project. Any activity involving CERCLA-regulated substances will be in full compliance with Engineering Regulation 1165-2-132. The District and the non-Federal sponsor understand that ER 1165-2-132 requires, *inter alia*, in which the non-Federal sponsor is responsible for the disposal costs associated with CERCLA-regulated substances. To the extent that such areas exist, HTRW-contaminated areas have been or will be identified in the Reconnaissance, Feasibility or PED Phase and construction in these areas will be avoided where practicable (see ER 1165-2-132 § 6.b).

IV1.9.2 Terminal Development

IV.1.9.2.1 Solid Waste

There are no firm estimates for solid waste that will be generated at the new terminal. Solid waste generated at existing facilities is minimal and handled by city or contract pick-up services. This solid waste consists of miscellaneous paper, as well as office and maintenance facility materials. Based upon this review, it appears that the proposed port will not significantly impact the area through generation of solid waste, as there are sufficient disposal facilities to handle generated solid waste.

The VPA, through its operating affiliate, will implement programs similar to those currently in place at existing ports that reduce or recycle the following waste products.

1. Used waste oil from equipment oil changes will be used to power portable heaters in vehicle and facilities maintenance garages and workshops. Waste oil that is not recycled on-site will be picked up for a recycling by an outside consultant.

2. Used cleaning solvents will be removed from the terminal facility by a licensed contractor that recycles the products for use in manufacturing concrete.

3. All other parts cleaning solvents used at the facility will be biodegradable.

4. Used tires will be removed by a licensed contractor, shredded, and recycled for use in manufacturing asphalt.

5. Ballast replacement program: All PCB light ballast will be removed and replaced as light fixtures fail in all terminal facilities.

In November 2004, the VPA developed a Litter Management Master Plan to address the need to reduce litter at NIT. The plan addresses on-going placement of additional receptacles in high foot traffic and vehicle parking locations, relocation of unused receptacles, frequency of emptying receptacles, and designation of labor crews to remove litter from problem areas. The plan is reviewed annually and revised as necessary to reflect changes in use/new construction at the terminal. A similar plan will be developed for the proposed Craney Island Terminal.

IV.1.9.2.2 Hazardous Materials

Minimal amounts of hazardous materials handled at the terminal and hazardous waste generated at the terminal are expected. In accordance with USDOT guidelines on transporting hazardous materials, the terminal facility will comply with proper handling, storage, and transportation of cargo. Furthermore, efforts to prevent and control hazardous spills and releases will be maintained with the use of the VIT Safety Manual (Emergency Response Plan) and an SPCC, as noted below.

Any sediment suspected of contamination, or hazardous or solid wastes that are generated, transported, disposed, stored, or treated in Virginia, must be tested and handled in accordance with applicable Federal, state, and local laws and regulations. Dredge materials, when managed in accordance with requirements of the State Water Control Board or other Virginia agencies with similar authority, are conditionally exempt from the Virginia Solid Waste Management Regulations (9 VAC 20-80-60.E.) and are excluded from the waste barging regulations (9 VAC 20-170-10).

In addition, any storage, treatment, or disposal of hazardous wastes must be conducted in accordance with applicable state laws and regulations. These include, but are not limited to, the following:

- Virginia Waste Management Act (*Virginia Code* sections 10-1400 et seq.);
- Virginia Hazardous Waste Management Regulations (9 VAC 20-60);
- Virginia solid Waste Management Regulations (9 VAC 20-80); and
- Virginia Regulations for the Transportation of Hazardous Materials (9 VAC 20-110).

Applicable Federal laws include, but are not limited to:

- Resource Conservation and Recovery Act (42 U.S.C. 6901 et seq.);
- U.S. Department of Transportation's Rules for Transportation of Hazardous Materials, 49 Code of Federal Regulations, Part 107.

VIT maintains the VIT Safety Manual, which contains an Emergency Response Plan for responding to hazardous materials releases. Upon observation of a hazardous material release, the cargo facility police

will contact the local fire department to respond to the incident. Staff from the local fire department periodically tour the Hampton Roads Terminals to familiarize themselves with the facilities should an incident occur. In addition, the VIT currently has three on-call contractors that may be utilized by the responsible party for cleanup of hazardous releases. According to the VDEQ, several agencies should be contacted in the event of a hazardous materials release of reportable quantity, including:

- Extremely Hazardous Substance (EHS) Releases
  - Local Emergency Planning Committee (LEPC)
  - Virginia Emergency Response Council (VERC)
- CERCLA Hazardous Substance Releases
  - Authorities listed for EHS releases
  - National Response Center (NRC)

The reportable substances include CERCLA hazardous substances, air pollutants under the Clean Air Act, reaction products, petroleum products, mixture/trade-name products, hazardous waste, mining/mineral extraction waste, and naturally occurring substances. Emergency response equipment, including sand, kitty litter, and absorbents, will be maintained on-site to prepare for emergency situations associated with releases.

In addition to the VIT Safety Manual, which includes an Emergency Response Plan, a SPCC Plan is maintained for the VPA-owned terminals. The SPCC plan is intended to prevent environmental impact caused by hazardous material discharges from vessels and storage tanks. The SPCC contains information including proper transfer of tank contents, regular inspection, and personnel training.

As mentioned in Part III, Section 1.9, Handling and Transport of Hazardous Materials, 49 CFR establishes guidelines for the transportation of hazardous materials and will be enforced on the site. The regulation sets guidelines on such items as the documentation, labeling, and storage of hazardous materials.

IV.1.10 LAND USE

IV.1.10.1 CIDMMA Expansion

IV.1.10.1.1 Land Use

The 580-acre east expansion of CIDMMA is not anticipated to result in the conversion of land use outside the limits of the eastward expansion and the existing CIDMMA. Construction of the east cell as described previously will take place primarily from the waters east of the existing CIDMMA, and staging areas would be on-site at CIDMMA, requiring temporary use of the adjacent Federal land. Currently CIDMMA operates consistent with a DMMP. Part of the plan calls for use of the existing north, center, and south containment cells to be rotated. Rotation allows for optimal drying of the dredged material within the facility. This will not change. Because the Recommended Plan calls for the east expansion cell to be constructed for future port terminal development, the cell will be rapidly filled, which consists of having dredged material placed into that cell as rapidly as possible without the expansion cell

participating in the DMMP cell rotation for optimal drying. During cell construction, the existing CIDMMA and the Rehandling Basin will continue to operate as in the past, receiving dredged material from Hampton Roads Harbor and vicinity.

A review of the Portsmouth General Land Use Plan and the proposed plans for the project reveals that the proposed east cell or the container terminal facility appears to be compatible with the Land Use Plan designation of the industrial uses along the Elizabeth River. Therefore, no adverse impact is expected.

IV.1.10.1.2 Zoning

The area of the eastward expansion of CIDMMA appears to be in a USG (U.S. Government) district or would be designated as such in the short-term while the dredged material management area is used for disposal of dredged material. As an agency of the Commonwealth of Virginia, the VPA is not subject to local zoning ordinances; therefore, the CIDMMA will not have to be rezoned in order to develop either the proposed east cell or the container terminal. The city of Portsmouth, however, may choose to rezone the property from USG to either M-1 or M-2 as the site use changes from a USG facility to a container terminal operated by the VPA. Both the M-1 and M-2 districts allow terminal and maintenance facilities for motor freight transportation, as well as railroad transportation and warehousing. These districts also allow other transportation services such as arranging transportation of freight and packing and crating. The M-1 and M-2 zoning classifications would be consistent with the prevailing zoning of land along the Elizabeth River in the city of Portsmouth. No adverse impact is anticipated.

IV.1.10.2 Terminal

IV.1.10.2.1 Land Use

The development of CIDMMA as a container terminal is not anticipated to result in the conversion of land use outside the limits of the eastward expansion. Direct impacts on land uses along the route of the proposed freight rail line are also not anticipated to be significant, as the route, although not finalized at this time, is expected to traverse the existing ROW's of the Craney Island Connector highway and existing VA Route 164 and I-664. If the final rail corridor substantially deviates from this route, then the land use analysis would be updated as part of supplemental NEPA documentation prepared by the VPA prior to port facility construction.

Future land use patterns were based on existing local land use and development plans and the city of Portsmouth 2005 Vision Plan. It was assumed that the area of direct influence on land use alterations extends approximately two miles from the point of access/egress. Moreover, the influence on future land use patterns is likely to be dependent upon the following factors: (1) available vacant land, (2) close access to the facility, and (3) proximate access to a limited access highway/freeway. Land use alteration and conversion would potentially include, but not be limited to: container/shipping related business office operations.

Impacts from operation of the terminal, such as increased noise levels from truck and rail freight traffic to and from the terminal, are addressed in Section 1.12. In the short-term during construction, it is anticipated that staging areas would be on-site, requiring no temporary use of adjacent land. Travel to and from the site by construction workers and trucks delivering supplies, equipment, and construction

materials is anticipated to follow the existing and planned major highway system, thereby avoiding local streets and the indirect impacts on land use typically associated with such traffic.

IV.1.11 NOISE

IV.1.11.1 CIDMMA Expansion

Noise impacts from diesel or electric-powered dredges will be localized in the specific area being dredged. In addition, dredging activities will occur at sufficient distances from sensitive receptors, such as protected bird species and human residential areas; thus, no excessive and out-of-character noise levels will be experienced. Therefore, no specific noise mitigation measures will be required.

Noise impacts from construction activities associated with the 580-acre eastward expansion will be localized in the specific construction area subjected to construction equipment and/or dredging. In addition, construction activities will occur at sufficient distances (i.e., greater than 1 mile away) from sensitive receptors, such as protected bird species and human residential areas; thus, no excessive and out-of-character noise levels will be experienced. Therefore, no specific noise mitigation measures will be required.

IV.1.11.2 Terminal Development

The FHA "Traffic Noise Model" (TNM) version 1.0b was used in the noise assessment to model future noise levels for the proposed port's Build-Out configuration. In a single model run, the TNM can calculate noise levels over multiple ground cover types, allow for trees and vegetation lines to be inserted at various heights and widths, model various noise barrier types, and allow a background noise input for general terminal noise emissions.

TNM was released in 1997 and updated in 1999 with the release of version 1.0b. This model has been used and improved by the FHA for over 20 years since the inception of its predecessor, the stamina/optima, in 1977.

The model computes future noise levels by inputting many different parameters into individual model runs. The model uses its own internal database to compute noise sources using the 1994-1995 noise emission levels for several vehicle types. Heavy trucks and background noise from general port operations were used as the noise sources in the modeling. According to the model, heavy trucks consist of all cargo vehicles with three or more axles, and a general gross weight of more than 12,000 kg (26,400 lbs.). TNM includes full-throttle noise emission levels for vehicles on upgrades and vehicles accelerating away from the traffic-control devices. The model combines these full-throttle noise emission levels with its internal speed computations to account for the full effect (noise emissions plus speed) of roadway grades and through traffic-control devices. TNM propagates sound energy between roadways and nearby receivers by taking the following factors into account:

- Intervening ground: its acoustical characteristics and its topography.
- Intervening barriers: walls, berms, and/or the combination of the two.
- Intervening rows of buildings.
- Intervening areas of heavy vegetation.

- Various ground cover types such as grass, pavement, water, etc.

These factors can be inserted into the model according to their specifications. In this assessment, noise results from the TNM were calculated in LAeq1h, the hourly A-weighted equivalent sound level (FHA, 1998).

After all relevant variables were input, the model calculated the noise level at specified distances from the port activities. The model results were then compiled to prepare contour mapping of noise levels southwest across CIDMMA (Figure IV-7). A separate TNM analysis was performed to simulate noise levels to the east across the Elizabeth River. However, contour mapping was not prepared for this latter modeling analysis over water since residential areas to the east are at least 8,000 feet away.

The primary source of noise will be from the heavy truck traffic along the western perimeter of the facility. In addition, a background noise 80 dBA source was added to simulate other activities on the port facility. Since NIT is comparable in size to the Build-Out configuration of the proposed Craney Island terminal, the background levels used in this evaluation are the same as in the "November 2000 Noise Study" conducted by Malcolm Pirnie for VPA (Malcolm Pirnie, 2000). This was done to provide a conservative background noise level in the model of non-heavy truck traffic noise, such as loading and unloading of containers, berthing of container vessels, straddle carriers, and other machinery at the terminal. This estimate is consistent with noise levels generated from straddle carrier operations at NIT North Terminal and repair facilities located interior to the facility measured by Thomas Bragg and Associates (Thomas Bragg and Associates, 2000).

TNM version 1.0(b) does not include the ability to add noise levels generated in the model to existing background levels of the community. Therefore, the results depict the terminal noise level generated sources only. This analysis provides a clearer result of the facility impacts since the results are not masked by highly variable existing conditions.

IV.1.11.2.1 Trucks

The model is driven primarily by noise generated from the heavy trucks entering, stopping, and leaving the facility. These heavy trucks haul cargo containers to and from the port. Noise produced by these heavy trucks can be attributed to three major generating systems: rolling stock, such as tires and gearing; propulsion systems related to engine and other accessories; and aerodynamic and body systems. Noise levels will vary somewhat depending on vehicle speed and flow control devices (Canter, 1977).

Information on terminal operations and truck traffic volumes needed to assure realistic noise levels for the analysis were obtained from Moffatt & Nichol Engineers, who prepared traffic projections on behalf of VPA (Moffatt & Nichol Engineers, April 2002). The terminal would operate on a 24-hour per day schedule; however, the gates may only be open for truck traffic from 7 a.m. to 6 p.m., Monday through Friday, based on hours of operation at existing VPA terminals. As discussed in Section 1.7, terminal truck traffic projections were presented in peak and average daily format from the initiation of Phase I in 2013 to Build-Out in 2050. Only peak daily traffic counts for Build-Out, converted to peak hourly counts, were used in the FHA noise model.

Peak hourly truck traffic volume was input into the model to predict container terminal noise impacts on CIDMMA and the surrounding communities. Based on the traffic projections for the Craney Island terminal, 381 heavy trucks per hour at a speed of 15 miles per hour (mph) were used in the model. This hourly traffic estimate is considered conservatively-high and assumes that peak day truck traffic would be distributed over about a 12-hour period. No flow control devices were used, as the majority of the modeled roadway, the Port access road, is free of flow control devices.

IV.1.11.2.2 Operations

Major noise sources during operations would include cranes to load and offload container vessels, loaders to transfer containers to and from warehouses and onto trucks, rail cars, and miscellaneous vehicles and equipment to facilitate cargo movement. In addition to mechanical devices, movement of materials and equipment along with backup beepers also emit noise.

As previously discussed, terminal operations noise was modeled as an 80 dBA background noise level. Modeled noise impact results are based on the cumulative sound level results from operations and heavy truck traffic at the proposed terminal. Noise level modeling results are presented in Table IV-19

Table IV-19. NOISE LEVEL RESULTS

Distance from Port Facility (feet)	Build-Out Truck Traffic and Terminal Operations (dBA) (1)		Trains (dBA) (2)
	Over Land	*Over Water*	
100	66.7	71.0	82
500	53.4	59.8	69
1,000	46.4	54.1	62.2
2,000	39.9	47.9	55.9
4,000	36.0	41.1	52.4
6,000	31.5	36.9	47.7
8,000	28.1	33.7	44.3

(1) TNM results.
(2) Train noise levels were calculated using a noise level of 87 dBA at 50 feet, which dissipates at a rate of 3 to 6 dBA for every doubling of distance. (Parsons Brinckerhoff, 1998)

IV.1.11.2.3 Trains

It is envisioned that a double-track rail line would connect the proposed terminal to the mainline. The intermodal rail yard would have sufficient loading and storage to accommodate the anticipated cargo throughput. It was assumed that approximately six to seven (inbound or outbound) trains would occur per

day, with three locomotives per train. The train length would range between 5,000 and 7,000 feet. The trains would move at a rate of approximately 20 mph on the mainline closer to the terminal and slower within the yard.

Noise from a freight train pass-by is produced by a combination of two distinct elements: noise emitted by the locomotive and noise emitted by the freight cars. Locomotive noise is dominated by the exhaust components located atop the engine. Engine noise is dependent on engine load (power setting) and is independent of speed. Locomotive noise is also dominated by low frequencies. Freight car noise is dominated by the wheel/rail interaction. At close distances, the contribution of both the engine and cars are identifiable.

Acoustical calculations were performed to estimate noise from freight trains. According to Parsons Brinckerhoff's "Rail Feasibility Study" conducted for the Wisconsin Department of Transportation, typical noise levels of a freight train are about 87 dBA at a distance of 50 feet from the train (Parsons Brinckerhoff, 1998; Wyle Laboratories, 1973). The sound will dissipate at a rate of 3 to 6 dBA for every doubling of distance. Therefore, while a train traveling at the terminal will emit high sound levels, the levels will have dissipated considerably when they reach sensitive receptors in the neighboring communities. Noise level calculations for trains are presented in Table III-18.

1.11.2.4 Cumulative Noise Impacts from Terminal Development

Predicted Craney Island Terminal full build-out noise contours were developed by adding the baseline noise intensity to the modeled Craney Island Terminal build-out noise intensities and are presented in Figure IV-8. The Craney Island Terminal would likely be classified as an Activity Category C according to the FHWA guidelines (USDOT, 1974) with a recommended $Leq_{(h)}$noise level limit of 72 dBA, while the surrounding communities would be classified as Category B with a limit of 67 dBA. As can be seen in Figure IV-8, predicted noise levels in the vicinity of Craney Island would likely fall within the respective category guidelines.

The difference in noise levels due to the development of the terminal is shown in Figure IV-9, which shows the various zones of noise increases. The zone, including at least a perceptible increase, is limited to areas within a distance of 0.25 mile over land and 0.5 mile over water from the proposed terminal, while the zone including at least a noticeable increase is limited to an area within a distance of 0.1 mile over land and 0.3 mile over water (Figure IV-10).

The increase in noise levels due to the development of the Craney Island Terminal would be acceptable as it is predicted to be limited to a small area; no perceptible increase of noise levels in neighboring communities are expected; and the predicted noise levels would fall within the FWHA noise guidelines.

IV.1.12 VISUAL AND AESTHETIC RESOURCES

IV.1.12.1 CIDMMA Expansion

Visual experience is dependent upon the pattern of the land (the topography), the pattern of water bodies, vegetation, and manmade development. The topography in the study area is relatively flat. Elevated structures are easily visible due to the slight relief. Conversely, viewers can generally see long distances

from locations that are only slightly higher than the surrounding area. The Hampton Roads water body separates most viewers from the existing CIDMMA and the proposed expansion area.

In order to assess projects impacts, the following rating scale (and definitions) was used to determine the degree of change in a particular viewshed:

- *No Impact* – The project will not be visible to viewers of the facility; thus, no impacts would occur.
- *Low Impact* – The view of the proposed facility will produce a low impact if a view of the facility is partially obstructed; if the visual resources in the viewshed are of minimal quality; if there are other sources of visual intrusions in the viewshed; or if there is little or no visual contrast between the proposed facility and the existing landscape unit.
- *Medium Impact* – The view of the proposed facility will produce a medium impact if the facility produces an obvious change in the viewshed; or if there is a moderate contrast between the proposed facility and the existing landscape unit.
- *High Impact* – The view of the proposed facility will produce a high impact if the facility is located in the foreground of the viewshed resulting in a strong contrast with the surrounding landscape unit; if the facility alters the distinctive qualities of the viewshed; or if the proposed facility is located within areas of visual diversity.

Viewsheds for this project were based on the locations from which the proposed east expansion can be seen (i.e., areas within view of the existing CIDMMA). Within each viewshed, particular views are indicative of the character of the viewshed. Potential viewers identified in the study area are primarily residents in Norfolk and Portsmouth waterfront neighborhoods.

Based on the above, the impacts of the east cell expansion on the area's visual and aesthetic resources will range from no impact to low impact due to: 1.) the distance between the proposed site and the viewer(s) of the east cell; 2.) the fact that the existing CIDMMA obstructs most views of the proposed expansion site, especially from land; and, 3.) the imperceptible visual difference between the proposed expansion and the existing (adjacent) 2,500-acre CIDMMA, when viewed from most distances across the water or landscape.

According to Virginia Department of Historic Resources (VDHR) records, several architectural resources have a viewshed of the proposed port facility (VDHR, March 2002) (VDHR correspondence included in appendices). However, the viewsheds for these properties would not be impacted by development of the port facility. As discussed in Section III (historic and archaeological resources), the architectural resources are currently surrounded by naval and industrial development, and most are currently used to support industrial or military activities. In addition, none of the identified architectural resources appear to have been evaluated for eligibility for inclusion on the National Register of Historic Places (NRHP) (VDHR, March 2002).

IV.1.12.2 Terminal

IV.1.12.2.1 Ambient Light Levels

The proposed terminal facility would result in an increase in nighttime ambient light levels resulting from general lighting and security lighting at the property boundaries of the container terminal. The port facility would also receive light reflections off of surrounding water bodies. Viewsheds for residential communities should not experience increases in nighttime ambient light levels from operation of the proposed port due to the distance of those areas from the port boundary. Nightglow impacts are also expected to be minimal due to the already existing nightglow characteristics from industrial sites and bridges in the area. Waterfront properties in the Edgewater residential neighborhood, especially properties without a vegetative buffer, may experience increased nighttime ambient light levels due to port operation; however, this community currently experiences nightglow impacts from nearby port terminals.

IV.1.12.2.2 Construction Impacts

Construction of the terminal facility would occur in phases; however, the first phase of the terminal would provide the most significant alteration to viewsheds of the project area. Initial construction would change the viewshed of sensitive receptors from an unvegetated dredged material containment area to an industrial facility. Further northward expansion of the port facility would continue to alter the viewshed, but to a lesser degree, since the viewshed would already have been compromised by Phase I port development.

The proposed port facility is a container facility that, when completely built out, will consist of container yards, several container vessel berths with 20 cargo cranes, and support facilities. Changes in the visual character of the proposed port facility area would not likely affect nearby industrial properties.

IV.1.13 RECREATIONAL AND COMMERCIAL USE OF WATERS

IV.1.13.1 CIDMMA Expansion and Terminal Development

IV.1.13.1.1 Commercial Shipping

Traffic forecasts and associated vessel call data for the proposed terminal were estimated by Moffatt & Nichol Engineers on behalf of the VPA (Moffatt & Nichol Engineers, April 2002). As forecasted, the Craney Island terminal would generate an additional 470 vessel calls to the Port of Hampton Roads by 2018, when the Craney Island terminal throughput is expected to reach 600,000 TEU's, with a further 300 vessel calls at Build-Out in 2050. This represents a 55 percent increase in current (year 2002) container/RORO vessel traffic. According to the Virginia Pilots, the anticipated increase in vessel traffic from 9 to 15 weekly calls under Phase I and Build-Out, respectively, could be accommodated and would not be expected to significantly affect safety in the harbor (Virginia Pilots Association, April 2002).

IV.1.13.1.2 Commercial Fishing

The Elizabeth River and waters surrounding the proposed eastward expansion and port facility serve as habitat for commercially-important species including blue crab, Atlantic croaker, and other commercial fish species. A moderate amount of commercial fishing, including the use of gill nets, occurs in the area adjacent to the east side of the existing CIDMMA for spot, croaker, and striped bass (VMRC, April

2002). Blue crabs are harvested from the waters to the east of CIDMMA for the local seafood market and export from the Chesapeake Bay area.

Dredging would be required to provide foundation conditions for the proposed east cell construction and create access channels. These dredging activities, including the area between the navigation channel and proposed wharf at the east cell expansion site, would be completed in conjunction with port development and would provide 50-foot-deep inbound and outbound channels to accommodate deep draft ships. Localized impacts on commercial fishing may occur due to port operations since vessel traffic would prevent the area from being fished. In particular, some local commercial gill netting and crabbing activities may be relocated outside of the proposed channel area.

VMRC's commercial harvest records from 2004 indicate that the value of finfish landings in the Elizabeth River for several important species were small in comparison to the value statewide. These species included menhaden, flounder, croaker, and striped bass. Values are provided in Table IV-20.

Table IV-20. COMMERCIAL FISHING VALUE STATISTICS FOR THE ELIZABETH RIVER, THE COMMONWEALTH OF VIRGINIA

Species	Value of Elizabeth River Landings	Value of VA Landings
Menhaden	$24	$288,250
Flounder	$955 (small only)	$3,785,089 (all flounder)
Croaker	$68	$2,822,769
Striped Bass	$198	$3,419,016
Total	$1,245	$10,315,124

While impacts to these fisheries would be expected as a result of the eastward expansion of Craney Island, these impacts are expected to be a portion of the dollar value represented above since the entire river would not be impacted by construction. According to VMRC, the area to the east of Craney Island is used by crab fisherman, but data on how many crab pots would be displaced by the proposed project are not known. It is reasonable to expect that the expansion would reduce the number of pots fished in this area.

The loss of benthic habitat due to project construction is expected to have a negligible effect on commercial fishing in Chesapeake Bay and vicinity. Benthic species of commercial importance, such as hard clams, *Mercenaria mercenaria,* were almost totally non-existent in the project footprint in recent surveys. Biomass per unit area of open bottom in the proposed project impact area is low. The limited commercial crabbing and fishing that occurs in the project impact area is expected to relocate to adjacent areas within the adjoining tributaries and Chesapeake Bay.

IV.1.13.1.3 Recreational Boating and Fishing

Recreational boating and fishing in the Hampton Roads Harbor will grow commensurate with projected population growth in the region. Organized boating events would continue to be conducted in similar fashion as today; traffic due to this type of activity would also be expected to increase in direct relation to the number of recreational vessels. Vessel traffic caused by recreational fishing cannot be predicted due to seasonal or periodic changes due to fluctuations in supply or demand for seafood products, the impact of disease or invasive species, and other natural phenomena.

According to the VMRC the area to the east of Craney Island is not heavily used for recreational fishing or pleasure boating (VMRC, personal communication, 2005). A review of the Virginia Saltwater Fishing Comparison Report (2003-2004) shows that no catches were made near Craney Island for those years. VMRC also indicated that based on their observations, the Craney Island area is not an especially popular destination for sport fisherman. This may be due to its proximity to active commercial and military shipping lanes.

According to the 2001 Boater Registration Registry maintained by the VDGIF, approximately 14,000 boats were registered to residents of Chesapeake, Portsmouth, and Norfolk. An indeterminate number of these boat owners likely use the Elizabeth River near Craney Island to travel into and out of Hampton Roads and the Chesapeake Bay. Construction of a port facility would not preclude their continued passage through this area. Boaters who choose to recreate directly in the area east of Craney Island (i.e., within the footprint of the new cell) would be impacted by construction and would no longer be able to use that area.

The 580-acre east cell expansion will displace all recreational boating and fishing within the boundaries of the cell's footprint. Again, mitigation will be provided to enhance and restore fish habitat and feeding areas. Mitigation efforts are anticipated to result in a more diverse and abundant recreational fish population than that displaced by the CIDMMA expansion. Rip-rap placed on the dike surfaces will provide attachment surfaces for fish food organisms and associated feeding areas for fish.

An increase in commercial traffic may result in increased conflicts between commercial vessels and recreational boats in the Craney Island Reach of Hampton Roads between the proposed container terminal and the mouth of the Elizabeth River. These potential conflicts would likely result in the voluntary displacement of recreational boaters to other areas of Hampton Roads as they seek less congested areas, especially in the case of recreational boaters traveling across the Craney Island Reach and the Norfolk Harbor Reach to arrive at their destinations.

IV.1.14 ECONOMICS

IV.1.14.1 CIDMMA Expansion - Direct, Indirect and Induced Impacts

The no-action alternative will have direct, indirect and induced impacts in the local and regional economies. Direct impacts consist of employment and the purchase of goods and services required to construct an eastward expansion. For users of the eastern expansion, direct impacts are created as these users dredge berthing areas, access channels, marinas or private docks at reduced dredging costs both in the immediate short-term and the long-term. Short-term costs are reduced in utilizing the eastern

expansion due to shorter pumping distances that require less dredging pipe. The long-term costs are lower by avoiding ocean disposal, a higher cost alternative, in the future.

Indirect impacts include the effect on other industrial and service sectors of the economy caused by the direct activity of the eastern expansion. These include the impacts resulting from off-site businesses providing the expansion or users of the expansion with services, materials, machinery or other resources necessary to support their original dredging needs.

Induced impacts are the result of the re-investment of the direct and indirect impacts into the local and regional economy through successive rounds of inter-industry and household spending and re-spending. For example, spending by an individual directly employed by a dredge operator becomes new income for businesses that, in turn, pay wages to employees, invest or re-spend what they earn. Successive rounds of spending create more sales revenues, jobs, personal income, and tax earnings.

Not withstanding the effects of the construction costs of the eastern expansion on the local and regional economies, the overall degree of the direct, indirect and induced impacts will be relatively minor. The eastern expansion provides a service to the dredging community that is already available, albeit at a slightly lower cost due to shorter pipe lengths. This beneficial direct impact will end in the short-term as the eastern expansion is rapidly filled. The long-term beneficial direct impact will begin to occur in 2025 as the increased capacity is realized and ocean disposal can be avoided for approximately 3 years. The indirect and induced impacts would be expected to follow suit with the direct impacts in their timing and longevity.

Construction of an eastward expansion will have direct, indirect and induced impacts in the local and regional economies. Direct impacts consist of employment and the purchase of goods and services required to construct an eastward expansion. For users of the eastern expansion, direct impacts are created as these users dredge berthing areas, access channels, marinas or private docks at reduced dredging costs both in the immediate short-term and the long-term.

Indirect impacts include the effect on other industrial and service sectors of the economy caused by the direct activity of the eastern expansion. These include the impacts resulting from off-site businesses providing the expansion or users of the expansion with services, materials, machinery or other resources necessary to support their original dredging needs.

Induced impacts are the result of the re-investment of the direct and indirect impacts into the local and regional economy through successive rounds of inter-industry and household spending and re-spending. For example, spending by an individual directly employed by a dredge operator becomes new income for businesses that, in turn, pay wages to employees, invest or re-spend what they earn. Successive rounds of spending create more sales revenues, jobs, personal income, and tax earnings.
Not withstanding the effects of the construction costs of the eastern expansion on the local and regional economies, the overall degree of the direct, indirect and induced impacts will be relatively minor. The eastern expansion provides a service to the dredging community that is already available, albeit at a slightly lower cost due to shorter pipe lengths. This beneficial direct impact will end in the short-term as the eastern expansion is rapidly filled. The long-term beneficial direct impact will begin to occur in 2025 as the increased capacity is realized and ocean disposal can be avoided for approximately 3 years. The

indirect and induced impacts would be expected to follow suit with the direct impacts in their timing and longevity.

IV.1.14.2 Terminal Development - Direct, Indirect and Induced Impacts

Port activity generates direct, indirect, and induced impacts in the local and regional economies. Direct impacts consist of employment and purchases of goods and services required to move cargo through the port, produce goods that are shipped via the port, or build new port facilities. The direct impacts include the initial round of spending generated by the port industry, port user industries, and port capital spending. For port users, direct impacts are generated as industries sell exported or imported goods or use them in production. Port industry direct impacts are created as revenues are earned from handling and transporting cargo through VPA facilities. To describe it another way, the direct impacts are the initial sales revenue, employment, personal income, and state and local impacts created from Hampton Roads' port users and port industry import/export activities through the VPA's port system. All direct impacts are economic catalysts for creation of indirect and induced impacts.

Indirect impacts include the effect on other industrial and service sectors of the economy caused by the direct activity of the port. These include the impacts resulting from off-site businesses providing port user and port industry firms with services, materials, machinery or other resources necessary to support their original port-related activities. This includes the economic activity between industries supported by the purchase of supplies, services, labor, and other inputs.

Induced impacts are the result of the multiplier or ripple effect. The multiplier effect occurs when direct and indirect impacts are re-injected into the local and regional economy through successive rounds of inter-industry and household spending and re-spending. For example, spending by an individual directly employed by a terminal becomes new income for businesses that, in turn, pay wages to employees, invest, or re-spend what they earn. Successive rounds of spending create more sales revenues, jobs, personal income, and tax earnings.

IV.1.14.3 Measurements of Economic Benefit

The economic impact on the Hampton Roads region and the Commonwealth of Virginia consists of employment, sales revenues, income, and taxes. This analysis reports direct impacts as well as indirect and induced impacts for these measurements. Employment is the most important indicator from the perspective of growth and development requirements within the region. It is employment that drives the population growth estimates, generating the most impact in the built environment. Income resulting from employment is a measure of the support for growth and development that would occur within the region during the analysis period. Wages, in combination with manufacturing and spin-off development, would create value within the region, ultimately generating income and real estate taxes to help fund the services and improvements necessary to sustain this level of growth and development along with an acceptable standard of living.

Wages received by employees are spent on housing, food, clothing, and other required living expenses. Subsequently, these expenditures serve as income to those providing services to households. Subsequent expenditures continue to multiply as long as they are captured within the region.

The port's economic impact on the Nation is calculated by identifying transportation cost savings that would be generated by building a Craney Island terminal. If the terminal is not built, the Port of Virginia

expects to experience significant capacity shortfalls by 2015. Cargo bound for Norfolk would need to be re-routed to alternate ports, which, in many cases, would incur additional landside transportation costs. More detailed economic information is available in Appendix B of the Feasibility Report.

IV.1.14.4 Terminal Operation

The economic impacts of the construction, operation, and related distribution center activity generated by the proposed CIDMMA container terminal have been estimated using input-output multipliers developed by the U.S. Bureau of Economic Analysis. The multipliers used reflect national averages, rather than a Virginia-specific impact in terms of employment, output, and income resulting from changes in demand due to each phase of the project. The projections in terms of economic impact resulting from the full Build-Out of the Craney Island terminal site are conceptual in nature.

Construction of the four phases of CIDMMA, with total estimated construction costs of $1.28 billion, is expected to provide direct and indirect employment for more than 1,100 individuals in construction and other industries over the 20-year construction period (2013-2032), generating earnings of approximately $734 million and $1.4 billion in final output to the economy.

Phase One Operations are projected to be fully underway by 2018, and demand for CIDMMA, measured in TEU's, is projected to be 600,000 TEU's. This throughput would generate an estimated 8,000 new jobs located at the terminal and throughout the transportation sector, $250 million in annual income, and $730 million in average annual output throughout the state (Employment and dollar figure estimates averaged over 2013-2032 study period) (Moffat & Nichol, 2004). Another 10,000 jobs, $300 million in annual wages, and $1 billion in total annual output would be produced downstream in the supply chain due to distribution center activity spurred on by the development of CIDMMA. Income taxes derived from this payroll are estimated at approximately $113 million.

The full Build-Out condition of CIDMMA is currently projected for the year 2032. At that point, demand for Craney's facilities is projected to reach 2.5 million TEU's, resulting in increased local benefits over the 50-year study period. Annual averages will be 27,000 permanent jobs throughout Virginia's economy, $870 million in earnings, and $2.5 billion in average annual output. These jobs are at the terminal and in the inland transportation system sector. Port-oriented distribution centers add an additional 25,000 jobs, $788 million in annual earnings, and $2.7 billion in output. Resulting income taxes are estimated at approximately $155 million.

Development of a new container terminal at CIDMMA and the resulting benefits to the local and regional economy are also likely to have a beneficial effect on the real estate market and property values in the city of Portsmouth as well as other communities in the region. For instance, a decline in existing home sales in the region during the year 2000 has been associated with a slowing regional economy (HRPDC, 2001). An improvement in the economy associated with the proposed Craney Island terminal would likely lead to an increase in demand for new and existing homes. This increased demand would contribute to an increase in home prices and property values that will benefit owners of real property and, indirectly, the city of Portsmouth through increased tax revenues associated with higher property values. This increase is not likely to be offset by any other impacts, such as increased noise levels and/or truck and rail traffic, as increased truck traffic would be primarily limited to existing and planned major highways and the new

rail line connection, while not finalized, would strive to stay within the median or ROW's of the CIDMMA connector highway and existing VA Route 164 and I-664.

In the short-term, construction of the Craney Island terminal will result in the creation of almost 1,200 jobs during all four phases of construction. Earnings from employment during all four phases of construction are estimated at approximately $734 million. Expenditures for materials, equipment, and labor will generate approximately $1.4 billion in total output to the local and regional economy.

In the long-term, the annual operation of the Craney Island terminal would have a positive impact on the Hampton Roads region and the Commonwealth of Virginia by generating over 13,000 direct jobs, 14,000 indirect jobs, and another 25,000 jobs from distribution center activity. It is anticipated that some of the indirect jobs would be new positions. It is anticipated that increased revenue and activity from operation of the Craney Island terminal would also provide for continued employment of individuals already working in sectors of the local and regional economy that presently benefit from port activity in the Hampton Roads region. It is anticipated that direct and indirect employment generated by CIDMMA operations will provide average annual earnings of $870 million and $2.5 billion in total output and that distribution center operations will add another $788 million in wages and $2.7 billion in total output.

The local economy, the Commonwealth, and the Nation will also benefit from increased generation of local sales taxes from purchases made as a result of the new terminal, workers directly employed by the terminal, and workers indirectly employed by businesses in the region. Payroll taxes are estimated at approximately $84 million per year from port operations and inland transportation and another $71 million from the distribution centers.

IV.1.15 ENVIRONMENTAL JUSTICE

IV.1.15.1 CIDMMA Expansion and Terminal Development

The proposed CIDMMA expansion and port development would not have a disproportionately high or adverse effect on minority communities. The site for these proposed activities is located within an area that had a smaller minority population than the overall minority population of the city of Portsmouth. Even though the minority population levels in four of the five jurisdictions analyzed exceeded the level for the State of Virginia, two of the four were within 10 percent of the state level.

The communities within the project area had a much lower percentage of residents in poverty and had a significantly higher median household income than the city of Portsmouth, Norfolk-Virginia Beach-Newport News MSA, and the Commonwealth. In addition, four of the five communities analyzed had a median income above that of the Commonwealth of Virginia. Therefore, based upon the analysis conducted for this assessment, it was determined that activities associated with the proposed alternative would not have significant adverse impacts on low-income communities.

No minority or low-income residents will be displaced by development of the new cell or terminal. The proposed access roads servicing the terminal will be sited entirely within the expansion area of CIDMMA, and the proposed rail corridors providing access to the port facility will likely be located within existing VDOT ROW's; therefore, the road and rail corridors should not displace minority or low-income residents.

Some minor and short-term adverse impacts to various environmental resources are expected to occur from project construction; however, long-term benefits to the community are anticipated due to potential employment opportunities and increased demand for local services. Therefore, no further environmental justice analysis appears warranted.

IV.1.16 PUBLIC SAFETY

IV.1.16.1 CIDMMA Expansion and Terminal Development

The HRPDC has projected that the population of Portsmouth will decline until the year 2011. From 1980 to 2000, the population of Portsmouth declined by about 4,000 persons (see Section 18.0). As a result, no substantial increase in public services, including fire protection, law enforcement, and emergency medical services would be expected. Beyond the year 2011, as the demand for public services increases, additional paid and volunteer firefighters, law enforcement officers, and emergency medical personnel will be required. More equipment and stations will also be needed. Forecasting future public safety services requires thorough analysis of the local provider's capacity including evaluation of fire alarm facilities, analysis of the water supply system, fire department training, manpower, equipment, and station facilities. Analysis of response time is also an important consideration when evaluating the need for additional public safety facilities and personnel. The need for emergency medical services should be based upon the response time of available units, the level of professional training of the emergency service personnel, as well as the type of transport vehicles and equipment available.

The development and operation of the new cell and terminal are not anticipated to adversely affect, or to be affected by, various elements of public safety in the project area. It is anticipated that residential, commercial, and industrial growth would continue into the future consistent with any growth projections. This would result in a commensurate growth in public safety services in the project area. This situation is expected to be adequate to serve the new cell and terminal facilities. Development and operation of the terminal would not affect hurricane evacuation.

Fire protection, law enforcement, and other public services and infrastructure would continue to expand in response to the projected regional growth in the Hampton Roads area. In order to provide adequate protection to support this growth, additional staffing of these services would be required to maintain the current levels of service in the vicinity of the proposed terminal, whether or not the facilities are constructed. The efficiency of hurricane evacuation routes is dependent on growth and would be affected on a cumulative basis as the region continues to develop regardless of the terminal.

IV.1.17 HISTORIC AND ARCHAEOLOGICAL RESOURCES

IV.1.17.1 CIDMMA Expansion

No historical/cultural resources have been identified in the approximately 580-acres to be filled, nor in the adjacent berthing area and access channels for the terminal; thus, no impacts to such resources are anticipated in these areas. No mitigation measures are required for these areas. However, no identification of cultural resources have been carried out for the areas that would be affected by the overall mitigation plan that currently includes wetlands restoration, sediment clean-up, and oyster reef restoration at various locations throughout the Elizabeth and James Rivers. In the next phase of this

study, additional studies will be necessary to determine if there are any such resources at the mitigation sites, what the effects on such resources will be, and what historical/cultural resources mitigation, if any, will be necessary.

IV.1.17.2 Terminal Development

Several architectural resources were identified within a 1-mile radius of the proposed port facility; however, none of the properties would be directly impacted by development of the port facility. The architectural resources identified by VDHR include three sites in the city of Norfolk: Maritime Terminals Numbers 6, 7, and 8 at the Norfolk Naval Base; the Norfolk and Western Grain Elevator Complex located at the Sewells Point Terminal, just south of the Norfolk Naval Base; and NIT. The Norfolk and Western Grain Elevator Complex was constructed in the early 1920's and consists of a large grain elevator or "headhouse," a gantry, silos, railroad tracts, pier, and warehouses. The Sewells Point Terminal is typical of industrial construction during this time and does not possess significant design associations that would meet Criterion C of the eligibility criteria for inclusion on the NRHP (VDHR, June 2001). Other architectural resources identified within a 1-mile radius of the project site include the following sites located in the city of Portsmouth, just south of the project area: Craney Island Fuel Terminal in the Norfolk Harbor and five buildings located on the Craney Island Naval Fuel Depot. According to VDHR, none of these sites appear to have been evaluated for eligibility for inclusion on the NRHP (VDHR, March 2002). The sites are surrounded by naval and industrial development, including Naval Station Norfolk, NIT, PMT, Lambert's Point Coal Terminals, and the U.S. Naval Supply Center. Most of these architectural resources are currently used to support industrial or military activities.

The proposed port facility and immediate access roadways will be constructed on manmade land comprising CIDMMA; therefore, no cultural resources would be impacted by construction of the port facility or immediate access roadways. For purposes of this analysis, it was assumed that the proposed rail corridor would be located within the VDOT roadway ROW to the maximum extent practicable. The final rail corridor location has not been determined. However, as currently envisioned, the rail corridor would be located within cleared ROW of VDOT's connector highway from CIDMMA to VA Route 164. The rail corridor would then continue west paralleling VA Route 164 to I-664, then continue south along I-664 to the Norfolk Southern and CSX railways near the Hampton Roads Airport in Suffolk, VA. If the final rail corridor substantially deviates from this route, then the historic and archaeological resource impact analysis would be updated as part of supplemental NEPA documentation prepared by VPA prior to port facility construction.

The Cultural Resource Group of Louis Berger & Associates, Inc. (Berger), conducted an intensive cultural resources survey of the crossing alternatives proposed in the VDOT HRC Study FEIS (Berger, 2001), which is included as an appendix to the VDOT FEIS (VDOT, 2001). Crossing alternatives evaluated in the study include the CIDMMA connector highway and expansion of I-664 from VA Route 164 to I-64. The study, based on background research and field evaluations, concluded that the CIDMMA connector highway would not impact cultural resources eligible for inclusion or listed on the NRHP (VDOT, 2001). Therefore, it can be assumed that construction of the rail spur within the CIDMMA connector highway ROW would likewise not impact cultural resources eligible for inclusion or listed on the NRHP.

From the CIDMMA connector highway, the proposed rail spur would continue west within the existing VA Route 164 ROW. When constructed in the late 1980's, the VA Route 164 freeway was designed to support eastbound and westbound rail corridors within the median. No reports are on file with VDHR for cultural resource investigations associated with construction of the VA Route 164 freeway in Portsmouth, Virginia (VDHR, April 2002). VDOT was also unable to locate information regarding any cultural resource investigations completed for the VA Route 164 freeway (VDOT, April 2002). If present, archaeological resources within the VA Route 164 median would likely have been impacted by road construction. No historic structures are located within the VA Route 164 median. Therefore, impacts to cultural resources within the VA Route 164 median, if present, are assumed to be negligible.

At the intersection of VA Route 164 and I-664, the proposed rail corridor would continue south within the I-664 ROW to connect with the Norfolk Southern and CSX railways. This portion of I-664 was also evaluated in the VDOT HRC Study FEIS. Based on the results of the intensive cultural resources survey, one possibly significant archaeological site (Site 44CS244) and a previously recorded cemetery (Site 44CS93- Old New Hope Cemetery) lie adjacent to I-664 (VDOT, 2001). Site 44CS244 contains both prehistoric and historic components and is located in the city of Chesapeake. Use of the Old New Hope Cemetery in the city of Chesapeake dates from the 1920's to the present. Based on current conceptual engineering design, these sites would be avoided, and impacts would not occur (VDOT, 2001). Therefore, it can be assumed that construction of the rail corridor within the VDOT I-664 ROW would also not impact cultural resources eligible for inclusion or listed on the NRHP.

No temporary or permanent impacts to cultural resources are anticipated from construction of the proposed port facility, access roads, or rail corridors. However, prior to final design of the port facility, access roads, and rail corridor, the SHPO would be consulted to determine additional information needs regarding historic resources in the project vicinity.

IV.1.18 SECONDARY GROWTH

IV.1.18.1 Residential Growth

The majority of the 568 persons estimated to be employed under full Build-Out of the CIDMMA container terminal will likely already reside within the Hampton Roads region. Some of the 250 administrative staff may not already reside in the region and would, therefore, relocate to the region. Nevertheless, the number of relocations is not anticipated to be significant and would likely be accommodated by the existing housing stock in the region. Additionally, the estimated 3,890 indirect and induced jobs that may result from direct employment and sales generated by the CIDMMA facility are expected to be filled by existing residents in the region. Therefore, operation of the CIDMMA container facility is not anticipated to generate significant new residential development within the region.

IV.1.18.2 Commercial Development

The additional jobs and sales generated by the CIDMMA container terminal are anticipated to generate additional jobs and revenue in several sectors of the local and regional economy. Existing commercial establishments are expected to be the beneficiaries of a majority of this increased economic activity. However, it is anticipated that new establishments would be built in the study area. Some of these new businesses are likely to be accommodated by existing vacant/underutilized or planned commercial facilities in Portsmouth and throughout the region. Other commercial or industrial development could

occur on existing brownfields, which in Newport News are contributing more and more to redevelopment of that city. While the magnitude of commercial development resulting from the Craney Island terminal is uncertain, any new commercial development is likely to have a beneficial impact on the city of Portsmouth through the creation of additional jobs, potential reduction in the unemployment rate, and increase in retail sales and other tax revenues. The beneficial impacts would be realized in the short-term during new construction or renovation of existing facilities and in the long-term through continued operations of commercial facilities.

IV.1.18.3 Industrial Development

As stated previously, the additional jobs and sales generated by the CIDMMA container terminal are anticipated to generate additional jobs and revenue in several sectors of the local and regional economy. Other related industries are expected to be the beneficiaries of a majority of this increased economic activity. However, it is anticipated that new industrial activity, such as warehousing, would be generated in the study area. Some of this activity is likely to be accommodated by existing or planned industrial development in Portsmouth and throughout the region. Other industrial development could occur on existing brownfields, which in Newport News are contributing more and more to redevelopment of that city. Although the magnitude of industrial development resulting from the Craney Island terminal is uncertain, any new development or redevelopment of existing industrial property or facilities is likely to have a beneficial impact on the city of Portsmouth through the creation of additional jobs, potential reduction in the unemployment rate, and increase in sales and other tax revenues. The beneficial impacts would be realized in the short-term during new construction or renovation of existing facilities and in the long-term through continued operations of industrial facilities.

Operation of the proposed container terminal is not anticipated to have a significant adverse affect on population growth or associated residential development, as most jobs that would be created at the Craney Island terminal, or at other businesses indirectly benefiting from the Recommended Plan, are expected to be filled by workers already living in the region. A beneficial effect on commercial and industrial development, however, is anticipated, as new businesses or expanded businesses that would serve the Craney Island terminal are likely to be located at existing facilities or on redeveloped sites. This development would benefit the region in the short-term through the generation of construction jobs related to new construction or facility renovation work. In the long-term, the region will benefit from increased employment, the purchase of goods and services, and the tax revenues generated by this development.

IV.1.19 COASTAL ZONE RESOURCES AND PERMITS

In accordance with the Coastal Zone Management Act of 1972, as amended, and the VCRMP, the proposed project has been evaluated for consistency with coastal development policies. Application submission for appropriate permits will ensure compliance with VCRMP and the Coastal Zone Management Act. The VDEQ serves as the lead agency for Virginia's networked coastal zone management program. VDEQ will evaluate the findings of this DEIS, based upon the USACE consistency determination that the USACE will obtain and comply with all approvals from agencies administering the applicable enforceable policies, as well as comments received from coastal management agencies. VDEQ will then comment as to whether the findings of this document regarding the proposed project are consistent with the Virginia Coastal Program.

COASTAL ZONE MANAGEMENT ACT OF 1972, AS AMENDED
VIRGINIA COASTAL RESOURCES MANAGEMENT PROGRAM

Enforceable Program (Agency Oversight)
1. Fisheries Management (VMRC, VDGIF)
2. Subaqueous Lands Management (VMRC)
3. Wetlands Management (DEQ)
4. Dunes Management (VMRC)
5. Non-Point Source Pollution Control (DCR)
6. Point Source Pollution Control (DEQ)
7. Shellfish Sanitation (DOH)
8. Air Pollution Control (DEQ)
9. Coastal Lands Management (DEQ)

All applicable water protection and/or wetland permits have not been applied for at the time of the preparation of this DEIS but will be obtained prior to construction. These may include, but may not necessarily be limited to, a VDEQ Virginia Water Protection permit pursuant to Section 401 of the CWA, a VMRC permit for encroaching on state bottom pursuant to Title 28.2 and 62.1 of the Code of Virginia and local Wetlands Board Permit. A USACE Section 404 CWA permit is not required for USACE Civil Works projects [33 CFR 323.3(b)]. A section 404 (b) (1) evaluation was prepared for the proposed project and appears as Appendix H.

Virginia's Coastal Management Area includes most of Tidewater Virginia, as defined by the Code of Virginia § 28.2-100, and all coastal waters of the U.S. territorial sea, extending to the 3-mile limit of Virginia sovereignty. Federal lands, the use of which is by law subject solely to the discretion of, or which is held in trust by the Federal Government, its officers or agents, are excluded from Virginia's coastal management area. However, activities on Federal lands with any reasonably foreseeable coastal effects must be consistent with the VCP.

IV.1.20 SAND BORROW FOR DIKE CONSTRUCTION

In order to construct the dikes, sand will be dredged from offshore borrow areas by hopper dredge. Once transported to the eastward expansion site, the material will be offloaded using a self-contained offshore transfer station buoy ("SCOTS buoy"). The Atlantic Ocean Channel is designated as the primary source of material for dike construction, with Thimble Shoal and Cape Henry Channels as secondary sources. It has been a long-standing policy of the USACE to use dredged material in a way that is of benefit to local, state, and Federal interests in the vicinity of navigation projects. In particular, this means using dredged material of suitable quality and quantity for construction, placement on nearby shorelines and beaches, or other beneficial uses. Significant quantities of material suitable for dike construction are expected to be available in these channels.

As mentioned previously, ESA Section 7 consultation has been completed for dredging in these channels. Environmental impacts related to dredging in these channels have also been addressed in project specific NEPA documents (Table IV-21). After specific engineering and design information is developed during PED, and sand requirements are more specifically identified, unaddressed impacts, if any, may be handled in a Supplemental EIS.

IV.1.21 CUMULATIVE EFFECTS

A cumulative effects assessment (CEA) of the eastward expansion of the CIDMMA (including terminal development) was prepared for the Norfolk District, USACE, by the University of Oklahoma (Canter, 2004). A multi-step methodology developed by the Council on Environmental Quality (CEQ) was used as the framework for the study. Three primary work elements were involved: (1) reconnaissance visits to the Norfolk District and the CIDMMA; (2) the procurement, evaluation, and summarization of more than 50 pertinent reference documents and materials; and (3) the preparation of the CEA report. Pertinent text from the report is provided below, while the entire CEA document is contained in EIS, Appendix C.

Table IV-21. NEPA DOCUMENTS AND BORROW AREAS

Report and NEPA Document	Date	Placement Site	Borrow Site(s) Identified
VB BEHP - Feasibility Report and EIS	FEIS: 19 September. 1972	• Va. Beach between 49th and 89th streets	• Ocean bottom offshore Chesapeake Bay off Lynnhaven Inlet
Thimble Shoal Channel (Maintenance Dredging), FEIS	23 August 1973	• Va. Beach	• Eastern portion of Thimble Shoal Channel (maintenance material)
VB, VB Erosion Control FEIS	1 August 1975	• Va. Beach	• Thimble Shoal Channel (maintenance material)
VB BEHP - Phase I GDM and Supplemental EIS	HD 99-216 dated 1986; Supplement 1, FEIS:22 February 1985	• Va. Beach between 49th and 89th streets	• Offshore VB oceanfront • Atlantic Ocean Channel
Final Supplement 1, Norfolk Harbor and Channels, Deepening and Disposal, FEIS	14 June 1985	• Va. Beach	• Atlantic Ocean Channel • East end of Thimble Shoal Channel
VB BEHP - Phase 2 GDM	January 1989	• Va. Beach between 49th and 89th streets	• Thimble Shoal Channel
VB BEHP - Phase 1 General Reevaluation Report, EA (1)	1994	• Va. Beach between 49th and 89th streets	• Thimble Shoal Channel
Limited Reevaluation Report (Beach Nourishment Project)	1997	• Va. Beach between Rudee Inlet and 49th street	• Truck-haul from upland borrow site
Final EIS, Baltimore Harbor and Channels Deepening, MD and VA	1981	• Beneficial uses when available	• Cape Henry, York Spit, and Rappahannock Shoal - VA Channels

(1) EA deals with storm water drainage modifications and ESA Section 7 consultation for sea turtles

Cumulative effects refer to the impacts (effects) on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions (RFFA's) regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts (effects) can result from individually minor but collectively significant actions taking

place over a period of time (40 CFR 1508.7). This definition encompasses the following implications relative to the CEA study:

- The action refers to the construction and completion of an eastward expansion of the CIDMMA on about 580 acres of shallow bottom habitat (the expansion includes the construction of containment dikes, and the filling of the new cell to an elevation of about 12.0 feet above the MLW level) and the subsequent construction and operation of a marine terminal.

- For those cumulative effects that need to be addressed, it is necessary to consider the direct and indirect effects of past, present, and RFFA's on the affected resources, ecosystems, and human communities (past actions can include those in the area prior to and during the construction and use of the CIDMMA, as well the 40 [+] years of placement of dredged material at the CIDMMA; present actions include those involving on-going dredging and materials placement in the CIDMMA and other projects that are under construction in the area; and RFFA's include those beyond mere speculation but within the time frame for analysis).

- The respective actions may have been, or will be, the result of decisions made by various governmental levels (Federal, state, or local) or the private sector; further, such actions may be on or nearby the CIDMMA, or off-site (the key issue is that common resources, ecosystems, or human communities are being affected).

- Five RFFA's of particular relevance to this study are the deepening of the inbound lanes of the Norfolk Harbor Channel and the Craney Island Channel from 45 to 50 feet to accommodate larger container ships; the VPA proposed construction and operation of a new marine terminal on the eastward expansion of the CIDMMA; the VDOT proposed Third Crossing of the Hampton Roads area; the Ecosystem Restoration Program for the Elizabeth River; and the construction and operation of a new marine terminal by APM Terminals, Inc.

IV.1.21.1 Cumulative Effects Issues Identified During Scoping

The USACE Feasibility Study of the eastward expansion of the CIDMMA has included at least 24 public meetings involving persons and groups with various interests and expertise. The total includes four stakeholder meetings, five meetings of a NEPA Technical Committee, and 15 meetings of a Mitigation Subcommittee of the NEPA Technical Committee. These meetings included extensive discussions that are associated with the scoping process as delineated within the NEPA regulations of the CEQ. Details related to the scoping meetings are in Appendix A of the CEA document. A central theme in many of the discussions related to the need for a CEA study. The following items reflect the manner in which the issues related to cumulative effects were articulated:

- A comprehensive EIS should be prepared to address connected actions, cumulative actions, and cumulative effects. A piecemeal approach wherein multiple EIS's are prepared without referring to other nearby actions would not provide the best approach from an environmental management perspective.

- The environmental effects of multiple current and future projects in the vicinity of the eastward expansion of the CIDMMA should be considered together. Examples of these other projects include dredging of the inbound portion of the Norfolk Harbor Channel to a depth of 50 feet (by the USACE), construction and operation of a major marine terminal on the completed expansion cell (by the VPA), construction and operation of a second marine terminal about 1.5 to 2.0 miles south of the CIDMMA (by APM Terminals, Inc.), construction and use of a Third Crossing bridge-tunnel project (by the VDOT), and implementation of sediment cleanup and wetland restoration projects in the Elizabeth River Basin (by the Elizabeth River Ecological Restoration Program).

- The environmental impact study of the eastward expansion of the CIDMMA should encompass the direct, indirect, and cumulative effects on specific resources such as, but not limited to, water quality, benthos, fisheries, protected species, birds, and wetlands.

- Hydrodynamic modeling should be used as a tool to explore the effects of single and multiple projects on various important hydrodynamic parameters in the Hampton Roads area.

- Mitigation measures for the direct effects of the eastward expansion of the CIDMMA should be developed. Such measures could also be utilized, in a collaborative manner with other agencies and parties, to systematically provide opportunities for mitigating cumulative effects on specific resources and ecosystems.

IV.1.21.2 Cumulative Effects Assessment Methodology

The 11-step CEA methodology published in 1997 by the CEQ was the basis for the CEA study (CEQ, 1997). Following is the explanation of each step, modified as appropriate for the CIDMMA CEA study. Steps 1-4 relate to scoping for cumulative effects, Steps 5-7 to describing the affected environment, and Steps 8-11 to determining the cumulative environmental consequences.

- Step 1: Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals. This step focused on the experienced impacts of the CIDMMA, the anticipated impacts of the phased construction of the eastward expansion for a port facility, and the typical impacts of marine terminals during the receipt and movement of goods. The focus was on those resources, ecosystems, and human communities that have been or will be impacted by the "proposed action."

- Step 2: Establish the geographic scope for the analysis. The geographic scope is dependent on the affected resources, ecosystems, and human communities within the vicinity of the CIDMMA. Further, it was necessary to utilize different boundaries for some of the impacted items. Both localized and regional boundaries were considered as appropriate.

- Step 3: Establish the time frame for the analysis. The time frame is to include the past, present, and future. A possible historical (past) boundary (or reference point) would be just prior to

construction of the CIDMMA. Historical trends, up to the current time, for the impacted resources, ecosystems, and human communities were examined. The future time boundary encompassed the anticipated lifetime of the CIDMMA (to approximately 2030), as well as the complete Build-Out for the VPA's Craney Island terminal (2050).

- Step 4: Identify other actions affecting the resources, ecosystems, and human communities of concern. Other actions include past actions, present actions, and RFFA's, regardless of whether these actions have been or will be done by governmental agencies or the private sector. Some RFFA's may be difficult to identify with any specificity due to uncertainties related to approvals, funding, etc. Many of the reference documents and materials delineate historical and current actions, while others are related to RFFA's. Examples of RFFA's include VDOT's Third Crossing of the Hampton Roads area, the proposed containership terminal by APM Terminals, Inc., and continued projects associated with the Elizabeth River Ecological Restoration Program. The output of this step included several tables that summarize various pertinent actions.

- Steps 5 and 6: Characterize the resources, ecosystems, and human communities identified in Steps 1 through 4 in terms of their response to change and capacity to withstand stresses. Further, characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds. Considerable information on the conditions of these environmental categories, their current stress, and their relation to regulatory thresholds and requirements have been accumulated via special studies sponsored by the USACE, and related documents by the USACE, VPA, VDOT, and Virginia environmental departments. The major effort associated with Steps 5 and 6 involved the extraction and summarization of existing information from those various reports.

- Step 7: Define a baseline condition for the resources, ecosystems, and human communities. The words "baseline condition" can be used in three ways in an impact study: (1) to define the conditions of pertinent resources, ecosystems, and human communities at an "historical reference date and as reflected by trends" to the current date; (2) to define the "current conditions" (such as done in the Description of the Environment section in EIS's, with the current conditions reflective of historical cumulative effects); and (3) to define the "future without the proposed action conditions" based upon forecasting of changes over the future time period within the analysis. Descriptive information was assembled on conditions reflective of an "historical reference date and trends." Steps 5 and 6 above relate to "current conditions." The "future without the proposed action conditions" is summarized in conjunction with Step 9 below.

- Step 8: Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities. These relationships were addressed by identifying and describing common pathways or connections between the CIDMMA eastward expansion and the construction and operation of the proposed port facility, related past, present, and RFFA's, and the affected resources, ecosystems, and human communities. This step is related to Steps 1 and 4 above. The cause-and-effect relationships have been qualitatively described and displayed as appropriate.

- Step 9: Determine the magnitude and significance of cumulative effects. It would be desirable to quantify all of the cumulative effects; however, such data were not available for many issues. In most cases, qualitative descriptions of cumulative effects were prepared based upon field studies, related reports, as well as professional judgment. The significance of the cumulative effects was determined by considering historical, current, and forecasted conditions for the affected resources, ecosystems, and human communities, along with relevant regulatory thresholds and professional judgment.

- Step 10: Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects. The current Feasibility-level study has already examined several expansion locational alternatives. Further, the design features and operational practices of the CIDMMA have been and are focused on avoiding, minimizing, or mitigating associated direct effects. Also, it should be noted that the proposed main terminal already includes a number of design, construction, and operational measures that are focused on avoiding, minimizing, or mitigating direct, indirect, and cumulative effects. Accordingly, summaries of these existing and planned efforts have been prepared for these steps. Further, of particular note are the mitigation planning efforts of the Mitigation Subcommittee of the NEPA Review Team.

- Step 11: Monitor the cumulative effects of the selected alternative (proposed action) and adapt management. Extensive monitoring of the physical-chemical and biological environment is already conducted at the CIDMMA and in the general vicinity, in conjunction with related programs of other Federal and state agencies. If significant potential cumulative effects are identified, then a coordinated monitoring program for selected indicators will be recommended, along with a protocol for identifying and implementing adaptive management strategies.

IV.1.21.3 Identification of Past, Present and Future Actions

Past, present, and future actions that may have a potential cumulative effect when considered along with the Recommended Plan have been summarized in the following table. More detailed information on the projects contained in the following table, as well as other existing and continuing projects and actions, current project and actions, and proposed projects and potential future projects is contained in the CEA report.

Table IV-22. PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS CONTRIBUTING TO CUMULATIVE EFFECTS

Action	Past	Present	Future	Chapter with detailed information (1)
CIDMMA				
• Continuing use of existing 3 cells (1)	X	X	X	2
• Eastward expansion (2)			X (M)	2, 7
PostAuthorization Norfolk District Projects				
• Navigation channel deepening and anchorages - constructed (3)	X			4
• Navigation channel deepening and anchorages - not yet constructed (4)		X	X	4
• Maintenance dredging (5)	X	X	X	4
Navigation Planning - channel deepening and maintenance dredging (6)			X (H)	4
Water-related laws, regulations, and programs (7)	X	X	X	4
Other existing and continuing projects in the area (8)	X	X	X	4
APM Terminals (new marine terminal) (9)		X	X	5
Elizabeth River Ecological Restoration Program				
• Sediment cleanup (10)		X	X	5
• Wetland restoration (11)		X	X	5
Pinner's Point Flyover (highway bridge and connector) (12)		X	X	5
CIDMMA Terminal (VPA) (13)			X (M)	6
Third Crossing of Hampton Roads Area (VDOT) (14)			X (M)	6
Pre-Authorization Norfolk District Studies (five on beneficial uses of beach-quality dredged material, and one on a city dredging and water management plan) (15)			X (L)	6
Midtown Tunnel Project (VDOT) (16)			X (L)	6
Virginia Intermodal Transportation Center (17)			X (L)	6

(1) Refers to full report, EIS, Appendix C.

Notes: The actions are numbered (1) through (17). Past denotes actions from mid-1950's to 1999, present denotes actions in general time period from 2000 to 2005, and future denotes actions from 2006 to 2050. In the future column, H denotes high likelihood of occurrence, M denotes medium, and L denotes low. No "occurrence code" indicates the continuation of a past and/or present action.

IV.1.21.4 Results of Cumulative Effects Assessment

A total of 17 types of actions were identified as contributing to cumulative effects in the Hampton Roads area, including the Elizabeth River Basin. These actions include those that have occurred since the mid-1950s, are now taking place, or are anticipated to occur in the future to the year 2050. The 17 types of actions include: (1) continuing use of the 3 existing cells at the CIDMMA; (2) an approximate 580-acre eastward expansion of the CIDMMA (the potential proposed action); (3) historical navigation channel deepening and provision of anchorages; (4) presently authorized channel deepening and anchorages (not yet constructed); (5) continuance of maintenance dredging for navigation; (6) planning for future channel deepening and maintenance dredging; (7) water-related laws, regulations, and programs; (8) other existing and continuing industrial and military projects and facilities in the local area; (9) a new marine terminal (APM Terminals, Inc.); (10) sediment cleanup and (11) wetland restoration components of the Elizabeth River Ecological Restoration Program; (12) Pinner's Point Flyover; (13) CIDMMA Terminal (proposed by the VPA for construction on the eastward expansion area of the CIDMMA); (14) the Third Crossing of the Hampton Roads area (a bridge-tunnel connector); (15) pre-authorization studies by the Norfolk District of the USACE; (16) the Midtown Tunnel Project; and (17) the Virginia Intermodal Transportation Center. The previous table delineates the respective time periods (past, present, and/or future) for the 17 actions.

The cumulative effects of these 17 types of actions have been addressed in the CEA report for water quality, hydrodynamics, air quality, noise, biological resources (including benthic habitat in the approximate 600-acre eastward expansion area for the CIDMMA), protected species and critical habitat, recreation (boating and fishing), aesthetics, cultural resources, and socioeconomics (including area traffic and environmental justice) (as shown in the following table). In the absence of appropriate monitoring and mitigation efforts, potentially significant adverse cumulative effects could occur on water quality, benthic habitat, and protected species and critical habitat. Beneficial cumulative effects are anticipated for the socioeconomic conditions of the Hampton Roads area.

Table IV-23. CONNECTIONS BETWEEN AFFECTED RESOURCES, ECOSYSTEMS, AND HUMAN COMMUNITIES, AND THE MAJOR AFFECTING ACTIONS

Affected Resources, Ecosystems, and Human Communities	Major Affecting Action (numbered actions are from Table IV-22)
Geology	2
Water Quality	1,2,3,4,5,6,7,8,9,10,13,14,16
Hydrodynamics	1,2,3,4,6,8,9,13,14,16
Air Quality	2,9,13,14,16
Noise	2,8,9,12,13,14,16
Biological Resources	1,2,3,4,5,6,8,9,10,12,13,14,16
Protected Species and Critical Habitat	1,2,3,4,5,6,8,9,10,11,12,13,14,16
Recreation	1,2,3,4,5,6,8,9,10,12,13,14,16
Aesthetics	1,2,3,4,5,6,8,9,10,12,13,14,16
Cultural Resources	1
Socioeconomics	1,2,3,4,5,6,8,9,10,12,13,14,15,16

Source: Canter, L. 2004.

The proposed action, when considered in the context of past, present, and future activities, can be expected to contribute to the overall cumulative effects to specific resources. Some of these cumulative effects can be considered positive, such as increased employment opportunities and increased economic benefits to the local, regional, state, and national economies. However, other cumulative effects, such as impacts to aquatic resources, if not successfully mitigated, would be considered in a negative context.

One of the recommendations resulting from the CEA was that consideration should be given to establishing a Hampton Roads Area Environmental Management Committee. There are a number of agencies, groups, and committees that currently meet on a regular basis, review monitoring information, and adapt management practices that influence cumulative effects in the Hampton Roads area and the Elizabeth River Basin. For example, the HRPDC Physical and Environmental Planning Department (PEP) provides a forum for the local governments to exchange information and to develop cooperative initiatives that address regional environmental issues and opportunities, as well as state and Federal regulations. The PEP staff undertakes technical and policy studies and provides technical assistance to the member localities and others. With a current emphasis on water resource management, it also encompasses general physical planning activities, regarding issues such as comprehensive planning and ordinance development, solid waste, recreation, open space, and linkages to state and Federal agencies and programs. The PEP also coordinates comprehensive environmental education and outreach to the Hampton Roads community. The USACE will coordinate with the HRPDC regarding this CEA recommendation.

The construction and operation of the CIDMMA east cell and subsequent construction and operation of the marine terminal will affect in a cumulative fashion, some in a positive way and some in a negative

way, the resources and ecological components addressed in this EIS. On balance, the potential cumulative effects associated with this proposed project are not expected to be substantial.

IV.1.22 MITIGATION

The potential environmental consequences of the Recommended Plan have been described in detail in the preceding paragraphs of Part IV. Table IV-23 titled "Craney Island Expansion – East Expansion" summarizes those environmental impacts and identifies the impact categories for which mitigation will be undertaken. The USACE and the VPA have developed an integrated and comprehensive mitigation program to reduce the potential impacts of the Recommended Plan, and the details of that mitigation program are contained in the Appendix B to this EIS. The elements of the proposed mitigation activities are summarized below.

IV.1.22.1 Background

In accordance with CEQ Regulations for Implementing NEPA, Section 404 of the Clean Water Act, and with ER 1105-2-100, *Policy and Planning Guidance for Conducting Civil Works Planning Studies (Planning Guidance Notebook),* the project-related adverse environmental impacts (i.e., impacts to fish and wildlife resources) have been avoided or minimized to the extent practicable, and a mitigation plan has been developed to compensate for remaining unavoidable significant adverse impacts. A Cost Effectiveness/Incremental Cost Analysis (CE/ICA) has been performed to identify the most cost-effective plan(s).

The compensatory mitigation plan was developed with input from a Mitigation Subcommittee consisting of representatives from 12 Federal and State agencies and 3 local interest groups. The committee convened on 15 occasions between June 2002 and May 2005. The CE/ICA resulted in a total of 22 plans that were determined to be cost effective, including three "Best Buy" plans. The selected mitigation plan is one of the "Best Buy" plans.

Using data from existing studies, and those performed specifically for this feasibility investigation, the Mitigation sub-committee was tasked with assessing the degree of habitat impact associated with the 580-acre fill, formulating mitigation ratios to replace or to increase the ecological function and productivity of the area lost, and developing a conceptual mitigation plan comprised of various tidal and sub-tidal habitats. The Mitigation sub-committee and NEPA committee meeting minutes from as early as October 2001 also document discussions of the access channel. Dredging for the access channel and the cell construction is discussed extensively under every major resource category in this environmental consequences section of the EIS. These impacts are not permanent, and dredged bottom areas will recover fairly rapidly once the dredging is completed. While some shifts in benthic populations will occur, this is not necessarily seen as an adverse impact. For this reason, dredging alone does not have its own compensatory mitigation plan. The recommended mitigation plan does, however, provide bottom habitat, water quality, and fisheries habitat benefits in the form of cleaned sediments, restored wetlands, and restored oyster reefs.

A "landscape approach" was used to establish physical connectivity between various mitigation sites and to establish ecological synergy. Application of this approach also maximizes productivity and ensures long term viability of each of the sites. Habitat Equivalency Analysis (HEA) methodology was used to quantify the loss in habitat productivity from the proposed CIDMMA expansion and to provide a scale for

a mitigation project that would compensate for the estimated loss in ecosystem services and production at the appropriate trophic levels. This information was used to conduct the CE/ICA.

The USACE and VPA used this information and the committee's input to develop and present a "Draft Conceptual Mitigation Plan" at subcommittee meetings in February 2005. The plan considered in-kind relatedness, proximity to impact site, publicly recognized value of the habitat type, risk /long term viability, ability to restore lost ecological functions, and the habitat productivity lost and productivity supplied by each mitigation option to replace the loss. Subsequent meetings in May 2005 resulted in modifications to the conceptual plan and the development of a "Draft Consensus Mitigation Plan." This consensus plan, also known as the locally preferred plan (LPP), consists of approximately 20 acres of oyster reef restoration, 56 acres of wetland restoration, and 411 acres of bottom sediment restoration (Table IV-24). Figures IV-11 and 12 depicts the locations of the proposed sites in the Elizabeth River and their relationship to each other. In the Lower James River, the plan proposes wetland and aquatic habitat restoration at the Ragged Island Wildlife Management Area and oyster restoration at Hoffler Creek (Figures IV-13 and 14). In addition, it is estimated that 10 acres of eroding salt marsh will be protected from permanent loss over the next 20 years. Figure IV-12 shows other restoration projects in the Elizabeth River demonstrating connectivity to the proposed mitigation plan.

This mitigation plan amounts to a slightly greater amount of production than is estimated to be lost from project construction, and is distributed among the three major mitigation measures, which include including oyster reefs restoration, wetlands restoration, and sediment clean-up and restoration.
Of the three "Best Buy" plans identified in the CE/ICA, the LPP was selected as the recommended and fully justified mitigation plan. The recommended mitigation plan is acceptable, efficient (cost-effective), complete, and supported by the non-Federal local sponsor (VPA), as developed by other state and Federal agencies, such as the USEPA, USFWS, NOAA, and VIMS, and non-profit organizations such as the Elizabeth River Project, who also provided input into the development of the LPP.

In conclusion, the Mitigation Subcommittee, along with the USACE and VPA, has identified specific feasible mitigation options. The USACE has used CE/ICA to evaluate the options and has identified a "Best Buy" plan that fully compensates for the unavoidable environmental impacts of the project. During plan development, every effort was made to accommodate the diverse input of the stakeholders involved in this process. The recommended "Draft Consensus Mitigation Plan" (Figure IV-15), which is based on three years of stakeholder involvement, scientific study, and thorough analysis of all data and information collected, proposes 487 acres of compensatory mitigation in the form of large scale ecosystem restoration at a total cost of approximately $50 million. Upon successful completion, the mitigation plan will replace important habitat and ecological functions in the lower James and Elizabeth River estuaries and will provide compensation for the water column and benthic productivity lost from the proposed expansion of CIDMMA.

Table IV-24. CRANEY ISLAND DREDGED MATERIAL MANAGEMENT AREA – EAST EXPANSION IMPACTS AND MITIGATION

Impacts and Issues	Proposed Mitigation (1)	Potential Residual Impacts
GEOLOGY		
Navigation Improvements; Expansion Cell Construction		
Slope Instability.	Slope stability of channel side-slopes and expansion cell containment dikes would be provided by proper design and construction methods and by removal of surficial bottom muds from basal area of dike footprint.	With Mitigation - Minor Residual Impact
Alteration of Bottom Topography.	None proposed.	Minor Residual Impact
Terminal Development & Operation		
No significant geological impacts.	None proposed.	
WATER QUALITY		
Navigation Improvements		
Turbidity and depressed DO could exceed water quality criteria set by VDEQ during construction.	Dredge methods employed will include use of a hydraulic cutterhead or hopper dredge to minimize and localize the generation of turbidity and settable solids. Monitoring of DO during construction.	Minor Residual Impact
Potential release of toxic levels of trace materials and synthetic organic contaminants during construction.	Dredging will take place in "virgin" (i.e., previously undredged) bottom areas. Elevated contaminant levels expected to be negligible – will be verified through pre-dredging testing.	Potential Minor Residual Impact will be fully determined with pre-dredge testing of sediments.
Expansion Cell Construction		
Potential release of toxic levels of trace materials and synthetic organic contaminants during construction.	Dredging/excavation will take place in "virgin" (i.e., previously undredged) bottom areas. Elevated contaminant levels expected to be negligible - will be verified through pre-dredging testing.	Potential Minor Residual Impact will be fully determined with pre-dredge testing of sediments.

Table IV-24. CRANEY ISLAND DREDGED MATERIAL MANAGEMENT AREA – EAST EXPANSION IMPACTS AND MITIGATION (Cont'd)

Impacts and Issues	Proposed Mitigation (1)	Potential Residual Impacts
Expansion Cell Construction (continued)		
Confined dredged material cell effluent.	Pump effluent through existing CIDMMA. Monitor water quality effluent and adjust retention times. Provide mitigation alternatives that contribute water quality benefits (i.e., oyster restoration, wetlands restoration, sediment clean-up, etc.).	With Mitigation - Minor Residual Impact.
Terminal Development & Operation		
Spills from ships.	Increases in shipping traffic are commercial container ships – low incident of hazardous materials. Response plans implemented by.	With Mitigation - Minor Residual Impact
WATER QUALITY (cont'd)		
Terminal Development & Operation (cont'd)		
Refueling of ships.	No fuel will be transferred from the terminal to ships. Refueling from barges must be performed in accordance with USCG regulations.	With Mitigation - Minor Residual Impact.
Stormwater – The potential surface runoff into river/harbor would increase.	A stormwater runoff system will be designed to reduce the potential for unrestricted runoff. A facility-wide SWP3 will be implemented. Compliance with Virginia Stormwater Management Regulations. Implementation of BMP's.	With Mitigation - Minor Residual Impact.
Sediment suspension from ship traffic.	Proposed 50- to 55-foot deep channels will provide sufficient clearance to avoid sediment resuspension.	Minor/Insignificant Residual Impact.

Table IV-24. CRANEY ISLAND DREDGED MATERIAL MANAGEMENT AREA – EAST EXPANSION IMPACTS AND MITIGATION (Cont'd)

Impacts and Issues	Proposed Mitigation (1)	Potential Residual Impacts
BIOLOGICAL RESOURCES		
Navigation Improvements		
Loss of benthic infauna from dredging site(s) with some recovery in deeper channel in less than 5 years. Periodic redisturbance with maintenance.	Off-site and out-of-kind mitigation for losses and changes in benthic community structure (see below).	Significant, but short-term. With Mitigation - Minor Residual Impact.
BIOLOGICAL RESOURCES (cont'd)		
Expansion Cell Construction		
Loss of approximately 600 acres of estuarine bottom habitat used by fish, shellfish, crabs, and bottom dwelling organisms. Finfish – limited feeding area – primarily a migratory pathway; Crabs – primarily a migratory pathway, not a nursery area; Bottom Dwelling Organisms – Benthic Index of Biotic Integrity (abundance, diversity, biomass) – 3 of 5 stations degraded – commercially-valuable species (clams, oysters) not a significant component	Off-site and out-of-kind mitigation has been proposed and will be implemented to mitigate the effects of bottom habitat loss and open water effects to finfish, crabs, and bottom-dwelling organisms. Mitigation alternatives will compensate for lost functional values and include: oyster habitat restoration; wetland restoration; sediment clean-up; riparian buffers/conservation areas; bird management plan; shoreline stabilization; etc.	With Mitigation - Minor Residual Impact

Table IV-24. CRANEY ISLAND DREDGED MATERIAL MANAGEMENT AREA – EAST EXPANSION IMPACTS AND MITIGATION (Cont'd)

Impacts and Issues	Proposed Mitigation (1)	Potential Residual Impacts
BIOLOGICAL RESOURCES (cont'd)		
Expansion Cell Construction (cont'd)		
Loss of 600 acres open water.	Widening and deepening adjacent berthing access channel will provide equivalent X-sectional area of open water. Off-site and out-of-kind mitigation will be implemented to mitigate open water effects to finfish, crabs, and other aquatic species.	With Mitigation – Minor Residual Impact.
Terminal Development & Operation		
The potential for toxic spills and surface runoff into the river/harbor would increase.	A stormwater runoff system will be designed to reduce the potential for unrestricted runoff. (See Water Quality – stormwater)	With Mitigation – Minor Residual Impact.
Introduction and proliferation of exotic species.	National Invasive Species Act of 1996 and Virginia regulations (4 VAC 20-395) require foreign vessels to file a Ballast Water Control Report with VMRC and exchange ballast water 200 nautical miles from shore. Incorporate oyster shell into riprap levee surfaces.	Minor/Insignificant Residual Impact.
AIR QUALITY		
Navigation Improvements		
Estimated emissions from construction activities above threshold levels prescribed by general conformity regulation of 100 tons/yr for Nox and for both VOC's and NO_x for Build-Out condition.	Electrification of the diesel-powered dredge would reduce emissions but would not decrease the number of significant impacts. Utilization of low sulfur fuels on the diesel dredge would reduce impacts over 3 times.	Potentially significant, but short-term.

Table IV-24. CRANEY ISLAND DREDGED MATERIAL MANAGEMENT AREA – EAST EXPANSION IMPACTS AND MITIGATION (Cont'd)

Impacts and Issues	Proposed Mitigation (1)	Potential Residual Impacts
Expansion Cell Construction		
Estimated emissions from construction activities above threshold levels prescribed by general conformity regulation of 100 tons/yr for Nox and for both VOC's and NO_x for Build-Out condition.	Electrification of the diesel-powered dredge would reduce emissions but would not decrease the number of significant impacts. Utilization of low sulfur fuels on the diesel dredge would reduce impacts over 3 times.	Potentially significant, but short-term.
Terminal Development & Operation		
Estimated emissions from terminal facility above threshold levels prescribed by general conformity regulation of 100 tons/yr for Nox and for both VOC's and NO_x for Build-Out condition.	New SIP for Hampton Roads ozone maintenance area is expected in 2005-2007. Demonstrate that proposed terminal will conform with future SIP's for the Hampton Roads region. Purchase of air credits to offset effects.	Potentially significant.
High pollutant levels and substantial emissions associated with cargo ships; long-term violations to air quality guidelines may occur. These would also occur if the project were not constructed.	Reduce operational emissions by use of distillate oil in maneuvering vessels and the use of clean fuels for on-dock equipment. Purchase of air credits to offset effects.	Potentially significant.
NOISE		
Navigation Improvements		
Dredging activities will be far enough away from receptors that noise will pose no significant effect.	None required.	Minor/Insignificant Residual Impact.
Expansion Cell Construction		
Construction will not affect any sensitive receptors due to great distance (more than 1 mile) between source of noise and closest sensitive receptor.	None required.	Minor/Insignificant Residual Impact.

Table IV-24. CRANEY ISLAND DREDGED MATERIAL MANAGEMENT AREA – EAST EXPANSION IMPACTS AND MITIGATION (Cont'd)

Impacts and Issues	Proposed Mitigation (1)	Potential Residual Impacts.
NOISE (cont'd)		
Terminal Development & Operation		
Cumulative noise levels from operations, truck traffic, rail, and intermodal yard will not affect any sensitive receptors due to great distance (> 1 mile) between source and closest sensitive receptor.	None required.	Minor/Insignificant Residual Impact.
PUBLIC SAFETY		
Terminal Development & Operation		
Because of isolated location, facilities on the containment cell will require state-of-the-art protection measures and additional security.	VPA will implement and upgrade fire protection services as necessary and include storage tanks with foam injection systems. Security staff will be employed as necessary.	With Mitigation - Minor Residual Impact.
SOCIOECONOMICS		
Navigation Improvements; Expansion Cell Construction & Operation; Terminal Development & Operation		
Short-term: Revenue generated by construction activities will provide benefit to the local communities in the way of increase of sales tax revenue, sale of goods, etc. Employment of approx. 15,000 people during 4 phases of construction. Long-term: 570 direct jobs at terminal facility and 3,900 indirect jobs in the region. Under full Build-Out: $900 million of annual output to local economy.	None required.	Beneficial.

Table IV-24. CRANEY ISLAND DREDGED MATERIAL MANAGEMENT AREA – EAST EXPANSION IMPACTS AND MITIGATION (Cont'd)

Impacts and Issues	Proposed Mitigation (1)	Potential Residual Impacts.
Navigation Improvements; Expansion Cell Construction & Operation; Terminal Development & Operation (continued)		
Displacement of commercial crabbers.	Provide mitigation options that enhance standing stocks of crabs (i.e., wetlands, sediment remediation, oyster reefs).	With Mitigation - Minor Residual Impact.
HYDRODYNAMICS		
Navigation Improvements; Expansion Cell Construction & Operation; Terminal Development & Operation		
3-D Hydrodynamic modeling indicates no significant effects to circulation, sedimentation, salinity, currents, and tidal flushing with east cell expansion.	Mitigation (avoid/minimize) involved a comprehensive evaluation of alternatives and selection of the construction alternative that had the least amount of effects (i.e., east expansion).	With Mitigation - Minor Residual Impact.
RECREATION		
Navigation Improvements; Expansion Cell Construction & Operation; Terminal Development & Operation		
Permanent loss of 580 acres of open water will displace recreational fishing, boating activities.	Provide mitigation that will enhance recreational fishing and fish stocks. Wetlands, clean sediments, and oyster reefs.	Adverse but not significant.
Potential reduction in fishing activities in the harbor.	Construct fish habitat, feeding and foraging areas in harbor and lower bay.	With Mitigation - Minor Residual Impact.
CULTURAL RESOURCES		
Navigation Improvements		
No temporary or permanent impacts to cultural resources are anticipated. No historical/cultural resources have been found to be located within project area.	None required.	Minor/Insignificant Residual Impact.

Table IV-24. CRANEY ISLAND DREDGED MATERIAL MANAGEMENT AREA – EAST EXPANSION IMPACTS AND MITIGATION (Cont'd)

Impacts and Issues	Proposed Mitigation (1)	Potential Residual Impacts.
Expansion Cell Construction & Operation		
No temporary or permanent impacts to cultural resources are anticipated. No historical/cultural resources have been found to be located within project area.	None required.	Minor/Insignificant Residual Impact.
Terminal Development & Operation		
No temporary or permanent impacts to cultural resources are anticipated. No historical/cultural resources have been found to be located within project area.	None required.	Minor/Insignificant Residual Impact.
AESTHETICS		
Navigation Improvements		
Minimal visible effects, except possibly during dredging.	None required.	Minor/Insignificant Residual Impact.
Expansion Cell Construction; Terminal Development & Operation		
A permanent loss of 580 acres of open water would be replaced by a dredged material placement site, then a terminal facility.	Vegetation and landscaping measures, coupled with the painting of buildings would help facilities blend into the surrounding landscape.	Adverse but not significant.
UTILITIES – WATER SUPPLY, WASTEWATER, ENERGY, AND TELECOMMUNICATIONS		
Expansion Cell Construction		
Utilities already in place for existing dredged material containment facility. Minor utilities upgrades may be required.	None required.	Minor/Insignificant Residual Impact.

Table IV-24. CRANEY ISLAND DREDGED MATERIAL MANAGEMENT AREA – EAST EXPANSION IMPACTS AND MITIGATION (Cont'd)

Impacts and Issues	Proposed Mitigation (1)	Potential Residual Impacts
UTILITIES – WATER SUPPLY, WASTEWATER, ENERGY, AND TELECOMMUNICATIONS (cont'd)		
Terminal Development & Operation		
At full Build-Out water supply requirements estimated to be about 70,000 gpd. The city of Portsmouth contacted and can supply required demand. Other utilities can be supplied.	Implement methods to minimize water consumption and optimize efficient use of new supplies and reclaimed water.	Minor/Insignificant Residual Impact.
PROTECTED SPECIES & CRITICAL HABITAT		
Navigation Improvements		
Dredging activities could impact endangered/threatened sea turtles.	Selected use of dredging equipment and sea turtle exclusion devices, where appropriate, and dredge operation controls will avoid and minimize sea turtle impacts.	With Mitigation - Minor Residual Impact.
Expansion Cell Construction		
Construction activities involving dredging, dike construction, and filling could potentially impact protected species or their habitat.	Selected use of dredging equipment will avoid impacts to sea turtles. Upland activities will be carefully coordinated to avoid impacts to any endangered/threatened birds and their habitat. Define and observe buffer areas near nesting species. Bird habitat development and improvement opportunities will be pursued in Bird Management Plan.	With Mitigation - Minor Residual Impact.

Table IV-24. CRANEY ISLAND DREDGED MATERIAL MANAGEMENT AREA – EAST EXPANSION IMPACTS AND MITIGATION (Cont'd)

Impacts and Issues	Proposed Mitigation (1)	Potential Residual Impacts
Terminal Development & Operation		
Bird use at CIDMMA could be impacted. Increased ship traffic may potentially affect sea turtles, but mobility should allow them to avoid ships or seek foraging areas away from port facility.	Upland activities will be carefully coordinated to avoid impacts to any endangered/threatened birds and their habitat. Bird habitat development and improvement opportunities will be pursued. Mitigation may involve development of a long-term bird management plan for CIDMMA and vicinity.	With Mitigation - Minor Residual Impact.
ENVIRONMENTAL JUSTICE		
Expansion Cell Construction & Operation; Terminal Development & Operation		
Executive Order 12898, Environmental Justice.	Port facility located within a portion of Portsmouth with a minority population much less than overall minority population in the city. Site road and railways within existing VDOT ROW's. Avoid impact to minority or low-income residents.	Minor/Insignificant Residual Impact.
VESSEL TRANSPORTATION		
Terminal Development & Operation		
Additional 572 vessel calls to the port by year 2016, and 468 calls by year 2050 at full Build-Out. Total 988 vessel calls per year. A 17-percent increase in vessel traffic.	Coordination with USCG and Virginia Pilots Assoc. to maintain safe and efficient navigation. Channel deepening and widening to accommodate vessels.	Minor/Insignificant Residual Impact.

Table IV-24. CRANEY ISLAND DREDGED MATERIAL MANAGEMENT AREA – EAST EXPANSION IMPACTS AND MITIGATION (Cont'd)

Impacts and Issues	Proposed Mitigation (1)	Potential Residual Impacts
GROUND TRANSPORTATION		
Terminal Development & Operation		
Because of its proximity to existing or planned major interstate transportation routes, the construction and operation will have minimal impacts on local streets and major highways as a result of increased truck traffic. Specifically, local streets will not be significantly affected, as trucks traveling to and from terminal in the short-term during construction and in the long-term during operation will access the site from new connector highway to VA Route 164 and from there to I-664 and I-64.	None required.	Minor/Insignificant Residual Impact.
No significant effects on railroads. Five to six additional trains per day.	None required - Existing rail network will be able to accommodate increases in rail traffic.	Minor/Insignificant Residual Impact.

Table IV-24. CRANEY ISLAND DREDGED MATERIAL MANAGEMENT AREA – EAST EXPANSION IMPACTS AND MITIGATION (Cont'd)

Impacts and Issues	Proposed Mitigation (1)	Potential Residual Impacts
SECONDARY GROWTH		
Expansion Cell Construction; Terminal Development & Operation		
Potential population growth or associated residential development.	Jobs at terminal will likely be filled by people already living in the area. New or expanded businesses will be located at existing facilities or on redeveloped sites. Development would benefit the region in short-term with construction jobs and in the long-term with increased employment, purchase of goods and services, and tax revenues generated by development.	Beneficial.
Increased traffic.	Project related vehicles will use existing or planned major interstate transportation routes. Trucks can access major highways without going through residential areas.	Minor Residual Impact.

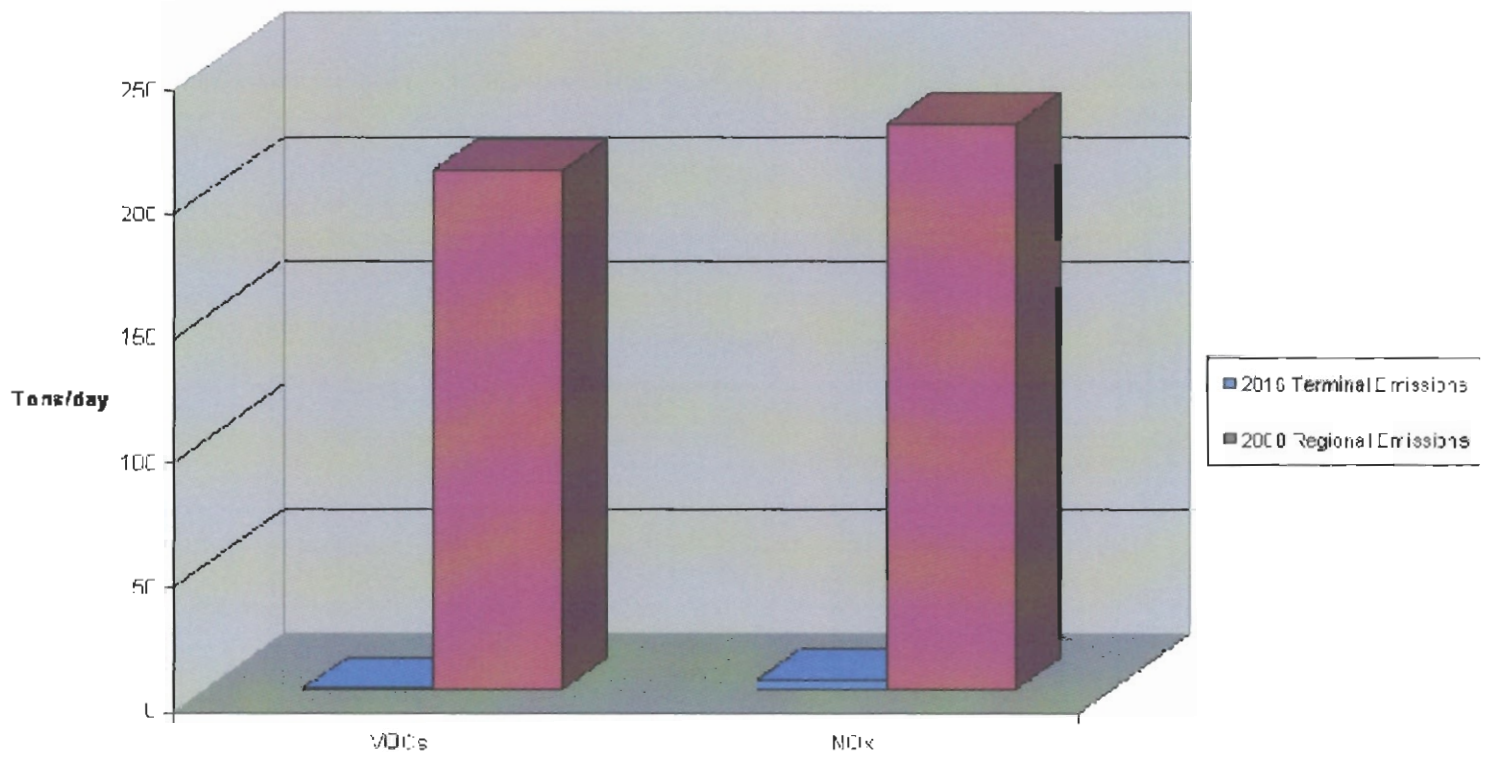
(1) Mitigation includes avoidance, minimization, and/or compensation.

Table IV-25. CONSENSUS MITIGATION PLAN FOR CRANEY ISLAND EXPANSION - MAY 26, 2005

Site Name(s)	Mitigation Type	Location	Acreage	Unit Cost	Total Cost
Wycoff Creosote and Pipe; Republic Creosote; Money Point; Paradise Creek; Scuffletown Creek	Sediment Restoration	S. Br. Elizabeth River	67 cleanup; 411 restoration	$100 yd3	$33,200,000
Lamberts Point Wetlands	Wetlands	Mainstem Elizabeth River	0.6	$250,000	$ 150,000
Shotmeyer	Wetlands	S. Br. Elizabeth River	1	$250,000	$ 250,000
Paradise Creek Park (Peck)	Wetlands	S. Br. Elizabeth River	5	$250,000	$ 1,250,000
Elizabeth River Terminals	Wetlands	S. Br. Elizabeth River	5	$250,000	$ 1,250,000
Jones and Gilligan Creek	Wetlands	S. Br. Elizabeth River	10	$250,000	$ 2,500,000
St. Julians Annex (40 ac)	Wetlands	S. Br. Elizabeth River	30	$250,000	$ 7,500,000
Oyster/Clam Restoration	Oysters	Elizabeth River - All Branch	15	$150,000	$ 2,250,000
Hoffler Creek Oyster Reef	Oysters	Hoffler Creek/James River	1	$150,000	$ 150,000
CI Bird Long-term Management Plan	Bird Management	CIDMMA - James/Elizabeth River			$ 150,000
Ragged Island WMA	Wetlands, Clams, Oysters	James River	4/4	$250,000 $150,000	$ 1,600,000
Total			487		$50,250,000

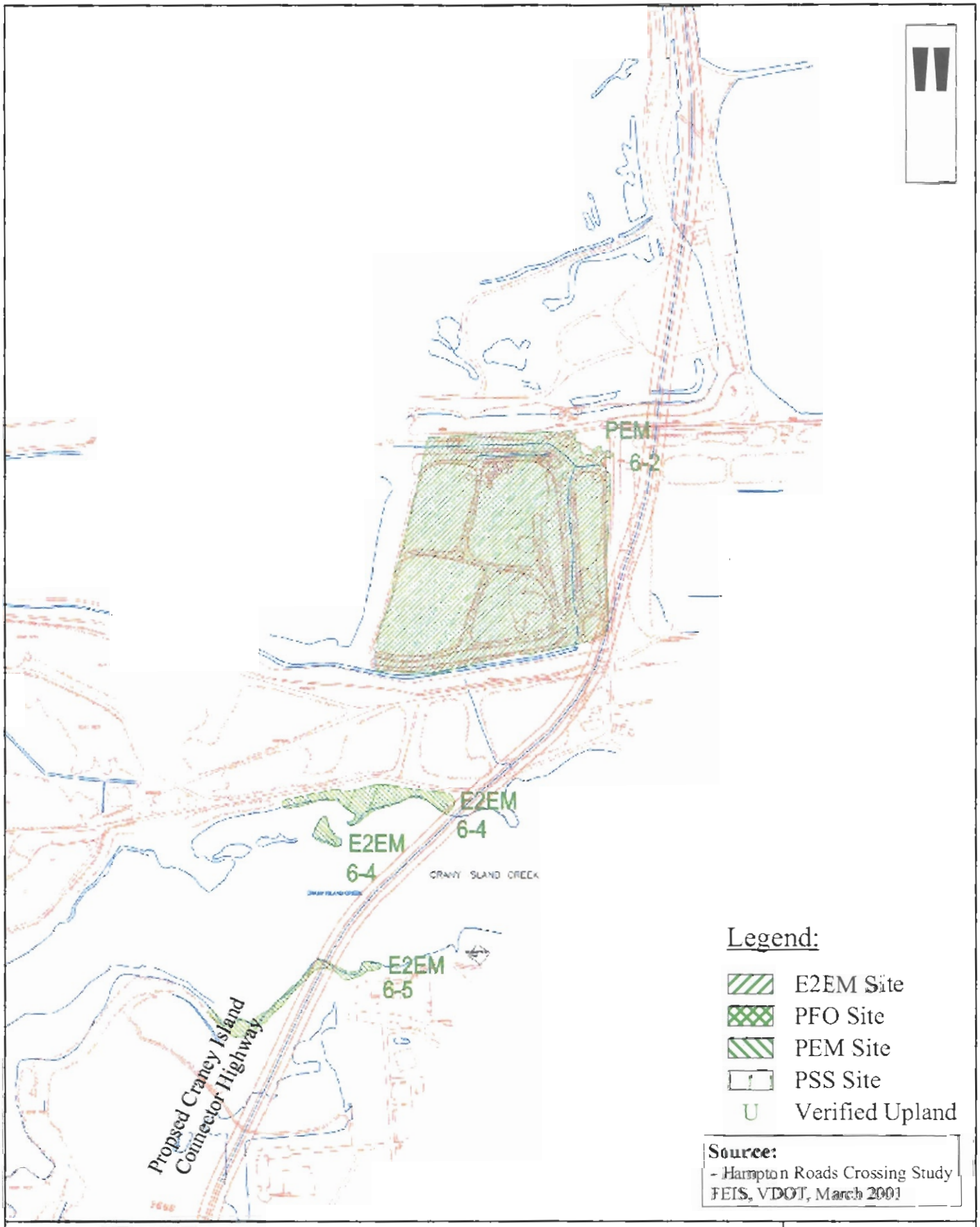
Acres of Sediment Restoration = 411
Acres of Wetland Restoration = 56
Acres of Oyster Reef/Clam Restoration = 20

Figures



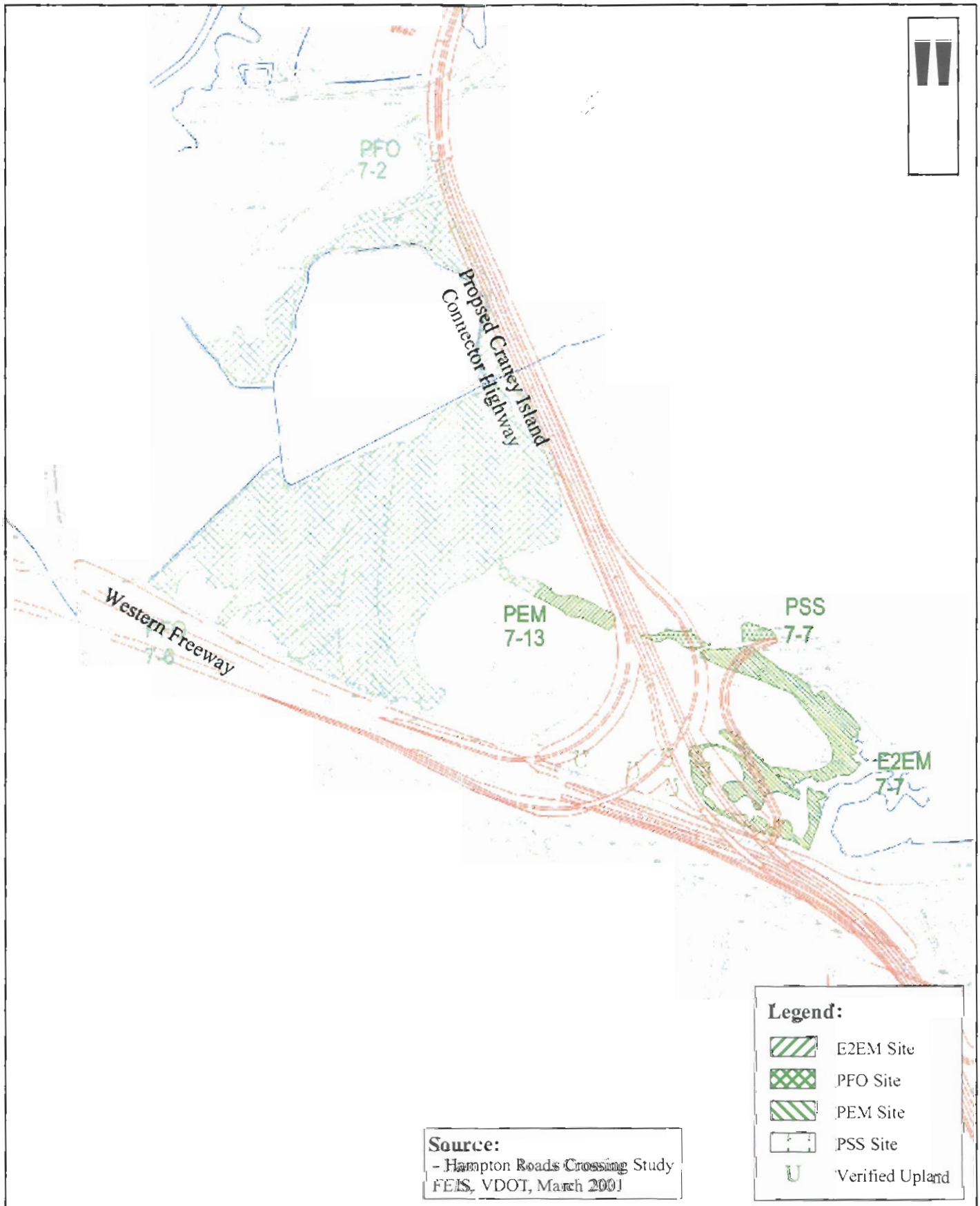
COMPARISON OF 2016 TERMINAL EMISSIONS AND 2008 PROJECTED INVENTORY FOR HAMPTON ROADS

Figure IV-1



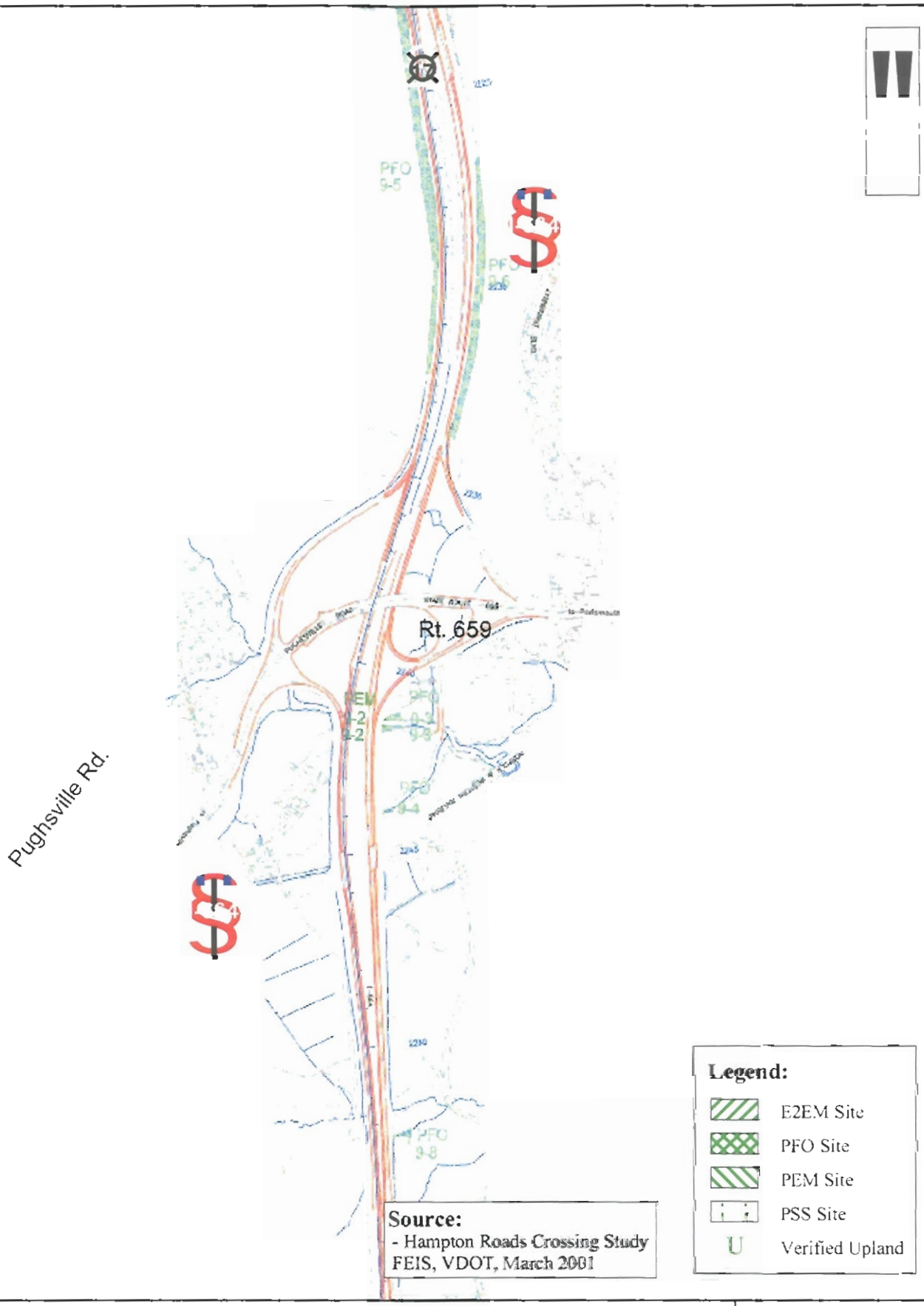
WETLANDS ALONG THE PROPOSED VDOT CRANEY ISLAND CONNECTOR HIGHWAY

Figure IV-2



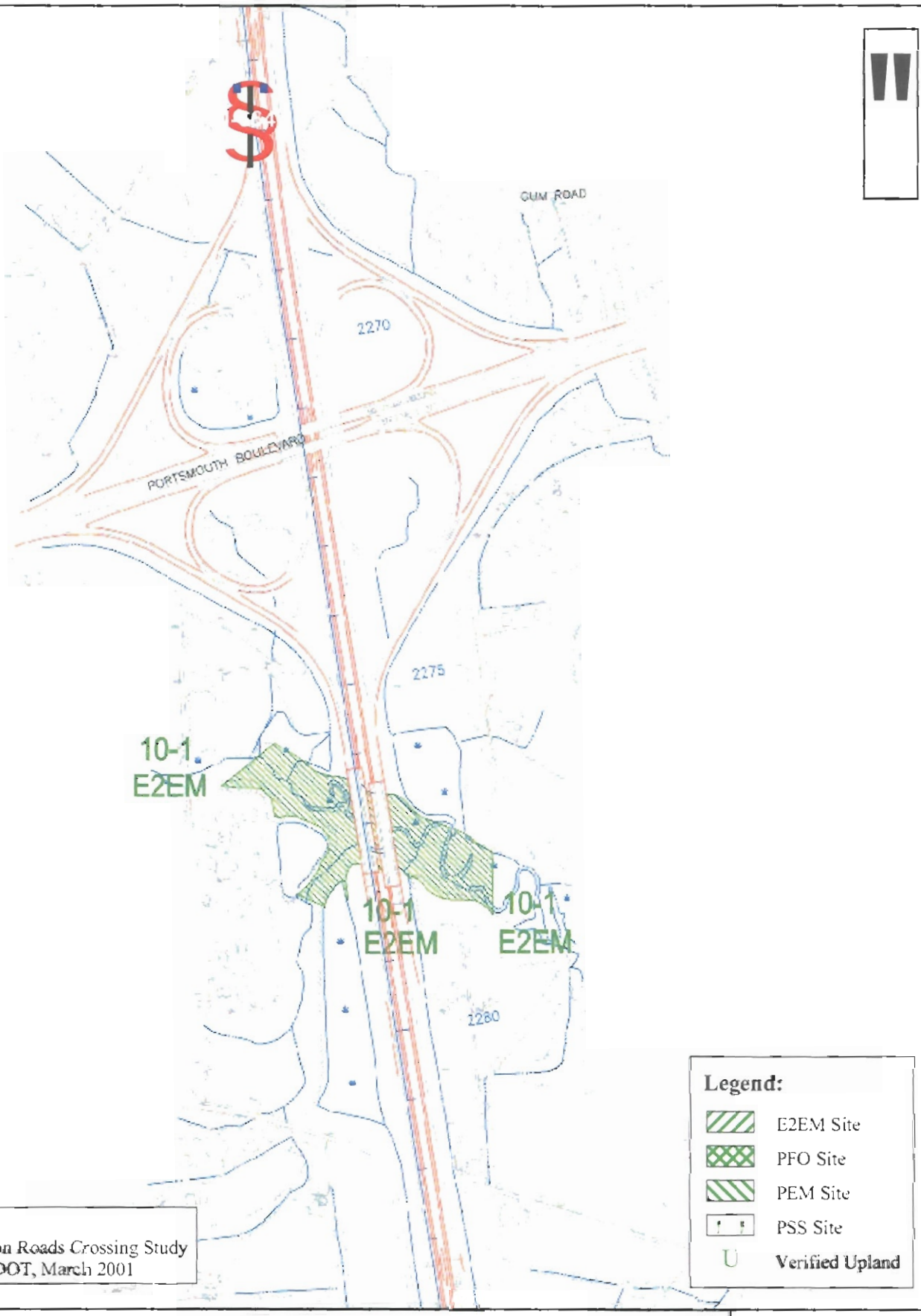
WETLANDS ALONG THE PROPOSED VDOT CRANEY ISLAND CONNECTOR HIGHWAY

Figure IV-3



WETLANDS ALONG SELECTED PORTIONS OF I-664

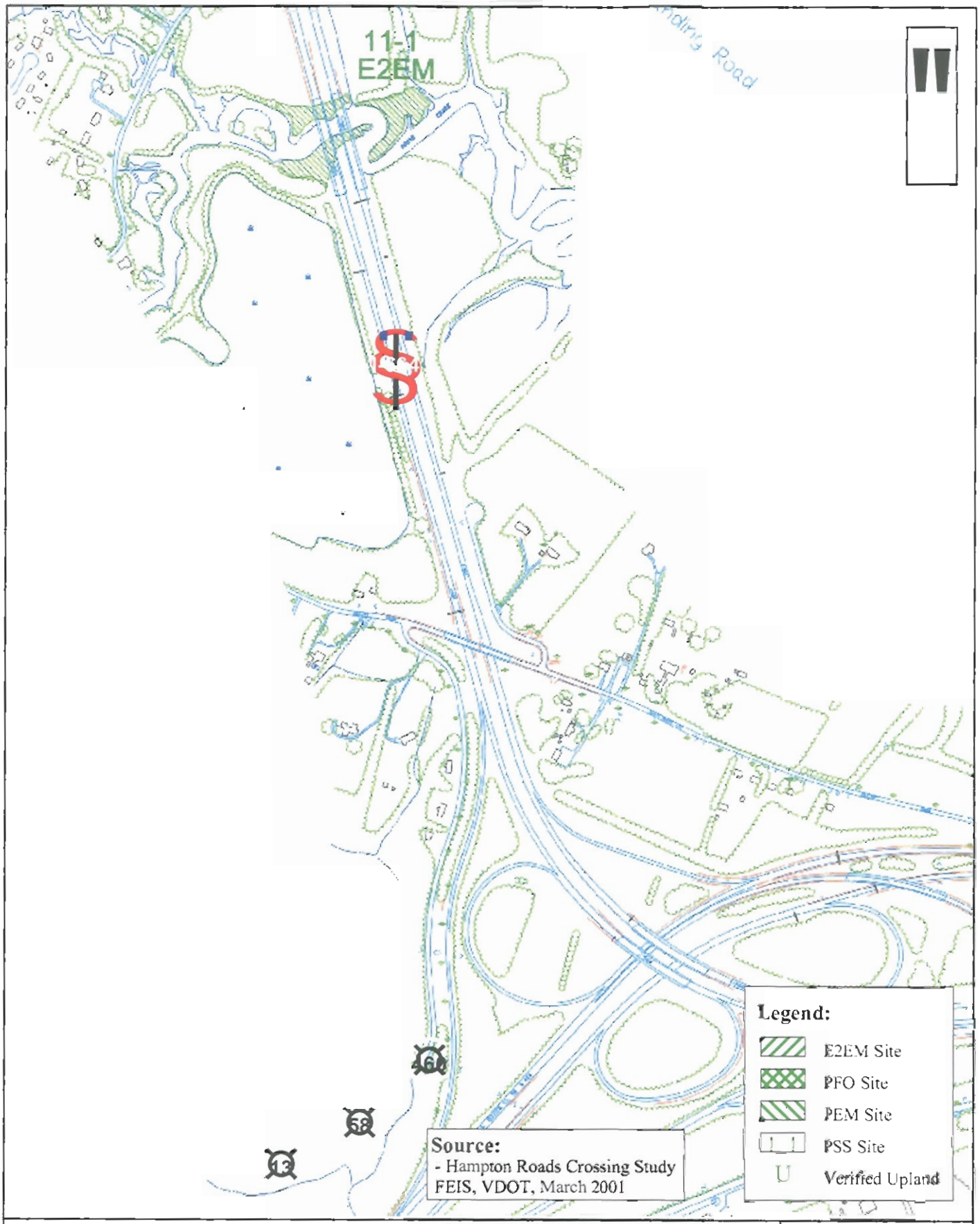
Figure IV-4



Source:
- Hampton Roads Crossing Study FEIS, VDOT, March 2001

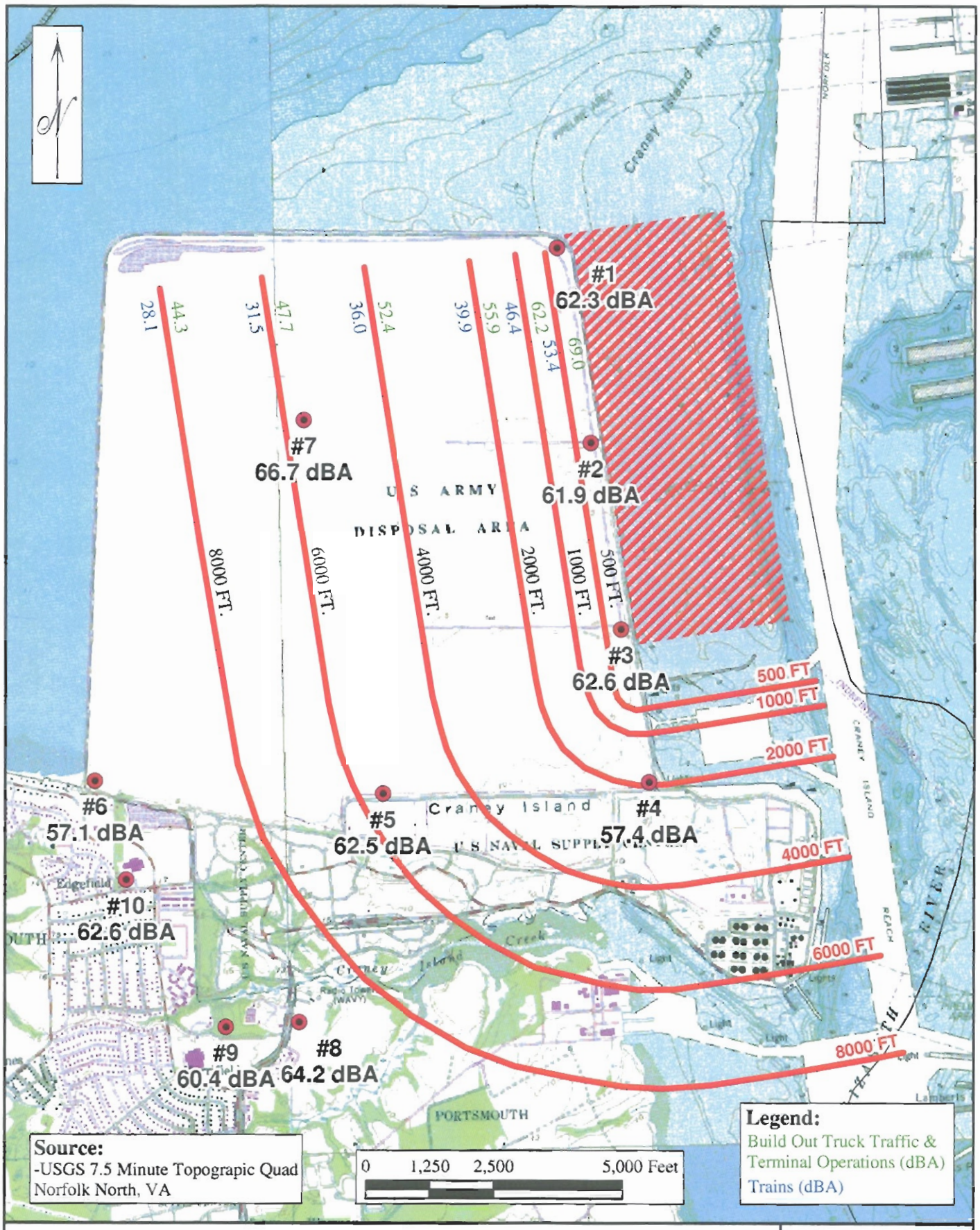
WETLANDS ALONG SELECTED PORTIONS OF I-664

Figure IV-5



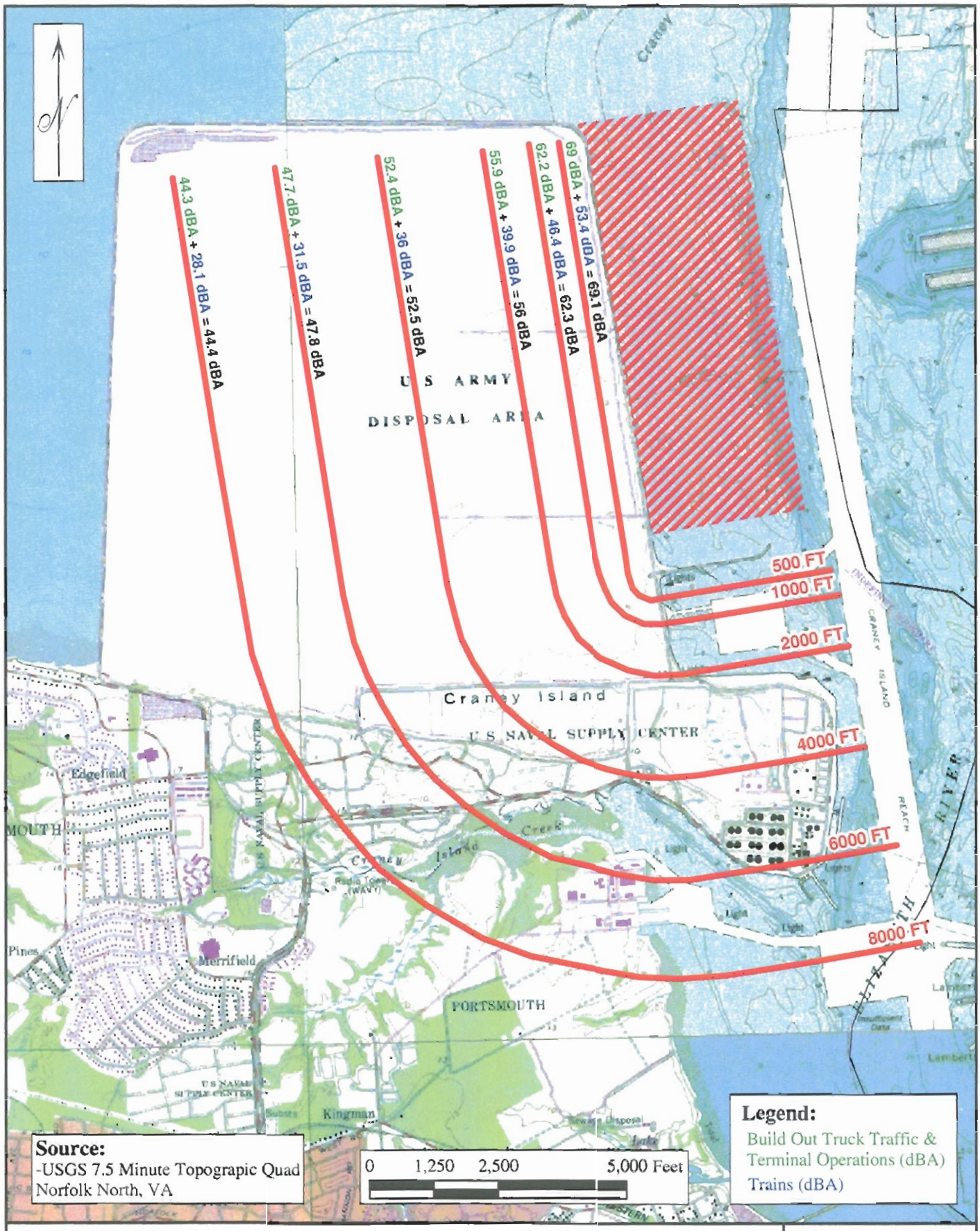
WETLANDS ALONG SELECTED PORTIONS OF I-664 TO U.S. ROUTE 13, 58, & 460

Figure IV-6



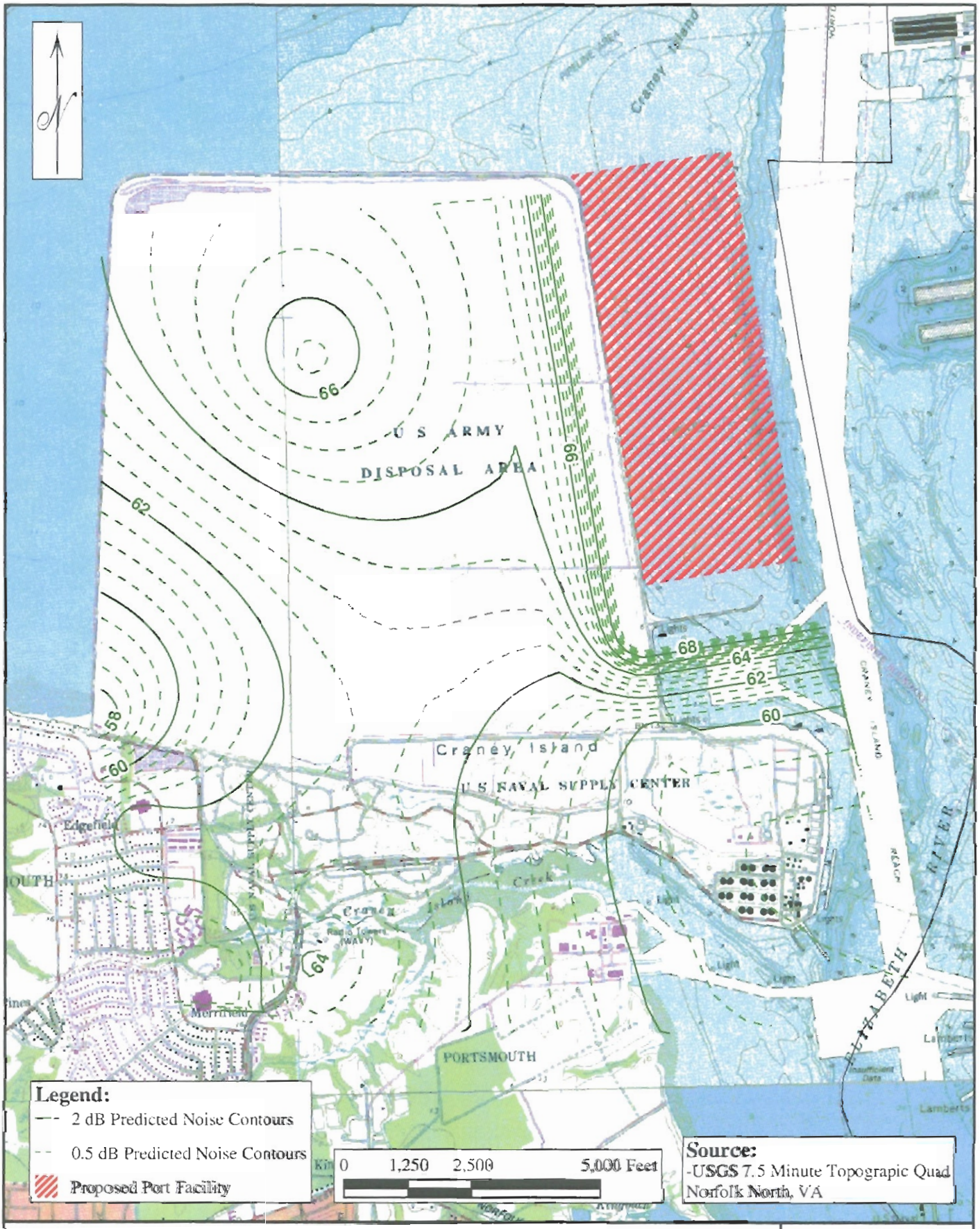
NOISE CONTOUR MAP

Figure IV-7



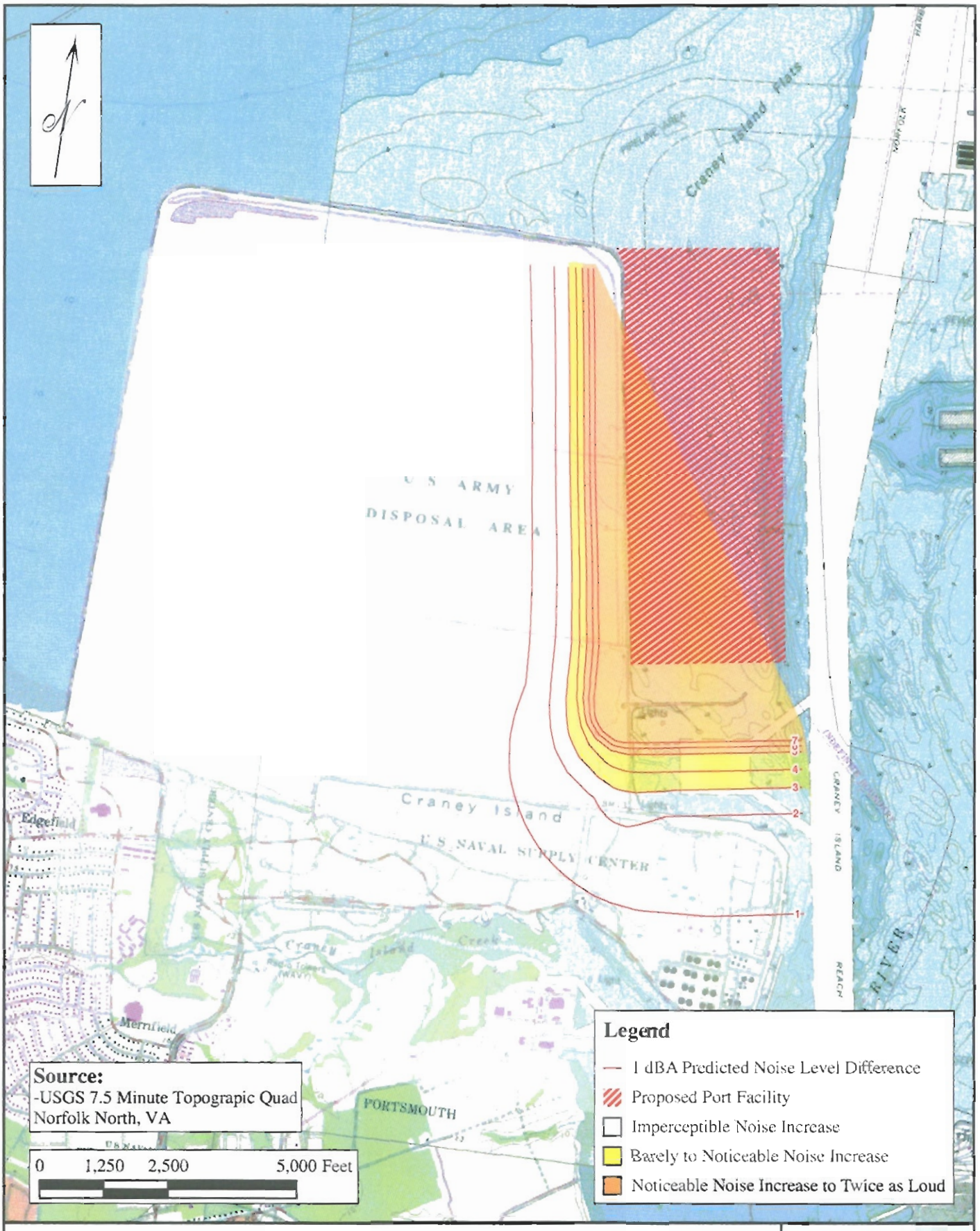
MODELED NOISE CONTOURS

Figure IV-8



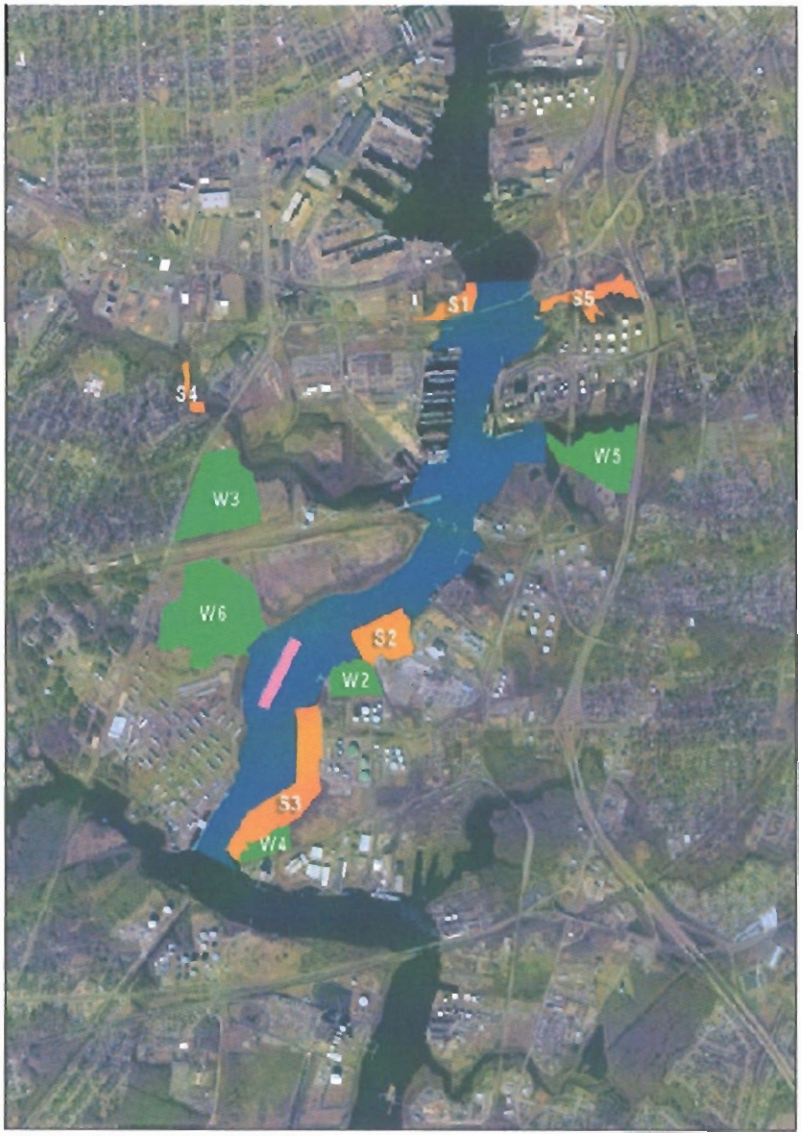
PREDICTED BUILD OUT NOISE CONTOURS

Figure IV-9



BUILD OUT NOISE INCREASE OVER AMBIENT

Figure IV-10



Craney Island Consensus Mitigation Plan
Southern Branch, Elizabeth River

LEGEND

- Sediment Remediation/Restoration Opportunities ≈ 67 Acres
- Wetlands Restoration Areas ≈ 57 Acres
- Oyster Reef Creation, Site Shown ≈ 2 Acres
  Total Oyster Reef Creation Proposed ≈ 15 Acres
- Total River Restoration Area ≈ 411 Acres

KEY TO SITES:

W2 – Former Exxon Site
W3 – Paradise Creek Park
W4 – Elizabeth River Terminals
W5 – Jones and Gilligan Creeks
W6 – St. Julians
S1 – Wycoff
S2 – Republic
S3 – Money Point
S4 – Paradise Creek
S5 – Scuffletown Creek

MITIGATION SITE: SOUTHERN BRANCH, ELIZABETH RIVER

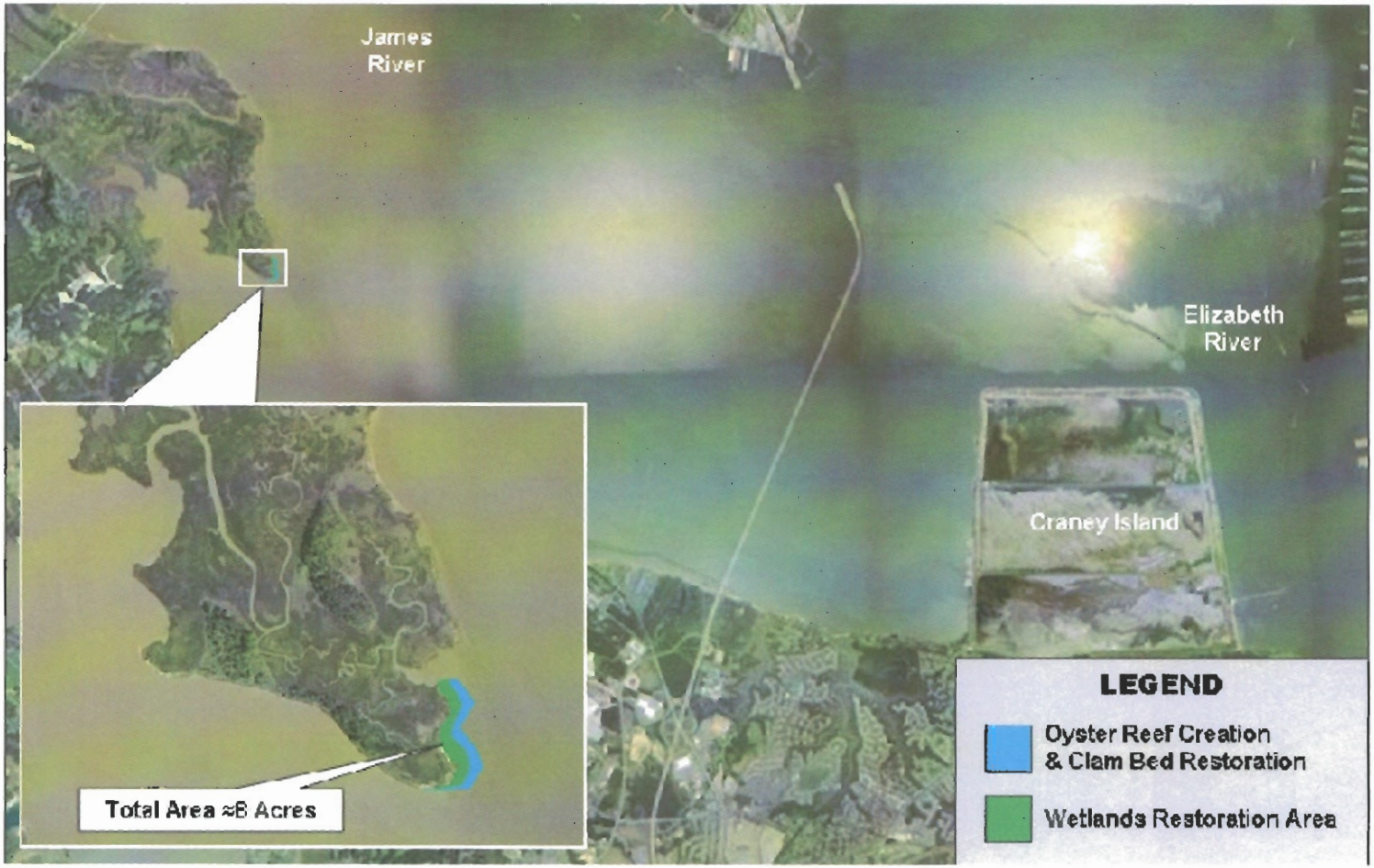
Figure IV-11

Craney Island Consensus Mitigation Plan
Lamberts Point Wetlands Restoration Area and Craney Island Bird Management Planning Area

LAMBERTS POINT WETLANDS RESTORATION AND CRANEY ISLAND BIRD MANAGEMENT PLAN

Figure IV-12

Craney Island Consensus Mitigation Plan
Ragged Island Wetlands Area, Oyster Reef Creation and Clam Bed Restoration



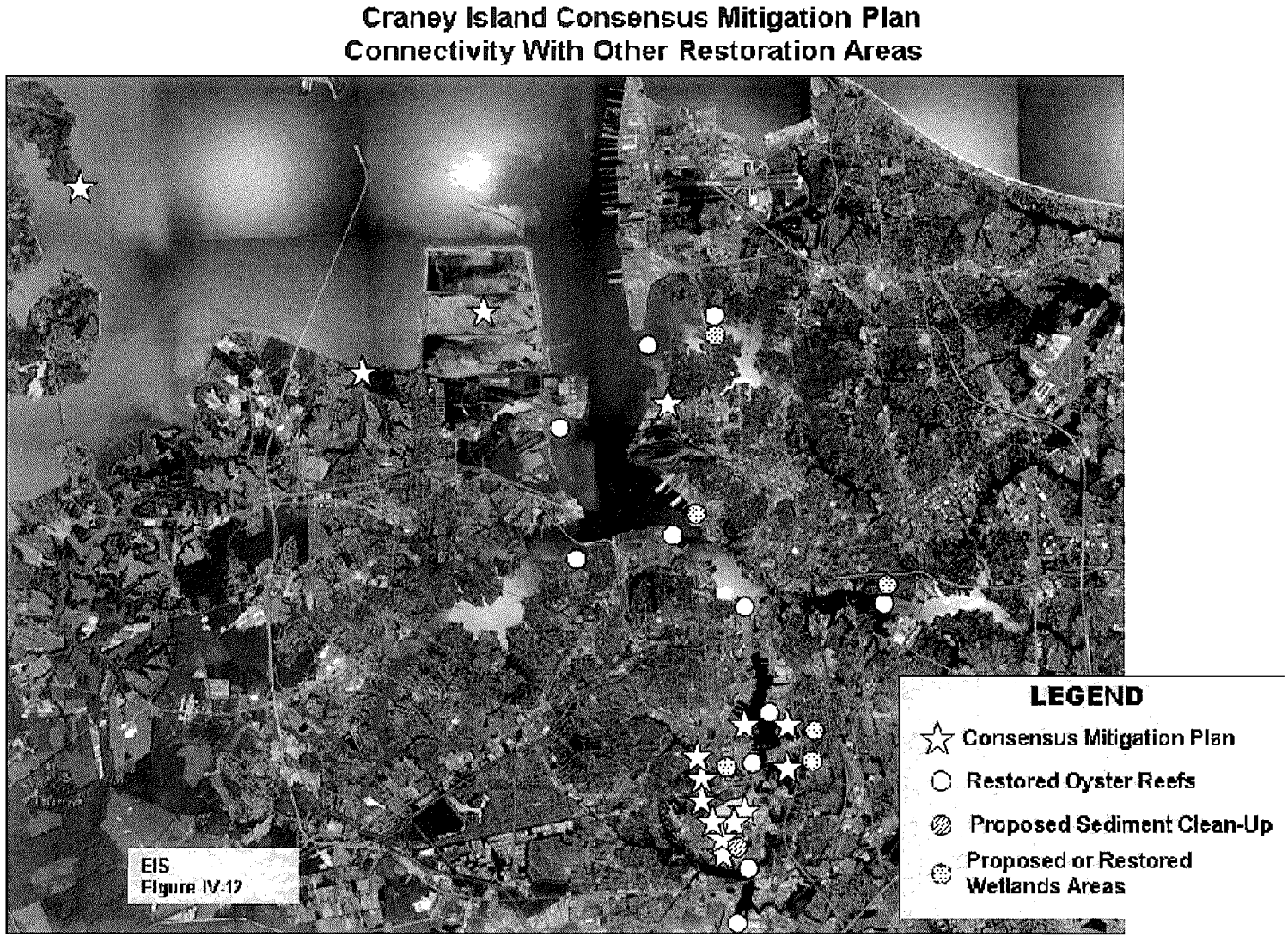
RAGGED ISLAND WETLANDS AND CLAM BED RESTORATION AND OYSTER REEF CREATION AREAS

Figure IV-13

Craney Island Consensus Mitigation Plan
Hoffler Creek Oyster Reef Creation Site and Craney Island Bird Management Plan

HOFFLER CREEK OYSTER REEF CREATION AND CRANEY ISLAND BIRD MANAGEMENT PLAN

Figure IV-14



CRANEY ISLAND CONSENSUS MITIGATION PLAN
CONNECTIVITY WITH EXISTING RESTORATION AREAS

Figure IV-15

List of Preparers

PART V

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PART VI

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Acronyms

Craney Island Expansion Final Environmental Impact Statement Acronyms
(Included in the Executive Summary and Sections I, III, III, and IV)

ADT – average daily total
AST's – above ground storage tanks
B-IBI – Benthic Index of Biotic Integrity
BMP – Best Management Practice
BOD – biological oxygen demand
bu/acre – bushel per acre
ca. – circa
CAA – Clean Air Act
CAD – confined aquatic disposal
CBLAD – Chesapeake Bay Local Assistance Department
CBF – Chesapeake Bay Foundation
CBP – Chesapeake Bay Program
CBPA -- Chesapeake Bay Preservation Area
CBR – Chesapeake Bay Restoration
CDF – confined disposal facility
CEA – cumulative effects assessment
CE/ICA – Cost Effectiveness/Incremental Cost Analysis
CEQ – Council on Environmental Quality
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS – Comprehensive Environmental Response, Compensation, and Liability Information System
CFR – Code of Federal Regulations
CL – city line
CIDMMA – Craney Island Dredged Material Management Area
CI-LR – Craney Island-Lafayette River
CMS – Congestion Management System
CO – carbon monoxide
COTP – Captain of the Port
CWA – Clean Water Act
CY – cubic yard
CZMA – Coastal Zone Management Act
dB – decibels
dBA – decibels
DEIS – Draft Environmental Impact Statement
DEQ – Virginia Department of Environmental Quality
DMMA'S – Dredge Material Management Areas
DMMP – Dredged Material Management Plan
DNODS – Dam Neck Ocean Disposal Site
DO – dissolved oxygen
DWT – dead weight tonnage
EDR – Environmental Data Resources, Inc.

Craney Island Expansion Draft Environmental Impact Statement Acronyms
(Included in the Executive Summary and Sections I, III, III, and IV)
(Cont'd)

EEZ – Exclusive Economic Zone
EFH – essential fish habitat
EHS – Extremely Hazardous Substance
EIS – Environmental Impact Statement
EMS – Emergency Medical Services
EO – Executive Order
ERDC – Engineer Research and Development Center
ERNS – Emergency Response Notification System
ERDC – Engineer Research and Development Center
EPA – U.S. Environmental Protection Agency
ERP – Elizabeth River Project
ERRT – Elizabeth River Restoration Trust
E&S – erosion and sediments
ESA – Endangered Species Act
ESCP – erosion and sediment control plan
FE – Federally-endangered
FEMA – Federal Emergency Management Administration
FEIS – Final Environmental Impact Statement
FHA – Federal Highway Administration
FMC – Fishery Management Councils
FMP – Fishery Management Plan
FT – Federally-threatened
FWPCA – Federal Water Pollution Control Act
FY – fiscal year
gpd – gallons per day
gpm – gallons per minute
GIS – Geographic Information System
g/bhp-hr – grams/brake horsepower-hour
g/vmt – grams per vehicle mile traveled
HAPC – Habitat Area of Particular Concern
HDDV – heavy-duty diesel vehicles
HEA – Habitat Equivalency Analysis
HMS – highly migratory species
hp – horsepower
HRC – Hampton Roads Crossing
HRMA – Hampton Roads Maritime Administration
HRPDC – Hampton Roads Planning District Commission
HRSD – Hampton Roads Sanitation District
HOV – high occupancy vehicle
kg – kilogram

Craney Island Expansion Final Environmental Impact Statement Acronyms
(Included in the Executive Summary and Sections I, III, III, and IV)
(Cont'd)

Kw – kilowatt
lbs/year – pounds per year
I/M – inspection and maintenance
Leq – Equivalent Sound Level
LEPC – Local Emergency Planning Committee
LERR – lands, easements, rights-of-way, and relocations
LDGV – light-duty gasoline vehicles
LF – linear feet
LOS – Level of Service
LPP – Locally Preferred Plan
LTANKS – Leaking Petroleum Tanks
LUST—Leaking Underground Storage Tanks
m – meter
MARPOL – International Convention on the Prevention of Pollution from Ships
MBTA – Migratory Bird Treaty Act of 1918
mcy – millions of cubic yards
MD DNR – Maryland Department of Natural Resources
mg\L – milligrams per liter
MLLW – mean lower low water
mm – millimeters
MMPA – Marine Mammal Protection Act
MMS – Minerals Management Service
mph – miles per hour
MSA – Metropolitan Statistical Area
MSFCMA – Magnuson-Stevens Fishery Management Conservation Act
Mw – megawatts
NAAQS – National Ambient Air Quality Standards
NED – National Economic Development
NEPA – National Environmental Policy Act
ng\L – nanograms per liter
NHPA – National Historic Preservation Act
NIT – Norfolk International Terminals
NMFS – National Marine Fisheries Service
NMHC – non-methane hydrocarbons
NNMT – Newport News Marine Terminal
NO_2 – nitrous oxide
NO_X – nitrogen oxide
NOAA – National Oceanic and Atmospheric Administration
NOS – Norfolk Ocean Site
NPL – National Priority List

Craney Island Expansion Final Environmental Impact Statement Acronyms
(Included in the Executive Summary and Sections I, III, III, and IV)
(Cont'd)

NRC – National Response Center
NRHP – National Register of Historic Places
NS – no status
O&G – oil and grease
O&M – operation and maintenance
ODU – Old Dominion University
OMRR&R – operation, maintenance, repair, rehabilitation, and replacement
PAH's – polynuclear aromatic hydrocarbons
PCA – Project Cooperation Agreement
PED – Preconstruction Engineering and Design
PEL's – Probable Effects Levels
PMT – Portsmouth Marine Terminal
ppt – parts per thousand
POP – Planned Office Park
psi – pounds per square inch
RCRA – Resource Conservation and Recovery Act
RCRIS-SQG – Resource Conservation Recovery Information System – Small Quantity Generator
RDF – Refuse Derived Fuel
RFFA's – reasonably foreseeable future actions
RMA – resource management area
RORO – roll on/roll off
ROW – right-of-way
RPA – resource protection area
RPD – redox-potential discontinuity
RTP – Regional Transportation Plan
S&A – supervision and administration
SAV – submerged aquatic vegetation
SDWA – Southeastern Virginia Planning District Commission
SE – state-endangered
SHPO's – State Historic Preservation Officers
SIP – State Implementation Plan
SO_2 – sulfur dioxide
SPCCP – Spill, Prevention, Control, and Countermeasures Plan
SPL – sound pressure level
SPSA – Southeastern Public Service Authority
SS – state special concern
ST – state-threatened
SWP3 – Stormwater Pollution Prevention Plan
TBT – tributyl tin

Craney Island Expansion Final Environmental Impact Statement Acronyms
(Included in the Executive Summary and Sections I, III, III, and IV)
(Cont'd)

TGS – Total Grounded Slots
TEMS – Tidewater Emergency Medical Services
TEU's – twenty-foot-equivalent units
TIP – Transportation Improvement Plan
TISA – Transportation Impact Study Area
TNM – Traffic Noise Model
TSS – total suspended solids
ug\L – mircrograms per liter
USACE – U.S. Army Corps of Engineers
USCG – U.S. Coast Guard
USDOT – U.S. Department of Transportation
USEPA – U.S. Environmental Protection Agency
USFWS – U.S. Fish & Wildlife Service
USG – U.S. Government
V/C – volume-over-capacity
VCP -- Virginia Coastal Resources Management Program
VDACS – Virginia Department of Agriculture and Consumer Services
VDCR – Virginia Department of Conservation and Recreation
VDEM – Virginia Department of Emergency Management
VDGIF – Virginia Department of Game and Inland Fisheries
VDHR – Virginia Department of Historical Resources
VDOT – Virginia Department of Transportation
VERC – Virginia Emergency Planning Committee
VIMS – Virginia Institute of Marine Science
VIT – Virginia International Terminals
VMRC – Virginia Marine Resources Commission
VMT – vehicle miles traveled
VOC's – volatile organic compounds
VPA – Virginia Port Authority
VPC -- Virginia Coastal Resources Management Program
VPDES – Virginia Pollution Discharge Elimination System
WET – Wetland Evaluation Technique
WRDA – Water Resources Development Act