Baltimore Harbor Anchorages and Channels (BHAC) Modification of Seagirt Loop Channel Feasibility Study

Draft Integrated Feasibility Report and Environmental Assessment

FEBRUARY 2022

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND PORT ADMINISTRATION

US Army Corps of Engineers
Baltimore District

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Executive Summary

This Draft Integrated Feasibility Report and Environmental Assessment (Draft Feasibility Report/EA) documents the U.S. Army Corps of Engineers (USACE) feasibility study planning process for the Baltimore Harbor Anchorages and Channels Project (BHAC project) Modification of Seagirt Loop Channel, Maryland ("Seagirt Study") and compliance with the National Environmental Policy Act (NEPA) and other environmental laws as integrated into the planning process. The BHAC project study was completed in 1998 and authorized for construction in Section 101(a)(22) of the Water Resources Development Act (WRDA) of 1999. Construction for the BHAC project was completed in 2003. The BHAC project consists of the main navigation access channels to the Port of Baltimore (Port) facilities at Dundalk, Seagirt, and South Locust Point Marine Terminals and the federally-authorized anchorages (Anchorage 3 and 4) serving vessels in Baltimore Harbor.

The purpose of the Seagirt Study is to identify technically feasible, economically justifiable, and environmentally acceptable recommendations for a federal navigation improvement project in Baltimore Harbor. This study is being completed by USACE in partnership with the Maryland Department of Transportation Maryland Port Administration (MDOT MPA), the non-Federal sponsor of the study. When the original BHAC project feasibility study was completed in 1998, the design vessel used for modeling the branch channels was a Panamax container vessel that measured 965 feet long with a 106-foot beam, with design consideration for larger beam vessels (135 to 145-foot beam) that were already in service at the time. Since the completion of the original study, larger container vessels (termed post-Panamax vessels) that are longer, wider, can carry twice the cargo capacity and require deeper drafts than the ships that were used to design the current 42-foot deep access channels to the Seagirt Marine Terminal (SMT) have started calling at the Port. These larger vessels have a greater risk of grounding, collision, allision, and marine casualties, which has resulted in limitations to operations within the Harbor.

The Seagirt Study is being completed to determine whether improvements to the BHAC project channels and anchorages would result in improved navigation efficiencies at the Port to meet future demand capacity at the Port facilities, including efficient handling of increased container volume at Seagirt Marine Terminal (SMT) and faster and safer movement of vessels transiting the channels. The overall costs and benefits associated with each alternative were compared to identify the National Economic Development (NED) Plan. The models used to forecast the future conditions and changes for the Seagirt Study are consistent with those used on other Harbor investigations and have been certified or approved for use by the USACE.

The study area includes 32-square miles of Baltimore Harbor, including the navigable parts of the Patapsco River below Hanover Street, the Northwest and Middle Branches, and Curtis Bay and its tributary, Curtis Creek, as well as the associated Port. The study area is a highly developed industrial area zoned as a Marine Industrial District, an area where maritime shipping can be conducted without intrusion of non-industrial uses and where investment in maritime infrastructure and related jobs is encouraged. The Port marine facilities include various private and public terminals and ranks first nationally for volume of autos and light trucks, roll-on roll-off (RORO) heavy farm and construction machinery, and imported gypsum. The Port is one of only four U.S. East Coast ports with both a 50-foot-deep channel and two 50-foot-deep berths (Berths 3 and 4), allowing it to accommodate some of the largest container ships in the world. Ships reach the Port by traveling one of two routes along the Chesapeake Bay navigational channel system: the C&D Canal linking the Delaware River with the northern end of the Chesapeake Bay, or the 50-Foot Channel, which extends 150 nautical miles (NM) from the mouth of the Chesapeake Bay to the Port. The BHAC channel system is the primary focus of this study.

The BHAC consists of the Seagirt Loop Channel, the Dundalk Access Channels, the South Locust Point Branch Channel and Turning Basin, and Anchorages 3 and 4. The Seagirt Loop Channel includes all channels to access the SMT: the West Seagirt Branch Channel (WSBC), the West Dundalk Branch Channel, and the Dundalk-Seagirt Connecting Channel.

The study area also includes historic architectural resources including the Dundalk Historic District, the Baltimore Municipal Airport Harbor Field, the Baltimore Municipal Airport Air Station, the Western Electric Company/Point Breeze Historic District, the Canton Grain Elevator, and the Fort McHenry National Monument and Historic Shrine (Fort McHenry). Important cultural resources include the Star-Spangled Banner National Historic Trail and the Captain John Smith Chesapeake National Historic Trail.

The period of analysis for this study is 50-years per ER 1105-2-100 and extends from the study base year of 2030 through 2079. The base year is when the project is anticipated to be fully implemented and project benefits will begin to accrue. The Tentatively Selected Plan (TSP) will also be assessed for engineering and environmental performance in consideration of coastal sustainability and adaptation to relative sea level rise (SLR) out to 2130, which is 100 years from the base year.

FIGURE E-1: BALTIMORE HARBOR ANCHORAGES AND CHANNELS PROJECT STUDY AREA

Estimates of the future commerce directly connected to the Port over the period of analysis are linked to the Port's hinterland and the extent to which the Port shares commodity flows with other ports. Under future with and without project conditions, the volume of cargo moving through the Port is assumed to be the same. The share of the commodity projections also remains the same as existing conditions. However, channel deepening will allow shippers to load vessels more efficiently and take advantage of larger vessels. This efficiency translates to transportation cost savings and is the main driver of the NED plan. Cargo projections ultimately drive vessel fleet projections in terms of the quantities and sizes of vessels in the with and without project conditions.

The Project Delivery Team (PDT) formulated alternatives by combining compatible management measures that were retained during initial screening. These measures were considered to meet planning objectives and avoid constraints identified during the study. The alternatives were formulated using an alternatives matrix and were further refined to include separable elements for management measures corresponding to different and separable BHAC project components. Deepening and widening increments were a consideration for optimization of the design of alternative plans later in the feasibility study and expected to be informed by the selection of design vessels, completion of ship simulation during the feasibility study, and evaluation of alternative plans incrementally using HarborSym modeling. The array of alternatives was evaluated and screened as documented in Chapter 4 and is summarized in the Array of Alternatives table detailed in Table E-1.

TABLE E-1: ARRAY OF ALTERNATIVES

NUMBER	ALTERNATIVE
1	No Action
2	Assumption of Federal Maintenance for State Improvements to Seagirt Loop
3	Completion of Seagirt Loop & Assumption of Federal Maintenance
4-1	Completion of Seagirt Loop, South Locust Point Modification & Assumption of Federal Maintenance
4-2	Completion of South Locust Point & Assumption of Federal Maintenance
5-1	Completion of Seagirt Loop, South Locust Point Modification., Anchorage Modification & Assumption of Federal Maintenance
5-2	Completion of Seagirt Loop, Anchorage Modification & Assumption of Federal Maintenance
5-3	Anchorage Modification & Assumption of Federal Maintenance

Note that after scoping, measures related to the assumption of federal maintenance for state improvements to the West Dundalk Branch Channel and the Dundalk-Seagirt Connecting Channel could not be considered further in this feasibility study due to legal and policy compliance issues. Additionally, discussions for the problem identification at the South Locust Point Branch Channel did not conclusively identify a difference between the existing and future vessel fleet calling at the terminal that would necessitate a change in the study authority that would be considered as part of the feasibility study, therefore this measure was also removed from consideration. Further detail is documented in Chapter 4 for the removal of measures identified during the scoping phase. The anchorage modification alternative was evaluated and screened because it resulted in negative net benefits and a benefit to cost ratio (BCR) of 0.1. Following the evaluation of screening of alternatives presented in Chapter 4, the PDT selected the TSP – Alternative 3 Completion of the Seagirt Loop (deepening and widening of the WSBC).

Tentatively Selected Plan Features

The TSP is Alternative 3 – Completion of the Seagirt Loop Channel. The TSP is the NED Plan, or the plan that reasonably maximizes net benefits. The TSP presented in this draft report proposes widening of the WSBC to a minimum width of 620 feet with deepening to a federally-authorized depth of -47 feet mean lower low water (MLLW). An additional 2 feet of allowable overdepth has been assumed for purposes of dredged material volume and cost purposes. The evaluation and characteristics of the TSP are summarized in Table E-2. Figure E-2 illustrates the TSP – NED Plan described in this section. During the course of the study, ship simulation modeling will be completed for the Seagirt Loop that will be used to optimize the channel design, refine dredge quantities, update cost estimates, and re-examine benefit assumptions that may affect the optimum project design that reasonably maximizes net benefits.

The MDOT MPA has also expressed interest in pursuing a potential locally preferred plan (LPP) if the results of channel optimization indicate that the channel design is less than MDOT MPA's desired depth. The potential LPP would specify deepening and widening of the WSBC to complete the Seagirt Loop Channel at an authorized depth of -50 feet MLLW and widening to a minimum width of 620 feet. The LPP ensures consistent channel depths from the approach channels leading to the Port and throughout the entire Seagirt Loop Channel allowing all present and future vessels calling at the Port of Baltimore's SMT to be able to safely maneuver the loop to deliver cargo. If an LPP is selected as a recommended plan, cost sharing amounts above the NED Plan are covered 100 percent by the non-Federal sponsor. The evaluation and dimensions of the LPP are also summarized in Table E-2.

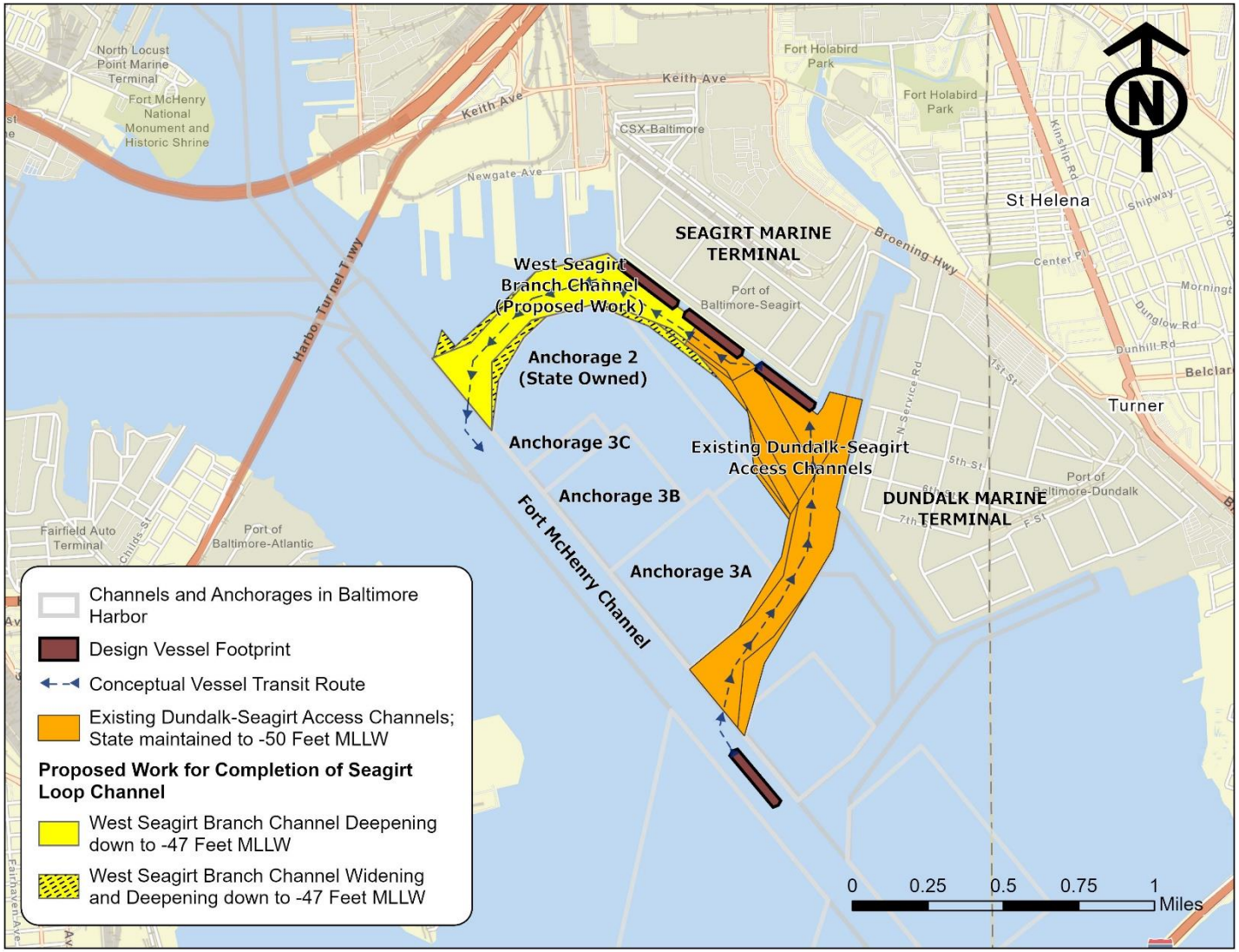

FIGURE E-2: TENTATIVELY SELECTED PLAN – NED PLAN FOR WSBC

TABLE E-2: TOTAL COSTS, ECONOMIC EVALUATION, AND CHARACTERISTICS OF THE TSP – NED PLAN AND POTENTIAL LPP

	TSP - NED PLAN	POTENTIAL LPP
Total Investment Cost	$34,333,000	$44,952,000
Average Annual Equivalent (AAEQ) Investment Cost	$1,155,000	$1,514,000
AAEQ Operation and Maintenance Cost	$57,000	$57,000
Total AAEQ Costs	$1,212,000	$1,571,000
AAEQ Benefits	$4,894,000	$5,202,000
Net Benefits	$3,682,000	$3,631,000
Benefit-Cost Ratio (BCR) at 2.5%	4.0	3.3
Benefit-Cost Ratio (BCR) at 7%	1.9	1.5
Proposed Authorized Channel Depth [feet MLLW]	-47	-50
Length of Improvement [feet]	5200	5200
Channel Width [feet]	620	620
Quantity to be dredged [cy]	1,317,210	1,922,000
Predominant Side Slope	5:1	5:1
Predominant Channel Bottom Material	Sediment with various contaminants	

Construction

The project assumes a construction start date of October 2025 occurring over two federal fiscal years (FFY) and two dredging periods (two mobilizations), ending October 2027. Construction years are assumed for the economics evaluation in this study and are subject to report approval and project approval and funding requirements, including federal and non-Federal funds.

Real Estate Requirements

USACE projects require that the non-Federal sponsor provide the lands, easements, rights-of-way, relocations, and disposal areas necessary for a project. The Tentatively Selected Plan will not require any cost or costs associated with the acquisition of lands, easements, rights-of-way, relocations, and disposal areas.

Project Cost

Project first cost is the constant dollar cost at the current price level and is the cost used in the authorizing document for a project. Project costs shown in this section are shown in price level year 2022 and are discounted using an interest rate of 2.5 percent.

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Acronyms

AAEQ	Average Annual Equivalent Costs
ADC	Air Draft Clearance
APE	Area of Potential Effects
ASA (CW)	Assistant Secretary of the Army Civil Works
BCR	Benefit Cost Ratio
BLM	Bureau of Land Management
BHAC	Baltimore Harbor Anchorages and Channels
BUILD	Better Utilizing Investments to Leverage Development
C&D	Chesapeake and Delaware
CAD	Confined Aquatic Disposal
CBCA	Chesapeake Bay Critical Area Protection Program
CENAB	U.S. Army Corps of Engineers, Baltimore District
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH4	Methane
CO	Carbon Monoxide
CO2	Carbon Dioxide
CO2e	Carbon Dioxide Equivalents
COMAR	Code of Maryland Regulations
CSX	CSX Transportation
CZMA	Coastal Zone Management Act
CZMP	Maryland Coastal Zone Management Program
dB	Decibel
dBA	A-weighted decibel as perceived by the human ear.
DPS	Distinct Population Segment
DMCF	Dredged Material Containment Facility
DMMP	Dredged Material Management Plan
Draft Feasibility Report	Draft Integrated Feasibility Report

EA	Environmental Assessment
EA EST	EA Engineering, Science, and Technology Inc.
EQ	Environmental Quality
ECOS-IPac	Environmental Conservation Online System Information for Planning and Consultation
EFH	Essential Fish Habitat
EOP	United States Army Corps of Engineers Environmental Operating Principles
FE-SUEZ-ECUS	Far East – Indian Subcontinent – Southeast Asia – Suez Canal – East Coast United States Route Group
Fort McHenry	Fort McHenry National Monument and Historic Shrine
FONSI	Finding of No Significant Impact
FWCA	Fish and Wildlife Coordination Act
FWOP	Future Without Project Condition
GHG	Greenhouse Gases
GRR	Draft Baltimore Harbor and Channels 50-foot General Reevaluation Report
HTRW	Hazardous, Toxic and Radioactive Waste
IBRU	Innovative Beneficial Reuse
ICTF	Intermodal Container Transfer Facility
IDC	Interest During Construction
IHS	IHS Maritime and Trade
INFRA	Infrastructure For Rebuilding America
IPCC	Intergovernmental Panel on Climate Change
LERRD	Lands, Easements, Rights-of-Way, Relocation and Disposal Areas
LOA	Length Overall
LPP	Locally Preferred Plan
MBTA	Migratory Bird Treaty Act
MDE	Maryland Department of the Environment
MDOT MPA	Maryland Department of Transportation Maryland Port Administration
MDDNR	Maryland Department of Natural Resources

MES	Maryland Environmental Service
MHHW	Mean Higher High Water
MHT	Maryland Historical Trust
MITAGS	Maritime Institute of Technology and Graduate Studies
MLLW	Mean Lower Low Water
MCY	Million Cubic Yards
MSI	Maritime Strategies Inc.
N2O	Nitrous Oxide
NM	Nautical Miles
NAAQS	National Ambient Air Quality Standards
NED	National Economic Development
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOx	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places
O&M	Operation and Maintenance
OMRR&R	Operation, Maintenance, Repair, Rehabilitation, and Replacement
OSE	Other Social Effects
P&G Criteria	Principles & Guidelines for Water and Related Land Resources Implementation Studies
PA	Programmatic Agreement
PAC	Ports America Chesapeake
PED	Pre-construction, Engineering, and Design
PEL	Probable Effects Levels
PM	Particulate Matter
Port	Port of Baltimore
PDT	Project Delivery Team

PPA	Project Partnership Agreement
PPX Gen 1	Post-Panamax Generation I vessel
PPX Gen 2	Post-Panamax Generation II vessel
PPX Gen 3	Post-Panamax Generation III vessel
PPX Gen 3 max	Post-Panamax Generation III max vessel
RED	Regional Economic Development
RECONS	Regional Economic System
RCRA	Resource Conservation and Recovery Act
SAV	Submerged Aquatic Vegetation
SHPO	State Historic Preservation Office
SLC	Sea Level Change
SLR	Sea Level Rise
SMT	Seagirt Marine Terminal
SOx	Sulfur Oxides
TEU	Twenty-foot Equivalent Units
TMDL	Total Maximum Daily Load
Tonnes	Metric tons
TPY	Tons per Year
TSP	Tentatively Selected Plan
TSS	Total Suspended Solids
UKC	Underkeel Clearance
USACE	United States Army Corps of Engineers
USDOT	United States Department of Transportation
U.S.C.	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile Organic Compounds
WLA	Waste Load Allocation
WTS	World Trade Service
WRDA	Water Resources Development Act
WSBC	West Seagirt Branch Channel

1 Study Information

1.1 Introduction

This Draft Integrated Feasibility Report and Environmental Assessment (Draft Feasibility Report/EA) documents the U.S. Army Corps of Engineers (USACE) feasibility study planning process for the Baltimore Harbor Anchorages and Channels Project (BHAC project) Modification of Seagirt Loop Channel, Maryland ("Seagirt Study") and compliance with the National Environmental Policy Act (NEPA) and other environmental laws as integrated into the planning process. The sections of this report that satisfy NEPA requirements are marked with an asterisk (*). The BHAC project study was completed in 1998 and authorized for construction in Section 101(a)(22) of the Water Resources Development Act (WRDA) of 1999. The BHAC project consists of the main navigation access channels to the Port of Baltimore (Port) facilities at Dundalk, Seagirt, and South Locust Point Marine Terminals and the federally-authorized anchorages (Anchorage 3 and 4) serving vessels in Baltimore Harbor.

The Seagirt Study is being completed to determine whether improvements to the BHAC project channels and anchorages would result in improved navigation efficiencies at the Port to meet future demand capacity at the Port facilities, including efficient handling of increased container volume at Seagirt Marine Terminal (SMT) and faster and safer movement of vessels transiting the channels. The overall costs and benefits associated with each alternative project component were weighed against each other to identify and recommend the best outcome. The models used to forecast the future conditions and changes for the Seagirt Study are consistent with those used on other Harbor investigations and have been certified or approved for use by the USACE.

1.2 Study Purpose and Need for Action*

The purpose of the Seagirt Study is to identify technically feasible, economically justifiable, and environmentally acceptable recommendations for a federal navigation improvement project in Baltimore Harbor. When the original BHAC project feasibility study was completed in 1998, the design vessel used for the branch channels was a Panamax container vessel that measured 965 feet long with a 106-foot beam, with design consideration for larger beam vessels (135 to 145-foot beam) that were already in service at the time. Since the completion of the original study, the expansion of the Panama Canal has allowed for the larger fleet to call on East Coast ports. Larger container vessels that have started using Baltimore Harbor, termed post-Panamax vessels, can carry twice the cargo capacity and require deeper drafts than the ships that were used to design the current 42-foot-deep access channels to the SMT. As a result, the vessels routinely calling on Baltimore Harbor today are longer, wider, and have drafts deeper than the existing channel design vessel. These larger vessels have a greater risk of grounding,

collision, allision, and marine casualties. These risks have resulted in limitations to operations within the Harbor.

This investigation is needed to improve the efficiency and safety of commercial vessels that currently call and are expected to call at the Port of Baltimore. A loop consisting of the West Seagirt Branch Channel, the Dundalk-Seagirt Connecting Channel, and the West Dundalk Branch Channel is currently used to access the Seagirt Marine Terminal berths. However, the channels that make up the loop are maintained at various dredging depths. The West Seagirt Loop Channel is currently maintained at a depth of -45 feet MLLW, and the Dundalk-Seagirt Connecting and the West Dundalk Branch Channels are maintained at a depth of -50 feet MLLW. Vessels with a draft of -42 feet MLLW or greater do not use the West Seagirt Branch Channel due to a lack of sufficient under keel clearance. Vessels with a draft of greater than -42 feet MLLW are required to "back out" of the loop. "Backing out" of the loop increases the time of maneuvering in these channels and presents concerns for vessel maneuverability adjacent to berth infrastructure. This maneuver also results in other vessels having to wait for a vessel to back out in order to access the Seagirt Marine Terminal berths. This additional time and maneuvering results in transportation inefficiencies and maneuverability concerns for vessels using the Seagirt Loop Channel.

1.3 Study Authority

This review of the operations of the BHAC is conducted pursuant to §216 of the Rivers and Harbors Act of 1970 (Pub. L. No. 91-611, 33U.S.C. §549a), which reads:

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

The BHAC project is the constructed USACE project that will be reviewed for modification as part of this study. The study for the BHAC project was authorized on June 23, 1988, by the Committee on Environment and Public Works, U.S. Senate. The resolution authorizing that study follows:

> *RESOLVED BY THE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS OF THE UNITED STATES SENATE, that the Board of Engineers for Rivers and*

Harbors is hereby requested to review the reports of the Chief of Engineers on Baltimore Harbor and Channels, Maryland, and Virginia, contained in House Documents Number 94-181, 94th Congress, 1st Session, and Number 86, 85th Congress, 1st Session, and prior reports, with a view to determining if further improvements for navigation, including anchorages and branch channels, are advisable at this time.

The study, conducted pursuant to this authority, resulted in a Chief Engineer's Report dated June 8, 1998, and construction of the BHAC Project was authorized in §101(a)(22) of WRDA 1999 (PL. 106-53). As discussed in the Chief of Engineer's Report, the project included improvements to access channels serving the public terminals of Dundalk, Seagirt, and South Locust Point. The federal government assumed maintenance of these channels at their authorized depths.

1.4 Non-Federal Sponsor

A Feasibility Cost Sharing Agreement was executed on September 22, 2020, with MDOT MPA as the non-Federal sponsor. The Seagirt Study is cost-shared, 50 percent federal and 50 percent non-Federal.

1.5 Existing Harbor Projects

The Port is located on a 32-square-mile area of the Patapsco River and its tributaries, approximately 12 miles northwest of the Chesapeake Bay. Container ship traffic enters the Port through the federally-authorized 50-foot Baltimore Harbor Channels that run from the Atlantic Ocean by two distinct shipping routes: from the south through the Virginia Capes and the Chesapeake Bay, or from the east through the Delaware Bay, Chesapeake and Delaware (C&D) Canal, and the Chesapeake Bay (Figure 1-1). The Port includes three federal projects: the BHAC project (which is dredged to various depths), and portions of the 42-Foot and the 50-Foot Projects. The BHAC project was authorized for construction in WRDA 1999 following recommendations in the BHAC Project Feasibility Study of 1998. The BHAC project resulted in deepening and assumption of maintenance of navigation branch channels to Seagirt, Dundalk, and South Locust Point Marine Terminals, turning basins, and federal authorization for two anchorages (Figure 1-2). A BHAC Limited Re-evaluation Report was completed in 2001, following project authorization to examine the most appropriate dimensions for the federal anchorages. Construction for the BHAC project was completed in 2003. The federal navigation channels are used by and designed for the deep-draft commercial vessels calling on the facilities within Baltimore Harbor. Container vessels, tankers, car carriers, and other bulk goods carriers make up most of the deep-draft commercial vessels using these channels. Among these vessels, container vessels are the most depth-limited and are most

constrained by the configuration of the channels. The BHAC project is the focus of this study and is described in this section (Figure 1-3). The existing constructed as authorized federal channel dimensions for the BHAC project are shown in Table 1-1.

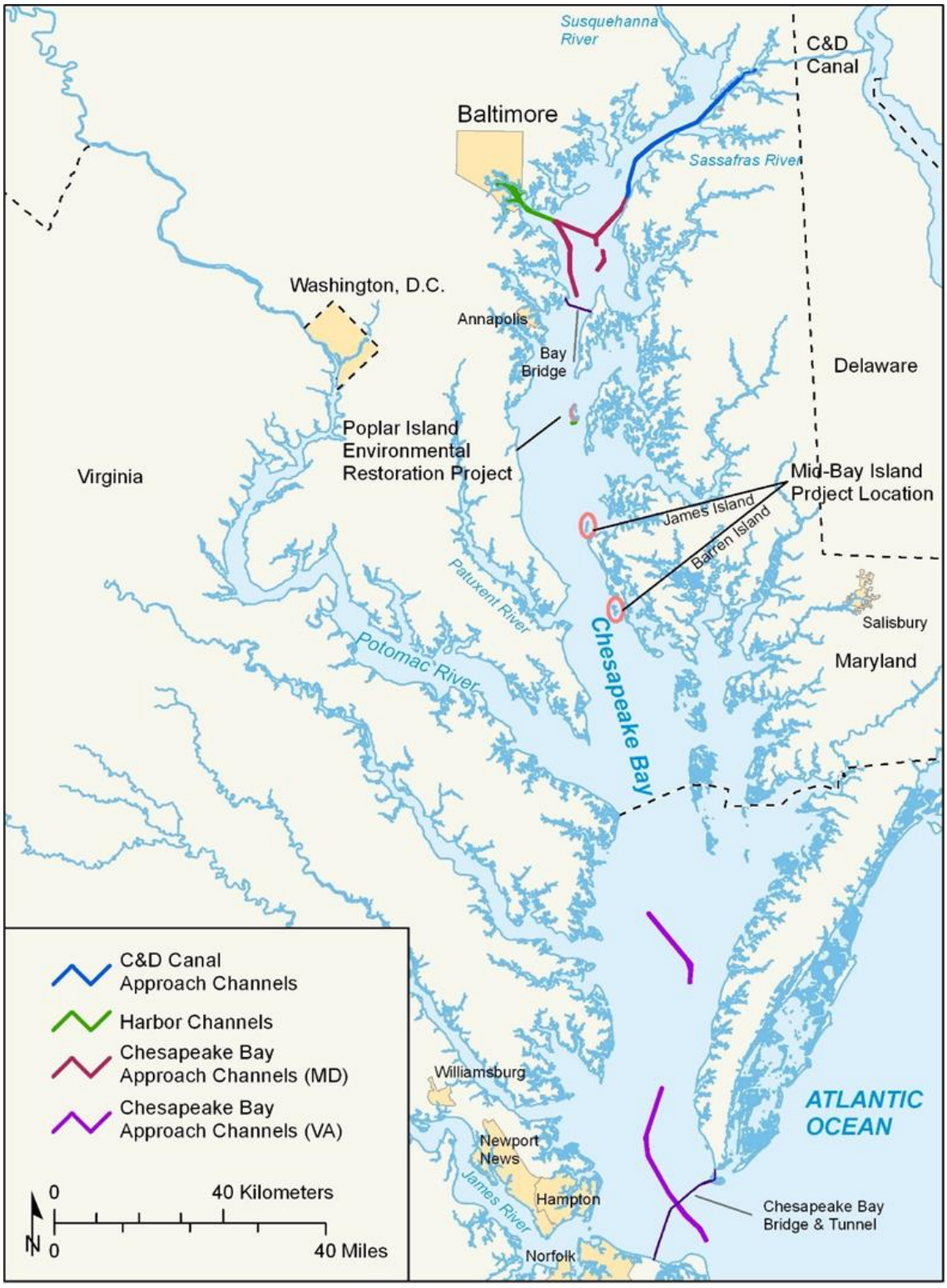

FIGURE 1-1: FEDERALLY-AUTHORIZED BALTIMORE HARBOR CHANNEL PROJECTS IN MARYLAND AND VIRGINIA

Also shows the location of Dredged Material Island Projects in the Maryland section of the Bay.

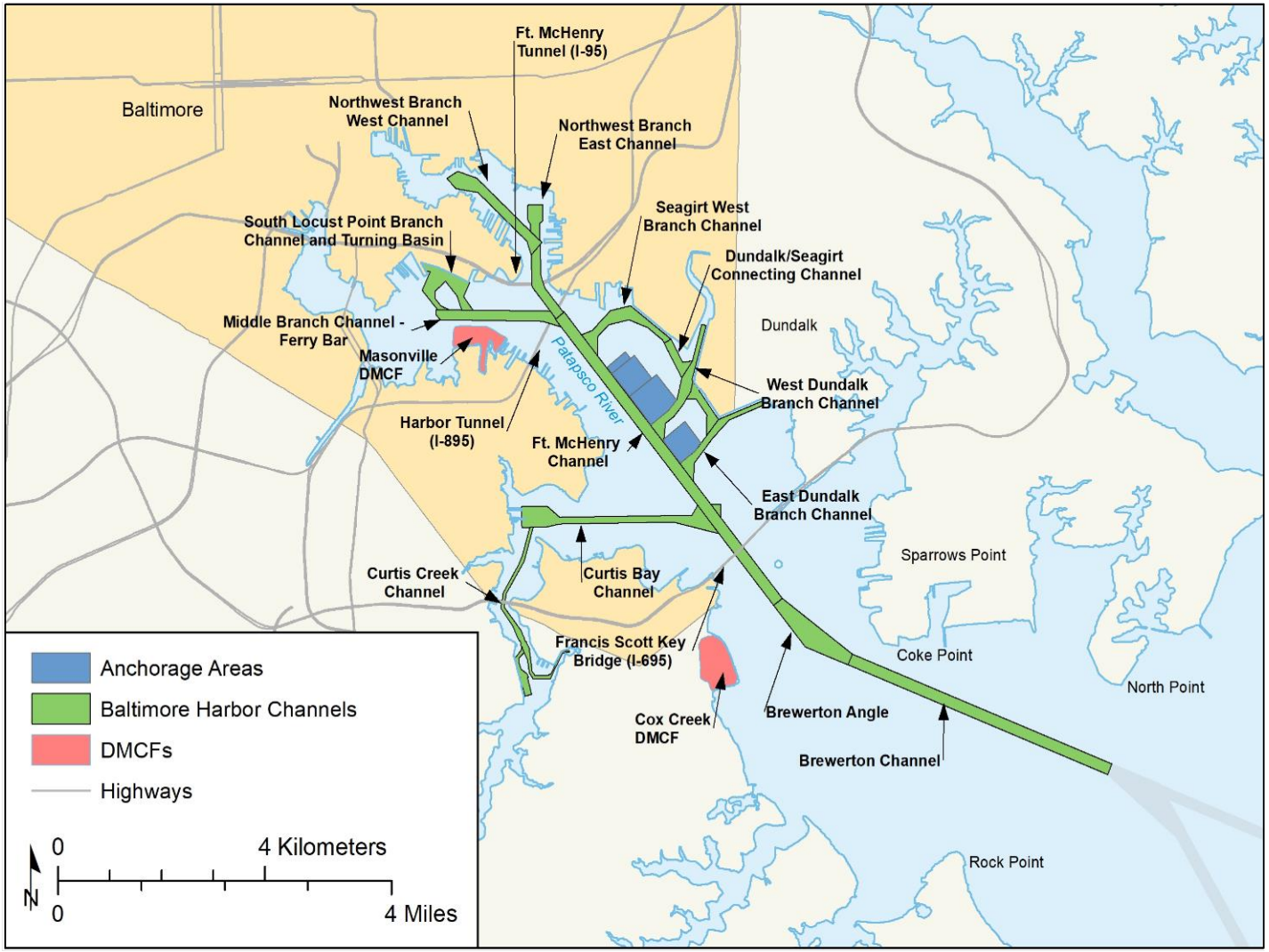

FIGURE 1-2: DETAIL SHOWING THE HARBOR CHANNELS AND ANCHORAGES IN THE PATAPSCO RIVER AND THE DREDGED MATERIAL CONTAINMENT FACILITIES (DMCFS) WHERE DREDGED MATERIAL FROM THE CHANNELS IS PLACED AND CONTAINED

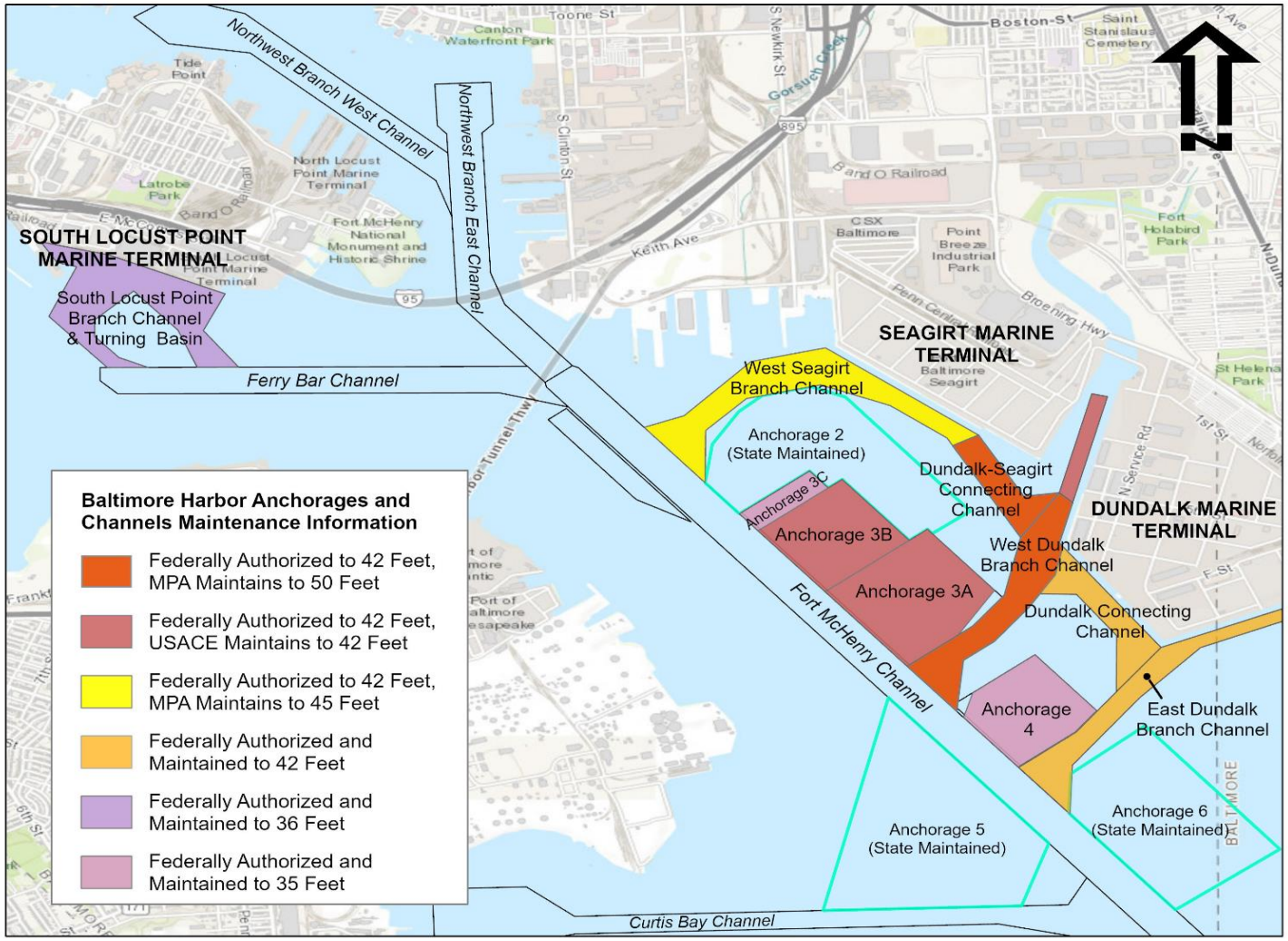

FIGURE 1-3: DETAILS AND MAINTENANCE INFORMATION FOR THE BALTIMORE HARBOR ANCHORAGES AND CHANNELS PROJECT

The Ferry Bar channel is part of the 42-ft Channel Project. The Fort McHenry, Curtis Bay, and Northwest Branch channels are part of the 50-ft Channel Project. These channels are not part of the BHAC study.

TABLE 1-1: FEDERALLY AUTHORIZED DEPTHS AND DIMENSIONS FOR COMPONENTS OF THE BHAC PROJECT

PROJECT COMPONENTS	USACE AUTHORIZED MAINTENANCE DEPTH	DIMENSIONS
Anchorage 1	Deauthorized after the 2001 LRR.	
Anchorage 2	Maintained by the State of Maryland.	
Anchorage 3	3A: -42 feet. 3B: -42 feet. 3C: -35 feet.	3A: 2,200 by 2,200 feet. 3B: 1,800 by 1,800 feet. 3C: 1,500 by 500 feet.
Anchorage 4	-35 feet.	1,800 by 1,800 feet.
West Seagirt Branch Channel (Access to Seagirt Berths 1-2)	-42 feet.	500 feet wide.
Dundalk – Seagirt Connecting Channel (Access to Seagirt Berths 3-4)	-42 feet.	500 feet wide.
West Dundalk Branch Channel (Access to Dundalk Berths 4-6)	-42 feet.	500 feet wide.
Dundalk Connecting Channel (Access to Dundalk Berths 7-10)	-42 feet.	500 feet wide.
East Dundalk Branch Channel (Access to Dundalk Berths 11-13)	-42 feet.	400 feet wide.
South Locust Point Branch Channel and Turning Basin	-36 feet.	400 feet wide.
Turning Basin at Fort McHenry Channel	-50 feet.	1,200 by 1,200 feet.

Approximate anchorage dimensions (from 33 CFR 110, 84 FR 16778: https://www.federalregister.gov/documents/2019/04/23/2019-08116/anchorage-grounds-baltimore-harbor-baltimore-md

1.5.1 Recent Baltimore Harbor and Channels Construction History

- **Seagirt Marine Terminal Berth 3 Modernization** – The first 50-foot-deep container berth (Berth 4) and super post Panamax cranes became operational at the terminal in 2013 allowing it to accommodate some of the largest container ships in the world. SMT 3 Modernization project was initiated through an MDOT MPA study completed in 2018 as part of grant application for the Better Utilizing Investments to Leverage Development (BUILD) program. As part of the modernization project, deepening of Berth 3 to -50 feet MLLW and improvements to the access channel, turning basin and wharf area were completed in 2021. Additional upgrades to the terminal including terminal technology improvements

that increase capabilities and reduce congestion, main gate upgrades that reduce the time trucks spend at the terminal and shifting a portion of terminal equipment from diesel fueled to electric, which will lead to reduced emissions, propulsion costs, and lower maintenance and repair costs are expected to be fully operational in 2022. A cost benefit analysis for the Berth 3 project determined that the improvements would result in significant safety and environmental benefits at the Port. The SMT is operated by Ports America Chesapeake (PAC) under a public-private partnership with the MDOT MPA (MDOT MPA 2018).

- **Howard Street Tunnel and Rail Access Improvements** – CSX Transportation's (CSX) freight rail corridor paralleling I-95 currently has several problem areas, including the historic Howard Street Tunnel in Baltimore, where vertical clearances on the route are limited, preventing the use of double-stacked well cars for containers. Recent State Freight Plans in Maryland, Delaware, and Pennsylvania all point to increased freight tonnage of at least 58 percent between 2012 and 2040. This Rail Access Improvement project will address the risk of delays and inefficiencies across freight modes, the national transportation network and impacts on the mobility for both passengers and cargo (Federal Railroad Administration 2021). Once the Howard Street Tunnel and Rail Access Improvement project is completed (estimated double stacked service starting in late 2024/2025), the Port will be able to provide an improved option for global shippers to reach key inland markets. Benefits associated with the movement of double stacked containers via rail and trucks may include reductions in traffic accidents, pavement damage, and emissions.

1.6 Prior Studies and Reports

Over approximately 50 years, several reports have been completed concerning navigation projects for Baltimore Harbor. Advances in engineering, economics, and other sciences have aided each successive investigation. An abbreviated list of the relevant studies and reports relating directly to BHAC are summarized below.

1. **June 1969** – Review Report for the Baltimore Harbor and Channels Maryland and Virginia 50-Foot Project
2. **July 1974** – Supplement to the Review Report.
   Consideration of cost-saving methods in response to the Rivers and Harbors Act of 1970.
3. **August 1981** – Final General Design Memorandum (GDM) and January 1982 Supplemental Information Report
   Reaffirmed the authorized Baltimore Harbor and Channels Maryland and Virginia 50-Foot Project, approved in January 1982.

4. **October 1985** – Supplement to the GDM
   Recommended narrower channels as Phase I of the project. The additional dredging required to complete the full authorized project is shown as Phase II.
5. **June 1998** – Baltimore Harbor Anchorages and Channels (BHAC)
   Recommended navigation improvements to branch channels leading to the marine terminals at Dundalk, Seagirt, and South Locust Point, federal authorization of two anchorages and a turning basin. Assumed federal responsibility for operation and maintenance for listed improvements.
6. **November 2001** – BHAC Limited Re-evaluation Report
   Recommended modifications to anchorage dimensions and location of the turning basin and decreased dredged material estimates for the overall project.
7. **November 2015** - 50-Foot Project Phase II Widening (Maryland and Virginia).
   The 50-foot Project Phase II Widening study is currently on hold while additional investigations regarding the placement of dredged material from the Virginia channels are completed. The 50-Foot Project Phase II Widening would widen the channels outside of Baltimore Harbor to their authorized widths. Phase I of the project, authorized in 1985, provided a 50-foot-deep main shipping channel from the Virginia Capes to Fort McHenry in Baltimore Harbor. Phase I included improvements to the Curtis Bay Channel, the East Channel, and the West Channel, which are dredged to depths of 50 feet, 49 feet, and 40 feet, respectively, and are authorized to a width of 600 feet. Due to financial and dredged material placement capacity constraints at the time, several channel components of the 50-foot project were not constructed to their authorized widths during Phase I. Two of the three Virginia approach channels, authorized to a width of 1,000 feet, were only constructed to a width of 800 feet; the Maryland approach channels, authorized to a width of 800 feet, were only constructed to 700 feet; and, the Curtis Bay Channel, authorized to a width of 600 feet, was only constructed to a width of 400 feet.

1.7 Study Area

The study area includes 32-square miles of Baltimore Harbor, including the navigable parts of the Patapsco River below Hanover Street, the Northwest and Middle Branches, and the Curtis Bay and its tributary, Curtis Creek, as well as the associated Port. The study area is a highly developed industrial area zoned as a Marine Industrial District, an area where maritime shipping can be conducted without intrusion of non-industrial uses and where investment in maritime infrastructure and related jobs is encouraged. The Port marine facilities include various private and public terminals and ranks first nationally for volume of autos and light trucks, roll-on roll-off (RORO) heavy farm and construction machinery and imported gypsum. The Port is one of only four U.S. East Coast ports with

both a 50-foot-deep channel and two 50-foot-deep berths (Berths 3 and 4), allowing it to accommodate some of the largest container ships in the world. Ships reach the Port by traveling one of two routes along the Chesapeake Bay navigational channel system: the C&D Canal linking the Delaware River with the northern end of the Chesapeake Bay, or the 50-Foot Channel, which extends 150 nautical miles (NM) from the mouth of the Chesapeake Bay to the Port. The BHAC channel system is the primary focus of this study.

The BHAC consists of the Seagirt Loop Channel, the Dundalk Access Channels, the South Locust Point Branch Channel and Turning Basin, and Anchorages 3 and 4. The Seagirt Loop Channel includes all channels to access the SMT: the West Seagirt Branch Channel (WSBC), the West Dundalk Branch Channel, and the Dundalk-Seagirt Connecting Channel.

The study area also includes historic architectural resources including the Dundalk Historic District, the Baltimore Municipal Airport Harbor Field, the Baltimore Municipal Airport Air Station, the Western Electric Company/Point Breeze Historic District, the Canton Grain Elevator, and the Fort McHenry National Monument and Historic Shrine (Fort McHenry). Important cultural resources include the Star-Spangled Banner National Historic Trail and the Captain John Smith Chesapeake National Historic Trail.

Two additional terms are used in this document to describe the study area. The term “Action Area” is used to assess existing conditions and potential impacts to federally listed species as described in Sections 2.8 and 6.8. The term “Area of Potential Effect (APE)” is used to assess existing conditions and potential impacts to cultural resources as described in Sections 2.9 and 6.9.

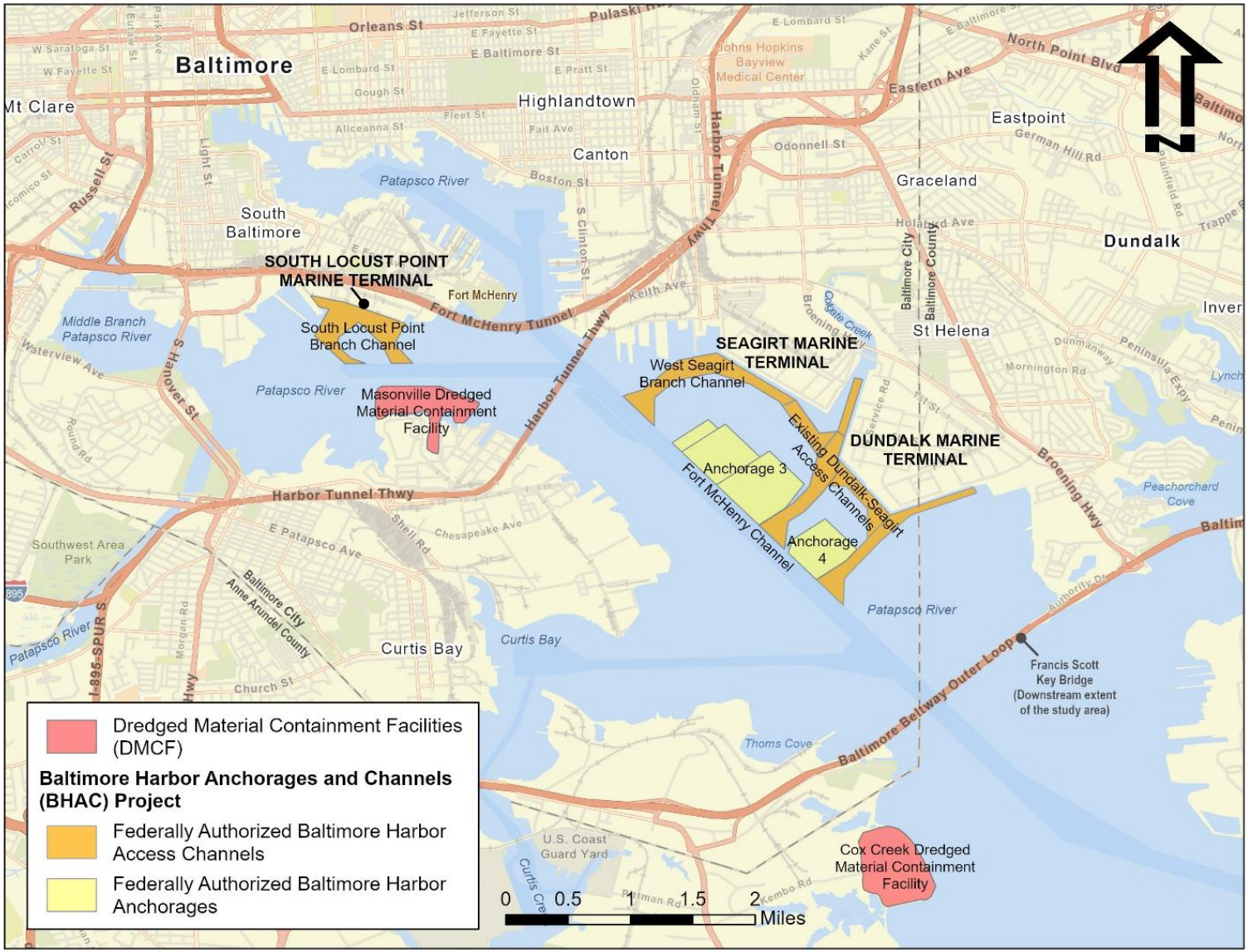

FIGURE 1-4: BALTIMORE HARBOR ANCHORAGES AND CHANNELS PROJECT STUDY AREA

1.8 Compliance with the National Environmental Policy Act and other Environmental Laws*

This Seagirt Study was conducted in accordance with the NEPA as amended, the 2020 Council on Environmental Quality (CEQ) Regulations for Implementing NEPA (40 Code of Federal Regulations 1500-1508), and the USACE Procedures for Implementing NEPA (Engineering Regulation 200-2-2). This Draft Feasibility Report includes an EA that provides information on potential environmental, cultural, and socioeconomic impacts that could result from the proposed action and its alternatives. This report reflects an integrated planning process that minimizes and avoids adverse impacts associated with the proposed navigation improvement actions. A Finding of No Significant Impact (FONSI) has been prepared for the proposed action (Appendix A1).

1.8.1 Cooperating and Participating Agencies

In accordance with Section 1005 of the Water Resources Reform and Development Act (WRRDA) of 2014, the following federal and state agencies served as cooperating and participating agencies in the environmental review process:

Cooperating Agencies:

1. National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS)
2. Environmental Protection Agency (USEPA)
3. National Park Service (NPS)

Participating Agencies:

4. Maryland Department of the Environment (MDE)

1.9 Agency and Tribal Coordination and Public Involvement*

An interagency meeting including the cooperating and participating agencies was held on January 14, 2021, prior to the Alternatives Milestone Meeting, to discuss the scope of the study, to identify an initial array of alternatives, and to gather agency scoping comments. Coordination letters were sent to federal and state agencies in March of 2021 to gather scoping comments. A second interagency meeting was held on September 13, 2021, prior to the selection of the Tentatively Selected Plan, to discuss the updated array of alternatives, the status of the environmental evaluation, and to gather additional agency comments. Agencies participating in these meetings included USEPA, U.S. Fish and Wildlife Service (USFWS), NOAA NMFS, NPS, U.S. Coast Guard, MDE, Maryland Department of Natural Resources (MDDNR), Maryland Historical Trust (MHT), and the

City of Baltimore. Appendix H includes details related to agency, tribal and public coordination. Additional coordination was conducted throughout the study to address specific agency concerns.

Section 106 of the National Historic Preservation Act (NHPA) requires consultation with the State Historic Preservation Office (SHPO), federally recognized Native American tribes, and other interested consulting parties for proposed federal actions that may affect historic properties. The MHT is designated as the SHPO for Maryland. USACE initiated Section 106 consultation via letters dated February 3, 2021, with MHT, the Baltimore City Historical Society, Delaware Tribe of Indians, Pamunkey Indian Tribe, and Seneca-Cayuga Nation. No responses were received from the Baltimore City Historical Society, Delaware Tribe of Indians, Pamunkey Indian Tribe, or Seneca-Cayuga Nation. USACE also initiated Section 106 consultation with NPS via letter dated July 28th, 2021, and NPS agreed to be a consulting party pursuant to Section 106. Coordination with the Section 106 consulting parties is ongoing (refer to Section 6.9 for more information).

Meetings with the Association of Maryland Pilots were held during the study period to gather information related to shipping issues in the Harbor. A public meeting may be held during the public review period of the Draft Feasibility Report/EA.

2 Existing Environmental and Socioeconomic Conditions*

Chapter 2 describes the existing environmental and socioeconomic conditions found within the study area. This section represents the “affected environment” section for NEPA purposes. The conditions described are the existing (baseline) conditions, which provide a basis for plan formulation as described in Chapter 4 and the environmental consequences evaluation provided in Chapter 6. The topics in this section are structured to mirror the topics presented in Chapter 6, where the future without-project and future with-project alternatives are evaluated and compared. A combination of literature reviews, agency coordination, and information from previous Baltimore Harbor projects and NEPA documents were used to focus on relevant issues and sensitive resources to be addressed in this report. Each environmental, cultural, and socioeconomic topic was reviewed for its applicability to the project. Through this analysis, resource topics clearly not applicable to the proposed action were eliminated for further evaluation. Potential impacts to the resources listed in Table 2-1 would be non-existent, negligible, localized, and most likely immeasurable.

TABLE 2-1: RESOURCE TOPICS NOT EVALUATED

RESOURCE TOPIC	REASON FOR ELIMINATION
Submerged Aquatic Vegetation (SAV) and Oysters	Not applicable. No SAV or oyster habitat is located within the boundaries or adjacent to the study area (VIMS 2021).
Wetlands	Not applicable. The study area is located within a maintained navigation channel with water depths over 40 feet deep and does not support vegetated wetlands.
Marine Mammals and Sea Turtles	Not applicable. No marine mammals or sea turtles are found in Baltimore Harbor (NOAA 2018).
Bald Eagles	No Bald Eagle nests currently exist within or adjacent to the study area. The closest recorded Bald Eagle nest is located in Masonville Cove, which is not part of the study area and will not be used for dredged material placement for this study. The study area is not located in a Bald Eagle Concentration Area.
Migratory Birds	Negligible impact. The proposed action will have an immeasurable impact on migratory birds and their habitats protected under the Migratory Bird Treaty Act and Executive Order 13186. Impacts related to the placement site are addressed under the Cox Creek DMCF Environmental Assessment (2000).
Wild and Scenic Rivers	Not applicable. The study area is located in the Patapsco River, which is not designated as a Wild and Scenic River (NPS 2021).
Floodplains	Not applicable. The study area is not located within a floodplain, and the proposed action would not impact floodplains under the criteria in Executive Order 11988. Dredged material will be placed in an appropriately permitted upland disposal site able to handle and properly store dredged materials from the Harbor. The proposed action will not influence the chance of flooding in the local floodplain. No effect on local floodplains due to project implementation is expected, and impacts to floodplains, as defined in Executive Order 11988, are dismissed from further consideration.

2.1 Environmental Justice

Executive Order 12898 directs federal agencies to investigate the environmental and human health effects of their actions on minority and low-income populations.

2.1.1 Identification of Environmental Justice Communities

U.S. Census Data (USEPA 2021) was used to identify minority and low-income populations that could potentially be affected by dredging operations in the WSBC[1]. No minority or low-income populations are located within or directly adjacent to the existing navigation channel. Adjacent areas consist of Port facilities and other industrial complexes and commercial buildings.

Census tracts located within one mile of the study area (as measured from the outer edges of the WSBC) were included in the analysis. This approach to assess impacts on environmental justice communities was agreed upon during a meeting held with USEPA on October 13, 2021. Census tracts identified for the analysis included two tracts located in Baltimore City, Maryland (24510250600 and 24510260605) and two tracts located in Baltimore County, Maryland (24005421000 and 24005421102). Only a small portion of both census tracts located in Baltimore County are within one mile of the WSBC (Figure 2-1). The American Community Survey (U.S. Census Bureau 2021) was used to identify minority and low-income communities within these four census tracts. One census tract (24510250600) located across the river from the study area has no households and was excluded from analysis.

As of April 2020, Maryland reported a population of 6,177,224. Of the state total, 854,535 reside in Baltimore County and 585,708 reside within the City of Baltimore. For the state, 15.9% of the population is over 65 years old, whereas population over 65 years old is 14.5% and 17.6% in Baltimore City and Baltimore County, respectively. The census tracts identified in the study area (24510260605, 24005421000, and 24005421102) have 12.3%, 16.5%, and 19.2% of their respective population over 65 years of age.

The state of Maryland reported an unemployment rate of 5.7% as of October 2021. For 2019 unemployment rates for the State, Baltimore County, and Baltimore City were reported at rates of 3.5%, 3.6%, and 5.0%, respectively.

Low-income was determined by using the U.S. Census Bureau's 2019 poverty threshold for a 4-person household of $25,926. Of the three populated census tracts, one tract (24005421000) was identified as having a low-income community with a median household income of $24,556 (shown in red in Figure 2-1). This census tract, which includes the residential community of St. Helena, was identified as an environmental justice community. The other two census tracts have median household incomes ranging from $41,698 to $62,750, indicating that communities in these tracts, on average, do not

[1] This analysis was not conducted for the entire study area. At the time of the analysis, only two alternatives remained: the No Action Alternative and deepening and widening of the WSBC to a depth of -47 feet..

have low-income populations. Median household income in Baltimore County is $76,866 and Baltimore City is $50,379.

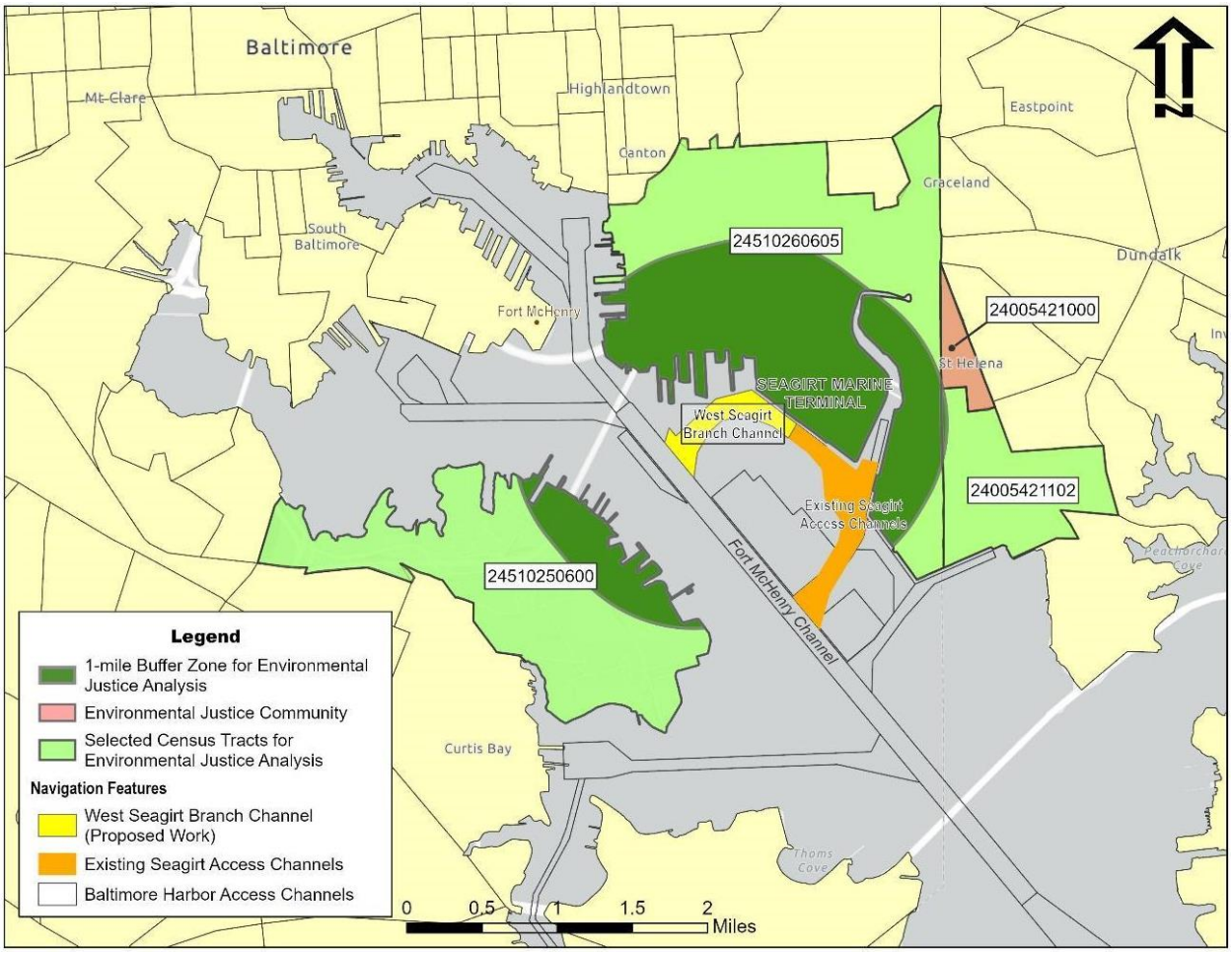

FIGURE 2-1: AMERICAN COMMUNITY SURVEY CENSUS TRACTS LOCATED WITHIN ONE MILE OF THE STUDY AREA

The state of Maryland consists of approximately 58.5% white and 41.5% non-white, the City of Baltimore is 31.8% white and 68.2% non-white, and Baltimore County is 60.2% white and 39.8% non-white. The three census tracts ranged from 14.4% to 33.0% non-white populations, which are below the average minority populations for the State of Maryland, Baltimore County, and Baltimore City. Based on CEQ guidance, a threshold of greater than 50 percent non-white population was used for this analysis, indicating that the census tracts evaluated did not meet the minority population threshold (greater than 50 percent) used for this analysis.

2.1.2. Environmental Justice Community Existing Conditions

The residential community of St. Helena, located approximately one mile from the WSBC, was identified as an environmental justice community for this analysis due to the median household income below the U.S. Census Bureau's poverty threshold. Traffic, air quality, and noise effects on this community from dredging operations in the WSBC are analyzed in Section 6.1.2. Below is a summary of existing conditions.

Traffic

Many of the roadways in the St. Helena community are Baltimore County restricted routes for commercial truck traffic (roads highlighted in blue in Figure 2-2). Restricted routes are roadway segments where trucks are prohibited from traveling from one end to the other without making a pickup or delivery along the roadway, unless travel is necessary to reach a pickup or delivery location. These routes are locally mandated and enforced. The "preferred route" for commercial truck traffic is Broening Highway, which is located south of the community (roads highlighted in red in Figure 2-2). Preferred routes are the roadways that drivers are recommended to use. While these routes hold no binding legal designation, their inclusion alongside the existing restricted routes creates a complete map that clearly communicates where large commercial vehicles should and should not be traveling and guides vehicle operators away from areas of concern (Baltimore County Department of Transportation and Public Works 2021).

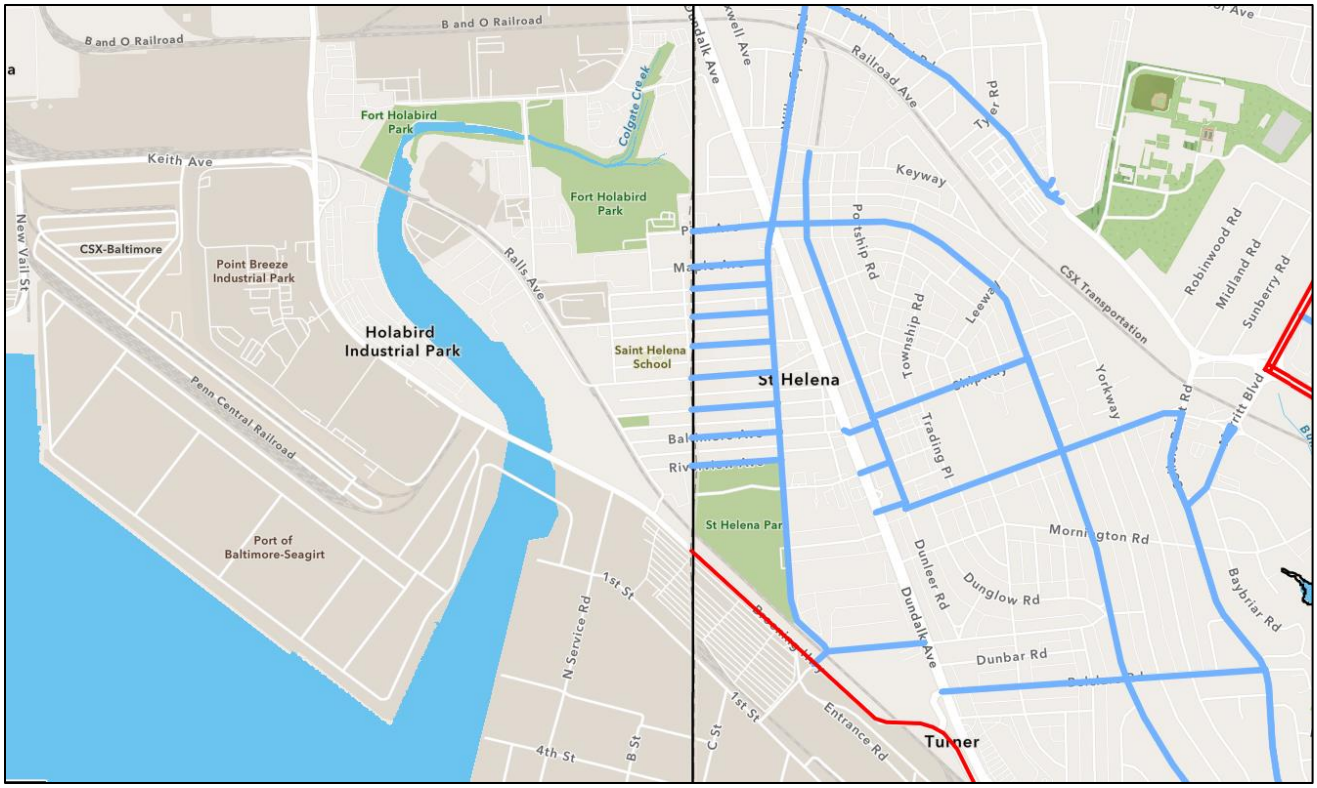

FIGURE 2-2: BALTIMORE COUNTY OFFICIAL TRUCK ROUTE MAP
Roads restricted to commercial traffic are shown in blue, Preferred Commercial routes are shown in red. (Baltimore County Department of Transportation and Public Works, 2021)

Air Quality

As will be described in Chapter 2.14, air quality within and surrounding the study area is not in compliance with the National Ambient Air Quality Standards (NAAQS) for certain criteria pollutants and is designated by the USEPA as a “nonattainment” area. St. Helena is located within Baltimore County, which has been designated as a nonattainment area for criteria pollutants including 8-hour ozone (2008) (moderate nonattainment), 8-hour ozone (2015) (marginal nonattainment), and sulfur dioxide (2010) (USEPA 2021).

Noise

St. Helena residents are exposed to the sounds of a city, including noise from cars, motorcycles, trains, police sirens, helicopters, commercial trucks, construction equipment, vessels, transit, and industrial/commercial activities, including a working port. Many of the homes built near urban industrial areas are older homes, often built without insulation that may buffer some of the noise. Noise loudness is measured in decibels (dB). In general, noise over 85 dB is harmful depending upon how long a person is exposed to the sound. Normal conversation is about 60 dB (Baltimore County 2020).

Traffic is the single greatest contributor to background noise levels in urban areas (Earth Journalism Network 2014). Heavy traffic is about 80 to 89 dB (Baltimore County 2020). Noise is associated with proximity to roads and public transportation and is higher among communities with mid-to-low incomes per capita (Huang et al. 2021). St. Helena is located between two major highways, I-95 approximately one mile west and I-695 approximately two miles east.

Port terminals located south and east of St. Helena conduct primary operations during daylight hours, so port facilities are producing less noise at night. Dredging activities can intermittently generate noise levels as high as 88 dBA (A-weighted decibels). The loudest expected sounds of 88 dBA from dredging operations can be expected to be attenuated to levels approaching 55 dBA (with levels exceeding the 65 dBA considered acceptable according to the Department of Housing and Urban Development Policy 24 CFR Part 51) approximately 2,000 feet from the source. Therefore, noise from dredging the navigation features in the study area likely attenuates before reaching St. Helena or may be muffled by the ambient background noise.

2.2 Topography and Bathymetry

The topography of the study area is level, with an approximate topographic range of 1 to 8 feet above mean sea level. No naturally occurring steep slopes occur along the channels or berthing areas. USACE Baltimore District (CENAB) performed a multi-beam hydrographic survey of the Seagirt Loop Channel and Anchorage 3 in February 2021. The survey indicates that only limited reaches of the channel in front of Berths 2 and 3 exhibit side slopes of 3H (Horizontal):1V (Vertical) or steeper. Most of the side slopes of the Seagirt Loop Channel are between 3H:1V and 5H:1V. Existing side slopes indicate slope steepness that is marginally stable. Refer to the Baltimore Harbor nautical chart (https://www.charts.noaa.gov/OnLineViewer/12281.shtml) to see the bathymetry throughout the study area (NOAA n.d.). Refer to Section 3.1.1 for a description of the bathymetry of the navigation features within the study area.

2.3 Geology, Sediments, and Soils

2.3.1 Geology

The Chesapeake Bay is located within the Atlantic Coastal Plain physiographic province and is underlain by sequences of clay, silt, sand, and gravel. The general geologic setting of Baltimore Harbor consists of a series of wedge-shaped sediment layers dipping and thickening bayward. The older, and generally harder, cretaceous sediments are encountered to the north and west within Baltimore Harbor, while younger and less compact tertiary and quaternary sediments are typically encountered eastward. The area

surrounding the study area is characterized by manmade, landfilled, and/or altered features.

2.3.2 Baltimore Harbor Sediments

Bottom sediments in the Chesapeake Bay and approach channels to Baltimore Harbor are predominantly clayey silt, with some locations containing a fraction of sandy material (CENAB 1997 and EA EST 2019). The upper Chesapeake Bay and Baltimore Harbor are zones of sediment deposition. The principal source of sediment is the Susquehanna River. The bottom sediments in the study area are generally characterized as soft, highly plastic, organic silty clay. The upper layer of sediment in the project area, varying from 0.5 to 3 feet thick, exists primarily in a semi-liquid state.

USACE routinely collects sediment samples in federally-authorized channels and anchorages. Previous testing for Baltimore Harbor Channels was conducted in 1995, 1998, 2002, 2005, 2008, 2012, and 2019. USACE testing does not include channels and anchorages maintained by MDOT MPA. MDOT MPA has performed sediment sampling in support of various activities, which recently included sampling of the Seagirt Loop Channel and Dundalk Loop Channel in 2019.

Sediment characteristics have been obtained from previous reports (CENAB 1997, MDOT MPA 2019, and EA EST 2019). In general, the site is characterized by very fine silt and clay sediments with a very low percentage of sand sediments. Surveys of bottom sediments by the Chesapeake Biological Laboratory in 1997 found that the sediments in the Patapsco River near the Masonville DMCF consisted of 90 to 95 percent silts and clays, while sediments closer to the mouth of the Patapsco were comprised mainly of sand sediments (CENAB 1997). Analyses conducted in 2019 confirm that sediments remain consistent with the 1997 survey findings (EA EST 2019).

2.3.2.1 West Seagirt Branch Channel and Seagirt-Dundalk Connecting Channels Sediments

Under contract with the MDOT MPA and Gahagan & Bryant and Associates (GBA), Soil and Land Use Technology, Inc. performed an extensive sediment sampling program in 2019 in support of a study to deepen the Seagirt Loop. Fifty-six (56) borings were drilled to an elevation of approximately -60 feet MLLW. Borings were located afront Berth 1, Berth 2, Berth 3, in the Seagirt-Dundalk Connecting Channel, and in the WSBC.

In nearly all boreholes, dark gray to grayish-brown and black silt and clay was encountered to the full depth of the borings. Natural water contents generally exceeded

100 percent and the average liquid limit, indicating that the sediments exist in a liquid state.

Analysis of a multi-beam survey performed by USACE in January 2021 shows the range of natural side-slopes that are achieved after dredging the channels. While some side slopes are as steep as 2H:1V (2:1) and 3:1, side slopes are generally between 4:1 and 5:1. If not for the low unit weight (approximately 86 pounds (lbs.) per cubic foot given the average properties above), the side slopes would be much shallower because of the low shear strengths (MDOT MPA 2019).

2.3.2.2 West Dundalk Branch Channel Sediments

Under contract with MDOT MPA and GBA, Findling Inc. performed a geotechnical investigation of the West Dundalk Branch Channel in 2012 in support of the proposed widening and deepening of the channel. The widening and deepening work has since been completed. A total of fifteen (15) borings were drilled in the area where the channel was widened.

All borings contained surficial layers of dark gray to green silt with trace fine sand. Beneath the surficial layer of silt, brown silty fine to coarse sand with varying amounts of gravel was found. The sand layer was encountered anywhere from approximately -43 feet MLLW to -53 feet MLLW. In some borings, only the silt layer was observed.

Natural water contents generally exceeded 100 percent and the average liquid limit, indicating that the sediments exist in a liquid state. Based on grain size analysis, the sand is classified as well-graded sand, poorly graded sand to silty sand, silty sand with interspersed layers of gravel. The gravel is classified as well-graded gravel and well-graded to silty gravel (Findling 2012).

2.3.2.3 South Locust Point Branch Channel and Turning Basin Sediments

A dredged material evaluation of Baltimore Harbor Channels was completed in 2019 by EA Engineering, Science, and Technology Inc. (EA EST) under contract with USACE. This evaluation was the latest in a series of routine evaluations to assess the physical and chemical attributes of the sediments within the federal channels and anchorages. Three samples were collected in the South Locust Point Channel and analyzed. A composite sample that was composed of all three samples was tested.

Grain size analysis indicated that the material within the South Locust Point Channel was sandy elastic silt. The material was highly plastic. The in-situ water content was 76 percent. Unlike the material within the Seagirt Loop and Dundalk Loop Channels, the material within South Locust Point exists in a plastic state.

Strength data was not collected as a part of the material evaluation. However, given the lower in-situ water content, it is presumed that while still weak, the material likely had more strength than the materials found within the Seagirt Loop and Dundalk Loop Channels. A multi-beam survey performed by USACE in January 2021 indicates most existing channel side slopes are between 3H:1V and 4H:1V. This also suggests the material is slightly stronger than the material found within the Seagirt Loop Channel (EA EST 2019).

2.3.2.4 Anchorages 3 Sediments

Sediment composition in Anchorage 3 was studied as part of the 1998 BHAC Project Feasibility Study. Ten (10) borings were collected in Anchorage 3. The borings were collected to a depth of approximately -45 feet MLLW.

Borings generally consisted of a silty, sandy, black, and brown clay layer within the full depth of the boring. The material was classified as a high plasticity clay. Water contents exceeded the liquid limit, indicating the material exists in a liquid state (CENAB 1997).

2.3.3 Baltimore Harbor Soils

Channel dredging and filling of wetlands in Baltimore Harbor began in the late eighteenth century. In general, the area reflects human influences on soil development. Soils in the study area are classified as Urban Land and Udorthents 9 (USDA 1988).

2.4 Water Resources and Water Quality

2.4.1 Surface Water Quality

Water quality conditions in the Chesapeake Bay area vary due to many factors including proximity to urban areas, type and extent of industrial activity, streamflow characteristics, and amount and type of upstream land and water usage. Water quality in the study area is poor. Water quality in Baltimore Harbor is impacted by a heavy volume of urban runoff, in combination with industrial and commercial discharges. Polluted discharge and runoff from land activities have degraded the overall water quality as well as the bottom habitat. Nutrient levels are relatively high, and algae blooms are frequent. During summer months, Harbor waters separate into warm surface waters with lower salinity and cool, deeper waters with higher salinity. Saline waters at greater depths frequently become hypoxic (dissolved oxygen less than 2 mg/L) during the summer months.

Under section 303(d) of the Clean Water Act, waterbodies that do not meet established water quality standards are subject to Total Maximum Daily Loads (TMDLs). A TMDL establishes the maximum limit of an impairing substance, or pollutant, a waterbody can

receive from all combined sources and still meet water quality standards for its designated use(s) and criteria. TMDLs also divide the limited load among point and nonpoint sources, known as a Waste Load Allocation (WLA).

The USEPA has developed an overall Chesapeake Bay TMDL, approved in 2010, which established watershed pollution limits for nutrients (nitrogen and phosphorus) and total suspended solids (TSS) for the entire Chesapeake Bay watershed. The TMDL is designed to ensure that all pollution control measures needed to fully restore the Bay and its tidal rivers are in place by 2025, with at least 60 percent of the actions completed by 2017. The pollutant limits for TSS and nutrients are designed to help states meet their state water quality standards for dissolved oxygen, water clarity, underwater Bay grasses coverage, and chlorophyll-a (an indicator of algae levels) because the reduction of sediment and nutrient pollution has been shown to be the best way to meet these water quality standards.

In Maryland, the USEPA has approved a Baltimore Harbor TMDL for nutrients, chlordane in sediments, trash and debris for the Middle Branch and Northwest Branch Portions of the Patapsco River, and PCBs in fish tissue within the Patapsco River due to its history of industrial use.

Under current regulatory practices, only placement sites have an allocation and are thus subject to the Bay TMDL and the WLAs; under the Baltimore Harbor TMDL, WLAs must be met for the discharge of water from dredged material placement operations at Cox Creek DMCF. These WLAs are enforced in Maryland under the National Pollutant Discharge Elimination System (NPDES) permit program through individual discharge permits for the Baltimore Harbor DMCFs.

2.4.2 Groundwater

Groundwater is addressed as part of this study because of potential impacts from widening the channels to aquifers used by the public and municipalities. The Baltimore industrial area has a long history of domestic, industrial, and municipal use of groundwater. This use most likely peaked during World War II, when use of groundwater was so great that saltwater intrusion became a problem. As a result, the probable maximum water table decline was during the same period. It is believed that water table levels have generally risen since that time, although in some areas industrial pumping has created cones of depression below sea level.

2.5 Essential Fish Habitat

An essential fish habitat (EFH) is defined under the Magnuson-Stevens Fishery Conservation and Management Act (Public Law 94-265), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The Sustainable Fisheries Act requires that EFH be identified for those species actively managed under federal fishery management plans. This includes species managed by the eight regional Fishery Management Councils, established under the Magnuson-Stevens Fishery Conservation and Management Act, as well as those managed by the NMFS under fishery management plans developed by the Secretary of Commerce (NOAA 1996).

EFH designations emphasize the importance of habitat protection to healthy fisheries and serve to protect and conserve the habitat of marine, estuarine, and anadromous finfish; mollusks; and crustaceans. EFH includes both the water column (including its physical, chemical, and biological growth properties) and its underlying substrate (including sediment, hard bottom, and other submerged structures). EFH is designated for a species' complete life cycle, including spawning, feeding, and growth to maturity, and may be specific to each life stage (e.g., eggs, larvae).

Species for which EFH have been designated in Baltimore Harbor are shown in the table below. These designations are based on the NOAA Estuarine Living Marine Resource program, the EFH habitat mapper tool and accompanying text descriptions, and NOAA EFH source documents.

TABLE 2-2: ESSENTIAL FISH HABITAT SPECIES AND LIFE STAGE

SPECIES	LIFE STAGE			
	EGGS	LARVAE	JUVENILES	ADULTS
Windowpane flounder (*Scophthalmus aquosus*)			X	X
Bluefish (*Pomatomus saltatrix*)			X	
Atlantic butterfish (*Peprilus triacanthus*)	X	X	X	X
Black sea bass (*Centropristis striata*)			X	X
X = EFH has been designated for a given species and life stage.				

In addition, several important prey species also use this area including spot (*Leiostomus xanthurus*), bay anchovy (*Anchoa mitchilli*), and blue crab (*Callinectes sapidus*). Prey species are a component of EFH because impacts to their populations can influence the productivity of commercially important species (VIMS 2021).

2.6 Fish and Wildlife

2.6.1 Finfish

Both resident and migratory fish inhabit Baltimore Harbor, although the abundance of species in the Harbor is dramatically reduced from the historical numbers of fish. There are very few bottom-dwelling species present, and there is a high occurrence of diseased fish. It is expected that the low numbers and the loss of diversity of fish in the project area is partly a result of the water quality problems and degraded benthic habitat.

Migratory species, particularly alewife (*Alosa pseudoharengus*), blueback herring (*A. aestivalis*), and American eel (*Anguilla rostrata*) migrate through the Patapsco estuary to the upper non-tidal section of the river. Migration times vary from spring through autumn depending on the species. Other migratory and resident fishes found in Baltimore Harbor include white perch (*Morone americana*), bay anchovy, hogchoker (*Trinectes maculatus*), Atlantic silversides (*Menidia menidia*), bluefish, channel catfish (*Ictalurus punctatus*), hickory shad (*Alosa mediocris*), American shad (*Alosa sapidissima*), and striped bass (*Morone saxitilis*). The blue crab (*Callinectes sapidus*) is a common shellfish in the harbor. White perch is the most abundant migratory species, with large numbers of both adults and juveniles present (NOAA 2021).

2.6.2 Birds

There are no nesting bird colonies within the study area, but four known nesting sites exist relatively near the site. An established colony of black-crowned night heron

(*Nycticorax nycticorax*), consisting of approximately 350 breeding pairs, nest at Sollers Point near the northern end of the Francis Scott Key Bridge. This is approximately three miles from the study area. Approximately 500 pairs of herring gulls (*Larus argentatus*) nest at a site on Sparrows Point, over three miles from the study area (CENAB 2001). Annually nesting by various species of gulls, double-crested cormorants (*Nannopterum auritum)*, and a mixed heronry (breeding ground for herons) is identified at Fort Carroll, which is over three miles from the study area. Masonville Cove, located just over two miles from the study area, hosts one of the only breeding pairs of bald eagles (*Haliaeetus leucocephalus*) in Baltimore City. An offshore barge just north of the cove hosts the only known common tern (*Sterna hirundo*) colony north of the Chesapeake Bay Bridge. Approximately 40 to 80 pairs of terns nest on the barge annually. Common terns are State listed endangered species; however, the Masonville DMCF is not a planned dredged material placement site for the Seagirt Study and lies outside of the project's vessel transit area so the colony would not be impacted. Resident species such as great blue herons (*Ardea herodias*), double-crested cormorants, and osprey (*Pandion haliaetus)* are found traversing the study area. Additionally, a variety of waterfowl species winter in the Harbor. These include mallards (*Anas platyrhynchos*), scaup (*Aythya sp.)*, bufflehead (*Bucephala albeola*), goldeneye (*Bucephala clangula*), ruddy duck (*Oxyura jamaicensis*), canvasbacks (*Aythya valisineria*), Canada geese (*Branta canadensis*), and black duck (*Anas rubripes*).

2.7 Benthic Fauna

Currently, the benthic macroinvertebrate community in Baltimore Harbor is substantially poorer in biomass and species diversity compared to historical conditions and to other areas in the Chesapeake Bay. A 2017 study reviewing benthic data from 1985-2016 concluded that abundance, number of species, and the biomass of large benthic species have declined in the Chesapeake Bay, and specifically in the Baltimore Harbor, due to hypoxia. Although hypoxia and other factors such as turbidity and nutrient runoff have resulted in degradation to benthic communities, the study suggests that year to year variability in benthic assessments shows benthic community resilience to stress and response to improvements in water quality. Improvements in water quality can be attributed to recent environmental laws and regulations (Versar 2017).

Few mollusks and crustaceans can be found in the project area, and no oyster bars are known to exist in the Harbor today. The layer of fluid mud that exists in most of the project area constitutes a poor substrate for many benthic species. The benthic communities that survive in the project area are not well developed and are made up of mostly pollution-tolerant species (EA EST 2003). The tubifex worm, a species tolerant of pollution, remained common in the Harbor throughout the study period (1985-2016), but

crustaceans and mollusks, species relatively intolerant of pollution, remained scarce. The low biomass and diversity of benthic organisms indicate that conditions in the area can be characterized as semi-polluted to polluted (Versar 2017).

2.8 Threatened and Endangered Species

Under Section 7 of the Endangered Species Act of 1973 (ESA), the action area includes the areas transited by dredging vessels/equipment and the areas under consideration for widening and/or deepening. The action area also includes the area of potential water quality impacts (turbidity plume during dredging). The geographic extent of water quality impacts is dependent upon factors such as the type of dredging equipment, the dredging depth, and environmental conditions such as wind and currents (CENAB 2016). The action area includes the range of noise impacts as they pertain to threatened and endangered species. This section provides a summary of the threatened and endangered species that are known or have the potential to occur in the action area. The action area is not designated as a critical habitat for listed or candidate species.

2.8.1 USFWS

The USFWS Environmental Conservation Online System Information for Planning and Consultation (ECOS-IPaC) identified the threatened northern long-eared bat (*Myotis septentrionalis*) as having the potential to occur in the action area. However, the action area is not located in a county with documented hibernacula or maternity roosts. The ECOS-IPaC also identified a candidate species, the monarch butterfly (*Danaus plexippus*), as having the potential to occur in the action area. However, there are no Section 7 requirements for candidate species (USFWS 2020).

2.8.2 NOAA NMFS

Threatened and endangered species under the purview of NMFS as having the potential to occur in the action area are the endangered Atlantic sturgeon (*Acipenser oxyrinchus*) and the endangered shortnose sturgeon (*Acipenser brevirostrum*) (NOAA 2019). Both species are also listed as endangered by the State of Maryland.

Atlantic Sturgeon

There are five distinct population segments (DPSs) of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*): the New York Bight, Chesapeake Bay, Carolina and South Atlantic DPSs are listed as endangered under the ESA, and the Gulf of Maine DPS is listed as threatened under the ESA. The range of all five DPSs extends along the Atlantic coast from Canada to Cape Canaveral, Florida. Atlantic sturgeon from all five DPSs could

occur within the Patapsco River/Baltimore Harbor and may forage throughout it if appropriate habitat conditions exist (NOAA 2013).

Atlantic sturgeon are well distributed throughout the Chesapeake Bay, typically from spring to fall. Atlantic sturgeon spawn in freshwater portions of large rivers. Spawning is known to occur in the following tributaries of the Virginia waters of the Chesapeake Bay: the James River (to Boshers Dam), Appomattox River (tributary of the James River; range not confirmed, but likely up to Battersea Dam), Potomac River (to Little Falls), Rappahannock River (range not confirmed, but likely throughout the entire river) and in the York River (to its confluence with the Mattaponi and Pamunkey Rivers) (NOAA 2021(a)). All of these spawning or potential spawning locations are located outside of the action area. Atlantic sturgeon spawn and develop within natal rivers, therefore eggs and larvae of Atlantic sturgeon would not occur in the action area. Although juvenile Atlantic sturgeon could occasionally venture into the action area year-round, they generally remain within natal rivers or seek winter refuge in overwintering areas, neither of which are known to occur in the action area (NOAA 2018). After emigration from the natal river, subadults and adults travel within the marine environment. Atlantic sturgeon may occur where suitable forage and appropriate habitat conditions are present. Only subadult and adult Atlantic sturgeon are expected to occur near the Patapsco River/Baltimore Harbor where the action is proposed to take place (NOAA 2013). The action area is not designated as critical habitat for the Atlantic sturgeon.

Shortnose Sturgeon

Shortnose sturgeon occur in large coastal rivers and estuaries along the east coast of North America and Canada. They are benthic and mainly occupy the deep channel sections of large rivers but will forage where food is accessible. Similar to Atlantic sturgeon, shortnose sturgeon will forage if appropriate habitat conditions exist (NOAA 2013). Shortnose sturgeon are rare in the upper Chesapeake Bay and extremely rare in the lower Chesapeake Bay. From 1996 to 2006, research programs that focused on Atlantic sturgeon throughout the Chesapeake Bay provided evidence of the capture of shortnose sturgeon. Only one genetically verified shortnose sturgeon was documented in the lower Chesapeake Bay at the mouth of the Rappahannock River, and 72 shortnose sturgeon were documented in the upper Chesapeake Bay from 1996 to 2006 (Balazik 2017). Before 1996, there were only 15 published records of shortnose sturgeon in the Chesapeake Bay and most of these were based on personal observations from the upper Chesapeake Bay during the 1970s and 1980s (NOAA 2010). A small, remnant spawning population may exist in the Potomac River, as evidence of a single female spawning in the Potomac was reported by Kynard et al. in 2009. The most recent report of a shortnose sturgeon was a catch in the Potomac River near the Chain Bridge in April 2021 (Bay

Journal 2021). One shortnose sturgeon was captured in the James River in 2016. This was the first verified occurrence of shortnose sturgeon inhabiting the James River (Balazik 2017).

Adult shortnose sturgeon occasionally use the C&D Canal to move from the Chesapeake Bay to the Delaware River. Adults may also occur in the Susquehanna River (up to the Conowingo Dam), foraging and potentially overwintering; in the Potomac River (up to Little Falls Dam) foraging, overwintering, and potentially spawning; and foraging in the Rappahannock River (NOAA 2021(b)).

It is possible that migrating or opportunistically feeding shortnose sturgeon may be present in the action area for short periods of time, but lack of established populations in and adjacent to the action area presumably make this less likely than in areas of the Chesapeake Bay closer to where established populations occur.

TABLE 2-3: THREATENED AND ENDANGERED SPECIES UNDER THE PURVIEW OF NMFS WITH THE POTENTIAL TO OCCUR IN THE ACTION AREA

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS	MARYLAND STATE STATUS	CRITICAL HABITAT IN ACTION AREA Y/N
Atlantic Sturgeon	Acipenser *oxyrinchus*	Endangered (LE)	Endangered (S1)	N
Shortnose Sturgeon	*Acipenser brevirostrum*	Endangered (LE)	Endangered (S1)	N

Federal Status Endangered LE - indicates that the Taxa listed as Endangered under the federal ESA; in danger of extinction throughout all or a significant portion of its range.
Maryland State Status Endangered S1 - indicates that the species continued existence as a viable component of Maryland's fauna is determined to be in jeopardy and is not only rare and at risk of elimination from within Maryland but also rare throughout its entire range and at risk of extinction.

2.9 Cultural Resources

This section describes cultural resources within the study's APE. As part of Section 106 consultation, a preliminary APE was defined to identify any potential historic properties that could be affected by the proposed project alternatives. The APE includes those areas where direct impacts are proposed and areas within which the undertaking may directly or indirectly cause alterations in the character or use of historic properties, including visual effects. For this project, the preliminary direct APE includes the proposed areas to be deepened or widened. The preliminary indirect APE includes the viewsheds of any nearby historic properties.

Cultural resources are locations of human activity, use, or occupation. They can be defined by expressions of human culture and history in the physical environment such as prehistoric or historic archaeological sites, buildings, structures, objects, districts, sacred sites, among others. Cultural resources may also include natural features, plants, and animals that are deemed important or significant to a group or community. It is important to note that historic properties, as defined by 36 Code of Federal Regulations (CFR) Part 800, the implementing regulations of Section 106 of the NHPA of 1966, as amended, are cultural resources that are eligible for or listed in the National Register of Historic Places (NRHP).

The potential for cultural resources within the direct and indirect APEs was assessed using MHT's Cultural Resources Information System, Medusa. Information gathered from Medusa included files pertaining to previously mapped archaeological and architectural resources and cultural resources surveys conducted within 0.5 miles of the project area.

2.9.1 Archaeological Resources

USACE used Medusa to gather existing information on previously conducted archaeological surveys and previously identified archaeological resources. This information is discussed below and listed in Table 2-4.

TABLE 2-4: PREVIOUS ARCHAEOLOGICAL RESOURCES INVESTIGATIONS

DATE	SURVEY NAME	SURVEYOR(S)	TYPE
1979	The Proposed Masonville and Seagirt (Canton Company) Disposal Sites for Interstate 95-Related Spoils, Baltimore City, Maryland	Dennis Curry	Phase I NHPA compliance
1979	Marine Cultural Resources Reconnaissance for the Baltimore Harbor and Channels 42-Foot Study	Daniel Koski-Karell	Phase I NHPA compliance
1994	Phase I Submerged Cultural Resources Survey, Baltimore Harbor and Anchorages Project, Baltimore, Maryland	R. Christopher Goodwin & Associates	Phase I NHPA compliance

Two archaeological surveys have been conducted in the vicinity of the direct APE and one was partially conducted within it. The earliest was a terrestrial Phase I survey

conducted outside of the direct APE in 1979 by Dennis Curry. This was completed for the proposed Masonville and Seagirt placement sites for material placement related to Interstate 95. Another survey was conducted outside of the direct APE in 1979 by Daniel Koski-Karell. This Phase I maritime survey was completed for USACE's Baltimore Harbor and Channels 42-Foot study. The third survey was completed by R. Christopher Goodwin and Associates in 1994 as part of an additional Baltimore Harbor and Anchorages project. This was a Phase I maritime survey, the northern portion of which is within the boundaries of the proposed project. No archaeological sites were identified within the direct APE.

2.9.2 Architectural Resources

USACE used MHT's Medusa to gather existing information on architectural resources within the direct and indirect APE. This information is discussed below and listed in Table 2-5.

TABLE 2-5: PREVIOUSLY IDENTIFIED ARCHITECTURAL AND ABOVE-GROUND RESOURCES

RESOURCE NAME	MARYLAND INVENTORY OF HISTORIC PROPERTIES NUMBER	NRHP ELIGIBILITY
Dundalk Historic District	BA-2213	Listed
Baltimore Municipal Airport Harbor Field	B-3603	Eligible
Baltimore Municipal Airport Air Station	BA-2094	Eligible
Western Electric Company/Point Breeze Plant Historic District	B-5298	Eligible
Canton Grain Elevator	B-985	Eligible
Fort McHenry National Monument and Historic Shrine	B-8	Listed
Star-Spangled Banner National Historic Trail	N/A	N/A
Captain John Smith Chesapeake National Historic Trail	N/A	N/A

No architectural resources are within the direct APE, but six resources are within the indirect APE. These are the Dundalk Historic District, Baltimore Municipal Airport Harbor Field, Baltimore Municipal Airport Air Station, Western Electric Company/Point Breeze Historic District, Canton Grain Elevator, and Fort McHenry National Monument and

Historic Shrine (Fort McHenry). Two of these are listed on the NRHP (Dundalk Historic District and Fort McHenry), while the other resources are eligible for the NRHP. Due to their importance as cultural resources, the Star-Spangled Banner National Historic Trail and the Captain John Smith Chesapeake National Historic Trail were also included to assess any impacts the proposed project may have on them.

2.10 Recreation

The recreational setting in and surrounding the Port is generally limited to boating-related activities. Although water use is predominantly related to commercial shipping, this area is also used by recreational and commercial boating and fishing enthusiasts. Sport fish frequently known to occur in the Patapsco River include white perch, channel catfish, striped bass, bluefish, and blue crab (CENAB 2001). Fort McHenry is located approximately 2 miles from the study area. There are an estimated 650,000 visitors to Fort McHenry annually, with most visits occurring from April to September. A breakdown of the average number of annual visitors is shown in Table 2-6 (Personal Communication July 12, 2021).

TABLE 2-6: FORT MCHENRY VISITORS – AVERAGE NUMBER OF VISITORS ANNUALLY PER CALENDAR QUARTER

CALENDAR QUARTER	VISITORS
January–March	97,500
April–June	260,000
July–September	195,000
October–December	97,500

Sections of the Captain John Smith Chesapeake National Historic Trail and the Star-Spangled Banner National Historic Trail are located in Baltimore Harbor and tidal portions of the Patapsco River. National Historic Trails are trails or routes of travel that have been identified by the Bureau of Land Management (BLM) as the travel routes of national historic significance. BLM protects these historic routes, remnants, and artifacts for public use and enjoyment. The NPS estimates that there are approximately 110,000 combined users of the Captain John Smith Chesapeake National Historic Trail and the Star-Spangled Banner National Historic Trail annually with 85-90 percent of the users occurring in the spring/summer/early fall months (Personal Communication June 17, 2021).

Masonville Cove Environmental Education Center is the nation's first Urban Wildlife Refuge Partnership and is located approximately two miles northwest of the study area

along the western shore of the Patapsco River. Masonville Cove is a birding “hot-spot” with over 251 bird species identified, including Baltimore City’s only pair of nesting bald eagles. It serves an important role in education, community engagement and outdoor recreation with an average of 994 visitors annually and over 2,500 visitors in 2021.

2.11 Aesthetics and Scenic Resources

The visual panorama within and surrounding the study area is typical of a commercial/industrial port. The area includes industrial, commercial, urban, residential, recreational, and tourist sites, as well as bridges, highways, and the waters of Baltimore Harbor. There are numerous towering cranes and related land-side infrastructure used for loading and unloading ships along the waterfront. Container vessels, tankers, bulk carriers, general cargo vessels, and other large commercial vessels use the anchorages, navigation channels, and port berths in Baltimore Harbor. There is general and constant activity as large vessels arrive and depart, and many smaller commercial vessels, including smaller tugboats and service vessels, and large and small recreational vessels move around the Harbor. Large recreational vessels include national and international passenger ships (cruise liners), which can dock at the Baltimore Cruise Terminal at South Locust Point on the Patapsco River in downtown Baltimore City (CENAB 2001).

Because much of the study area is low elevation with very slight relief, viewers can generally see long distances from locations that are only slightly higher than the surrounding area. From the ground level, these locations can only be seen from near the riverbank. However, both multi-story commercial and residential buildings can provide attractive waterfront views. Depending on the height of the individual building, these views can be had from a significant distance inland from the Harbor. There are elevated roads and highways and highway bridges that can be viewed from the study area, including the Francis Scott Key Bridge between Hawkins Point in Baltimore City and Sollers Point in Baltimore County.

2.12 Coastal Zone Management

The Maryland Coastal Zone Management Program (CZMP) was approved by NOAA in 1978, with the MDDNR acting as the lead agency. The CZMP is composed of several state planning and regulatory programs that enforce policies to protect coastal resources and manage coastal uses, including the Chesapeake Bay Critical Area Protection Program (CBCA). Maryland’s coastal zone follows the inland boundary of the counties and Baltimore City bordering the Atlantic Ocean, Chesapeake Bay, and the Potomac River (as far as the municipal limits of Washington, D.C), and includes all local jurisdictions within the counties and Baltimore City (NOAA 2012). As all study area work will occur within the Patapsco River (a tributary to the Chesapeake Bay) adjacent to the

City of Baltimore and associated dredging and placement have the potential to impact the coastal and biological resources of the State of Maryland, the study includes analysis under the CZMP (Attachment A3).

2.13 Hazardous, Toxic, and Radioactive Waste (HTRW)

Port-related activities in the past, and those activities that continue to take place at the Port, include the handling and storage of hazardous materials, including oil, chemicals, coal, steel, and ore. These activities have the potential to release HTRW into the Harbor during transfer operations or material handling, such as off-loading of fuel oils from tankers, lightening of cargo, and bunkering operations. USACE Engineering Regulation 1165-2-132, “Hazardous, Toxic and Radioactive Waste (HTRW) Guidance for Civil Works Projects”, dated June 26, 1992, provides guidance for consideration of HTRW issues and problems that may affect/be affected by USACE Civil Works projects. HTRW is a term used by USACE, and it primarily addresses “hazardous substances” as defined under the Comprehensive Environmental Response Cleanup and Liability Act (CERCLA).

A qualitative review of HTRW studies and investigations conducted in the study area dating back to the late 1960s was conducted; results of the Seagirt HTRW Investigation Report (Appendix G) conclude that the sediment in the Harbor is contaminated. The report detailed results from triennial USEPA Region 3 sediment analyses of Harbor sediments in 1995, 1998, 2002, 2005, 2009 and 2013, and revealed that metals (arsenic, chromium, copper, lead, mercury, nickel, silver and zinc) were found to exceed Probable Effect Levels (PELs) for a number of resident species. Zinc exceeded the PEL value most frequently. PELs represent contaminant concentrations above which adverse biological effects frequently occur. Additionally, some common organic contaminants found in Harbor sediments included DDD, DDE, and DDT polynuclear aromatic hydrocarbons (PAHs). These contaminants originated from several industrial and municipal sources, as well as from nonpoint sources, which would be expected in an urbanized/industrialized region.

The search range for the HTRW analysis is defined as any property within one-half mile of the target areas. At the time of the analysis, the target areas were defined as the Seagirt Loop Channel, South Locust Point Branch Channel, and Anchorage 3. There are several potential sources of environmental contamination identified in the vicinity of the target area. These include mostly industrial sources and municipal entities, including Constellation Power, a large quantity waste generator, and TE SubCom Baltimore, a very small quantity waste generator. Within the search range there are also five Maryland State Hazardous Waste Sites. There are several closed MDE listed Oil Control Program Cases listed within the study area that may have contributed to contamination of the

sediment in the Harbor during their operating life. Two Maryland Leaking Underground Storage Tank Recovery Sites are also located within the search range; both remain open.

Unexploded ordnance buried in the Harbor sediment may exist. Unexploded ordnance recovered during dredging operations would need to be handled and disposed of in an appropriate manner to prevent safety threats or detrimental impacts to the environment, in accordance with established safety protocols (Appendix G).

2.14 Air Quality

Sections 109 and 301(a) of the Clean Air Act as amended in 1990 [42 U.S.C. 7409(a)], and USEPA implementing regulations (40 CFR Part 50) define national, primary, and secondary ambient air quality standards as judged necessary to protect public health and welfare for “criteria” pollutants. USEPA regulations establish NAAQS. The agency publishes a list of all geographic areas relative to their compliance with NAAQS. Areas where NAAQS are being achieved are designated as “attainment” areas and are subject to Prevention of Significant Deterioration regulations. Areas not in compliance are designated as “nonattainment” areas. The project is located in Baltimore City, which is designated by the USEPA as a nonattainment area for 8-hour ozone (2015 Standard) (marginal nonattainment) and 8-hour ozone (2008 Standard) (moderate nonattainment) (USEPA 2021). There are several major point sources of air pollution near the study area that are part of MDE’s point source baseline, and MDE is evaluating these sources to find ways to reduce emissions. Baltimore City also impacts air quality in the study area with its transportation, infrastructure, industry, and power plants (CENAB 2001).

2.15 Greenhouse Gases (GHG)

The project area is primarily industrial, and GHG sources are extensive. Existing GHG sources in the study area include vehicles, marine vessels, and industrial production with additional residential and commercial sources throughout the region.

The City of Baltimore's 2017 GHG Inventory compared 2007 and 2017 emissions to assess the City’s progress toward its goal of reducing GHG emissions by 25 percent between 2007 and 2020. GHG emissions are mostly generated from the stationary energy sector (72 percent), with 25 percent of the total emissions from transportation within Baltimore City. The report shows an overall reduction in total CO2e emissions since 2007; however, the trend varies by the emissions source. Emissions from utility natural gas in the industrial and commercial sectors increased by approximately 50 percent and emissions from leaky pipelines within the city limits have risen by about 13 percent. Emissions from utility electricity generation for residential buildings decreased by 32 percent, and emissions from utility electricity generation for industrial, institutional, and

commercial facilities decreased by 24 percent. This significant reduction in emissions from electricity generation is mostly due to a decrease in the use of coal power and an increase in the use of natural gas (Gaeta et al. 2020).

In efforts to reduce climate change impacts related to GHG emissions from the Port, the MDOT MPA voluntarily entered into an agreement with MDE and the Maryland Energy Administration to reduce emissions and increase the energy efficiency of the Port. The details of this agreement are captured in the 2030 MDE Greenhouse Gas Emissions Reduction Act Plan with initiatives that include:

- Quantifying emissions from the Port operations through landside and waterside emission inventories to identify target areas for reductions.
- Securing funds to replace or retrofit less efficient diesel engines in drayage trucks, cargo handling equipment, harbor craft, and switch locomotives.
- Beneficially using dredged material for wetland and coastal restoration.
- Utilizing new technologies to track movements at the terminal to reduce trips, idling, and emissions.

MDOT MPA reports that these initiatives resulted in a 23 percent reduction in CO2 emissions between 2012 and 2016, with a corresponding 10 percent increase in cargo (MDOT MPA 2018).

In addition, the Port in a partnership with PAC, has committed to modernization efforts at the SMT (to be completed in 2022) that will result in improved emissions efficiencies related to terminal equipment improvements and reductions in truck traffic. These advancements to the Terminal Operating Systems allow for aggressive management to reduce congestion and reduce turn times, main gate improvements include a weigh in motion scale, allowing inbound trucks to be weighed without stopping, and the electrification of rubber-tired gantry equipment ensure increases in landside efficiency that result in reductions in GHG emissions. Aligned with improvements in cargo handling at the terminal, the Howard Street Tunnel Improvement project in Baltimore, will result in double-stacked container trains moving to and from the Port and is expected to result in a reduction of 1.2 billion truck vehicle miles traveled and reduce fuel consumption by an estimated 137 million gallons over 30 years.

2.16 Noise and Vibration

Noise and vibration are defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or diminishes the quality of the environment. Response to noise varies by the type and characteristics of the noise source, distance from the source, receptor sensitivity, and time of day. Noise can be

intermittent or continuous, steady, or impulsive, and it may be generated by either mobile or stationary sources. Changes in noise are typically measured and reported using a weighted sound intensity (or level) that represents sound heard by the human ear and is measured in units called decibels (dB). In general, noise over 85 dB is harmful depending upon how long a person is exposed to the sound. Normal conversation is about 60 dB (Baltimore County 2020).

There are several sources of ambient noise within the study area that can be attributed to both natural (wind, waves, fish, tidal currents, mammals) and anthropogenic (commercial and recreational ships/vessels, dredging, pile driving, etc.) inputs. While some anthropogenic underwater noise is produced intentionally (e.g., naval sonar, echosounders), most noise sources are an incidental by-product of human activity (e.g., shipping, construction) (Farcas et al. 2016). For underwater environments, ambient noise includes tides, currents, and waves, as well as noise produced by marine mammals, fish, invertebrates, and humans. Low frequency noise levels such as these, as well as noise produced by human activities, tend to carry long distances in the water but are attenuated the farther away one is from the source.

Noise levels within and around the study area are consistent with an urban, industrial setting. The study area is a working harbor with adjacent land use characterized largely by industrial, commercial, and residential uses, along with significant roadways and associated truck and car noise. Noise sources for vessels include cranes, whistles, and various motors for propulsion, while adjacent dockside noise sources include cranes, trucks, cars, and loading and unloading equipment.

All MDOT MPA terminals and Ports are required to operate in accordance with federal, state, and local regulations and noise ordinances including 46 CFR 504 Federal Maritime Commission Procedures for Environmental Policy Analysis, Code of Maryland Regulations (COMAR) 11.01.08.07 Implementation of the Maryland Environmental Policy Act, and Maryland Annotated Code, Environment, Noise Control § 3-101, COMAR 26.02.03. It is the goal of the MDOT MPA to avoid any violation of the federal, state, and local regulations and ordinances for all Port facilities. The following criteria provide a directive for the scenarios in which MDOT MPA properties emit noise.

TABLE 2-7: MDOT MPA NOISE IMPACT CRITERIA MAXIMUM ALLOWABLE NOISE LEVELS (DB(A)) FOR RECEIVING LAND USE CATEGORIES

DAY/NIGHT	INDUSTRIAL	COMMERCIAL	RESIDENTIAL
Day	75	67	65
Night	75	62	55

Other noise sources, such as active train tracks and major highways, lie within the vicinity of the project area. The closest noise receptor (a non-industrial/commercial site that is exposed to noise pollution from activities that occur in the study area) is a residential community, St. Helena, which is located approximately one mile from the study area along the Baltimore City-Baltimore County line. Another nearby noise receptor is Fort McHenry, which is located approximately two miles from the study area.

3 Existing and Future Economic and Navigation Conditions

This section describes the existing condition and Future Without Project Condition (FWOP) of the project area. The existing condition includes all navigation conditions and actions completed to the current time (2022). The FWOP describes the future conditions if no new actions result from this planning study. The baseline condition in base year 2030 is assumed to be the same as the FWOP. The existing and FWOP conditions serve as a baseline that will be compared to the future with project condition to evaluate differences resulting from the proposed plans. This comparison is integral to the selection of the Tentatively Selected Plan (TSP).

3.1 Period of Analysis

The period of analysis for this study is 50-years per ER 1105-2-100. The planning horizon starts in the base year 2030 and ends in year 2079. The base year 2030 was selected as the beginning of benefits assuming that all water-side (channel deepening) and land-side improvements (modernization efforts, berth 1-2 deepening and crane installation) at SMT are completed by that time, which is a conservative estimate beyond the completion of the proposed work in this study estimated to be 2028. Existing conditions detailed in this report reflect conditions in place during the feasibility study through 2022. FWOP conditions consider a range of activities from 2021, the most recent year for which complete data was obtained, through the base year based on current and forecasted plans to be implemented by the base year. The TSP will also be assessed for engineering and environmental performance out to 100 years from the base year, from 2030 to 2130. The 100-year planning horizon is determined by USACE Principle and Guidelines for considerations of coastal sustainability and adaptation to relative sea level rise.

3.2 General Setting

The study area includes the 32-square mile area of the Patapsco River and its tributaries that comprise Baltimore Harbor and the associated Port of Baltimore facilities. Ships reach the Port of Baltimore by traveling one of two routes along the Chesapeake Bay navigational channel system. Some ships travel south through the C&D Canal, which links the Delaware River with the northern end of the Chesapeake Bay. The C&D Canal, which is owned and operated by USACE Philadelphia District, is 35 feet deep, limiting the size of ships able to utilize this channel but making it suitable for RORO carriers. Most ships that call on the Port of Baltimore access the Port of Baltimore from the south utilizing the 50-Foot Channel, which extends 150 NM from the mouth of the Chesapeake Bay to the Port of Baltimore. These two options provide flexibility to arrange trade routes that minimize distances between ports of call.

According to the Waterborne Commerce Statistics Center, in 2019, Baltimore was the 15th largest U.S. container port in terms of Twenty-foot Equivalent Units (TEU) throughput. The major trade lanes include Europe, Asia, South America, and the Mediterranean. The Port services consumers in the Baltimore metropolitan area and markets in the Midwest, Pennsylvania, and West Virginia.

Port of Baltimore terminals are accessible via rail or truck. The rail system is served by two Class I railroads, CSX Transportation and Norfolk Southern Railroad. The Port is located within 700 miles of major cities and population centers in the Northeast and Midwest.

The BHAC channel system is the primary focus of this study. The BHAC consists of the federally-authorized navigation features summarized in Table 1-1 and include the Seagirt Loop Channel, the Dundalk Access Channels, the South Locust Point Branch Channel and Turning Basin, and Anchorages 3 and 4. These navigation features and land-side features are described in this section.

3.3 Existing Navigation Features

Seagirt Loop Channel

The Seagirt Loop Channel includes all channels to access the SMT. The Seagirt Loop Channel consists of the WSBC, the West Dundalk Branch Channel, and the Dundalk-Seagirt Connecting Channel. The Seagirt Loop is federally-authorized to a depth of -42 ft MLLW with a minimum width of 500 feet. The West Dundalk Branch Channel and the Dundalk-Seagirt Connecting Channel were deepened and widened by the State of Maryland in 2012 and are currently maintained to a depth of -50 feet MLLW. The Dundalk-Seagirt Connecting Channel also includes a turning basin and wideners currently used by larger draft vessels calling at Berth 3 and 4 to exit along the existing -50 feet channel network. The WSBC is maintained by the State of Maryland to -45 feet MLLW. The proposed action includes deepening and widening of the WSBC to complete the Seagirt Loop Channel, which will enable larger-draft vessels to call at the SMT and exit from the terminal without backing.

Dundalk Access Channels

The Dundalk Access Channels include all access channels to Dundalk Marine Terminal branching from the Fort McHenry Channel. The Dundalk Access Channels include the West Dundalk Branch Channel, also used by vessels to access the SMT, the Dundalk Connecting Channel and the East Dundalk Branch Channel. The East Dundalk Branch Channel and the Dundalk Connecting Channel are currently maintained to the federally-authorized depth of -42 feet MLLW.

South Locust Point Branch Channel

The South Locust Point Branch Channel and Turning Basin includes all access channels to the South Locust Point Marine Terminal. The South Locust Point Branch Channel is currently maintained to a depth of -36 feet MLLW, a width of 400 feet, and is approximately 1.0 statute miles long, with widening at the bends and entrances.

Anchorages (3 and 4)

There are currently two federally-authorized anchorages in the BHAC project, Harbor Anchorages 3 and 4. Harbor Anchorage 3 includes three anchor locations (3A-C). Anchorage 3A is 2,200 feet wide by 2,200 feet long and is maintained to -42 feet MLLW. Anchorage 3B is 1,800 feet wide by 1,800 feet long and maintained to -42 feet MLLW. Anchorage 3C is 1,500 wide and 500 feet long and maintained at a depth of -35 feet MLLW. Harbor Anchorage 4 is 1,800 feet wide by 1,800 feet long and maintained at a depth of -35 feet MLLW.

3.3.1 Navigation Operational Behaviors

Vessels drafting in excess of 35 feet must enter Baltimore Harbor via the mouth of the Chesapeake Bay, transiting the 150 nm from the bay to Baltimore Harbor using the -50-foot MLLW channel system. The Maryland Approach Channels and Harbor Channels, which allow vessel passage from the Chesapeake Bay Bridge into Baltimore Harbor are constructed and maintained to widths ranging from 600 to 700 feet. Broad- beamed vessels must wait at the Annapolis Anchorage, south of the Bay Bridge to allow other wide-beam vessels to clear the channels before approaching the Port of Baltimore.

On exiting their berth, vessels at SMT that draft in excess of -42 feet MLLW must be backed out of their berth with the assistance of tugs and turned in the turning basin at the mouth of Colgate Creek, adjacent to Dundalk Marine Terminal. This maneuver can involve stopping the vessels' main engine to change from astern propulsion to forward propulsion. Main engine power may be lost during this transition, as occurred during an incident in February of 2017, which creates safety concerns for allisions with terminal infrastructure when completing this maneuver.

Anchorage 3 and 4 are general anchorages. No vessel shall remain in Anchorage 3A, 3B, or 4 for more than 24 hours without permission from the Captain of the Port. No vessel shall remain in Anchorage 3C for more than 72 hours without permission from the Captain of the Port (33CFR§110.158).

3.3.2 Terminal Facilities

The Port marine facilities consist of private and public terminals located in the City of Baltimore capable of handling containers, RORO automobiles, forest products, and breakbulk. The SMT is the only dedicated container terminal at the Port and handles 97% of the Port's container cargo. Some containers are handled at other terminals periodically. Only those terminals that may be directly affected by this study are described here. In 2021, the Port ranks first for volume of autos and light trucks, RORO heavy farm and construction machinery, and imported gypsum. As of 2020, it ranks 11th among major U.S. ports for cargo handled and ninth nationally for total cargo value. In 2019, 857,890 cars and light trucks crossed the Port's public and private piers, the most in the U.S. for the ninth consecutive year. In 2019, the Port also handled a record 657,059 containers at the public terminals.

Figure 3-1 shows a map of the Port facilities including the container terminals. The terminals include SMT, Dundalk Marine Terminal, and South Locus Point Marine Terminal.

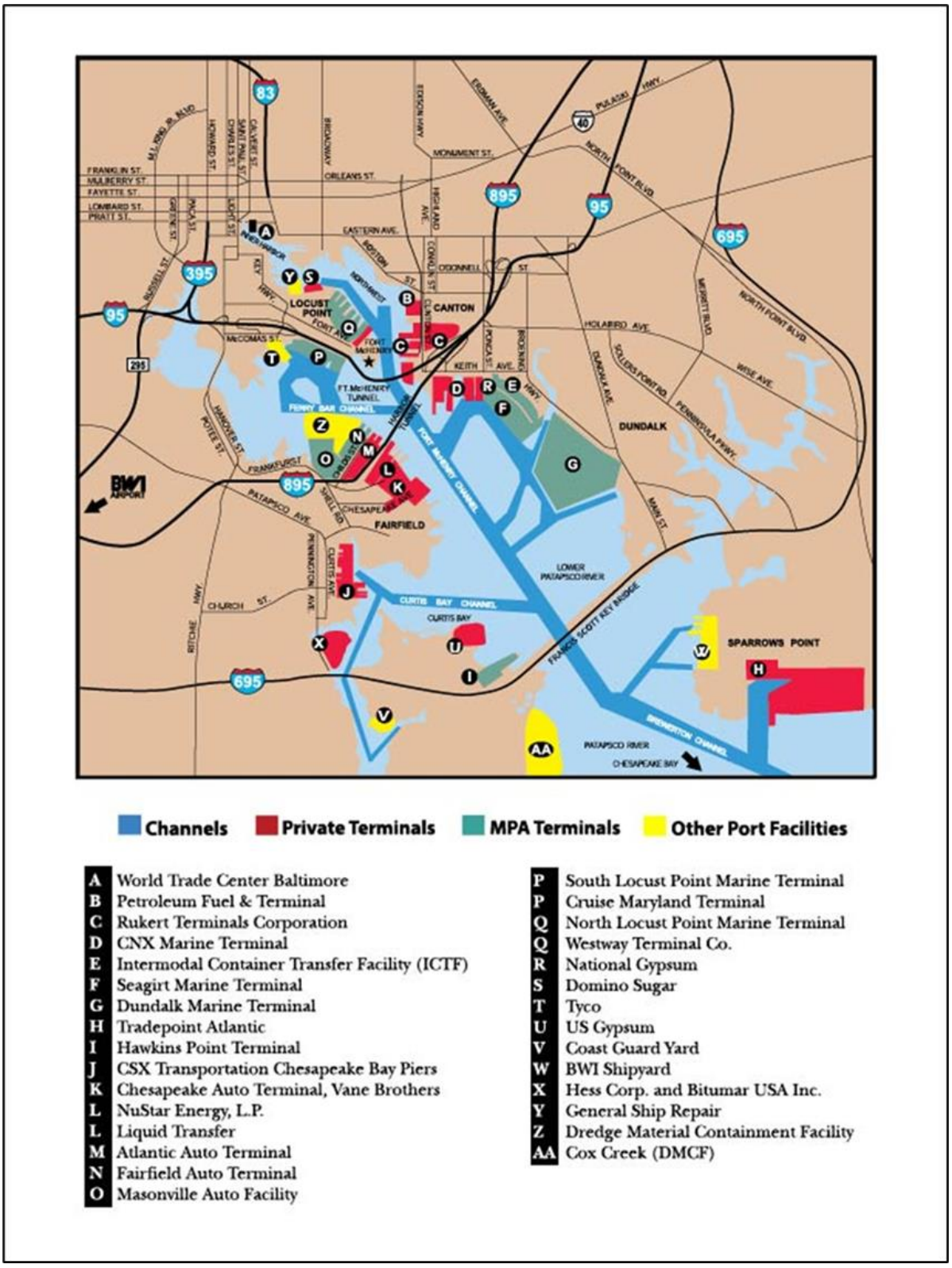

FIGURE 3-1: PORT OF BALTIMORE CHANNELS, TERMINALS, AND FACILITIES

Seagirt Marine Terminal

SMT is located directly across Colgate Creek from the Dundalk Marine Terminal on the east banks of the Patapsco River. Opened in 1990, SMT is a state-of-the art, 284-acre container terminal currently operated by Ports America Chesapeake (PAC). The terminal consists of four berths. Berths 3 and 4 have been deepened to -50 feet MLLW and feature the latest in cargo-handling equipment and systems with cranes capable of servicing two 16,000 TEU vessels simultaneously. The two remaining berths are -45ft MLLW with total alongside length of 3,127 feet. Each berth is capable of servicing 9,200 TEU vessels. The terminal can handle 900,000 container lifts a year; its capacity is expected to grow to 1.4 million container lifts by 2027. The storage yard is capable of handling 2,500,000 TEU. This terminal has direct connection to the Intermodal Container Transfer Facility (ICTF) operated by CSX Transportation and is close to I-70, I-81, I-83, I-95, I-97, and I-895.

South Locust Point Terminal

South Locust Point Terminal has three 36-foot-deep berths, one 100-short ton revolving gantry crane, and direct rail access. South Locust Point is also the location of the Port's 60,000-square foot cruise ship terminal. The terminal is located 0.75 miles from highway I-95. Cargo at the 79-acre terminal primarily includes forest and paper products and project cargo.

Dundalk Marine Terminal

Dundalk Marine Terminal is located on a peninsula bordered by the Patapsco River to the south and east, and Colgate Creek to the west. Dundalk Marine terminal has 13 berths, six container cranes, and direct rail access. This 570-acre terminal, with 9,500 feet in berth length, is the largest and most versatile general cargo facility at the Port. Cargo includes containers, automobiles, farm, construction and other RORO equipment, wood pulp, steel, breakbulk, and project cargo. The terminal has direct access to Norfolk Southern Railroad. Berths 1 through 4 were designed to accommodate vessels with drafts up to 34 feet, while Berths 5 and 6 were designed to accommodate vessels with drafts up to 50 feet. Berths 7 through 10 are located along the South Wharf and have a 42-foot depth. The East Wharf contains Berths 11 through 13 at a 42-foot depth.

Baltimore's proximity to the Midwest's major farm and construction equipment manufacturers has helped the Port become the leading U.S. port for the export of combines, tractors, and hay balers, in addition to importing excavators, and backhoes.

3.4 Port Operations and Economic Considerations

The existing Port operations consist of container storage capacity, cargo composition, fleet composition, container services, and route groups.

3.4.1 Container Storage and Distribution Centers

Distribution Centers are an integral component of importers' and exporters' internal supply chains. Distribution Centers not only provide the warehousing space necessary for storing the goods received from/delivered to the Port, but in a current business environment characterized by hub-and-spoke supply chains and "last-minute" orders, they oftentimes serve as central nodes in a company's regional or national logistics network and allow for value-added services such as consolidation/deconsolidation, cross-docking, and trans-loading (removing contents of international marine containers and repackaging in 53 foot domestic containers to create economies of scale for domestic delivery). Consequently, Distribution Center locations can influence importers', exporters', and container shipping lines cargo routing and port selection decisions. Approximately 70 percent of imports are destined to a storage center within 50 miles of the port, 14 percent are within 50-100 miles, and 7 percent are within 100-200 miles. Maryland has over 9,135 distribution and logistics companies operating within the state

3.4.2 Cargo Profile

The Port of Baltimore handled approximately 1.0 million TEUs in 2020. The largest containerized volumes are furniture, followed by machinery and appliances, plastic, and beverages. The largest containerized export volumes are wood pulp followed by vehicle parts, plastic, and wood. The lead trading partner is China for both imports and exports. Vietnam is second in total trading volume for imports and India for exports. Brazil is third in terms of volume traded for imports and Vietnam for exports. Figure 3-2 shows historical TEUs traded at the port.

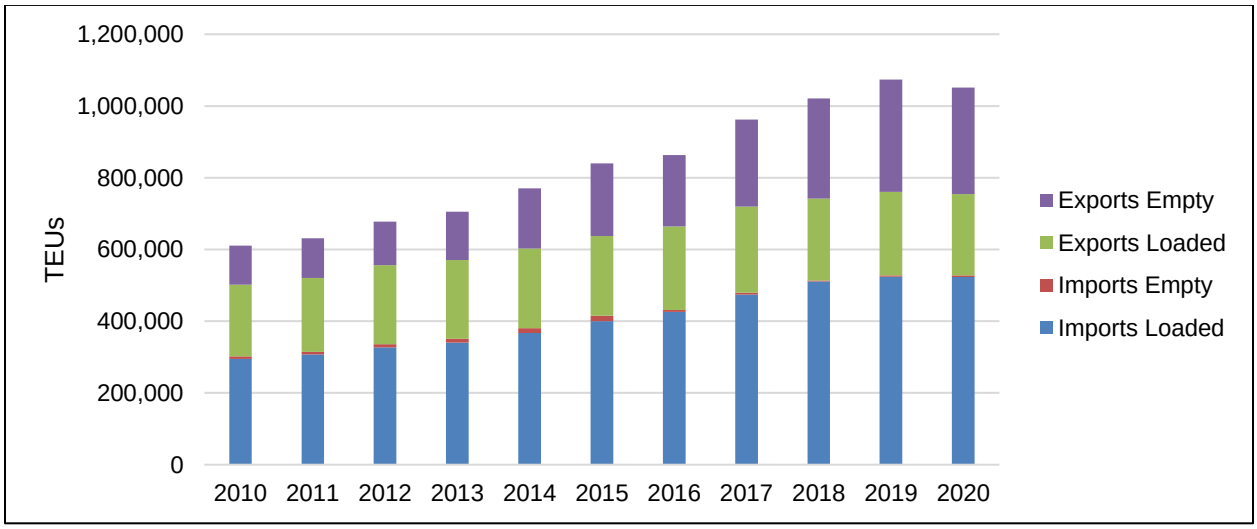

FIGURE 3-2: PORT OF BALTIMORE TEUS, 2010-2020

3.4.3 Historical Commerce

The Port of Baltimore captures 16.2 percent of the North Atlantic market share. The Port exports and imports approximately the same amount based on TEUs. The Port is located in the heart of the City of Baltimore and provides access to 6.8 million local consumers in the Baltimore-Washington Metropolitan Region with one of the highest household incomes in the nation. In addition, the Port's rail and truck connections allow shippers to reach 32 percent of U.S. consumers within 24 hours of calling port.

Based on data for years 2010 to 2020, shipments averaged approximately 837,000 TEUs. Of this total, imports accounted for approximately 416,000 TEUs, while exports accounted for 421,000 TEUs, each accounting for approximately 50 percent. Figure 3-3 shows historical containerized metric tonnage moving through Baltimore Harbor.

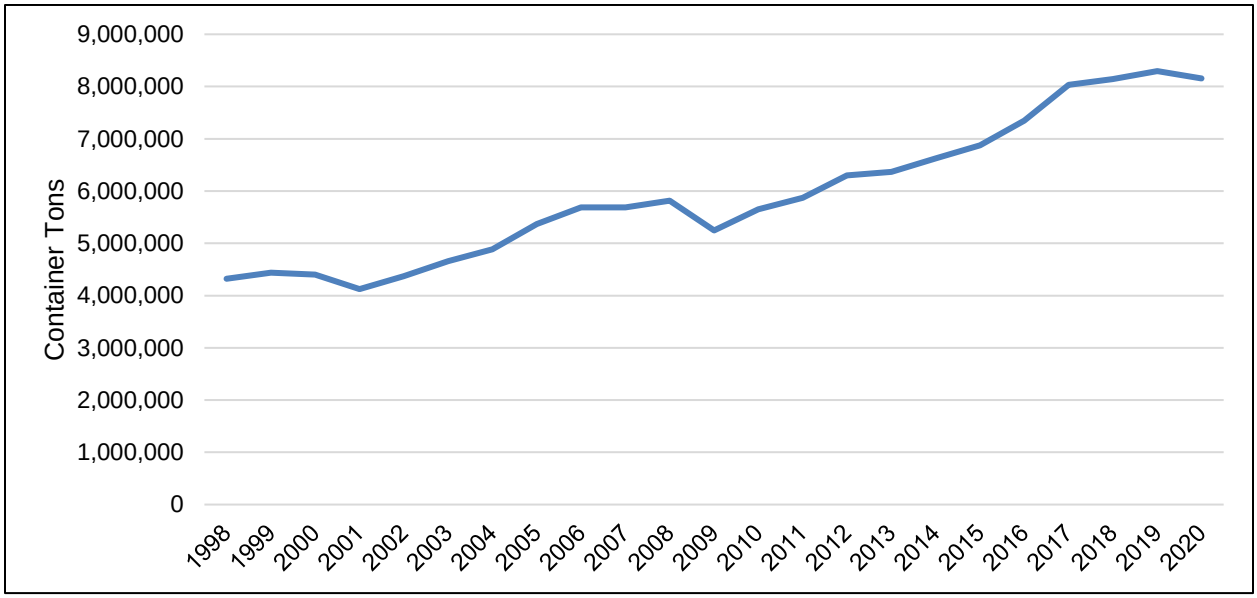

FIGURE 3-3: PORT OF BALTIMORE HISTORICAL CONTAINERIZED TONNAGE, 1998-2020

3.4.4 Fleet Composition

Data for the container fleet was obtained from the Waterborne Commerce Statistics Center, the National Navigation Operation & Management Performance Evaluation Assessment System (NNOMPEAs) and the MDOT MPA to determine vessel characteristics of the fleet calling the Port. The ships are classified as sub-Panamax, Panamax, post-Panamax Generation I (PPX Gen 1), post-Panamax Generation II (PPX Gen 2), post-Panamax Generation III (PPX Gen 3) and post-Panamax Generation III max (PPX Gen 3 max). The vessels are distinguished based on physical and operation

characteristics, including lengths overall (LOA), design draft, beam, speed and TEU capacity. Containership classes overlap in all facets of dimensions, such as length, beam, depth, and TEU capacity. For purposes of this study, Table 3-1 shows the breakdown of the containership class sizes. For the purposes of this analysis, beam width was the characteristic that separated the classes.

TABLE 3-1: CONTAINERSHIP CLASSIFICATIONS

SIZE CLASSIFICATION	DIMENSION	DIMENSION RANGE (FEET)	
		MINIMUM	MAXIMUM
Sub Panamax (TEU size brackets: 0.1-1.3, 1.3-2.9 k)	Beam	34.8	98.2
	Draft	8.2	38.1
	LOA	221.7	813.3
Panamax (TEU size brackets: 1.3-2.9, 2.9-3.9, 3.9-5.2 k)	Beam	98.0	106.0
	Draft	30.8	44.8
	LOA	572.0	967.5
Post Panamax (PPX Generation 1)	Beam	120.0	138.0
	Draft	35.4	47.6
	LOA	920	1,044.7
Super Post Panamax (PPX Generation 2)	Beam	139.0	144.0
	Draft	39.4	49.2
	LOA	910.7	1138
Ultra Post Panamax (PPX Generation 3 and Generation 3 max) (MSI size brackets: 5.2-7.6, 7.6-12, 12 k +)	Beam	160.0	176
	Draft	40	52
	LOA	**1,098**	**1,300**

Figure 3-4 shows historical trends in containership vessel sizes and fleet composition for Baltimore Harbor. As shown, Sub-Panamax vessels continue to be used at relatively the same rate. Panamax size vessels show a dramatic reduction as larger Post-Panamax vessels are used.

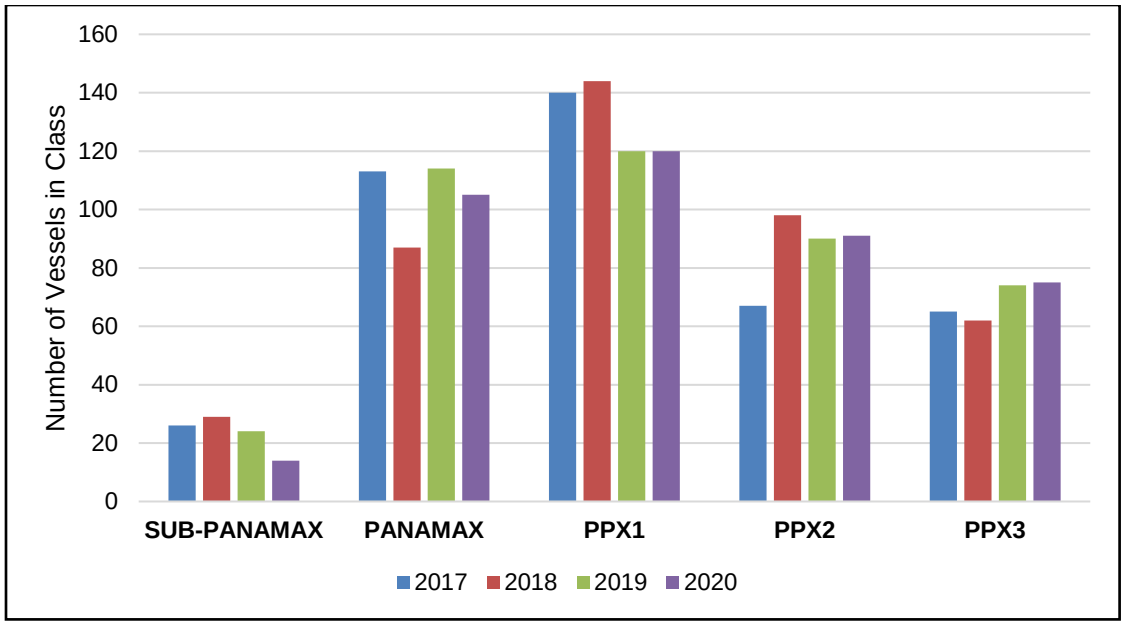

FIGURE 3-4: CONTAINERSHIP VESSEL TRENDS. 2017-2020

3.4.5 Container Services

Baltimore Harbor has 11 regular container services. Table 3-2 shows the number of services serving by region as of 2021.

TABLE 3-2: CONTAINER SERVICES

WORLD REGION	SERVICE NAME	AVERAGE TEU CAPACITY	MINIMUM TEU CAPACITY	MAXIMUM TEU CAPACITY
Asia	OCEAN Alliance	12,022	8,508	13,900
Asia	Maersk	4,471	4,250	5,100
Asia	2M Alliance	11,036	9,038	13,630
South Asia	MSC Indus 2	7,444	6,402	9,200
Europe and Mediterranean	2M Alliance	8,573	8,034	9,200
Europe	2M Alliance	7,762	6,178	8,241
Europe	ACL	3,809	3,809	3,809
Africa	Grimaldi Line	932	612	1,318
Africa/Caribbean	MSC/Maersk	2,644	1,798	3,674
Caribbean/South America	MSC – ZIM	6,152	5,248	6,969
South/Central America	Maersk Line/Hapag-Lloyd	4,137	3,752	4,544

3.4.6 Route Groups

Numerous container services call Baltimore Harbor which are operated by many carriers and have trade routes that originate in various parts of the world. Therefore, services were grouped by the world region they serve. For example, there are a number of services that call on various ports in the Far East, transit the Panama Canal, proceed to ports along the east coast United States and then return to the Far East. Cargoes were aggregated into route groups for forecasting, modeling and presentation purposes based on world regions and vessel composition. Vessel service information was provided by MDOT MPA. Two route groups were needed for creating the vessel call list for this study. One being a default route group since four of the alternative depths were in-port benefits and one for estimating the distance and time for a route to South Asia via the Suez Canal. The South Asia route has been identified as a benefitting service for this study. See Appendix C for more information. Table 3-3 shows the regions, route groups, and the distance of each route.

TABLE 3-3: ROUTE GROUP INFORMATION

ROUTE GROUP REGIONS	ROUTE GROUP NAME	DISTANCE DISTRIBUTION		
		Minimum	Most Likely	Maximum
Default	Default	0	0	0
Far East – Indian Subcontinent – Southeast Asia – Suez Canal – East Coast United States	FE-SUEZ-ECUS	18,000	19,000	20,000

3.4.7 Underkeel Clearance

The measure of underkeel clearance (UKC) for economic studies was applied according to the planning guidance. According to this guidance, UKC is evaluated based on actual vessel operator and pilot practices within a harbor and subject to present conditions, with adjustment as appropriate or practical for with-project conditions. Generally, practices for UKC are determined through review of written pilotage rules and guidelines, interviews with pilots and vessel operators, and analysis of actual past and present practices based on relevant data for vessel movements. Typically, UKC is measured relative to immersed vessel draft in the static condition (i.e., motionless at dockside). When clearance is measured in the static condition, explicit allowances for squat, trim, and sinkage are unnecessary. Evaluation of when the vessel is moved or initiates transit relative to immersed draft, tide stage, and commensurate water depth allows reasonable evaluation of clearance throughout the time of vessel transit. For purposes of this study, the UKC is

assumed to be 2.5 feet. This will be verified through ship simulation during the feasibility study.

3.4.8 Container Capacity

Current Port capacity throughput is 900,000 containers a year and forecasted to be 1.4 million in 2027. The TEU equivalent is 1.4 million TEUs currently and 2.2 million TEUs in 2027. In 2020, the Port moved 628,000 containers which is approximately 70 percent utilization. MDOT MPA has forecasted that utilization will exceed current capacity starting in 2026.

3.5 Fleet Future Without Project Conditions

The Baltimore Harbor federal channels are dredged periodically to maintain the authorized channel dimensions. Under FWOP, maintenance dredging is projected to continue on a periodic and as-needed basis to maintain the existing condition dimensions presented in this chapter.

3.5.1 Navigation Features

In the FWOP, the West Dundalk Branch Channel and the Dundalk-Seagirt Connecting Channel will continue to be maintained by the State of Maryland to a depth of -50 feet MLLW at their present width. The WSBC will continue to be maintained by the State of Maryland to -45 feet MLLW. The East Dundalk Branch Channel and the Dundalk Connecting Channel will remain maintained to the federally-authorized depth of -42 feet MLLW.

3.5.2 Navigation Operational Behaviors

In-bound wide-beam vessels will continue to anchor at the Annapolis Anchorage to wait for out-bound wide-beam vessels to clear the approach channels.

3.5.3 Port Operations

Numerous Distribution Center facilities are planned, in design, or will be delivered in the coming years. Of note, Tradepoint Atlantic, a 3,300-acre multimodal industrial site has delivered over 9.3 million square feet of distribution and warehousing facilities with up to an additional 7 million square feet planned for the future.

As previously stated, MDOT MPA has forecasted that TEU utilization will exceed current capacity starting in 2026. The projected increase in capacity is driven in part by the improvements to the SMT storage yard and gate complex which is funded by a non-Federal investment partnership as well $6.5 million in federal funds through the U.S.

Department of Transportation's (USDOT) BUILD Grant Program. Additional capacity increases are projected related to the Howard Street Tunnel Improvement Project, which will move cargo on double-stacked rail and is supported by $125 million in federal funds through the USDOT Infrastructure for Rebuilding America (INFRA) Grant Program. Containers processed in the Port can be transported either via rail or truck.

For the two class I rail lines serving the port, the Howard Street Tunnel expansion will allow double stacking, effectively eliminating the transportation constraint along the East Coast and to inland locations in the Midwest. In 2017, the ICTF is estimated to be capable of handling 130,000 to 150,000 containers annually. However, it was only handling around 20,000 to 30,000 containers due to the tunnel inefficiencies. An additional 80,000 to 90,000 containers (126,000 and 141,000 TEUs) throughput can be realized immediately once the tunnel expansion comes online.

Groundbreaking for the Howard Street Tunnel Project in Maryland occurred on November 29, 2021. The Howard Street Tunnel Project will improve clearance at the Howard Street Tunnel in Baltimore City and 22 other locations where obstructions exist along the CSX Transportation Interstate 95 rail corridor between Baltimore and Philadelphia. The project will remove all obstructions that restrict passage of modern double-stack intermodal trains along the corridor. Construction is projected to be completed in 2025.

The current gate complex at SMT averages 3,500 truck transactions daily. Qualitatively, the capacity of the complex is not sufficient to support the growing container volume. There are documented cases of the extended truck queue time in recent years. The non-Federal investment addresses the truck throughput capacity concerns.

3.5.4 Commodity Forecast

The Port of Baltimore's future commerce for the period of analysis are linked to the Port's hinterland and the extent to which it shares commodity flows with other ports. Under future without and future with project conditions, the same volume of cargo is assumed to move through Port of Baltimore. The port's share of the commodity projections remains the same as the existing condition. However, the deepening of Seagirt Loop will allow shippers to load vessels more efficiently and take advantage of larger vessels and move vessels through the system faster to gain efficiency from delay reductions. This efficiency translates to savings and is the main driver of the benefits captured by the National Economic Development (NED) evaluation. Cargo projections ultimately drive vessel fleet projections in terms of the numbers and sizes of vessels for without- and with-project conditions.

In 2015, IHS Maritime and Trade (IHS) provided an import and export commodity forecast and report. This forecast was used to help inform trends for analysis of the future conditions. The trends taken from the IHS forecast were applied to the Port existing condition assessment to estimate future throughput over time for containerized cargo. The forecast was held constant beyond the year 2050 through the end of the 50-year period of analysis.

3.5.5 Cargo Baseline

Empirical data from 2018 to 2020 was used to develop a baseline, allowing the cargo estimate to capture both economic prosperity and downturn which occurred over that timeframe. The baseline tonnage represents the starting point from which cargo is forecasted. Table 3-4 and Table 3-5 show historical containerized imports and exports that moved through the Port from 2018 through 2020. The containerized cargo is separated based on route groups mentioned above. In 2021, a new service began that serves South Asia (India) and Mediterranean via the Suez Canal. As of the time this report is being written, cargo volumes are unknown for this service. However, there is data for cargo volumes on other Asia routes. Cargo volumes were estimated for this new route using empirical data from the other Asia routes. Data from 2019 and 2020 was analyzed to determine the average inbound and outbound metric tonnage of a PPX2 and PPX3 containership. Given this is a weekly service and metric tons were estimated per vessel call, an annual estimate was made. This tonnage for 2021 is shown in the table below.

TABLE 3-4: CONTAINERIZED BASELINE IMPORTS (METRIC TONS)

IMPORT CONTAINERIZED CARGO	2018	2019	2020	2021	BASELINE TONNAGE
Containerized Cargo	4,951,800	5,082,600	5,008,000		5,014,100
South Asia via Suez				1,003,600	1,003,600
Total					6,017,700

TABLE 3-5: CONTAINERIZED BASELINE EXPORTS (METRIC TONS)

EXPORTED CONTAINER CARGO	2018	2019	2020	2021	BASELINE TONNAGE
Containerized Cargo	2,166,100	2,179,700	2,166,200		2,170,700
South Asia via Suez				722,800	722,800
Total					2,893,500

3.5.6 Trade Forecast Methodology

In 2015, IHS was engaged to provide commodity flow data and forecast for the Port of Baltimore. The effort involved examining U.S. North and South Atlantic trade and

international trade lanes by commodity as well as examining the Port's 2015 statistics of commodity shipments. IHS's World Trade Service (WTS) was used to derive the Port of Baltimore commodity forecast. According to the WTS, steady growth is projected to continue throughout the forecast period, primarily due to continued economic expansion of the United States.

3.5.7 Cargo Forecast Summary

Growth rates were estimated from the base year of 2021 to the base year 2030 through 2040 where the forecast was held constant through the end of the period of analysis, year 2079. Table 3-6 shows the average growth rates for imports and exports for each period shown.

TABLE 3-6: CONTAINERIZED CARGO GROWTH RATES

IMPORT CONTAINER ANNUAL GROWTH RATES				
	2021-2025	**2026-2030**	**2031-2035**	**2036-2040**
All Services	3.5%	3.8%	3.6%	2.7%
EXPORT CONTAINER ANNUAL GROWTH RATES				
	2019-2025	**2026-2030**	**2031-2035**	**2036-2040**
All Services	4.2%	3.1%	2.8%	2.5%

Using the baseline estimated commerce volumes, the estimated growth rates were applied to forecast import and export tonnage for Port of Baltimore for the Far East – Indian Subcontinent – Southeast Asia – Suez Canal – East Coast United States Route Group (FE-SUEZ-ECUS) and aggregated services over the period of analysis. For purposes of analysis, the forecast is held constant after year 2040 through 2079.

Table 3-7 and Table 3-8 shows the import and export commodity forecast tonnage for the South Asia service and all other services.

TABLE 3-7: CONTAINERIZED IMPORT FORECAST (METRIC TONS)

IMPORT FORECAST	BASELINE	2025	2030	2035	2040 - 2079
FE-SUEZ-ECUS	1,003,600	1,112,000	1,340,000	1,601,000	1,831,000
All Services	5,014,100	5,750,500	6,931,300	8,279,700	9,470,500

TABLE 3-8: CONTAINERIZED EXPORT FORECAST (METRIC TONS)

EXPORT FORECAST	BASELINE	2025	2030	2035	2040 - 2079
FE-SUEZ-ECUS	722,800	817,300	954,300	1,093,000	1,239,000
All Services	2,170,700	2,556,900	2,985,600	3,419,400	3,876,400

Table 3-9 provides estimated total TEU throughput (including empty TEUs). Current Port capacity throughput is 1.4 million. Capacity expansion plans includes a truck gate complex expansion, the Howard Street Tunnel Expansion and other storage improvements. These improvements increase the port capacity throughput to 2.2 million TEUs by 2027. Based on the estimated TEUs in Table 3-9 and annual throughput volume, TEU capacity is estimated to be reached between years 2035 and 2040. The forecast is held constant throughout the remainder of the period of analysis.

TABLE 3-9: SEAGIRT MARINE TERMINAL TEU FORECAST

	2030	2035	2040
Forecasted Import TEU	859,531	940,512	1,174,405
Forecasted Export TEU	940,512	1,077,154	1,221,111
Forecasted Total TEU	1,800,043	2,017,666	2,395,516

3.5.8 Vessel Fleet Forecast

Maritime Strategies Inc. (MSI) was requested by MDOT MPA and USACE to forecast the size composition of container vessels calling at the Port of Baltimore for the Baltimore Harbor and Channels 50-Foot study in 2015. The effort included three main tasks: developing a forecast of world fleet containerships, a forecast of container vessels deployed on US Atlantic Coast trade routes by size bands and capacity and a forecast of containerships calling at Baltimore by size bands through 2035. This data was used to inform the vessel fleet calling SMT.

3.5.9 Design Vessel

For deep-draft projects, the design vessel is selected on the basis of economic studies of the types and sizes of the ship fleet expected to use the proposed channel over the project life. The design ship is chosen as the maximum or near maximum size ship in the forecasted fleet" (USACE 1984, 1995, 1999).

For the Port, the study team recommends the Marco Polo containership class as the design vessel. This selection is meant to incorporate the full range of potential dimensions of the largest, most frequently calling vessel will have over the study period. Vessels of this size are expected to call frequently on the Port. The Port is anticipating the use of these vessels in the future and has made significant investment to do so. The specifications for the recommended design vessel class are as follows:

- 1,299.0 feet LOA
- 175.6 feet beam
- 52.5 feet design draft
- 16,022 TEU capacity

There is inherent uncertainty in design vessel selection. Vessel orderbooks change, and deployment of vessels on services calling Baltimore is based on fluctuating market forces and vessel availability. Vessels larger and smaller than the design vessel will call the Port over the study period. However, there is confidence that the chosen dimensions will remain relevant through the study period.

3.5.10 Container Fleet Forecast

MDOT MPA provided containership vessel call data to USACE from 2017 through 2020. By cross referencing the MDOT MPA data with Baltimore Maritime Exchange data, an observed TEU capacity that called Baltimore was calculated. Table 3-10 shows the approximate TEU capacity by year and vessel class from 2017 through 2020.

TABLE 3-10: HISTORICAL TEU CAPACITY

CONTAINERSHIP CLASS	2017	2018	2019	2020
Sub Panamax	2%	2%	1%	1%
Panamax	19%	14%	17%	16%
PPX Gen 1	34%	31%	23%	22%
PPX Gen 2	22%	32%	31%	32%
PPX Gen 3	23%	21%	26%	29%

Using the empirical data for Port of Baltimore and other resources mentioned, the forecast was adapted for Port of Baltimore to estimate the expected fleet composition over the period of analysis. The forecast introduces a PPX Gen 3 max containership vessel based on the historical transition of the fleet, which is the design vessel.

The observed TEU capacity of the distribution by vessel class varied from the 2015 projections; however, the overall TEU capacity calling the Port was close in comparison. The rates of change were used from the MSI fleet forecast and applied to the historical data for the forecasted period of 2021 through 2050. Table 3-11 shows the fleet forecast distribution by TEU capacity for selected years. The PPX Gen 3 Max is included in the PPX Gen 3 percentages.

TABLE 3-11: FORECASTED TEU CALLING CAPACITY

CONTAINERSHIP CLASS	2020 (ACTUAL)	2030	2040
Sub Panamax	1%	0%	0%
Panamax	16%	6%	6%
PPX Gen 1	22%	14%	8%
PPX Gen 2	32%	43%	31%
PPX Gen 3	29%	37%	55%

4 Plan Formulation

The guidance for conducting civil works planning studies, Engineer Regulation 1105-2-100, Planning Guidance Notebook, requires the systematic formulation of alternative plans that contribute to the federal objective. To ensure sound decisions are made with respect to the development of alternatives, and with respect to plan selection, the plan formulation process requires a systematic and repeatable approach. This chapter presents the results of the plan formulation process.

The planning strategy for formulating alternatives is summarized in Figure 4-1. The combined USACE and MDOT MPA project delivery team participated in weekly meetings to discuss and evaluate existing information about the BHAC project. Existing USACE reports including the Baltimore Harbor 50-Foot Widening Study and reports generated by MDOT MPA and its consultants included significant current information about existing conditions and proposed future conditions for project alternatives.

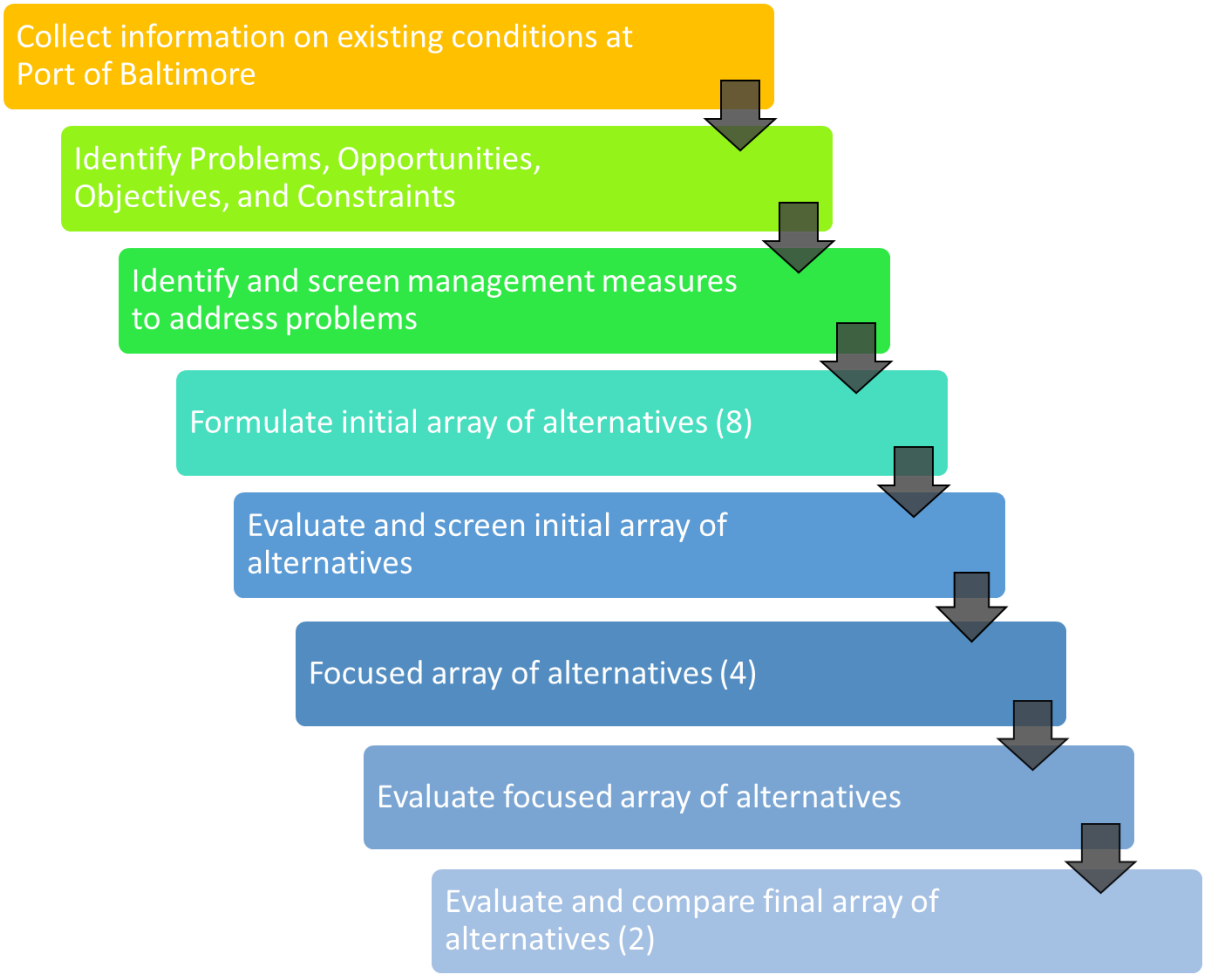

FIGURE 4-1: PLAN FORMULATION STRATEGY

4.1 Problem Identification and Opportunities

The Port has experienced an increase in the number of calls from larger, post-Panamax class container vessels since 2016. Post-Panamax vessels are longer, wider, and have deeper drafts than the federally-authorized dimensions of the Baltimore Harbor branch channels in the BHAC authority. Currently, the SMT and access channels are maintained to -50 feet MLLW to allow for vessels to call at Berth 4, following improvements completed by the MDOT MPA. Deepening of Berth 3 was completed in 2021 and additional improvements to the terminal will bring the berth to operational status in 2022, which will also accommodate similar sized vessels.

Now that there are more regular calls from post-Panamax vessels to the Port, the current channel configuration results in inefficiencies in transit due to insufficient channel width at turns. Currently, vessels transiting to or from Seagirt Berths 1-3 must proceed with great caution to avoid collisions or allisions (the running of one ship into a stationary ship) while Berth 4 is occupied with a large vessel. Furthermore, vessels with a sailing draft in excess of -42 feet MLLW must be backed out of the berthing areas or turned because the WSBC is maintained to -45 feet MLLW by the MDOT MPA. The current channel configuration results in transportation delays for vessels unloading cargo at Dundalk Marine Terminal Berths 1 through 6, as they must exit using the West Dundalk Branch Channel, which may be occupied by a turning vessel exiting SMT Berth 4. Additionally, discussions with MDOT MPA and the Association of Maryland Pilots resulted in identification of additional needs, including the future need for a -50-foot anchorage in Baltimore Harbor to reduce stand-by delays for larger vessels calling at Port facilities and the need for deepening of the South Locust Point Branch Channel and Turning Basin to increase transportation efficiencies for vessels calling at the terminal.

There are opportunities for:

1. Increased movement of containers and container traffic.
2. Increases in employment and regional economic activity.
3. Improvement of efficiency of vessel movements.
4. Improvement of safety of vessel maneuvers.
5. Avoiding vessel collisions and allisions.
6. Increased flexibility in vessel anchorages.
7. Lower transportation costs of goods moving inland based on Baltimore Harbor’s more inland location.
8. Improved regional competitiveness for container traffic handling.
9. Cost savings related to less tug assist if full loop is in place.

10. Reduced greenhouse gas emissions per ton of cargo from larger, more efficient vessels, and fewer tug assists.

4.2 Planning Goal and Objectives

The overall goal of the study is to maximize Baltimore Harbor's contribution to NED, consistent with protecting the Nation's environment, by improving the existing navigation system's ability to serve the forecasted vessel fleet safely and efficiently.

4.2.1 Objectives

1. Decrease transportation delays to vessels calling at the Port;
2. Improve navigability and increase safety for vessels using Baltimore Harbor access channels;
3. Increase transportation efficiencies for vessels calling at the Port; and
4. Meet current and future needs for handling of larger vessels to satisfy container traffic demand at the Port.

4.3 Planning Constraints

Constraints are restrictions that limit the extent of the planning process. Constraints considered during the planning process included:

1. Avoidance of impacts to utilities in the vicinity of the channels and Anchorages.
2. Dredged material placement capacity for handling of contaminated materials from Baltimore Harbor is limited.
3. Limited uses for dredged material based on quality and state laws[2] related to management of Baltimore Harbor sediments.
4. Limitation on vertical clearance (air draft) of vessels due to Francis Scott Key Bridge and the Chesapeake Bay Bridge.
5. Logistical constraints related to ship calling in Berth and ships moving along access channels.

4.4 Key Uncertainties and Planning Decisions

During the formulation process, there are planning decisions and uncertainties that must be considered and documented. This study uses many sources of existing data for the analysis. For example, the study team assumed existing bathymetric and geotechnical

[2] The Maryland Dredged Material Management Act of 2001 restricted dredged material placement from the Baltimore Harbor Channels to approved contained placement sites due to historic contamination of Harbor sediments.

data are sufficient to distinguish between the alternatives considered. Collecting new data was deferred to the Pre-construction Engineering and Design (PED) phase, which is the next phase of the project after the Draft Feasibility Report/EA document is completed. Since Baltimore Harbor has already been studied extensively, the availability of existing data enables the study team to work more efficiently. However, the existing data may not be tailored exactly to the study team's needs and, in some cases, assumptions or interpolations have been made to cover gaps in existing data. The decision to use existing bathymetric and geotechnical data from maintenance dredging data and previous studies may result in less accurate dredging quantity and cost estimates, nevertheless this was determined to be an acceptable risk.

The commodity and fleet forecast developed for the study is an additional source of uncertainty. The long-term trade commodity forecast assumed growth of containerized volumes from 1 million TEUs today to approximately 2.4 million TEUs by 2040. While the study assumes that long-term positive economic growth will drive continued increases in containerized trade, future trade volumes are difficult to predict with certainty. Commodity flows are subject to the ups and downs of the business cycle, individual commodity markets, and political influence.

4.4.1 Climate and Sea Level Change

As part of its water resources management missions and operations, the USACE has been working together with other federal agencies, academic experts, nongovernmental organizations, and the private sector to translate climate science into actionable science for decision-making. The USACE Civil Works Program has developed tools to analyze the potential effects and uncertainties associated with climate change and sea level change (SLC) relative to the USACE portfolio.

Engineering Construction Bulletin (ECB) no. 2018-14 provides guidance for incorporating climate change information in hydrologic analysis in accordance with the USACE overarching climate change adaptation policy (USACE 2018). It calls for a qualitative analysis. The goal of a qualitative analysis of potential climate threats and impacts to USACE hydrology-related projects and operations is to describe the observed present and possible future climate threats, vulnerabilities, and impacts of climate change specific to the study. This includes consideration of both past (observed) changes as well as potential future (projected) changes to relevant meteorological and hydrologic variables.

It is assumed that the channel modifications will not change water levels from the existing water level and, therefore, sea level rise (SLR) will have the same effect on any structural alternatives or the No Action alternative.

In Figure 4-2, the NOAA SLR Viewer was used to preliminarily understand what the effects of SLR would look like at the Port and the Cox Creek DMCF placement site. Inundated areas are in blue, with dark blue being the deepest and lighter blue being shallower, and areas in green are low-lying. The NOAA SLR viewer is a preliminary analysis and can be used for feasibility studies. The disposal area remains unflooded at the low, intermediate, and high SLC projections. The Port appears to see inundation at a SLR 2.9 feet NAVD88 (3.73 feet Mean Higher High Water (MHHW)), for the intermediate projected curve at the 100-year planning stage. The maximum observed water level for the Port was at 6.49-feet MHHW during Hurricane Isabel on September 19, 2003 (Appendix E).

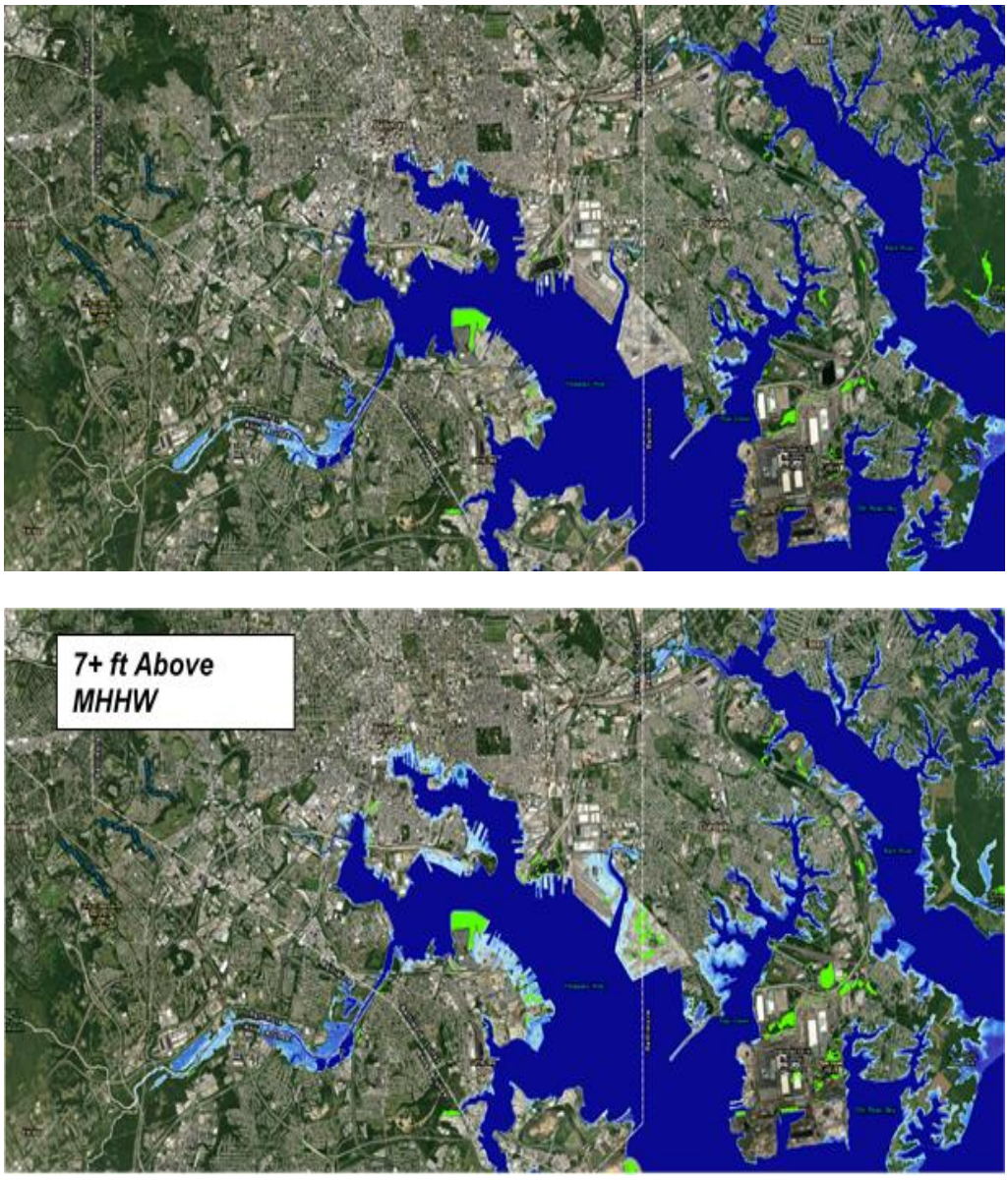

FIGURE 4-2: SEA LEVEL RISE VIEWER OF PORT OF BALTIMORE AREA

The top figure shows the Port Area at MHHW +4 feet of Sea Level Rise.
The bottom figure shows the existing water level at Mean High Higher Water +7 feet (epoch: 1983-2001) (NOAA 2020).

4.4.2 Sea Level Rise and Air Draft Clearance

The effects of SLR on the air draft clearance (ADC) at the Chesapeake Bay Bridge and Francis Scott Key Bridge were evaluated in order to understand how long-term SLR projections may affect navigation by PPX Gen 3 max vessels. Limitations were found to be dependent on both the projection scenario of low, intermediate, or high SLR (Figure 4-3) and the tide stage when the vessel would pass beneath the Chesapeake Bay Bridge.

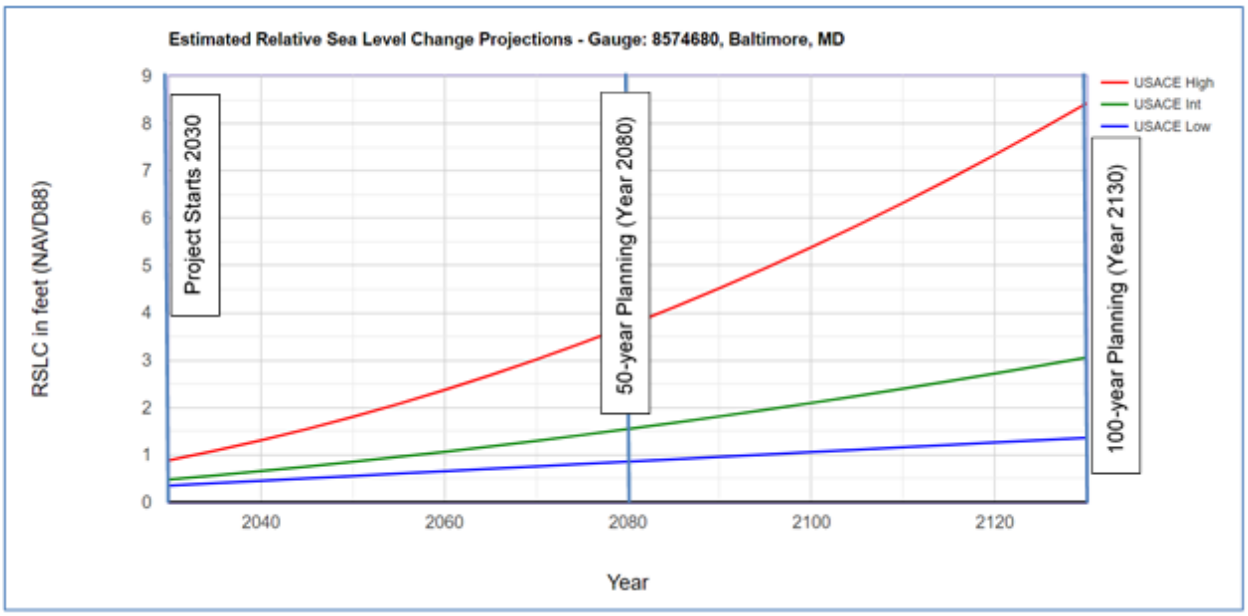

FIGURE 4-3: RELATIVE SLC PROJECTIONS FOR BALTIMORE, MARYLAND NOAA GAUGE
http://corpsmapu.usace.army.mil/rccinfo/slc/slcc_calc.html

The analysis showed that the main restriction for vessel access to the Port is the height of the Chesapeake Bay Bridge. The air draft of the vessel is defined as the distance from the water surface to the highest point on a vessel. Figure 4-4 presents definitions important to defining clearance distance under the controlling bridges. To pass under the bridge safely, a minimum ADC is required. The clearance is determined by the elevation of the water surface at a given time, the draft to which the vessel is loaded, and the speed of transit. The charted clearance of the two bridges is given by NOAA on the nautical chart relative to the mean high water (MHW) elevation:

- Chesapeake Bay Bridge 182 feet MHW (Bay Bridge)
- Francis Scott Key Bridge 185 feet MHW (Key Bridge)

The charted channel depths are given relative to mean lower low water (MLLW). Therefore, to calculate the vertical clearance available at a given time, the water surface elevation must be computed accounting for stage of the tide and any additional allowance, such as SLR. Figure 4-4 illustrates the variability in the water surface elevation with tide and future SLR.

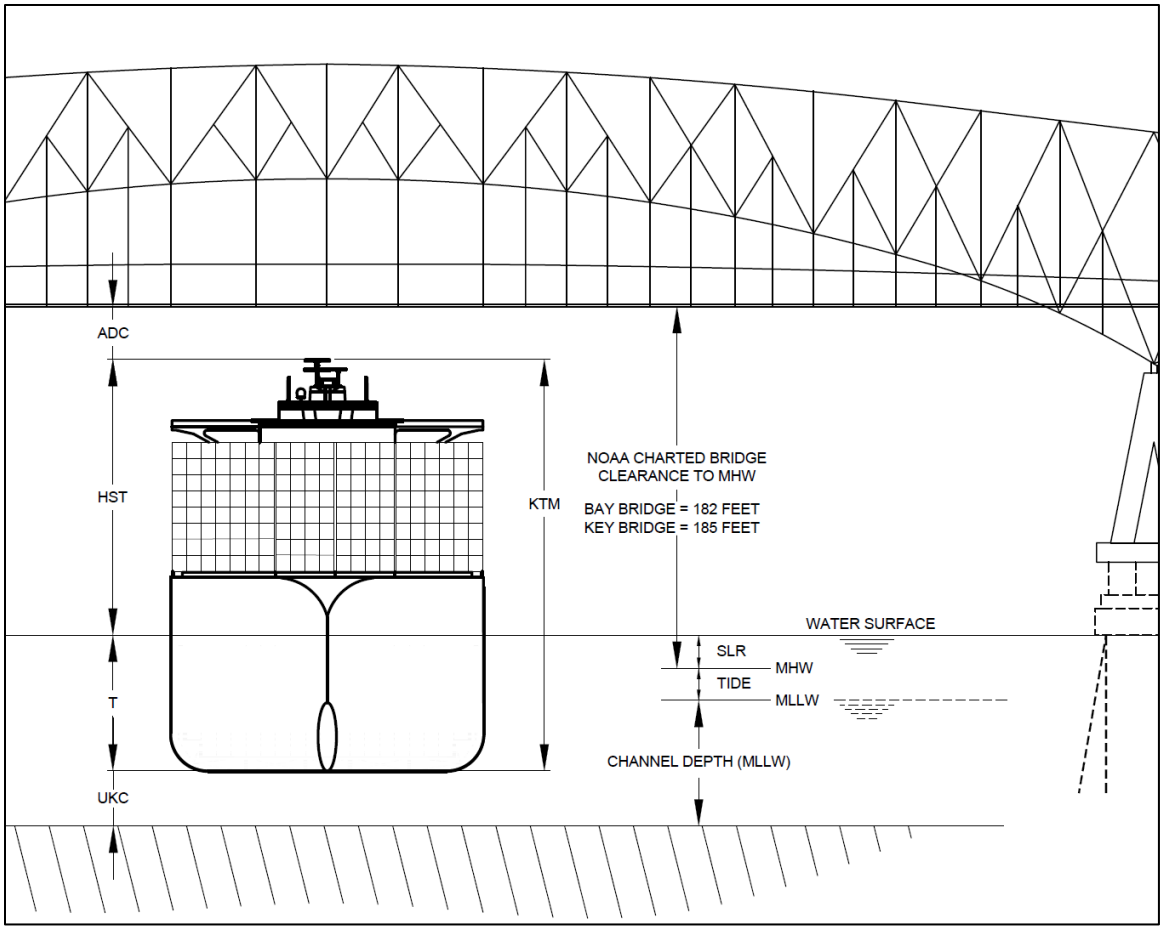

FIGURE 4-4: AIR DRAFT CLEARANCE PARAMETERS FOR VESSELS TRANSITING UNDER THE CHESAPEAKE BAY BRIDGE AND KEY BRIDGE RELATIVE TO SLR*

**Figure is not to scale*

Regardless of SLR projection, when PPX Gen 3 max vessels are expected to call at Port of Baltimore in the future, they would generally transit at low tide (MLW or MLLW) to achieve sufficient factor of safety in addition to the charted ADC under present-day and future conditions. In the USACE intermediate SLR, ADC for the Gen 3 max vessels would be reduced by 0.5 feet at MLW by 2050 at both the Bay Bridge and Key Bridge. By 2070, ADC using intermediate SLR projections for Gen 3 max vessels would be completely constrained at the Bay Bridge but would not be constrained at the Francis Scott Key Bridge for the period of analysis through 2130. In the USACE high SLR, ADC for Gen 3 max vessels would be reduced by 0.5 feet at MLW by 2030 at both the Bay Bridge and Key Bridge. Under the high SLR projection, ADC for the Gen 3 max vessels would be completely constrained by 2040 at the Bay Bridge and 2090 at the Key Bridge. More details on the ADC analysis are included in Appendix B3. Limited ADC for Gen 3 max vessels presents a constraint on the future fleet calling at the Port of Baltimore and would

need to be addressed through changes in the operational behavior of vessels transiting the 50-foot channel network, changes to vessel design, or future modifications to the Bay and Key Bridges that would allow for these vessels to continue to call at the Port in the future.

Based on both the air draft trend in the world fleet and the 100-year projected SLR, the PPX Gen 3 max vessel (16,000 TEU) represents the practical maximum feasible design vessel for the Seagirt Loop Channel that can call at the SMT with the present-day ADC of the Chesapeake Bay Bridge. Potential actions can be taken to maintain sufficient ADC for the PPX Gen 3 max vessels and reduce the impact of SLR. Allowing the transiting vessels to draft deeper than the current limit of 47.5 feet would increase or maintain the present-day ADC. However, allowing vessels to draft deeper than 47.5 feet presently would pose a navigation risk within the -50 feet MLLW channel, and the additional amount of draft would have to be equal to or greater than the amount of SLR observed from the middle of the last tidal epoch (currently 1992). Allowing vessels to draft deeper would also require either deepening the channel or maintaining the channel elevation relative to a fixed geodetic datum (e.g., NAVD88) as opposed to the tidal datum MLLW that will change overtime as SLR occurs and the tidal epoch is updated. Other potential actions to maintain sufficient ADC for future conditions include a collapsible mast requirement for transiting PPX Gen 3 max vessels.

4.5 Management Measures and Components

The Seagirt Study was initially scoped for deepening and widening of the WSBC and did not include anchorages or other branch channels within the authority. Following discussions with MDOT MPA and a review of information by the Association of Maryland Pilots, the Project Delivery Team (PDT) extended the scope to include evaluating modifications to other branch channels and the existing anchorages in the BHAC project. The PDT requested concurrence on this change in study scope and clarification from the vertical team on the feasibility of these changes. Clarification was provided through a legal analysis of the authority, Initial Appraisal Report, and authorizing language for the feasibility study.

The PDT identified management measures in accordance with the study-specific planning objectives, existing plans, analyses, and studies, information from vessel pilots, future fleet forecasts, and PDT experiences with deep draft navigation studies. The PDT has identified the following measures that may be considered during formulation:

Structural Measures

- Widen Channel

- Widen Channel Bends
- Deepen Channels
- Turning Basins
- Anchorage Deepening
- Passing Lanes

Non-Structural Measures

- Utilizing Favorable Tides
- Lightering
- Utilize Other Ports and Intermodal Transport
- Tug Assist
- Improved Traffic Management
- Pilot Regulations
- Improvements in Signaling

Natural and Nature-Based Features for Dredged Material Placement

- Chesapeake Bay Island Restoration
- Wetland Restoration

Structural Measures Dredge Material Placement

- Using Existing Upland Disposal Site for Dredged Material Placement
- Confined Aquatic Disposal (CAD) for Dredge Material Placement

Increments of deepening and widening will be developed at a later stage of design and once the design vessels for the various navigation components are identified.

4.5.1 Description of Structural Measures Considered

Channel Widening

The original BHAC project study considered the beam widths of post-Panamax vessels of 145 feet. Including clearance and a factor of safety, the final width of the channel was designed and constructed to 500 feet. The Seagirt Study evaluated additional increments of widening that were optimized based on the Gen 3 and Gen 3 max design vessels with beams of between 167 and 176 feet. A ship simulation study for the Seagirt Loop Channel was completed by the Maritime Institute of Technology and Graduate Studies (MITAGS) in 2018 that was used to inform the channel design dimensions. The channel width will be optimized based on additional ship simulation to be completed during the feasibility study.

Widening Channel Bends

The MITAGS ship simulation used two classes of post-Panamax vessels, the Class III Kalina and the Class IV Ben Franklin, to evaluate the proposed channel dimensions. During the simulation, safety concerns were identified related to the width of channel bends based on the length of the vessels (~1200–1300 feet) around turns. The MITAGS ship simulation study and any ensuing analysis will be used to evaluate widening at channel bends and optimized based on additional ship simulation to be completed during the feasibility study.

Deepen Channels

The BHAC authorization resulted in construction of approach channels up to a depth of -42 feet MLLW based on a draft of -38 feet MLLW for the design vessel. In 2013, MDOT MPA deepened the West Dundalk Branch Channel and Dundalk-Seagirt Connecting Channels to -50 feet MLLW to allow for vessels with drafts of up to -47 feet MLLW to unload at SMT Berth 4. The MDOT MPA will complete land-side improvements and deepening of Berth 3 to allow for post-Panamax container vessels to unload at Berth 3 (estimated to be fully operational in 2022). The BHAC modification study will consider deepening of the WSBC down to a depth of -50 feet MLLW to allow through traffic of vessels calling at Berths 1 & 2, 3 and 4 at SMT.

Currently, the South Locust Point Branch Channel is authorized to a depth of -36 feet MLLW, but the State of Maryland permit allows dredging up to -38 feet MLLW. Based on a review of existing vessel traffic and discussion with the Association of Maryland Pilots, the depth of these channels could be considered up to -40 feet MLLW to allow for a factor of safety for vessels since the arrival draft of some vessels calling at that terminal is almost equivalent to the maintained depths.

Turning Basins

Turning basins are used to help improve the maneuverability of ships. Benefits attributed to enhanced vessel maneuverability or delay reduction are usually computed as time savings multiplied by a per-unit cost applicable to vessel underway operations or idling at port. The turning basin between West Dundalk Branch Channel and Dundalk-Seagirt Connecting Channel will be considered as an existing condition. No additional need for turning basins in the study area were identified during the feasibility study and the measure was screened from consideration.

Anchorages

An anchorage is an area where a ship can anchor to await entrance into a Port, take shelter from adverse weather conditions, load, or unload, or await repairs. A circular area

with a minimum diameter of 3,300 feet is required for a vessel with a length of 1,200 feet. Given the existing depths in the Harbor, expansion of an existing anchorage will minimize the required dredging quantity. Existing Anchorage 3A/B, Anchorage 5, and Anchorage 6 are the best options for improvement. These existing anchorages allow vessels with drafts up to -42 feet MLLW and -35 feet MLLW, respectively. Vessels with deeper drafts must anchor in naturally deep waters at the Annapolis Anchorages.

Passing Lanes/Zones

Passing lanes or zones are areas of the channel that have been widened to allow two vessels to pass at a specific location. Passing zones are constructed for channels where maneuvering of larger vessels is restricted due to channel width. The advantage of a passing zone is that the overall width of the main channel system can be reduced by designating a location for passing, thereby significantly reducing the total volume of dredged material removed, contained, and managed. The major disadvantages of passing zones are related to the timing of vessel passing and the ultimate safety risks associated with passing and controlling two large vessels.

4.5.2 Description of Non-Structural Measures

A host of non-structural measures were considered for the Seagirt Study. The full list of non-structural measures includes utilizing favorable tides, lightering, other ports and intermodal transport, and tugboats; improved traffic management; pilot regulations; and improved signaling.

Utilizing favorable tides

Cargo vessels generally use favorable tides to navigate channels given channel depth constraints (use high tide) or air draft clearance constraint under bridges and other build infrastructure (use low tide). Currently, larger vessels calling at the Port of Baltimore use low tides (MLW or MLLW) to maneuver the limited clearance under the Bay and Key Bridges. This is an existing practice for vessels calling at the Port in current conditions.

Lightering

Some cargo vessels will lighter cargo before or after calling at a Port if the vessels are loaded too deeply to allow for vessels to call at berth. Lightering is generally done by unloading cargo to smaller vessels in a dedicated, deep water anchorage area in a sheltered location.

Use of Tugboats

Tugboats operate in various ports to assist ships while maneuvering in port. Very large container ships will often use tugboats to assist in turns and berthing. Tugboats have an hourly operating cost which should be a consideration in alternatives that may reduce the number of tugs needed.

The cost of a tugboat is the acquisition cost of a new tugboat (~$11 million in 2015), not the cost of a tugboat assist. Currently, vessels calling at the Port of Baltimore requires approximately two to three tugs, but post-Panamax vessels require a minimum of three and currently use four based on the current channel configuration.

Improved Traffic Management

Traffic management practices improve harbor efficiency by reducing transit times for individual ships or the fleet as a whole and include vessel routing, vessel location and tracking, better timing of transits to tidal stages. These practices can also improve safety of vessel movement in busy ports. The Port of Baltimore does not have crossing traffic, or other complex areas like the Port of New York. The primary flow of traffic is in and out of the channels, with some traffic coming in from the canal, so no special traffic system is required. There is currently no single hub where traffic issues are handled by a single party. Each ship communicates directly with one another, and this system works well. Most pilots communicate with no issue. Outbound ships typically have priority when passing.

Other non-structural measures

Pilot regulations are the rules that pilots operate while transiting a navigation channel system. Existing pilot regulations are considered adequate for navigating Baltimore Harbor in the existing and future with project conditions and have not been identified as a need in the study area.

Navigation signaling include buoys, light and sound signals, radar reflectors, beacons, ranges, and other electronic signals that assist pilots in maneuvering a channel system. No needs or issues associated with improved signaling were identified during the scoping of the study and are considered not needed at this time.

A feasible non-structural measure is the use of **other ports** when existing channel constraints prevent vessels from calling at the Port of Baltimore. However, it does not meet the planning objectives of this study as it would not accomplish the goals set out when initiating the study and detailed in this report. The use of **intermodal transport** to move goods is also a feasible measure, but also does not meet planning objectives as

substantive investments by federal and non-Federal stakeholders have already been made to make the Port of Baltimore an international shipping destination and waterborne transport is substantially cheaper per ton than other modes of shipping.

4.5.3 Suitable Dredged Material Disposal Areas

Several disposal options were considered for material from the dredging associated with deepening and widening the existing federal channels. However, the Baltimore Inner Harbor materials are contaminated and unsuitable for open water placement or beneficial use as detailed in Appendix G and Section 2.13 of this report. As a result of the poor quality of the dredged material, natural and nature-based features (NNBF) using dredged material were screened from consideration including the use of the material for island restoration or wetland restoration in Baltimore Harbor or the Chesapeake Bay. There were also no identified needs for confined aquatic disposal (CAD) in Baltimore Harbor. The most suitable dredged material disposal area is an existing upland disposal site. The primary placement site being considered for WSBC deepening and widening dredged material is Cox Creek DMCF. The 2017 USACE Dredged Material Management Plan (DMMP) details the current dredged material disposal sites from material coming from the Harbor and channels. The existing DMMP accounts for up to 2 million cy of new work material in existing DMCFs. An analysis of DMCF capacity was completed and included as Appendix B5.

4.6 Screening Pathways

4.6.1 Screening of Management Measures

The initial screening of measures will be completed using decision criteria found in similar USACE navigation studies and a reworked version of a measure screening matrix used in USACE Coastal Storm Risk Management studies. The criteria listed in Table 4-1 will be used to screen management measures using existing information and best professional judgment. The results of the screening of management measures are summarized in Table 4-2 and detailed in this section.

TABLE 4-1: CRITERIA FOR SCREENING MANAGEMENT MEASURES

CRITERIA	METRIC	INVENTORY
Effectiveness	Reduce Transportation Costs at Harbor (Yes/No)?	Best Professional Judgment
Efficiency	Cost-effective (Yes/No)?	Best Professional Judgment
Avoids Constraints	(Yes/No)?	Best Professional Judgment

TABLE 4-2: MANAGEMENT MEASURE SCREENING RESULTS

MEASURE	EFFECTIVE (Y/N)	EFFICIENT (Y/N)	AVOIDS CONSTRAINTS? (Y/N)	MEASURES RETAINED
Structural Measures				
Widen Channels	Yes	Yes	Yes	Retain
Widen Channel Bends	Yes (Likely)	Yes	Yes	Retain
Deepen Channels	Yes	Yes	Yes	Retain
Turning Basins	Yes	Yes	Yes	Screened Out
Anchorage Deepening and Widening	Yes	Yes	Yes	Retain
Passing Lanes	No	No	Yes (Likely)	Screened Out
Non-Structural Measures				
Utilize Favorable Tides	No	No	Yes	Screened Out
Lightering	No	No	Yes	Screened Out
Tug Assist	No	Yes	Yes	Screened Out
Improved Traffic Management	Yes	Yes (Likely)	Yes	Retain
Pilot Regulations	Yes	Yes	Yes	Screened Out
Improved Signaling	Yes	Yes	Yes	Screened Out
Natural/Nature Based Features for Dredged Material Placement				
Chesapeake Bay Island Restoration	No	No	No	Screened Out
Wetland Restoration	No	No	No	Screened Out
Structural Measures for Dredged Material Placement				
Using Existing Upland Disposal Site for Dredged Material Placement	Yes	Yes	Yes	Retain
Confined Aquatic Disposal (CAD) for Dredged Material Placement	Yes	No (Likely)	Yes (Likely)	Screened Out

The following measures were not identified as being needed at this time or outside of the purview of the current study and were screened from consideration: turning basins (existing turning basin already in place), passing lanes, pilot regulations (existing regulations in place), and improved signaling (existing signaling in place). Lightering and utilizing favorable tides would not provide adequate clearance needed to allow for these larger draft vessels to safely use the Seagirt Loop Channel and therefore do not meet planning objectives for improved efficiency and effectiveness. As a result, both measures were screened from consideration during scoping. Tug assist is an established practice in the Port of Baltimore and additional tug assist is not effective at addressing issues related to inadequate channel depth or width of the Seagirt Loop Channel and was screened from consideration.

4.7 Alternative Plan Formulation

Alternatives are a set of one or more management measures functioning together to address one or more planning objectives. An initial array of alternatives was formulated using professional judgment in consultation with MDOT MPA and the Association of Maryland Pilots. Several assumptions were made in the development of the initial alternatives and are described below.

4.7.1 Formulation Assumptions

Design Vessel Assumptions

Two vessel classes have been identified for use as Design Vessels: PPX Gen 3 and Gen 3 max containerships with 13,800 – 16,000 TEU capacity. PPX Gen 3 vessels represent the existing vessels calling at SMT Berth 4 and will be accommodated at Berth 3 following upgrades and are expected to be accommodated at Berths 1 – 2 in the future.

SMT cargo cranes will be able to handle vessels loaded with container stacks up to 22 containers wide with a working boom height of 164 feet. PPX Gen 3 vessels (up to 14,000 TEU) are typically loaded 20 containers wide. PPX Gen 3 max vessels (up to 16,000 TEU) up to 22 containers wide can take full advantage of the capacity of the upgrade to SMT.

Two representative vessels were selected as design vessels as shown in Table 4-3.

TABLE 4-3: REPRESENTATIVE DESIGN VESSELS

PARAMETER	PPX GEN 3	PPX GEN 3 MAX
Prototype	MSC Beatrice	CMA CGM Marco Polo
Number of Vessels in Peer Group[1]	54	18
Nominal TEU Capacity	13,800	16,000
Length Overall (LOA)	1,200 feet	1,299 feet
Beam (B)	168.0 feet	175.9 feet
Design Draft (T)[2]	47.6 feet	46 feet
Scantling Draft[3]	51.2 feet	52.5 feet

[1]As reported by Clarkson Register 2021

[2]Design draft is the draft of the vessel upon which the naval architecture stability and performance of the vessel hull are based.

[3]Scantling draft is the maximum structural draft for which the ship hull and supporting structures are designed. Scantling draft is typically greater than the design draft and represents the maximum limit to which a ship can be loaded.

Channel Width Assumptions

Proposed channel widths and depths for each alternative were determined based on existing bathymetry, existing channel dimensions, initial ship simulation conducted by MDOT MPA and the Association of Maryland Pilots, feasibility-level ship simulation, and guidance from Engineer Manual 1110-2-1613 “Hydraulic Design of Deep-Draft Navigation Projects” (USACE 2006). Channel widths assumptions are based on a beam of 176 feet from the CMA CGM Marco Polo. EM 1110-2-1613 requires consideration for safety of approximately 3.5 times the beam of the design vessel, which is estimated at 620 feet.

Local Facility Assumptions

Local facilities include terminals, docks, berthing areas, and local access routes. Berth 4 at the SMT was deepened to -50 feet MLLW and cranes were upgraded in 2013. Berth 3 is underwent a similar upgrade in 2021. It is expected that Berths 1 and 2 will also be upgraded by 2030 and all berths will be capable of handling the design vessel. Other terminal upgrades have been outlined in Section 1.5.1. Local facilities are assumed to be adequate for any Federal channel improvements that may occur.

Beneficial Use of Dredged Material Assumptions

Based on a review of past sediment chemical analysis from the areas of proposed dredging, the material exceeds chemical quality standards for beneficial use. Therefore, beneficial use of dredged material has been excluded from consideration.

4.7.2 First Planning Iteration: Initial Array of Alternatives

The PDT formulated alternatives by combining compatible management measures that were retained during initial screening. These measures were considered to meet planning objectives and avoid constraints identified during the study. The alternatives were formulated using an alternatives matrix initially used during the Baltimore Harbor 50-Foot Widening Study. The alternatives were further refined to include separable elements for management measures corresponding to different and separable BHAC project components. Deepening and widening increments were a consideration for optimization of the design of alternative plans later in the feasibility study and expected to be informed by the selection of design vessels, completion of ship simulation during the feasibility study, and evaluation of alternative plans incrementally using HarborSym modeling. The array of alternatives is detailed in the Alternatives Matrix detailed in Table 4-4. Maps for each alternative plan, excluding the No Action Alternative, are provided following the Alternatives Matrix.

TABLE 4-4: INITIAL ARRAY OF ALTERNATIVES

ALTERNATIVES	MANAGEMENT MEASURES			
	ASSUME FEDERAL RESPONSIBILITY FOR BHAC IMPROVEMENTS	DEEPENING AND WIDENING OF SEAGIRT LOOP CHANNELS	DEEPENING AND WIDENING OF SOUTH LOCUST POINT BRANCH CHANNEL	RE-DESIGN PART OF AN EXISTING ANCHORAGE TO 50' DEPTHS TO ACCOMMODATE LARGER VESSELS
Alternative 1 – No Action				
Alternative 2 – Assumption of federal maintenance for BHAC improvements	X			
Alternative 3 – Completion of Seagirt Loop with assumption of federal maintenance	X	X		
Alternative 4-1 – Completion of Seagirt Loop & South Locust Point modification (mod.) with assumption of federal maintenance	X	X	X	
Alternative 4-2 – South Locust Point mod. with assumption of federal maintenance	X		X	
Alternative 5-1 – Completion of Seagirt Loop, South Locust Point mod., & anchorage mod. with assumption of federal maintenance	X	X	X	X
Alternative 5-2 – Completion of Seagirt Loop & anchorage mod. with assumption of federal maintenance	X	X		X
Alternative 5-3 – Anchorage mod. with assumption of federal maintenance	X			X

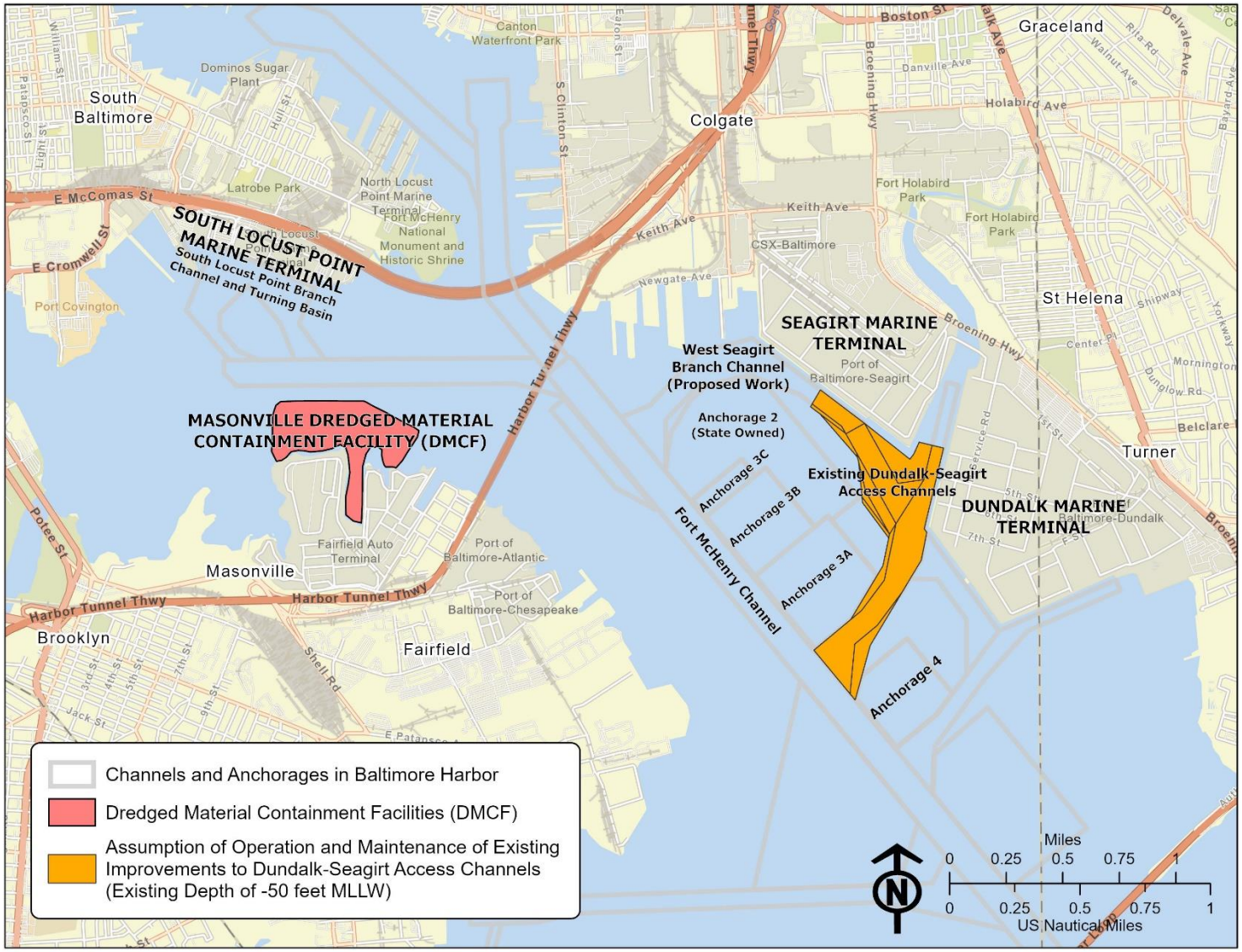

FIGURE 4-5: BHAC MODIFICATION ALTERNATIVE 2 MAP

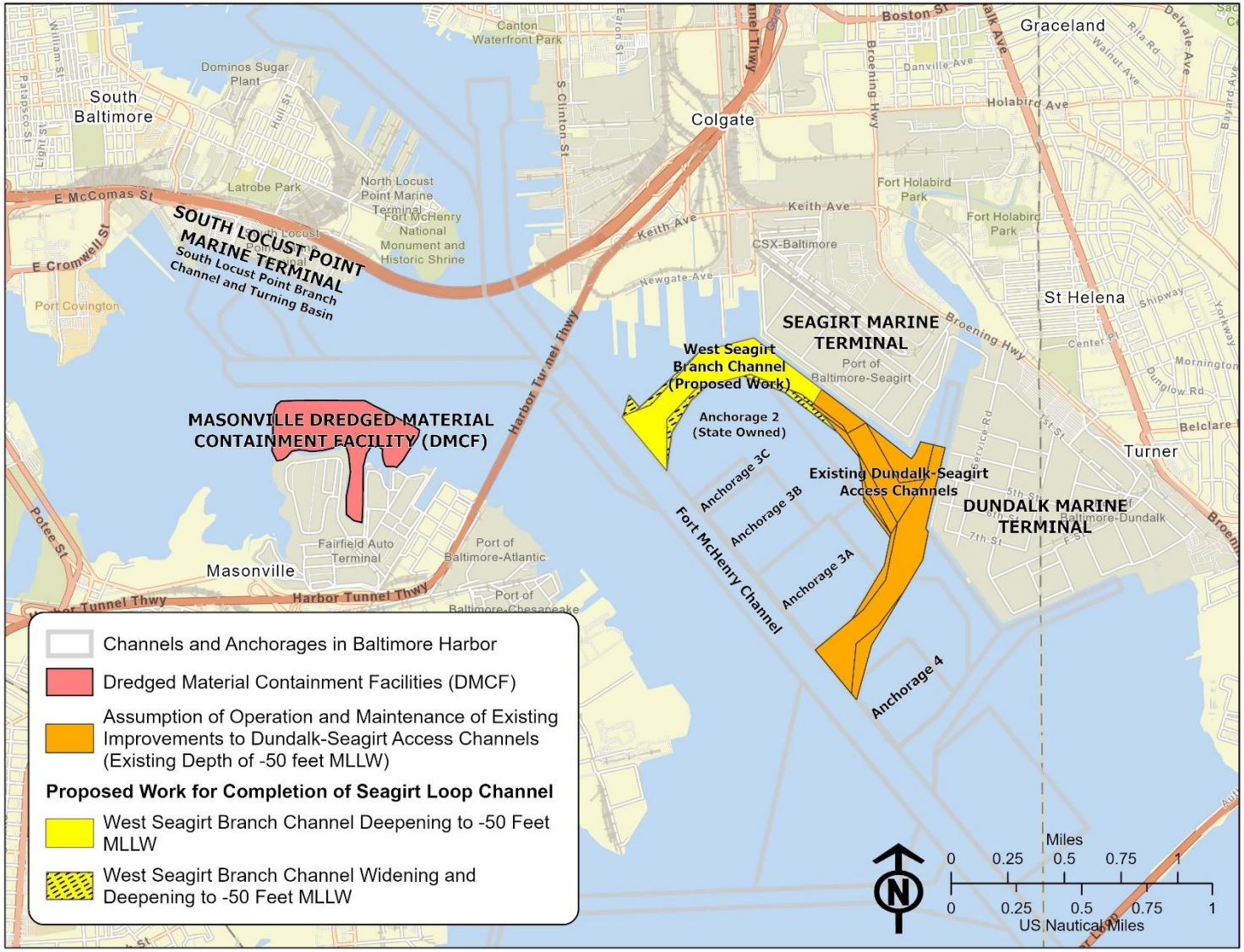

FIGURE 4-6: BHAC MODIFICATION ALTERNATIVE 3 MAP

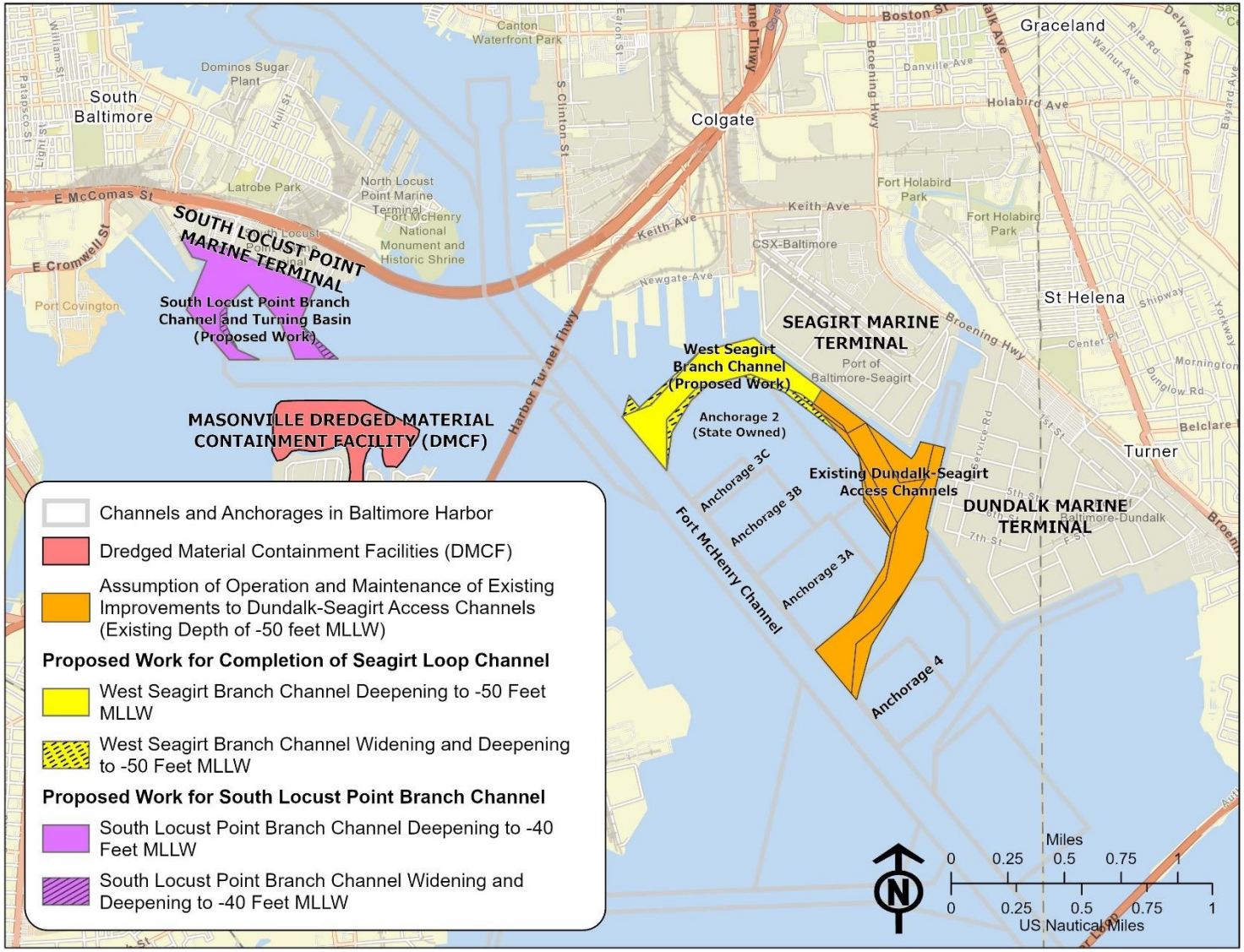

FIGURE 4-7: BHAC MODIFICATION ALTERNATIVE 4-1 MAP

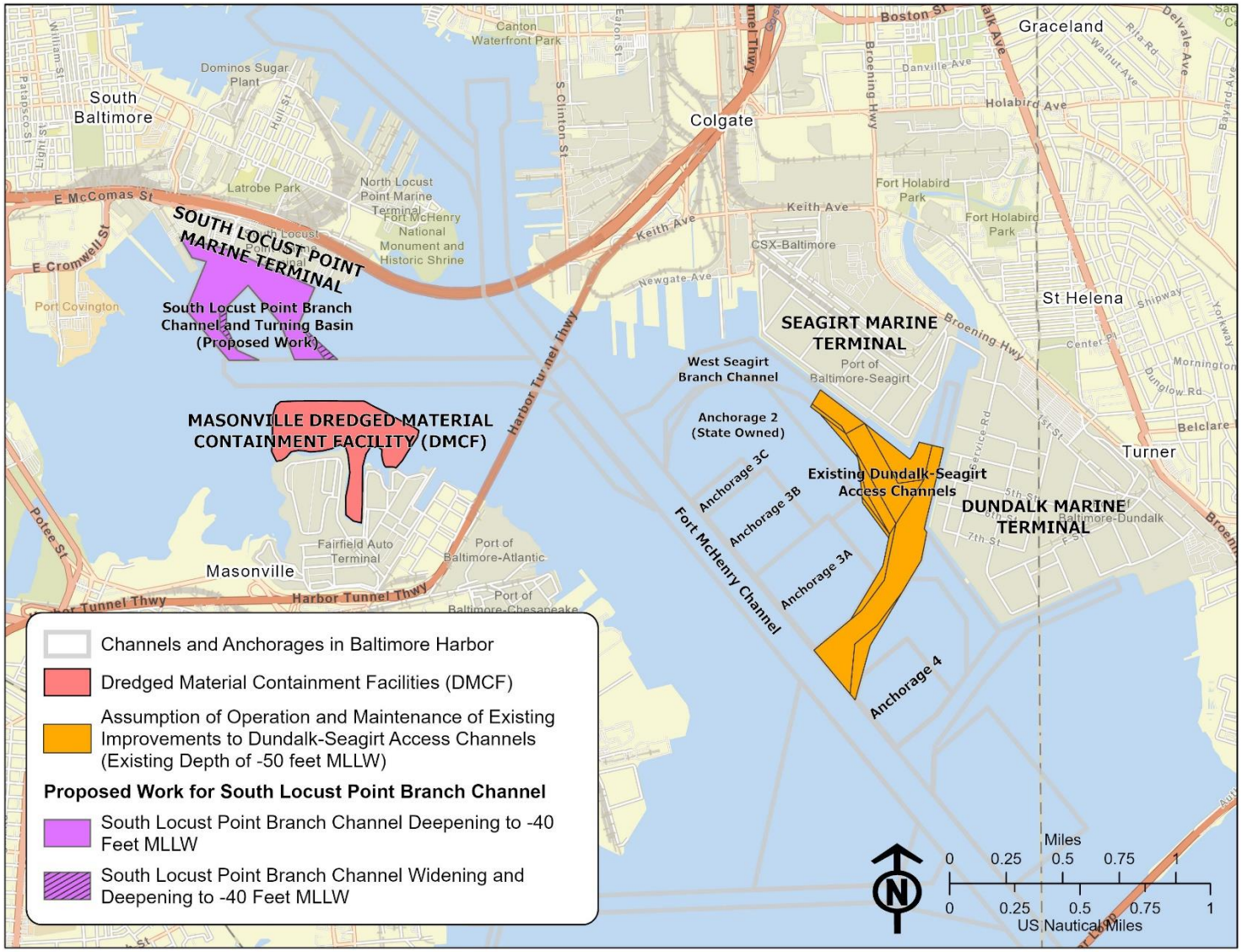

FIGURE 4-8: BHAC MODIFICATION ALTERNATIVE 4-2 MAP

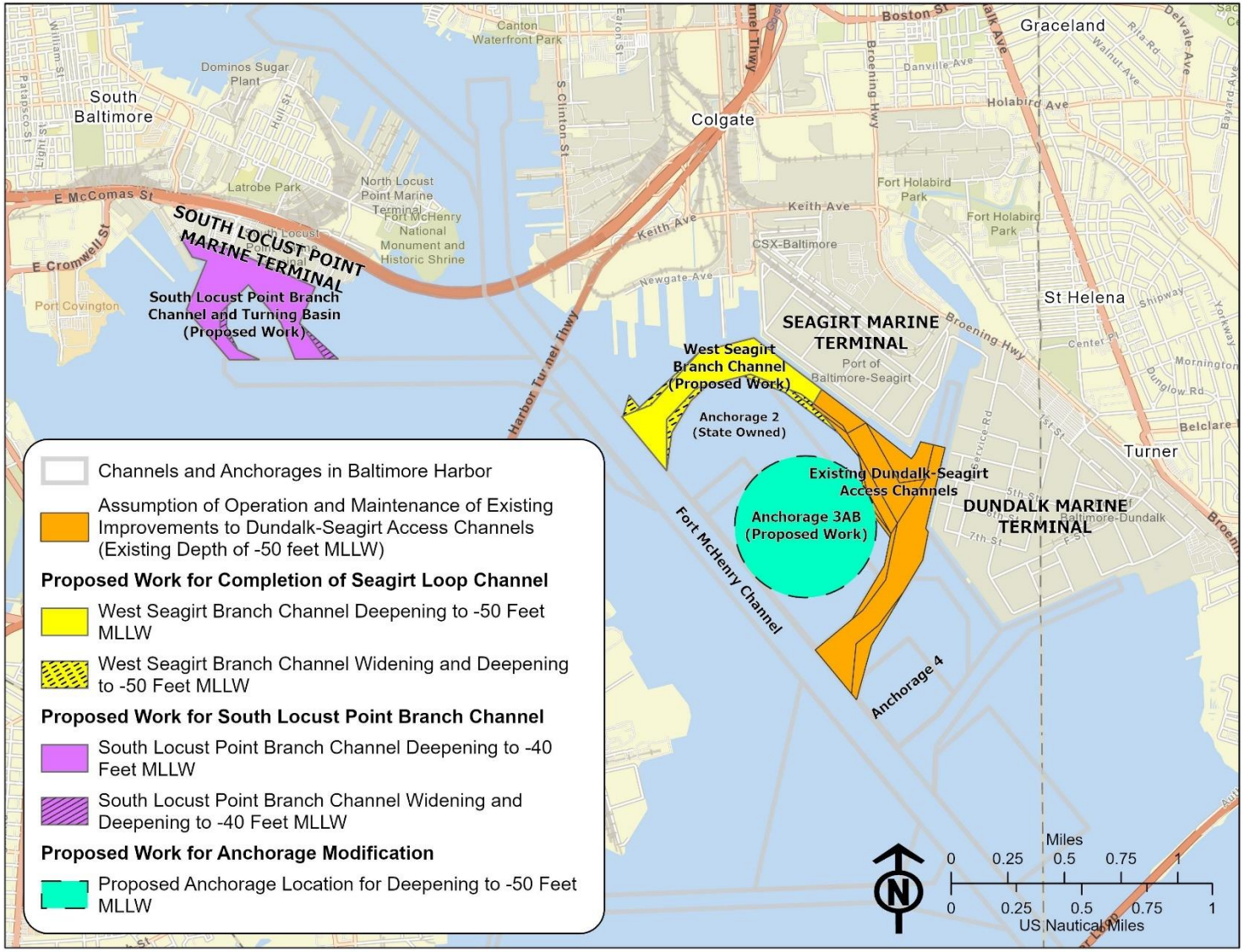

FIGURE 4-9: BHAC MODIFICATION ALTERNATIVE 5-1 MAP

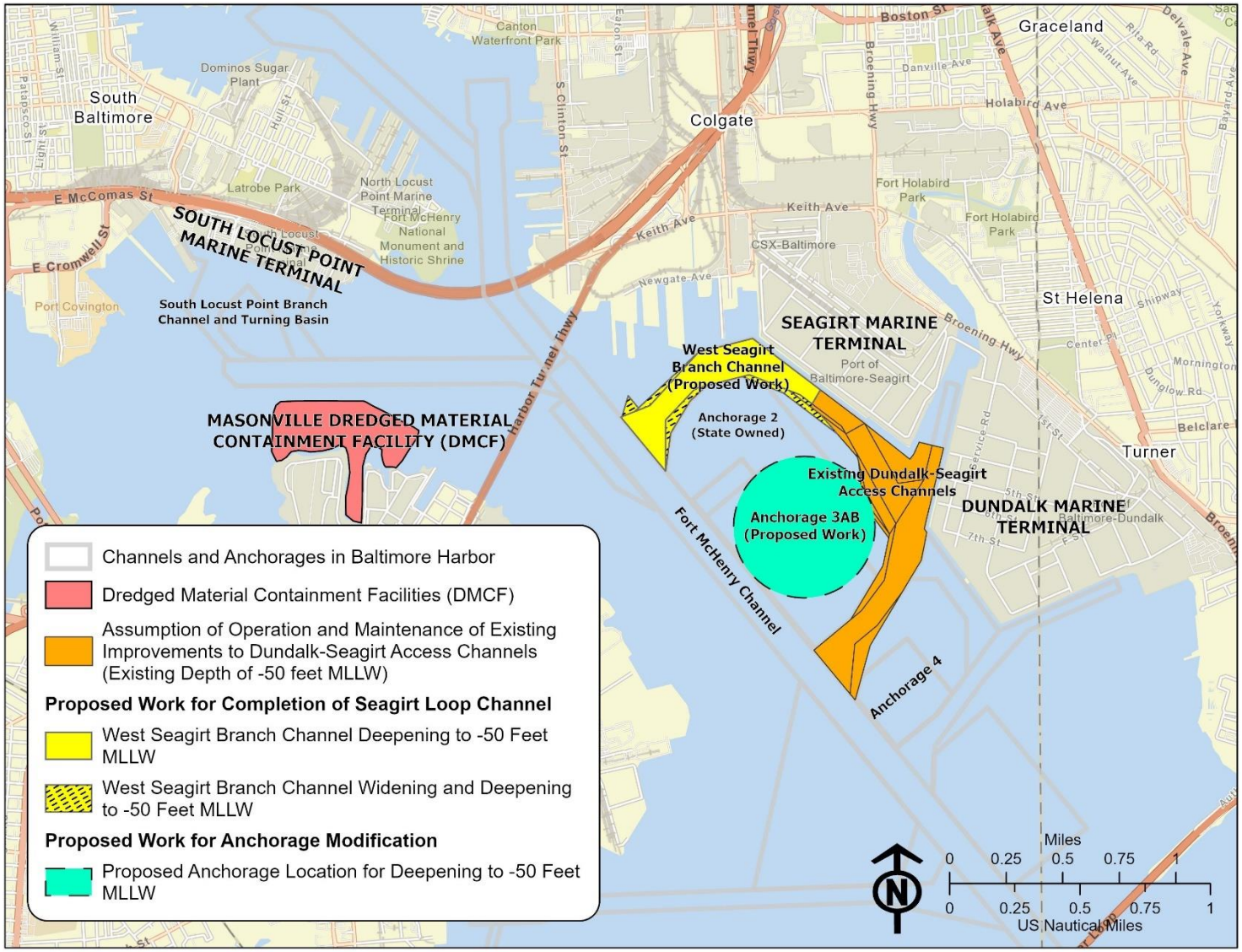

FIGURE 4-10: BHAC MODIFICATION ALTERNATIVE 5-2 MAP

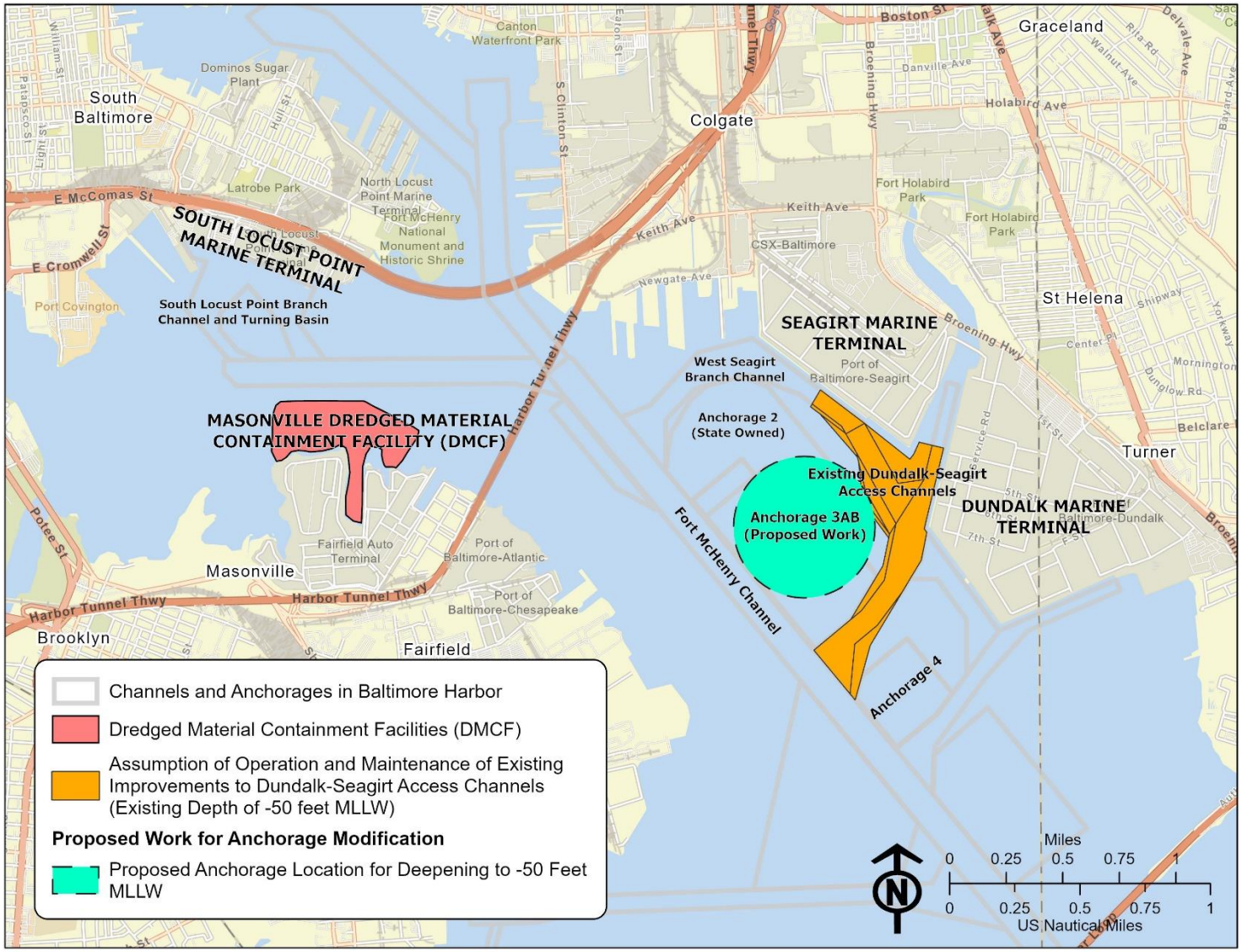

FIGURE 4-11: BHAC MODIFICATION ALTERNATIVE 5-3 MAP

4.7.3 Evaluation of Initial Array of Alternatives

The PDT used the Criteria from the Principles & Guidelines for Water and Related Land Resources Implementation Studies (P&G Criteria) (United States Water Resources Council 1983 and USACE 2000) to evaluate the initial array of alternatives while additional engineering information was developed by various disciplines to inform decision-making. The P&G criteria are described below.

1. **Completeness** - Completeness is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects. This may require relating the plan to other types of public or private plans if the other plans are crucial to realization of the contributions to the objective. This criterion accounted for whether the alternative included all actions (including actions by others) to achieve the desired result.

2. **Effectiveness** - Effectiveness is the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities. This criterion accounted for whether the alternative met the primary objectives of reducing transportation delays, improving navigability and safety, increasing transportation efficiencies, and meeting needs at the Port.

3. **Efficiency** - Efficiency is the extent to which an alternative plan is the most cost-effective means of alleviating the specified problems and realizing the specified opportunities, consistent with protecting the Nation's environment. This criterion accounted for whether the alternative is likely to be a cost-effective means of meeting the identified objectives.

4. **Acceptability** - Acceptability is the workability and viability of the alternative plan with respect to acceptance by state and local entities and the public and compatibility with existing laws, regulations, and public policies. This criterion accounted for whether the alternative plan is viable with respect to state and federal laws and regulations and acceptable by the non-Federal sponsor.

The results of this initial P&G evaluation are detailed in Table 4-5. No alternatives were screened out during the P&G evaluation.

TABLE 4-5: P&G CRITERIA EVALUATION OF ARRAY OF ALTERNATIVES

ALTERNATIVE	COMPLETENESS	EFFECTIVENESS	EFFICIENCY	ACCEPTABILITY
Alternative 1 – No Action	No	No	No	No
Alternative 2 – Assumption of federal maintenance for BHAC improvements	Yes	Yes	Yes	Yes
Alternative 3 – Completion of Seagirt Loop with assumption of federal maintenance	Yes	Yes	Yes	Yes
Alternative 4-1 – Completion of Seagirt Loop & South Locust Point modification (mod.) with assumption of federal maintenance	Yes	Yes	Yes	Yes
Alternative 4-2 – South Locust Point mod. with assumption of federal maintenance	Yes	Yes	Yes	Yes
Alternative 5-1 – Completion of Seagirt Loop, South Locust Point mod., & anchorage mod. with assumption of federal maintenance	Yes	Yes	Yes	Yes
Alternative 5-2 – Completion of Seagirt Loop & anchorage mod. with assumption of federal maintenance	Yes	Yes	Yes	Yes
Alternative 5-3 – Anchorage mod. with assumption of federal maintenance	Yes	Yes	Yes	Yes

4.8 Second Planning Iteration: Focused Array of Alternatives

Prior to the evaluation and comparison of alternatives, the PDT sought clarification on two key issues for the study; (1) whether it was policy compliant to evaluate the assumption of federal responsibility for the BHAC improvements completed by the State of Maryland as part of this feasibility study and (2) whether there was clear planning problem identified

for the South Locust Point Branch Channel, which would meet the study's planning objectives and thus could be formulated and evaluated as part of the feasibility study.

Key Issue 1: Assumption of federal operation and maintenance (O&M) responsibility for BHAC Improvements

On the first key issue, the PDT received clarification from the vertical team at the 8 June 2021 In-Progress Review (IPR) meeting. At the IPR meeting, the PDT presented the policy/legal compliance issue related to the study alternatives recommending federal assumption of O&M for state betterments to the federal navigation channel at the West Dundalk Branch Channel and the Dundalk-Seagirt Connecting Channel. The Section 204(f) process detailed in Engineer Regulation (ER) 1165-2-211, Operation and Maintenance of Improvements Carried Out by Non-Federal Interests to Authorized Harbor or Inland Harbor Projects (4 Feb 2016), allows the Secretary of the Army to consider proposed non-Federal improvements for federal responsibility of O&M but requires that the USACE and the non-Federal interest execute a written agreement before the improvements are constructed. Although the State of Maryland obtained applicable USACE and MDE permits and Section 408 approval prior to deepening the West Dundalk Branch Channel and the Dundalk-Seagirt Connecting Channel, the pre-approval component of Section 204(f) process, as codified in 33 USC § 2232(f) and explained in ER 1165-2-211, was not followed by the State of Maryland prior to state betterments to the federal channel. Following the IPR meeting therefore, it was believed that special legislation would be needed for federal assumption of O&M for those channels. However, on 20 January 2022, the PDT learned that Section 1016 of WRRDA 2014, which did not become part of the codified 33 USC § 2232 and is not discussed in ER 1165-2-211, does provide a process for potential Assistant Secretary of the Army (Civil Works) approval of improvements constructed prior to 31 December 2014. At this time, it is not known whether the State of Maryland would like USACE to evaluate assumption of federal maintenance in accordance with USACE Implementation Guidance for Section 1016 of the Water Resources Reform and Development Act of 2014 - Operation and Maintenance of Certain Projects (17 Jun 2016), or whether the State will seek special legislation to address this issue.

Key Issue 2: Deepening and widening of South Locust Point Branch Channel

The PDT had initially formulated potential for deepening of the South Locust Point Branch Channel and Turning Basin. The South Locust Point Branch Channel and Turning Basin is currently maintained to the federally-authorized depth of -36 feet MLLW. The USACE team sought clarification from the MDOT MPA on the nature of the problem in South Locust Point Branch Channel to be able to model the existing and conditions in

HarborSym. Following further data gathering, analysis, and discussions, the PDT identified no channel constraint or light-loading problem that could be evaluated during formulation as initially identified in discussions during the scoping phase of the study. Instead, the issue appears to be related to navigation channel O&M, including shoaling of some portions of the federal channel. The issue will be addressed through traditional O&M and the measure has been removed from consideration as part of the feasibility study.

Following resolution of these key issues, the array of alternatives was updated to reflect the focused array of alternatives to be evaluated leading up to the TSP. The focused array of alternative is summarized in Table 4-6. The PDT updated plans, estimated quantities, evaluated, and compared the focused array of alternatives.

TABLE 4-6: FOCUSED ARRAY OF ALTERNATIVES

ALTERNATIVES	MANAGEMENT MEASURES			
	ASSUME FEDERAL MAINTENANCE FOR BHAC IMPROVEMENTS	DEEPENING AND WIDENING OF SEAGIRT LOOP CHANNELS	DEEPENING AND WIDENING OF SOUTH LOCUST POINT BRANCH CHANNEL	RE-DESIGN PART OF AN EXISTING ANCHORAGE TO 50' DEPTHS TO ACCOMMODATE LARGER VESSELS
Alternative 1	No Action	No Action	No Action	No Action
Alternative 2	Removed			
Alternative 3	Removed	Retained		
Alternative 4-1	Removed	NA	Removed	
Alternative 4-2	Removed		Removed	
Alternative 5-1	Removed	NA	Removed	NA
Alternative 5-2	Removed	Retained		Retained
Alternative 5-3	Removed			Retained

4.9 Evaluation and Comparison of Alternative Plans

The PDT worked towards a full system of accounts to evaluate and compare alternative plans leading up to the TSP. All four accounts are described below.

1. **National Economic Development (NED)** - Contributions to NED are increases in the net value of the national output of goods and services, expressed in monetary units. Contributions to NED are the direct benefits that accrue in the planning area and the rest of the nation. Contributions to NED include increases in the net value of those goods and services that are marketed and that may not be marketed.

2. **Regional Economic Development (RED)** - The RED account registers changes in the distribution of regional economic activity that result from each alternative plan. Two measures of the effects of the plan on regional economies are used in the account: regional income and regional employment.
3. **Environmental Quality (EQ)** - Beneficial effects in the EQ account are favorable changes in the ecological, aesthetic, and cultural attributes of natural and cultural resources. Adverse effects in the EQ account are unfavorable changes in the ecological, aesthetic, and cultural attributes of natural and cultural resources.
4. **Other Social Effects (OSE)** - The OSE account is a means of displaying and integrating into water resource planning information on alternative plan effects from perspectives that are not reflected in the other three accounts. The categories of effects in the OSE account include the following: urban and community impacts; life, health, and safety factors; displacement; long-term productivity; and energy requirements and energy conservation.

4.9.1 Screening of the Focused Array of Alternatives

Improvements to Anchorages

The required dredging volumes for the proposed anchorage range from about 6.0 million cubic yards (MCY) (Anchorage 3A/B) to 10.64 MCY (Anchorage 5) to 10.8 MCY (Anchorage 6). Due to sediment quality, material from anchorage improvements would be placed at the Cox Creek DMCF. Based on an analysis of DMCF capacity (Appendix B5), the following has been concluded:

Anchorage 3A/B

- Dredging quantities associated with Anchorage 3A/B are significantly lower than the quantities associated with Anchorages 5 and 6.
- It is anticipated that the material required to improve anchorage 3A/B can be placed in Cox Creek DMCF.
- The total quantity of dredged material associated with Anchorage 3A/B could be accommodated by FY 2035 to FY 2038 depending on other Baltimore Harbor new work projects.

Anchorages 5 and 6

- By FY 2041, the predicted Baltimore Harbor dredging demand will exceed the planned Baltimore Harbor DMCF available capacity by 3.87 MCY to 4.03 MCY respectively.

- An alternative placement area would need to be considered or a significant portion would need to be accommodated through innovative reuse in order to minimize impacts to Harbor maintenance dredging.

Therefore, based on the dredged capacity analysis, consideration of improvement to Anchorage 5 and 6 are screened out from further analysis based on the constraint of DMCF capacity.

The PDT evaluated and compared the focused array of alternatives initially focusing on costs and economic benefits to determine the economic justification of the alternative plans. The evaluation of the alternative plans is summarized in Table 4-7. The dredging volumes for anchorage deepening reflected in this table were updated after completion of the hydrographic surveys in the spring of 2021, but cost estimates were not updated from initial scoping estimates. Cost estimates are summarized in Appendix B6 and were deemed to provide sufficient detail for the initial evaluation of the anchorages in Alternatives 5-2 and 5-3. The estimated initial construction costs for dredging Anchorage 3 to -50 feet MLLW were estimated to be $82,812,800 and did not include PED costs, construction management, or O&M costs. The annual equivalent (AEQ) costs for the anchorage deepening were estimated at $2,891,000.

The benefits associated with anchorage deepening include reduction in stand-by delays of up to 4 hours for larger containerships calling at SMT. These benefits are captured by only a small portion (about 6%) of all containerships that presently call at SMT because benefiting vessels must draft in excess of the -42-foot depth of the existing Baltimore Harbor anchorages and current data illustrates that this proportion has anchored at the Annapolis anchorages. The AEQ benefits are $314,000. The evaluation was completed by comparing the AEQ costs and AEQ benefits. The benefit cost ratio (BCR) is estimated by dividing the AEQ benefits by the AEQ costs, which equals 0.1. Net benefits are defined as the AEQ benefits minus the AEQ costs, which equals -$2,577,000. Based on this evaluation, the PDT screened out Alternative 5-2 and 5-3 as both would result in negative net benefits for the anchorage modification, a key measure of both alternative plans. Additionally, details on the economic evaluation are provided in Appendix C.

TABLE 4-7: EVALUATION AND COMPARISON OF THE FOCUSED ARRAY OF ALTERNATIVES

ALTERNATIVE	DREDGING MATERIAL VOLUME (CY)	ESTIMATED COSTS	AEQ COSTS	AEQ BENEFITS	BCR	NET BENEFITS	SCREENING RESULTS
Alternative 1	No Action						**RETAIN**
Alternative 2	Removed						REMOVED
Alternative 3	-	-	-	-	-	-	**RETAIN**
Alternative 4-1	Removed						REMOVED
Alternative 4-2	Removed						REMOVED
Alternative 5-1	Removed						REMOVED
Alternative 5-2	8,058,571*	-	-	-	-	-	**SCREENED OUT**
Alternative 5-3	6,136,511*	$82,812,800	$2,891,000	$314,000	0.1	-$2,577,000	**SCREENED OUT**

**Note that quantities were updated following the development of the conceptual design costs and increased from the previous estimate. The costs for anchorage deepening reflected in this table were developed prior to the revision of these quantities and are in FY2021 dollars. As costs were projected to increase once cost estimates were to be updated, the decision to screen this alternative based on out-of-date costs was deemed appropriate by the PDT.*

Deepening and Widening of Seagirt Loop Channels

The proposed modifications to the WSBC will improve existing navigation to accommodate the increased expected traffic and larger vessel sizes calling on SMT. Concept dredged material volumes were calculated for 5H:1V side slopes and resulted in volumes of approximately 1.9 MCY. These volumes of material can be accommodated at the Cox Creek DMCF when site improvements are completed. Incremental modifications to the WSBC with deepening up to -50 feet +2 feet MLLW and adding channel wideners is carried forward for further evaluation.

4.10 Third Planning Iteration: Evaluation of the Final Array of Alternatives

Following the evaluation and screening of anchorage alternatives in the focused array of alternatives, the PDT worked on refining total costs to evaluate and compare the final array of alternatives, which include Alternative 1, the No Action Alternative, and Alternative 3, deepening and widening of Seagirt Loop Channels, specifically the WSBC. For WSBC, dredging volumes were estimated for all dredging depths from the existing maintained depth of -45 feet MLLW down to -50 feet MLLW. The dredging volumes and total project costs for Alternative 3 are summarized in Table 4-8 and detailed in Appendix B.

TABLE 4-8: QUANTITIES AND COST ESTIMATES FOR DEEPENING AND WIDENING OF THE WSBC

ALTERNATIVE CHANNEL DEPTH (FT MLLW)	DREDGING VOLUME (CY)*	TOTAL PROJECT COSTS**	INTEREST DURING CONSTRUCTION (IDC)	AEQ COSTS	ANNUAL O&M COSTS	TOTAL AEQ COST
-46	1,131,860	$31,528,000	$127,000	$1,061,000	$56,600	$1,118,000
-47	1,317,210	$34,333,000	$138,000	$1,155,000	$56,600	$1,212,000
-48	1,514,450	$37,186,000	$148,000	$1,251,000	$56,600	$1,308,000
-49	1,716,370	$41,513,000	$164,000	$1,397,000	$56,600	$1,454,000
-50	1,922,060	$44,952,000	$177,000	$1,513,900	$56,600	$1,571,000

**Dredging volumes are conservatively estimated by counting an additional 2 feet of allowable overdepth in the calculation.*
***Total Project Costs shown are in FY2022 dollars and are annualized using a discount rate of 2.5%.*
Costs are rounded to the nearest thousand.

Economic modeling was completed in HarborSym and evaluation was completed for all proposed authorized depths starting with -45 feet MLLW down to -50 feet MLLW. Cost estimates also include 2 feet of allowable overdepth from the proposed authorization depths reflected in the evaluation. Total project costs are summarized in Appendix B6 and include PED costs, construction management costs, and have been escalated to the current year of 2022. Total project costs were annualized using a discount rate of 2.5%. Interest during construction (IDC) and annual O&M costs were added to the annualized costs to estimate a total AEQ cost for the economic evaluation.

The Seagirt Loop Channel was simulated in HarborSym to estimate reduction in transportation delays associated with completion of the loop. As 50 percent of the loop had already been completed by others, the PDT had to identify benefits associated with deepening and widening of WSBC only rather than benefits for the full loop. Two benefit categories were identified and quantified during the study, including: reduction of in-harbor transportation delays of up to 3 hours for vessels calling at SMT, and origin to destination (OD) benefits associated with Gen 3 max vessels being able to call more frequently at the Port of Baltimore with the Seagirt Loop Channel in place. Benefits begin to accumulate after deepening 1-foot beyond the existing condition of -45 feet MLLW. At -46 feet MLLW, there is a “tipping point” associated with the OD benefits and a big jump in benefits shown in Table 4-9. Benefits continue to increase up to -50 feet MLLW. Note that widening was assumed to be roughly the same approximate footprint for all incremental depths. However, benefits were primarily associated with the deepening of the channel.

The economic analysis was completed by calculating BCRs and net benefits for all increments of depths down to -50 feet MLLW and are summarized in Table 4-9. The NED plan is deepening and widening of WSBC to a proposed authorized depth of -47 feet MLLW. While the 48 foot-alternative plan has higher net benefits, E.R. 1105-2-100 Appendix G states that "where two cost effective plans produce no significantly different levels of net benefits, the less costly plan is to be the NED plan, even though the level of outputs may be less." The net benefits for these two alternative plans are within 5 percent, therefore, the NED plan is the least cost alternative depth of -47 feet MLLW. This plan results in net benefits totaling $3,682,000 and has a benefit cost ratio (BCR) of 4.0 at 2.5% discount rate. More information is available in Appendix C of this report.

The MDOT MPA has expressed interest for a potential locally preferred plan (LPP) that includes deepening and widening of the WSBC to a proposed authorized depth of -50 feet MLLW. The potential LPP has positive net benefits of $3,631,000 and a BCR of 3.3 at a 2.5% discount rate. The potential LPP still includes an economically justifiable project with significant benefits to NED. Additionally, the potential LPP ensures consistent channel depths throughout the Seagirt Loop Channel allowing all present and future vessels calling at the Port's SMT to be able to safely maneuver the loop to deliver cargo.

TABLE 4-9: ECONOMIC EVALUATION FOR THE ALTERNATIVE DEPTHS FOR THE DEEPENING AND WIDENING OF WSBC

ALTERNATIVE ESTIMATED DREDGING DEPTH (FT MLLW)*	TOTAL PROJECT COSTS**	TOTAL AEQ COST	AEQ BENEFITS	NET BENEFITS	BCR
-45' Alternative Depth (-47' cost estimate)	Existing Condition				
-46' Alternative Depth (-48' cost estimate)	$31,528,000	$1,118,000	$469,000	$(647,000)	0.4
NED PLAN -47' Alternative Depth (-49' cost estimate)	**$34,333,000**	**$1,212,000**	**$4,894,000**	**$3,682,000**	**4.0**
-48' Alternative Depth (-50' cost estimate)	$37,186,000	$1,308,000	$5,069,000	$3,761,000	3.
-49' Alternative Depth (-51' cost estimate)	$41,513,000	$1,454,000	$5,159,000	$3,705,000	3.6
POTENTIAL LOCALLY PREFERRED PLAN: -50' Alternative Depth (-52' cost estimate)	**$44,952,000**	**$1,571,000**	**$5,202,000**	**$3,631,000**	**3.3**

**Estimated dredging depth includes the proposed authorized depth plus 2 feet of allowable overdepth.*
***Total Project Costs shown are in FY2022 dollars and are annualized using a discount rate of 2.5%.*

4.11 Plan Evaluation and Comparison

4.11.1 National Economic Development

The NED evaluation for the No Action Alternative, NED Plan and the potential LPP are highlighted in this section and summarized in Table 4-10. The NED Plan is deepening and widening of the WSBC down to -47 feet MLLW, which results in net benefits totaling $3,682,000 and has a benefit cost ratio (BCR) of 4.0 at 2.5% discount rate. The total cost for implementation of the potential LPP is $44,952,000 in FY 2022 dollars, with the non-Federal sponsor being responsible for 100 percent of the costs in excess of the NED plan, an estimated $10,619,000. The BCR was also calculated in accordance with Executive Order 12893 of January 26, 1994 using a 7% discount rate resulting in a BCR of 1.9 for the NED Plan and 1.5 for the potential LPP. More details on the NED evaluation are included in Appendix C.

TABLE 4-10: SUMMARY OF COSTS AND BENEFITS FOR THE NED EVALUATION

	NO ACTION	NED PLAN	POTENTIAL LPP
Total Investment Cost	$0	$34,333,000	$44,952,000
Average Annual Costs			
AAEQ Investment Cost	No added impact	$1,155,000	$1,514,000
AAEQ Operation and Maintenance Cost	No added impact	$57,000	$57,000
Total AAEQ Costs	No added impact	$1,212,000	$1,571,000
AAEQ Benefits	No added impact	$4,894,000	$5,202,000
Net Benefits	No added impact	$3,682,000	$3,631,000
BCR at 2.5%	No added impact	4.0	3.3
BCR at 7%	No added impact	1.9	1.5
LPP Costs in Excess of NED Plan*	Not Applicable	Not Applicable	$10,619,000

All costs are in FY 2022 dollars and values have been annualized using a 2.5% discount rate unless otherwise stated.
All values are rounded to the nearest 1,000.
**LPP costs in excess of the NED Plan are 100% borne by the non-Federal sponsor.*

4.11.2 Regional Economic Development

The RED evaluation was completed using Regional Economic System (RECONS) to determine changes in the distribution of regional economic activity for each alternative plan. The RED evaluation focuses on the creation of jobs and regional contributions to income and economic output associated with investments from the proposed action. The results of this analysis for the No Action Alternative, NED Plan and potential LPP are

summarized in Table 4-11. The greater investment in implementing the potential LPP results in greater economic output and a larger number of direct jobs and total jobs than the NED Plan. More details on the RED evaluation are included in Appendix C.

TABLE 4-11: SUMMARY OF RED IMPACTS

RED IMPACTS CATEGORIES	NO ACTION	NED PLAN	POTENTIAL LPP
Direct Jobs (Total Jobs)	No added impact	376 (608)	492 (796)
Labor Income	No added impact	$26,984,835	$35,331,089
Gross Regional Product	No added impact	$30,114,720	$39,429,031
Economic Output	No added impact	$47,730,432	$62,493,181

4.11.3 Environmental Quality

The PDT also evaluated differences in the EQ for the alternative plans. The results of the EQ evaluation are summarized for the No Action Alternative, NED Plan and potential LPP in Table 4-12. Note EQ impacts are not expected to vary between the NED Plan and potential LPP; therefore, both plans are considered to be addressed under the Action Project Alternative. Both plans would remain within regulatory thresholds and require no mitigation actions. The primary environmental quality concerns are related to minor impacts resulting from increases in air quality emissions including pollutants of concern and GHG during construction, minor impacts in noise during construction, and potential impacts on air quality and noise to Environmental Justice communities adjacent to the Port facilities. There are also minor impacts associated with turbidity during construction and aesthetic/viewshed impacts from larger vessels calling at the Port from Fort McHenry and two National Scenic/Historic Trails. More information on the EQ analysis is included in Section 6 of the Draft Report.

TABLE 4-12: SUMMARY OF EQ IMPACTS

RESOURCE	NO ACTION	ACTION PROJECT ALTERNATIVE	
		NED PLAN	POTENTIAL LPP
Environmental Justice	Temporary, Negligible to Minor	Temporary, Negligible to Minor	Temporary, Negligible to Minor
Topography and Bathymetry	Permanent, Negligible to Minor	Permanent, Minor	Permanent, Minor
Geology, Soils, and Sediments	No Effect	No Effect	No Effect
Water Resources and Water Quality	Temporary, Negligible to Minor	Temporary to Permanent, Minor	Temporary to Permanent, Minor
Essential Fish Habitat	Temporary, Negligible to Minor	Temporary, Minor	Temporary, Minor
Fish and Wildlife	Temporary, Negligible to Minor	Temporary, Minor	Temporary, Minor
Benthic Fauna	Temporary, Minor	Temporary, Minor	Temporary, Minor
Threatened and Endangered Species	Temporary, Insignificant	Temporary, Insignificant	Temporary, Insignificant
Cultural Resources	No Effect	Permanent, Minor	Permanent, Minor
Recreation	Temporary, Negligible	Temporary, Negligible to Minor	Temporary, Negligible to Minor
Aesthetics and Scenic Resources	No Effect	Permanent, Negligible to Minor	Permanent, Negligible to Minor
Hazardous, Toxic, and Radioactive Waste	Temporary, Minor	Temporary, Minor	Temporary, Minor
Air Quality	No Effect	Temporary, Minor	Temporary, Minor
Greenhouse Gases (GHG)	No Effect	Temporary, Negligible	Temporary, Negligible
Noise and Vibration	No Effect	Temporary, Minor	Temporary, Minor

4.11.4 Other Social Effects

The USACE Institute for Water Resources defines Other Social Effects (OSE) as “how the constituents of life that influence personal and group definitions of satisfaction, well-being, and happiness, are affected by some water resources condition or proposed intervention” (USACE 2013-R-03). The work in the study area is expected to occur across 3 calendar years (2025-2027) and will be completed with minimal direct impact. All dredging work will be conducted from the waterside, including placement into an approved DMCF. No roadwork, bridge modification, or alterations to other public utilities are anticipated, therefore no landside impacts such as increased traffic are anticipated.

With or without the proposed project improvements, calls to the Port are projected to increase. However, the improvements to the Seagirt Loop and the movement of cargo using post-Panamax vessels are projected to improve efficiency, with lower cost and environmental impact per metric ton and increased safety. Additionally, other projects including the modernization of the SMT (ongoing) and the Howard Street Tunnel Improvement project (construction initiated in 2021) focus on increased efficiency at the Port. Since the proposed Seagirt dredging project is in part related to a larger effort to improve efficiency and safety at the Port, potential OSE are considered for the cumulative plans, including landside improvements. This assessment finds that, overall, direct project-related impacts would be minor and short-term, while project upgrades and continued community outreach are expected to have a cumulative long-term benefit to the residents of the State of Maryland and the surrounding communities of Baltimore, especially related to economic growth and increased jobs in the region.

The OSE evaluation compares the No Action Alternative to the NED Plan and the potential LPP. A reduction in some OSE benefits is expected under the NED Plan related to the parameters listed below. Reductions in cargo from large draft vessels may be influenced by perception of safety or convenience due to the full Seagirt Loop Channel not being completed to 50-foot of depth. The reduction in risk of collisions, allisions, and other vessel safety issues may not be fully realized since back-out procedures will still need to be conducted on some of the largest, most difficult to maneuver vessels. This would be a concern in particular with the projected expansion of Berths 1 and 2. Additionally, the perception of safety and inconvenience by Pilots, rather than quantifiable risk, may be the cause of diversion at a -47-foot channel depth versus a 50-foot depth. The impacts could result in loss of calls by large draft vessels and the associated benefits, and as the world fleet transitions to larger class vessels, it could have a disproportionate impact on the Port of Baltimore as compared to other East Coast with a 50-foot draft channel system. The OSE evaluation for the No Action Alternative, the NED Plan, and potential LPP is summarized in Table 4-13 below.

Health and Safety

Direct impacts of the project on human health related to air quality will be temporary and minor and are addressed in section 2.13. The study area is zoned as a Marine Industrial District, formally referred to as the Marine Industrial Zoning Overlay District, which was enacted in 2004 (Baltimore City Ordinance 04-804) to protect Baltimore’s maritime industries from pressures to convert waterfront industrial properties to mixed-use with residential. The intent of the designation was to delineate an area where maritime shipping can be conducted without intrusion of non-industrial uses and where investment in maritime infrastructure and related jobs is encouraged. The dredging related to this

study is considered part of normal Port operations and consistent with its designation as a marine industry. Since the surrounding area is highly developed as industrial, with the closest community being more than 1 mile away, and the dredging related to this project being relatively small-scale and short-term, there are no additional measurable impacts to health related to noise, vibration, or lighting expected.

Sediments in the study area contain contaminants from industrial and municipal sources as well as from non-point sources as a result of the current and past uses in an urbanized/industrialized region (USACE 2016). Some priority pollutants, including several heavy metals, are present in dredged material in Baltimore Harbor (EA EST 2012). The sediments related to this project do not qualify for beneficial use and will be placed at Cox Creek DMCF. Once placed at the DMCF, they may be used in Innovative Beneficial Reuse (IBRU) programs implemented by MDOT MPA. These state projects repurpose dredged material in the development or manufacturing of commercial, industrial, horticultural, agricultural, and other projects following the MDE criteria which details monitoring requirements, public health standards and long-term management needs.

MDOT MPA operates and manages discharges from Cox Creek DMCF by an individual permit issued under the NPDES permit program and has waste load allocations for nutrients that are consistent with the Bay and Baltimore Harbor TMDLs. No negative impacts to health related to placement are expected. Temporary and minor adverse impacts to water quality that result from project-construction dredging and continued channel maintenance operations include increased TSS, turbidity, and nutrient levels near the study area and have the potential to affect recreational boaters. Longer term water quality impacts related to this study would be similar to existing conditions and are not expected to have an additional impact on health, recreation, or overall quality of life in the study area regardless of dredging depth.

With increased cargo and ship traffic anticipated regardless of this project, improvements to the channel reduce the potential for ship collisions and groundings, therefore helping to minimize potential release of hazardous materials such as fuel or hazardous cargo into the nation’s waterways. Additionally, the increase in post-Panamax vessels that tend to have newer, more efficient technology with fewer emissions versus older vessels is likely to result in cargo moving into the region with lower overall impact to metrices such as GHG emissions per metric ton.

Other improvements not discussed as part of this study but addressed in projects related to the modernization of the SMT offer additional increased safety and efficiency. The SMT Berth 3 modernization project (underway in anticipation of providing 50-foot access) will enhance the safety of the terminal’s longshoremen, even with the anticipated increase in

cargo handling, through repairing wharf structures, resurfacing pavement, and providing the infrastructure for modern technology and equipment. An example of safety improvements is the installation of modern cranes with Smart Landing Systems technology that automatically profiles the working area and decreasing the opportunity for accidents to occur. The upgrade to the Smart Landing System automates cargo movement which also reduces on-dock noise.

The SMT Berth 3 modernization study, which was conducted in order to evaluate improvements needed to effectively accommodate a 50-foot draft vessel, also explains that without the improvements to the Port of Baltimore, cargo may be diverted to nearby ports such as New York and New Jersey; Norfolk, Virginia; or Canada, which would be a loss in revenue to the region and would result in an increased number of trucks needed to meet the requirements of shipment volumes in and out of the Baltimore region. Improvements to the SMT enable containers to arrive and depart from Baltimore, rather than entering the U.S. at another port and being trucked to Baltimore. This benefits all users of the regional transportation system through reduced congestion, improved road safety, and better air quality that will follow the traffic reduction. By reducing the number of trucks on the roads, accidents, fatalities, injuries, and property damage will be reduced.

Additionally, the Environmental Assessment for the Howard Street Tunnel Project found no additional impacts in noise or vibration related to operation of the new double-stacked trains. However, the study finds that improvement of the regional air quality would result in the transfer of freight volume from highways to the rail system and the subsequent decrease of vehicle emissions as the optimized travel mode of freight by train replaces on-road vehicles. Transporting freight by railroad, especially in a double stacked intermodal container configuration, produces significantly fewer emissions than if the same quantity of freight were moved by truck, and double stacking reduces the number of trains used to transport the expected growth in East Coast freight traffic. An estimated reduction of 137 million gallons of fuel and 1.2 billion truck miles traveled is estimated in the 30-year period of assessment (FRA 2021).

Economic Vitality

For more than 300 years, the Port has served as a vital point for commerce and shipbuilding. Its legacy and connection to the surrounding community continue today. For over 30 years, MDOT MPA has been engaging and partnering with communities throughout the Baltimore region through its DMMP and Planning and Environmental Management Programs. Recognizing that many in the surrounding communities are underserved or disadvantaged, MDOT MPA focuses activities on advancing stakeholder

inclusion, enhancing the local environment, and making socially responsible decisions (MDOT MPA 2020).

The Port of Baltimore is one of the largest job creators in the State of Maryland and MDOT MPA has been a strong advocate of connecting employers and prospective employees from neighborhoods throughout Baltimore. The 2017 report “Economic Impact of the Port of Baltimore in Maryland” shows that the Port generated approximately 15,300 direct jobs, with nearly 140,000 jobs overall linked to Port activities. The report also shows that the Port was directly responsible for $3.3 billion in personal wages and salary and $395 million in state and local tax revenues with an additional $2.6 billion in business revenue. MDOT MPA and the Baltimore Port Alliance collaborate on developing and distributing fact sheets about available Port-related training and job resources. In 2019, MDOT MPA supported the Baltimore Port Alliance’s first Hiring and Career Expo that helped connect 215 prospective employees with more than 30 Port businesses and organizations and followed up with a virtual event in 2021 that attracted over 275 job seekers. The SMT Berth 3 modernization study points out that efficiency at the Port will result in increased direct jobs (estimated 400 full-time equivalent) and goes on to explain that job creation will have a “domino effect”.

Outreach and Education

Through programs such as "Port 101," which provides presentations, terminal, and facilities tours, MDOT MPA works to establish a shared understanding of the needs, concerns, and priorities with community representatives. Twice each year, MDOT MPA hosts terminal tours that give the surrounding communities an opportunity to see the Port up close. When possible, MDOT MPA builds relationships through community engagement at public events and volunteer opportunities. Finally, when appropriate, MDOT MPA will often invest time and resources to provide technical and other support to communities to help advance mutual goals.

Widely accessible educational opportunities and equitable collaboration with Port stakeholders is a top priority. In partnership with the Living Classrooms Foundation and National Aquarium, Masonville Cove offers a variety of environmental education programs to students and citizens in the surrounding neighborhoods. Through the Terrapin Education and Research Partnership MDOT MPA engages Maryland students in a first-hand study of terrapin biology and participate in animal care and research, all while learning about the Port and its Poplar Island ecosystem restoration and habitat development project. The Port also sponsors the Baltimore Environmental Education Science, Math, and Reading Trailblazers summer program that combats summer learning loss and promotes literacy through environmental science. The 2020 program was

converted to a 100 percent virtual delivery platform with 53 student participants; by the end of the program, 100 percent of students increased their literacy level.

Social Connectedness

The relationship between the Port and the surrounding community may be considered relatively unique. Where other Ports operate outside of the public eye, the Port's success continues to be a major source of pride and social identity to residents of the City of Baltimore. The Port is one of only four East Coast ports with a 50-foot access channel and it is essential that it remain competitive and continue as a source of pride to the economically distressed city, which has over 20% of its population living in poverty: according to the 2019 American Community Survey.

As the Port's expansion continues, the changes in the surrounding viewshed only increases the perception of the Port as a vital part of the economics in the region. This was seen in the outpouring of support as the new post-Panamax cranes traveled up the Chesapeake Bay to be installed at SMT. Recreational boaters and landside onlookers posted unknown numbers of social media posts and local news sources continued to cover the expansion with enthusiasm and pride, noting the importance of the Port to the economics of the region.

Working to enhance the connectedness and quality of life of the Baltimore community it serves, MDOT MPA invests in projects such as the Masonville Cove Partnership, which recently celebrated 10 years of serving the adjacent communities of Brooklyn, Curtis Bay, Cherry Hill and Baybrook, with free and engaging experiences in the Environmental Education Center. In 2019, the Port awarded an MDOT's Secretary's Grant to the Fleming Park Shoreline IRBU project which will use Baltimore Harbor channel dredged material to make significant improvements to Fleming Park, located in Turner Station, a historically African American community. The improvements, using sediments that meet the IRBU state guidelines for intended use, will provide the community with multiple benefits, including flood risk protection, shoreline restoration, coastal resiliency, aquatic ecosystem, and water quality improvements as well as enhanced waterfront recreational opportunities.

Additionally, MDOT MPA continually strives to be a good neighbor. Outreach activities are held regularly to connect with the nearby St. Helena community (identified as an environmental justice community). Trash cleanups and tree plantings sponsored by the MDOT MPA, and their partners are held regularly. For example, in 2019, 70 MDOT MPA volunteers planted more than 100 trees along Broening Highway to help improve air and water quality.

MDOT MPA continues to look for ways to improve equitable representation and are prioritizing recruitment of DMMP committee members and engagement of stakeholders that reflect the diversity of the communities adjacent to, and impacted by, the Port to ensure the benefits of MDOT MPA restoration projects and programs are distributed equitably without disproportionate impacts on vulnerable populations.

TABLE 4-13: SUMMARY OF OSE IMPACTS

METRIC		NO ACTION	NED PLAN	POTENTIAL LPP
Health and Safety	**Mental Health**	No effect	No effect	No effect
	Physical Health	No effect	Minor temporary due to increase in air pollutants, noise related to construction	Minor temporary due to increase in air pollutants, noise related to construction. Occurring for a longer duration than the NED Plan due to a slight increase in the construction timeline
	Safety	Minor long-term decrease in safety due to existing maneuverability issues	Minor long-term increase in safety due to navigation improvements and reductions in risk	Safety improvements are greatest at 50-foot depth with all vessels able to complete the loop without the need to complete back-out maneuvers
	Traffic Impacts	No effect	No effect	No effect
Economic Vitality	**Financial Impacts**	No effect	Minor long-term effect due to the small scale of the project resulting in some increases in efficiency	Minor long-term effect due to the small scale of the project resulting in some increases in efficiency. Additional increases in efficiency are recognized under the LPP
	Employment Opportunities	No effect	Negligible short-term increase employment opportunities related to the dredging project	Negligible short-term increase employment opportunities related to the dredging project
Outreach and Education	**Public Engagement**	No effect	No effect	No effect
	Education and Outreach	No effect	No effect	No effect
Social Connectedness	**Community Investment**	No effect	No effect	No effect
	Community Identity	No effect	No effect	No effect
	Equitable Inclusion in Decisions	No effect	No effect	No effect

4.12 Plan Selection

The evaluation and comparison of alternative plan depths for Alternative 3 – deepening and widening of WSBC is detailed in this Chapter. The NED Plan is the plan that reasonably maximizes net benefits and is identified as the deepening of the WSBC to -47 feet MLLW with widening to a minimum width of 620 feet. NED benefits are reasonably close between the alternative depths, however, the least costly plan is the NED Plan per USACE guidance. The RED evaluation illustrates that the higher investment associated with dredging WSBC to -50 feet MLLW has greater RED benefits than the -47 feet MLLW plan, including greater job creation, labor income for the region, and regional economic output. Evaluations for EQ are not likely to vary between the alternative plan depths shown and were evaluated to the largest possible footprint (depth/width) to account for all possible environmental consequences of the proposed action. EQ categories of concern do not exceed regulatory thresholds and no mitigation actions are proposed. Lastly, the OSE evaluation primarily focused on the impact of the proposed action and did not quantify differences between the -47 feet and -50 feet MLLW alternative plans. Considerations of safety are likely to vary between the two alternative depths in the NED Plan (-47 feet MLLW) and the potential LPP (-50 feet MLLW) particularly as implementing the NED Plan as the recommended plan would result in differences in channel depths between WSBC and the -50-foot portions of the Seagirt Loop Channel. These considerations for safety will be captured through ship simulation to be completed during the feasibility study.

Based on the above alternative analysis, and considerations for NED, RED, EQ, and OSE accounts for the navigation improvements, the Tentatively Selected Plan is the NED Plan, the plan that reasonably maximized net benefits. The NED Plan is subject to change as a result of further analysis for plan optimization including ship simulation, refinement of channel design, dredged material quantities, cost and benefit calculations. The PDT recognizes that there are also likely to be differences between the alternative plan depths in the RED account, which shows an implicit trade-off in regional economic outputs based on national investments, and OSE, specifically safety that are being considered during plan optimization.

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5 Tentatively Selected Plan*

The analysis presented in Chapter 4 has demonstrated the planning process used to screen, evaluate, and compare alternatives in this feasibility study. As described in that chapter, other alternatives were screened from consideration through iterative evaluation of measures and alternative plans and identified Alternative 3 – deepening and widening of the Seagirt Loop Channel as the TSP. The TSP presented in this Draft Feasibility Report/EA is the NED plan, the plan that reasonably maximizes net benefits as detailed in Table 4-9, which includes deepening and widening of the WSBC to a federally-authorized depth of -47 feet MLLW. The NED plan has a BCR greater than 1 and reasonably maximizes net benefits resulting in $3,682,000 in annual net benefits. The MDOT MPA supports the TSP as written today and supports release of the draft report with optimization of the plan as the study progresses to the Agency Decision Milestone (ADM) meeting. MDOT MPA has also expressed verbal interest in pursuing a potential LPP that includes deepening and widening of the WSBC to a federally-authorized depth of -50 feet MLLW. The potential LPP varies from the NED plan but still has significant positive net benefits of $3,631,000 and a BCR of 3.3. During the course of the feasibility study, ship simulation modeling will be used to refine the proposed channel design, which will include refinement of quantities, cost estimates, and benefit assumptions that may affect the alternative depth that produces the most net benefits.

The Draft Feasibility Report/EA recommends the NED Plan as the TSP, but also presents that MDOT MPA has expressed interest in pursuing a potential LPP. The potential LPP includes deepening and widening of the WSBC to complete the Seagirt Loop Channel at an authorized depth of -50 feet MLLW and widening to a minimum width of 620 feet. The engineering dimensions for both the TSP - NED Plan and LPP are summarized in Table 5-1. The channel design has been optimized to the selected design vessel, the MSC Marco Polo – with a length of 1,299 feet, a beam of 175.9 feet, and a sailing draft of -50 feet MLLW including gross UKC in accordance with engineering principles presented in EM 1110-2-1613 (USACE 2006). Channel slopes will be dredged to a proposed slope of 5 feet horizontal to 1 foot vertical to ensure the long-term stability of the channel and reduce shoaling and therefore operation and maintenance (O&M) dredging. Dredged material from the WSBC have been assessed based on recent sediment samples previously collected by MDOT MPA and a review of existing information on the channel materials. Dredged material from the proposed work has been classified as contaminated because it exceeds various contaminant thresholds making it unsuitable for open water placement. The proposed work recommends disposal of dredged material into the Cox Creek DMCF, an approved upland containment site in Baltimore Harbor. The Cox Creek

DMCF has sufficient capacity to accommodate the estimated 1.9 million cy of material that would need to be dredged to reach the design dimensions.

The analysis leading up to the TSP selection included updating plans, quantities, and cost estimates. Quantities and cost estimates were generated for depths from the existing condition to -52 feet MLLW. A summary of the quantities and channel dimensions of the TSP – NED Plan and potential LPP are summarized in Table 5-1.

TABLE 5-1: SUMMARY OF CHARACTERISTICS AND DIMENSIONS OF THE TSP - NED PLAN AND POTENTIAL LPP

	TSP - NED PLAN	POTENTIAL LPP
Proposed Authorized Channel Depth (feet MLLW)	-47	-50
Length of Improvement (feet)	5200	5200
Channel Width (feet)	620	620
Quantity to be dredged (cy)	1,317,210	1,922,000
Predominant Slope	5:1	5:1
Predominant Channel Bottom Material	Sediment with various contaminants	

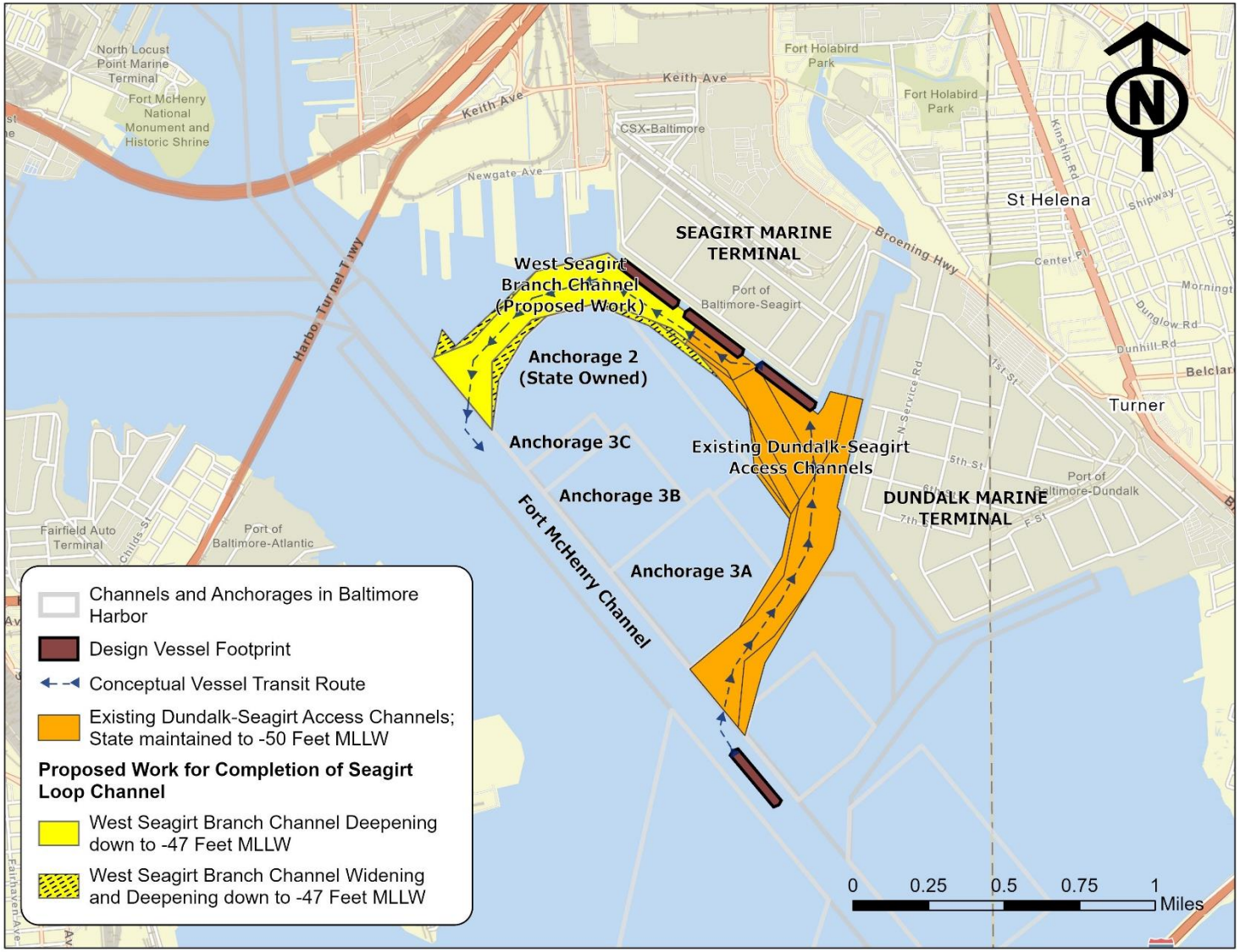


FIGURE 5-1. THE TSP – NED PLAN: DEEPENING AND WIDENING OF THE WSBC

5.1 Refined Costs

The costs for the TSP - NED Plan (deepening of WSBC to -47 feet) and the potential LPP (deepening of WSBC to -50 feet) were updated after plan selection. The total project costs for the NED Plan and the potential LPP are broken down by accounts in Table 5-2 and detailed in Appendix B6.

TABLE 5-2: PROJECT COST SUMMARY FOR THE TSP - NED PLAN AND POTENTIAL LPP

ACCOUNT	TSP NED PLAN	POTENTIAL LPP
01 Lands and Damages	$0	$0
12 Navigation Ports & Harbors	$33,745,000	$44,281,500
30 Pre-construction, Engineering, and Design (PED)	$384,000	$384,500
31 Construction Management	$204,000	$286,000
Total Project Costs	**$34,333,000**	**$44,952,000**

Total Project Costs are in FY2022 dollars and use a discount rate of 2.5%.
Costs have been rounded and may not add up from the accounts breakdown as shown.

5.1.1 Operation, Maintenance, Repair, Rehabilitation, and Replacement (OMRR&R)

The OMRRR only includes routine dredging of the channel and disposal of the dredged material at the approved upland disposal site. The anticipated volume of maintenance dredging was calculated for the channel based on the estimated rate of shoaling for the channel. The annual O&M post-deepening volumes were estimated at 3,148 cy/year or a 928 cy/year increase 42% from the existing channel condition. The annual O&M is roughly equivalent for the TSP - NED Plan and the potential LPP as the shoaling trends are more closely related to the channel footprint and surface area of the channel edge, which is roughly equivalent for both channel dimensions. The annual O&M costs associated with the proposed action are summarized in Table 5-3.

TABLE 5-3: ANNUALIZED COSTS AND ANNUAL O&M COSTS FOR THE NED PLAN AND POTENTIAL LPP

	TSP - NED PLAN	POTENTIAL LPP
AAEQ (Average Annual Equivalent Costs) Investment Cost	$1,155,000	$1,514,000
AAEQ Operation and Maintenance Cost	$57,000	$57,000
Total AAEQ Costs	**$1,212,000**	**$1,571,000**

Fiscal Year 2022 Price Level and discount rate of 2.5% used for annualizing costs. Costs have been rounded.

5.2 Uncertainty and Additional Analysis

A majority of project and study risks are associated with the uncertainties with commodity forecasts, fleet forecasts, and economic conditions in the future. The PDT is recommending mitigating actions to capture variability in the modeling including completing a sensitivity analysis for modeled parameters and to update economic information as it becomes available to verify assumptions made during the analysis. A minor source of uncertainty is related to the presence of cultural and historic artifacts in the project area within Baltimore Harbor, which is addressed by using existing cultural investigations during the feasibility study and by recommending completion of cultural surveys during PED. The PDT is also completing a full ship simulation during the feasibility study to finalize the design of the channel with consideration for environmental forcing parameters (i.e. wave, winds, tides). One final medium risk associated with requesting a potential LPP is that it may result in study delays and is being tracked as a high priority item in the study. The remaining risks are low or have been mitigated through other activities summarized in the risk register and decision log.

5.3 Environmental Operating Procedures

The USACE Environmental Operating Principles (EOP) were developed to ensure that USACE missions integrate sustainable environmental practices. The EOP relates to the human environment and applies to all aspects of business and operations. The principles were designed to provide direction on how to better achieve stewardship of air, water, and land resources, and to demonstrate a positive relationship between management of these resources and the protection and improvement of a sustainable environment. The EOP informed the plan formulation process and are integrated into the proposed solution for Deep Draft Navigation.

The Environmental Operating Principles are:

- Foster sustainability as a way of life throughout the organization

- Proactively consider environmental consequences of all USACE activities and act accordingly
- Create mutually supporting economic and environmentally sustainable solutions
- Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the USACE, which may impact human and natural environments
- Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs
- Leverage scientific, economic, and social knowledge to understand the environmental context and effects of USACE's actions in a collaborative manner
- Employ an open, transparent process that respects views of individuals and groups interested in USACE activities

Plan selection considered these principles to ensure the sustainability and resiliency of the NED plan while considering the environmental consequences of implementation. In addition to construction best management practices to maintain water quality standards, other opportunities to implement sustainable measures that are cost effective and comply with USACE construction standards will be further evaluated during the PED phase. The study team considered avoiding and minimizing adverse impacts to existing environmental resources and cultural resources within the project area to the extent practicable during the plan formulation process.

6 Environmental Effects and Consequences*

This chapter describes the environmental consequences or impacts from the No Action Alternative/FWOP and the Preferred Alternative (TSP, described in Chapter 5) on each resource topic discussed in Chapter 2. Figure 6-1 shows the extent of physical impacts from implementation of the Preferred Alternative including direct impacts from dredging and indirect impacts from noise and turbidity. Figure 6-1 also shows the transit route from the dredging area to the Cox Creek DMCF. The Preferred Alternative assumes that the potential LPP is implemented, which includes dredging of the WSBC to -50 feet MLLW. This decision was made to capture all potential impacts from this evaluation down to the proposed maximum depth of the project. However, environmental impacts are not anticipated to vary significantly between the NED Plan and potential LPP.

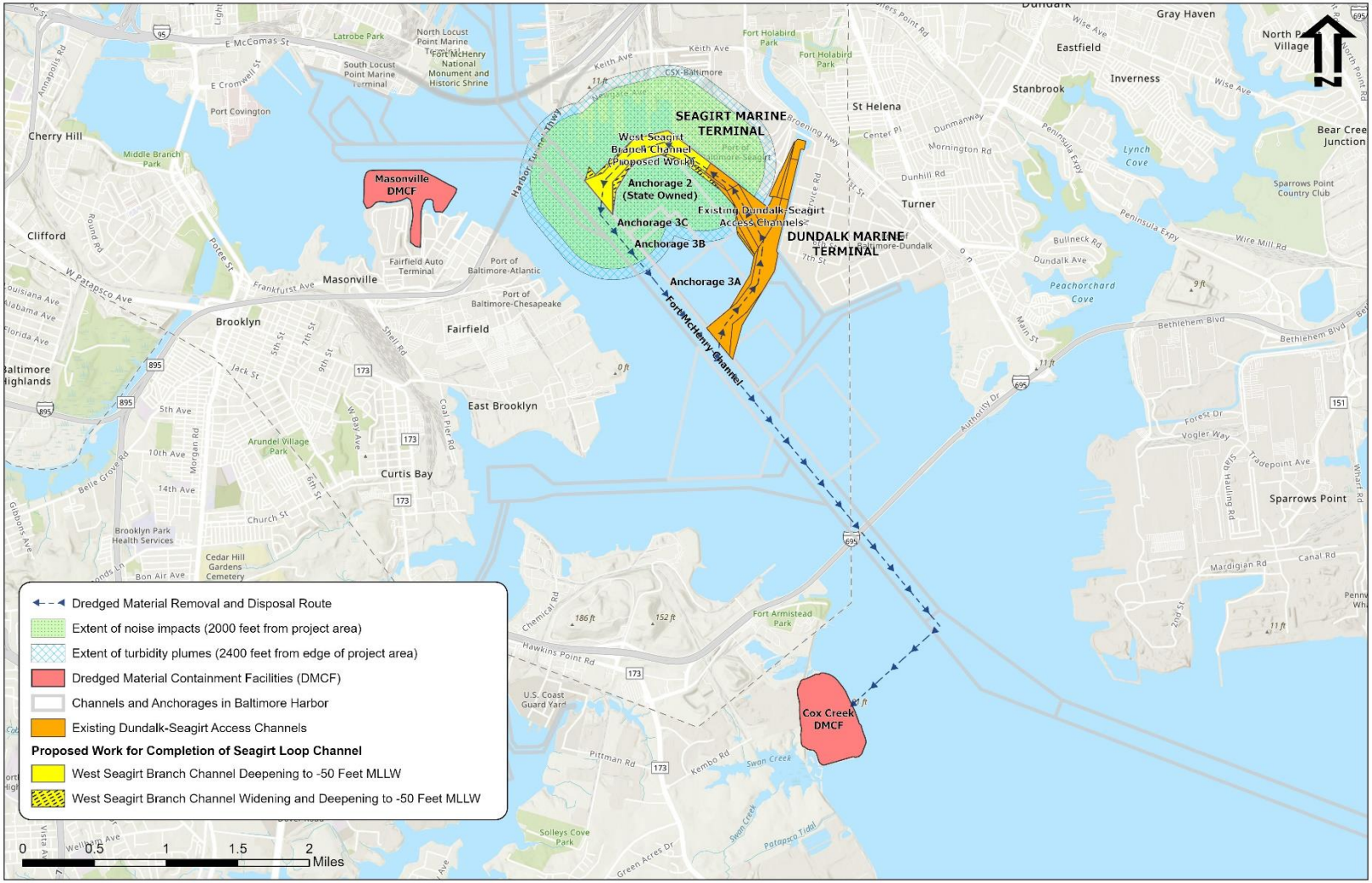


FIGURE 6-1: IMPACT AREAS ASSOCIATED WITH IMPLEMENTATION OF THE PREFERRED ALTERNATIVE

6.1 Environmental Justice

6.1.1 No Action Alternative/FWOP

The residential community of St. Helena, located approximately one mile from the WSBC, was identified as an environmental justice community for this analysis due to the median household income below the U.S. Census Bureau's poverty threshold. Impacts under FWOP conditions (maintenance dredging) and the Preferred Alternative (deepening and widening of the WSBC) are assessed below.

Traffic

As long as the Baltimore County Official Truck Route Map remains in place and restricted commercial truck routes continue to be locally mandated and enforced, local commercial truck traffic is not expected to directly affect the residential community of St. Helena.

Air Quality

Air emissions under the No Action Alternative/FWOP are unmitigated and will continue during normal maintenance dredging, although this action is considered to be a negligible component of the air quality issues in the region. Without improvements to the channels, ships have the potential to remain idling at anchorage for longer periods of time, which could lead to additional emissions. Commercial truck traffic will also continue along with associated emissions, likely at existing levels. However, the CSX rail improvement project will result in less commercial trucks on the road, which is expected to improve air quality in the region.

Noise

The residential community of St. Helena would continue to be exposed to the ambient noise of a city, traffic, and a working port. Future development within and surrounding St. Helena, increased highway traffic, an increase in the amount and size of vessels calling at the Port, etc. could increase the ambient noise in this community in the future. Dredging of the navigation features would continue regularly in the area; however, noise from the dredging is likely to attenuate before reaching St. Helena or may be muffled by the ambient background noise.

6.1.2 Preferred Alternative

No direct impacts to the residential community of St. Helena would occur as a result of implementation of the Preferred Alternative. However, indirect impacts from traffic, air quality, and noise could potentially affect the community and are discussed below.

Traffic

Implementation of the Preferred Alternative would not result in additional commercial truck traffic in the region. Consistent with the No Action Alternative, commercial trucks would be restricted from using the roads in the St. Helena neighborhood as long as the Baltimore County Official Truck Route Map remains in place and restricted commercial truck routes continue to be locally mandated and enforced.

Air Quality

As discussed in Section 6.13.2, impacts to air quality from implementation of the Preferred Alternative would be temporary and minor, and would fall below *de minimis* standards. Project related emissions as proposed do not exceed the NOx emission threshold of 100 tons per year that would require mitigation and/or offsetting.

Noise

The community of St. Helena is located approximately one mile from the outermost boundary of the West Seagirt Loop Channel. As stated in Section 2.1.2.3, the loudest expected sounds of 88 dBA from dredging operations can be expected to be attenuated to levels approaching 55 dBA approximately 2,000 feet from the source. Therefore, noise from the dredging is likely to attenuate before reaching St. Helena or may be muffled by the ambient background noise.

6.2 Topography and Bathymetry

6.2.1 No Action Alternative/FWOP

Existing maintenance dredging operations, dredged material placement/disposal, and navigation within the study area would continue. The existing sediment within the dredging footprint in the WSBC would continue to be removed as needed and the channel would be maintained at a depth of -45 feet MLLW.

6.2.2 Preferred Alternative

Implementation of the Preferred Alternative will increase the depth and width of the West Seagirt Loop Channel. This channel will be dredged periodically to maintain the newly authorized depth.

Potential impacts of channel side-slope failure include damage to structures located near the top of the slope and frequent maintenance dredging if shoaling is produced by failure of side-slopes. To prevent sloughing of the channel side slopes, a 5H:1V slope is recommended for the West Seagirt Loop Channel. A channel side-slope stability analysis has been completed for the Seagirt Loop Channel and a discussion of this analysis and

how it relates to the Preferred Alternative is provided in the Channel Stability section of the Engineering Appendix (Appendix B).

6.3 Geology, Sediments, and Soils

6.3.1 No Action Alternative/FWOP

The channels and anchorages will continue to shoal at their current rates. The sources of sediments will remain the same. Samples within the channels and anchorages show that the bottom sediments are soft, highly plastic, organic silty clay with water content exceeding the liquid limit. The upper layer of sediment is generally uniform and extends beneath the currently authorized dredging depths. Future maintenance dredging would not expose any new geological formations or differing soils.

6.3.2 Preferred Alternative

Dredging to the proposed depths under the Preferred Alternative is unlikely to change the composition of the sediments that are filling the channels and anchorages. The surficial layer of soft, highly plastic, organic silty clay extends beneath the depth of proposed dredging in most areas; therefore, the composition of the sediments will be the same as the FWOP.

6.4 Water Resources and Water Quality

6.4.1 No Action Alternative/FWOP

Adverse impacts to water quality including increased TSS, turbidity, and nutrient levels would be localized, temporary, and minor during maintenance dredging operations. There may be a temporary increase in the level of dissolved nutrients (nitrogen and phosphorus) in the water column following dredging activities as nutrients in sediment are released by dredging. Suspended particles would settle out within a short period of time with no measurable long-term effects on water quality. NOAA reports that plumes dissipated to background levels within 600 feet of the dredging activity in the upper water column and 2,400 feet in the lower water column. In the immediate area of the dredging bucket, elevated TSS concentrations at several hundreds of mg/L above background may be present but settle rapidly within a 2,400- foot radius of the dredge location (NOAA 2021).

Future dredging activities in Baltimore Harbor and disposal of sediments would comply with applicable state and federal laws

6.4.2 Preferred Alternative

Implementation of the Preferred Alternative would result in adverse impacts to water quality that would be localized, temporary, and minor, consistent with the No Action Alternative.

Increased depths from dredging in estuarine environments have the potential to alter salinity levels within the dredging footprint and can also potentially result in changes in dissolved oxygen levels. These changes in salinity, and decreases in dissolved oxygen and flushing rates, are anticipated to cause permanent, minor impacts to water quality.

Inflow of material to Cox Creek DMCF and discharge of supernatant water from this site will continue to occur under both the No Action and Preferred Alternative. Planning for water quality issues associated with the short-term increase in placement volume from new work dredging for the proposed project and long-term increases in volume associated with increased maintenance dredged material is expected to be addressed in a modification to the DMCF's water quality permit (Appendix A2a). Placement and associated discharge of the new work dredged material is not expected to result in water quality limits being exceeded for the facility.

6.5 Essential Fish Habitat

6.5.1 No Action Alternative/FWOP

Direct Impacts on EFH species

Dredging activity to maintain currently authorized depths in the study area has the potential to directly impact EFH species through mortality or injury of individual fishes (adults, sub-adults, juveniles, larvae, and/or eggs, depending on species, time of year, location, etc.). The nature of the study area (WSBC), which is maintained to a depth of -45 feet MLLW and is generally degraded due to the industrial nature of the surrounding area, has limited habitat value for EFH. Additionally, due to the temporary nature of normal maintenance dredging (over a period of a few months depending on the dredging need) and the time of year (usually occurring during fall/winter timeframe), direct impacts of dredging under the No Action Alternative are expected to be minimal. Every effort will be made to avoid dredging between April 1 and June 30 to avoid impacts to migratory fish during spawning season.

Turbidity and Water Quality Effects

Temporary water quality effects to managed fish species and their EFH due to maintenance dredging activities would be limited to short-term increases in turbidity levels

and suspended solids in the turbidity plume, which can extend up to 2,400 feet from the dredge location (NOAA 2021).

Direct effects from sedimentation and turbidity would result in deposition of suspended sediments on demersal eggs, larvae, immobile prey species, etc. Extremely elevated levels of turbidity may cause physical asphyxiation of aquatic organisms and cause localized, acute oxygen stress due to chemical oxygen demand. These factors would primarily affect eggs, larvae and small prey species that lack the physical swimming ability to evade the concentrated turbidity plume. Such effects would be spatially confined to only a very small portion of the turbidity plume and would persist less than one hour after a dredging event. Water column turbidity may induce avoidance behavior in some species and may interfere with species' ability to hunt prey or avoid predators. However, TSS levels expected for mechanical dredging (up to 445 mg/L) are below those shown to have adverse effects on fish (typically up to 1,000 mg/L) (NOAA 2021).

Due to dredging impacts, some fishes and invertebrates may also move a short distance upstream if they are intolerant of slight increases in salinity, or to microhabitats in Baltimore Harbor if they are intolerant of slight shifts in dissolved oxygen (a permanent effect of deep-draft dredging).

After late March, any nutrient concentrations in the water column released by dredging would be negligible relative to existing ambient conditions in the dredging area. Nutrient releases into the water column as a result of dredging operations are not expected to adversely impact sensitive life stages or spawning activities. Normal maintenance dredging under the No Action Alternative is usually scheduled during the fall/winter timeframe, outside of the sensitive spawning period of March through May.

Underwater Noise

Underwater noise can impact fish and other marine animal behavior, as sound is critical for hunting prey, predator avoidance, and social interaction. Noise can also cause acoustically induced stress to fish in their habitats. Increases in noise associated with dredging activities, increased ship traffic, and work at Port facilities are expected to occur over time with or without the proposed project (CENAB 2001).

Vessel Traffic

An increase in vessel calls to the Port is expected under the No Action Alternative and will result in an increase in vessel traffic. Indirect effects include alterations to the movements and foraging habits of individuals near dredging sites due to equipment. Vessel traffic associated with maintenance dredging activities would have a negligible impact on managed fish and their EFH.

Benthic Community Disturbance

Maintenance dredging will cause minor, adverse impacts to the benthic community resulting from direct removal or entrainment of benthic organisms, strikes and crushing of benthic organisms, and turbidity/siltation effects that could include burial and potentially impact respiration of benthic organisms. Indirect effects include alterations to the movements and foraging habits of individuals related to disturbed benthic habitats. The projected future adverse impacts to the benthic community are temporary and minor. For more information on benthic community disturbance, see section 6.7.1.

Impacts to Prey Species

With the current amount of vessel traffic that frequents SMT and the adjacent property (Dundalk Marine Terminal) the food available in this area for all species is likely scarce. Several important prey species, including spot, bay anchovy, and blue crab, may be found in the project area. Maintenance dredging would continue in the federally maintained channels at their current authorized dimensions, and disturbance to the benthic infauna populations would likely continue on a regular basis. Routine maintenance dredging may suppress recolonization of certain benthic organisms, and therefore, impact other trophic levels within the food chain, including prey species. However, since the actual channel widths encompass a fraction of the entire water body, and similar habitat occurs immediately adjacent to the channels, overall impacts to prey species in the region during maintenance dredging are expected to be temporary and minor (CENAB 2016).

6.5.2 Preferred Alternative

Direct Impacts on EFH species

Direct impacts under the Preferred Alternative would be similar to those under the No Action Alternative. Dredging is scheduled to occur over two events, with both occurring over a three-month duration. The additional dredging will increase the likelihood of direct impacts to EFH species, however due to the nature of the project area and the timing of the planned dredging (fall/winter), outside of the migratory fish spawning season, impacts are expected to be minimal. Every effort will be made to avoid dredging between April 1 and June 30 to avoid impacts to migratory fish during spawning season.

Turbidity, Water Quality Effects, and Underwater Noise

Effects to managed fish species and their EFH due to implementation of the Preferred Alternative would be consistent with the effects described for the No Action Alternative. However, due to the additional amount of new material that would need to be removed (1.9 million cubic yards), temporary degradation on EFH from increased turbidity and

underwater noise generated from the dredge during dredging operations would occur over a longer duration than maintenance dredging under the No Action Alternative (approximately 150 nonconsecutive workdays scheduled over three calendar years). Additionally, increased channel depths have the potential to result in permanent localized decreases in DO; however, since new work will be occurring in deep draft channels, additional DO impacts are expected to be minimal.

Vessel Traffic

An increase in vessel traffic and cargo movement through the Port is projected with or without implementation of the Preferred Alternative.. Any change in the vessel fleet accessing the existing large working Port would have a negligible impact on managed fish and their EFH. However, increased efficiencies in ship design and handling could potentially result in a decrease in noise impacts related to vessels (CENAB 2001).

Benthic Community Disturbance

It is anticipated that impacts to benthic habitats will involve the potential loss and displacement of non-motile benthic organisms at the dredging site, therefore, new work dredging will have additional temporary and minor impacts above those resulting from the No Action Alternative. For more information on benthic community disturbance, see section 6.7.2.

Water Depth Change and Impacts to Prey Species

Implementation of the Preferred Alternative will permanently increase the depth and width of the West Seagirt Loop Channel and require periodic dredging to maintain the authorized depth. A permanent increase in water depth will impact EFH. Indirect impacts include changes to and removal of habitat, particularly benthic and epibenthic communities. As the construction and routine maintenance dredging may suppress recolonization of certain benthic organisms, impacts to other trophic levels within the food chain may occur, including prey species (CENAB 2016).

Summary of impact to EFH under the Preferred Alternative

USACE has determined that adverse effects on EFH and EFH species from implementation of the Preferred Alternative are not substantial and are generally similar to those recognized under the FWOP. The study area is considered degraded with limited habitat value for EFH. Impacts can be minimized by continuing to dredge (both maintenance and new work) for short durations and during the fall/winter timeframe. Routine maintenance dredging may also suppress recolonization of certain benthic

organisms, and therefore, impact other trophic levels within the food chain, including prey species.

6.6 Fish and Wildlife

6.6.1 No Action Alternative/FWOP

Fish - Current dredging and navigation operations that may affect egg, larval, juvenile, and adult life stages of fishes within the action area include direct removal or burial, turbidity/siltation effects, temporary shifts in dissolved oxygen during dredging operations, entrainment, visual and noise disturbances, and alteration of habitat. The likelihood of vessel strikes to managed fish species and their prey is possible but is not anticipated to be a substantial threat due to the limited amount of time the dredging vessels/equipment will be operating, and the ability of motile fishes to move away from potential dredging impacts. Eggs, larvae, and species with limited swimming ability would be at highest risk of strike impacts. Routine maintenance dredging may suppress recolonization of certain benthic organisms, and therefore, impact other trophic levels within the food chain, including prey species. Effects to managed fish species and their prey from dredging vessel equipment/strikes are anticipated to range from negligible to minor and be temporary in duration and not significant. Impacts to fish and their prey from maintenance dredging and transiting to and from the DMCF would be minor and temporary. Dredging activities are generally limited to the fall/winter timeframe which is outside of migration for most finfish.

Bird - Operation of vessels and dredging equipment may flush wildlife, such as waterfowl or other birds foraging or resting in the open waters of the study area out of the area. The increased TSS and turbidity resulting from dredging operations may temporarily disrupt foraging abilities for some wildlife. However, this would be a minor impact due to the already disturbed nature of the majority of the study area and the amount of other available habitat for prey species.

Impacts to birds from maintenance dredging operations would be minor and temporary.

6.6.2 Preferred Alternative

Fish - Consistent with the No Action Alternative, potential impacts to fish and fish habitat from the Preferred Alternative result from dredging and from dredging vessels transiting to dredging and placement locations. The duration of the new work dredging would be longer than maintenance dredging within the project area, so impacts will occur over a longer period; however still short term (currently scheduled as two dredging events lasting

approximately 150 nonconsecutive workdays over two 75-day events, occurring over three calendar years).

Overall, the adverse effects on fish and fish habitats are expected to be minor and temporary. Impacts of the Preferred Alternative on federally managed fish including alewife, American eel and striped bass and their EFH have been evaluated using the NOAA Fisheries Greater Atlantic Regional Fisheries Office Essential Fish Habitat (EFH) Assessment & Fish and Wildlife Coordination Act (FWCA) Consultation Worksheet and is included as Appendix A-4.

Bird - Impacts to birds from implementation of the Preferred Alternative would be consistent with the impacts of the No Action Alternative and other than lasting for a longer duration, would not result in any additional impacts above those identified for the No Action Alternative.

6.7 Benthic Fauna

6.7.1 No Action Alternative/FWOP

Existing maintenance dredging operations within the study area, though infrequent, are likely to cause removal or entrainment of benthic organisms, strikes, and crushing of benthic organisms. McCauley et al. (1977) documented that the total abundance of benthic organisms at a dredging site returned to pre-dredging levels seven to 28 days after dredging was completed. In a similar study conducted on the nearby James River, Diaz revealed that almost all species of benthic organisms had recolonized the disturbed areas within three weeks after the dredging was completed. Diaz also demonstrated that benthic organisms continued to sustain pre-disturbance population densities three months after a dredging event (Diaz 1994). Additionally, benthic organisms outside the dredging footprint could be impacted temporarily by increased levels of TSS and turbidity from maintenance dredging. The siltation of benthic organisms may prevent or reduce respiration and/or foraging for filter-feeding organisms. However, the sediment plume during dredging operations will likely not be significant enough to result in more than minor mortality of benthic life outside the channel, as quantities of TSS released should not result in burial of the benthos deep enough such that they will be unable to survive. Dredging activities often generate no more increased suspended sediments than commercial shipping operations, bottom fishing or than those generated during severe storms (Parr et al. 1998). Furthermore, natural events such as storms, floods and large tides can increase suspended sediments over much larger areas and for longer periods than dredging operations (International Association of Dredging Companies 2015). It is therefore often very difficult to distinguish the environmental effects of dredging from those resulting from natural processes or normal navigation activities (Pennekamp et al.

1996). Dredging will cause minor, adverse impacts to the benthic community resulting from direct removal or entrainment of benthic organisms, strikes and crushing of benthic organisms, and turbidity/siltation effects that could include burial and potentially impact respiration of benthic organisms. The existing and projected future adverse impacts to the benthic community are expected to be temporary and minor.

6.7.2 Preferred Alternative

It is anticipated that impacts to benthic habitats will involve the potential loss and displacement of non-motile benthic organisms at the dredging site. New work dredging, because of the larger footprint, will have temporary and minor impacts above those resulting from the No Action Alternative.

6.8 Threatened and Endangered Species

6.8.1 No Action Alternative/FWOP

Section 7(a)(2) of the Endangered Species Act (16 U.S. Code 1531 et seq.) requires every federal agency, in consultation with and with the assistance of the U.S. Fish and Wildlife Service (USFWS) and the NOAA Fisheries Service (formerly known as NMFS), to ensure that any action it authorizes, funds, or carries out in the United States or upon the high seas, is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat.

Effects from the No Action Alternative (continued maintenance dredging of the Seagirt Loop Channel) on NMFS-trust threatened and endangered species was assessed in the NMFS Letter of Concurrence for the “Dredging of Deep-Draft Navigation Channels and Material Placement in Chesapeake Bay, Maryland” dated August 30, 2013. Activities covered under this Letter of Concurrence included the dredging of the deep-draft navigation channels and associated anchorages in the Maryland portion of the Chesapeake Bay. . In this Letter of Concurrence, NMFS concurred with the USACE determination that these activities are not likely to adversely affect any species listed as threatened or endangered including sea turtles, Atlantic sturgeon, and shortnose sturgeon under the ESA of 1973, as amended. Every effort will be made to avoid dredging between April 1 and June 30 to avoid impacts to migratory fish during spawning season.

Species Protected under the Migratory Bird Treaty Act of 1918 and Executive Order 13186 and Other State Listed Bird Species have the potential to forage, rest, and/or migrate through the action area. The noise and temporary turbidity plume caused by dredging actions may cause migratory birds to move away from the disturbance; however, this is a negligible to minor, and temporary impact that does not substantially impact their

long-term foraging or breeding success. Dredging operations have a temporary, minor adverse impact to benthic invertebrates and fish. This dredging may impact some of the prey species of migratory birds. Future shifts in salinity, temperature, and sea level rise all have the potential to result in shifts in prey species availability, which could also cause detrimental effects to migratory birds. However, because of the already disturbed nature of the majority of the action area and the amount of other available habitat for prey species, current maintenance dredging operations should not have any substantial impact on any prey invertebrate or fish populations.

6.8.2 Preferred Alternative

Atlantic and shortnose sturgeon life history and their behavior in and around the action area appears to demonstrate that sturgeon may be present in the vicinity of the area primarily while migrating between spawning grounds in Chesapeake Bay rivers, as there are no physical or biological barriers present except for potential low DO in the existing shipping channels during summer months. The benthic community is considered degraded within Baltimore Harbor therefore the foraging potential is low, particularly around the action area.

Additional impacts to shortnose and Atlantic sturgeon due to increased release of contaminants during dredging were considered, however are not expected to have an impact. Studies of sediments in Baltimore Harbor have shown that the highest concentrations of organic and inorganic contaminants tend to be present in the top 20–25 feet (below sediment surface) of the sediment column. Since most of the dredging related to the study is deepening existing channels that are maintained to -45 feet MLLW, the new work sediments are expected to be representative of native materials that are free of anthropogenic contaminants (EA EST 2009d and 2010b). Additional widening may cause a temporary increase in the release of contaminants but its impact on sturgeon is expected to be discountable. Every effort will be made to avoid dredging between April 1 and June 30 to avoid impacts to migratory fish during spawning season.

The additional impacts of vessel strikes on sturgeon due to increased vessel movement through the area both directly, related to increased dredging activity, and indirectly, through increased passage of post-Panamax vessels, were considered. Figure 6-1 shows the vessel transit for the Seagirt Study. Cargo vessels will also access the SMT along the Fort McHenry Channel. The study area and the transit areas serve one of the country's busiest ports with dredging within some portion of the BHAC occurring annually in addition to over 400 cargo vessels calling at SMT each year. The increase in vessels calling on the Port is projected over the next 50 years and there is a potential for increased vessel strikes; however, subadult and adult sturgeon are large animals with a strong swimming

ability, therefore there is little cause for concern that these animals would be vulnerable to direct impacts from the dredge or vessels transiting the area.

Based on the discussion above, the proposed action may affect but is not likely to adversely affect the Atlantic sturgeon or shortnose sturgeon.

6.9 Cultural Resources

6.9.1 No Action Alternative/FWOP

There would be no impacts to archaeological or architectural resources under the No Action Alternative. There would be no deepening or widening of existing channels and anchorages so no disturbance would occur within the study area.

6.9.2 Preferred Alternative

Widening the undisturbed portions of the Seagirt Loop Channel may have the potential to adversely affect underwater archaeological resources, especially since these areas have not been subjected to past archaeological surveys. For this reason, the areas proposed for deepening and widening would need to be surveyed for their potential to contain cultural resources. Due to funding and scheduling constraints, a Phase I investigation and any additional NRHP evaluations cannot take place during the feasibility planning phase of the project. To satisfy the requirements under Section 106 of the NHPA, USACE is proposing to develop a programmatic agreement (PA) pursuant to 36 CFR 800.14 (b)(ii). The purpose of the PA would be to allow the Draft Feasibility Report to move forward, while stipulating Phase I archaeological investigation requirements during Pre-Construction Engineering and Design of the project when funding can be obtained for this effort. MHT agreed with this methodology via e-mail correspondence dated August 12, 2021. Coordination and development of the PA is currently ongoing.

While widening the WSBC will not have a direct effect on architectural resources, this could result in adverse visual effects because it would allow larger class vessels to more frequently call at the terminal. To assess any potential visual effects the proposed project may have on architectural resources, USACE and MES, in consultation with MHT and NPS, have conducted a viewshed analysis (Appendix A). The viewshed analysis was conducted from pre-determined viewpoints around the project area and includes renderings of existing conditions, FWOP conditions, and future with-project conditions showing larger class vessels. Coordination on the viewshed analysis between USACE, MES, MHT, and NPS is currently ongoing.

6.10 Recreation

6.10.1 No Action Alternative/FWOP

The study area is located in a highly developed city and port with substantial navigation and shipping operations, with recreational boating and few nearshore parks. Existing maintenance dredging operations and navigation to and from the DMCF can cause minor turbidity, siltation, and boat wakes within the study area. Recreational fishermen may need to move their vessels from the immediate vicinity of dredging vessels due to vessel noise and localized turbidity, which will temporarily disturb fish in the local area as described in the noise and fishery sections of this EA. While parks provide views of the study area, most parks are some distance from the navigation channel and proposed improvements, which have frequent commercial vessel traffic. Fort McHenry and Masonville Cove Environmental Education Center are both located approximately two miles from the SMT.

Continuing maintenance dredging operations would not cause any significant impacts to these recreational resources. Adverse impacts to recreational resources with implementation of the No Action/FWOP are likely to be temporary and negligible.

6.10.2 Preferred Alternative

Impacts to recreation from implementation of the Preferred Alternative would be consistent with the impacts of the No Action Alternative but would occur over a longer duration.

6.11 Aesthetics and Scenic Resources

6.11.1 No Action Alternative/FWOP

There would be no additional impacts to aesthetic or scenic resources under the No Action Alternative. There would be no deepening or widening of existing channels and anchorages, so no additional disturbance would occur within the study area. Existing navigational uses within the study area (industry, commerce, and recreation) would continue and the view sheds and vistas would reflect the continued industrial land use within the area.

6.11.2 Preferred Alternative

Once construction is completed, the channels and improvements would need routine maintenance. Construction and maintenance would be consistent with the aesthetic character of the working harbor. Implementing the Preferred Alternative would result in temporary negligible effects on the visual resources within the study area over the period

of construction. There would be a permanent, negligible to minor change to the aesthetic environment of the study area as it would continue to be that of a working waterfront with a mix of industrial, commercial, highway transport, naval, marine, and urban shoreline uses, but would allow for a larger class of vessel to transit the area.

While deepening and widening the WSBC would not have a direct effect on aesthetic and scenic resources, this action could result in adverse visual impacts because it would allow larger class vessels to more frequently call at the terminal. While larger class vessels calling at SMT are not likely to change the overall aesthetic character of the study area, under the guidance of MHT and NPS, a viewshed analysis was conducted to assess any potential visual impacts the proposed project alternative may have on scenic resources such as the Star-Spangled Banner National Historic Trail and the Captain John Smith Chesapeake National Historic Trail (Appendix A). The viewshed analysis was conducted from pre-determined viewpoints around the project area and includes renderings of existing conditions, FWOP conditions, and future with-project conditions showing larger class vessels. Coordination on the viewshed analysis between USACE, MES, MHT, and NPS is currently ongoing.

6.12 Hazardous, Toxic, and Radioactive Waste (HTRW)

6.12.1 No Action Alternative/FWOP

In accordance with USACE Engineering Regulation 1165-2-132 guidance, maintenance dredged material will continue to be evaluated during periodic sediment sampling. Evaluations will be conducted in accordance with all appropriate guidelines and criteria, including Section 404 of the Clean Water Act. Dredged materials will be handled and placed at an approved upland DMCF in compliance with all pertinent regulations as defined under NPDES and other state and federal guidelines, ensuring that there are no HTRW issues related to placement and discharge of overlying water. Maintenance dredging of the WSBC is expected to have a temporary and minor impact related to the release of HTRW material into the surrounding water column.

6.12.2 Preferred Alternative

Testing and placement of dredged sediments under the Preferred Alternative would continue as described under the No Action Alternative. The new work material from the proposed deepening and widening of the WSBC is expected to include legacy contaminants (i.e., metals, PAHs, PCBs, pesticides, dioxins/furans) from former industrial activities within the Harbor. However, studies of proposed new work sediments at SMT (EA 2006a) and offshore of Sparrows Point (EA 2009d and 2010b) have indicated that the highest concentrations of organic and inorganic contaminants tend to be present in

the top 20–25 feet (below sediment surface) of the sediment column. Therefore, the quality of the dredged sediment material could potentially be delineated vertically into sediments with elevated concentrations of contaminants (top of sediment column) and sediments that are representative of native materials that are free of anthropogenic contaminants (bottom of sediment column).

Unexploded ordnance buried in the Harbor sediment may exist (especially in areas of new work dredging). Unexploded ordnance recovered during dredging operations would be handled and disposed of in an appropriate manner to prevent safety threats or detrimental impacts to the environment, in accordance with established safety protocols (Appendix G).

Impacts in the study area related to HTRW are expected to be temporary and minor.

6.13 Air Quality

6.13.1 No Action Alternative/FWOP

The No Action Alternative would result in periodic maintenance dredging that would not be subject to General Conformity Rule review and compliance since maintenance dredging is statutorily exempt from the Rule. While regulated emissions from the maintenance dredging may be lower overall than the temporary (construction) emissions from implementing the Preferred Alternative, potential improvements to air quality through greater navigational efficiency may not be realized. The no action alternative may preclude efficiency improvements related to the Preferred Alternative, including a decrease in vessel idling while waiting in anchorage and the need for tug assist when existing the Seagirt Loop Channel.

6.13.2 Preferred Alternative

An Air Quality Conformity Analysis was conducted for direct emissions associated with the proposed dredging operation to determine if emissions from the proposed action fall below de minimis levels for each NAAQS pollutant. The study area is located in Baltimore City, MD, which is designated by the USEPA as a nonattainment area for ozone (O3). The primary precursors to O3 development are nitrogen oxides (NOx) and volatile organic compounds (VOC). Emission factors were estimated for the dredging operations based on EPA AP42 Chapter 3.3 (10/1996) for engines less than 600 hp and Chapter 3.4 (10/1996) for large engines (greater than 600 hp). Each type of equipment was evaluated for emissions from criteria pollutants which include particulate matter (PM) PM10, PM2.5, NOx, VOC, sulfur oxides (SOx), and carbon monoxide (CO). No emissions from lead are anticipated from the Preferred Alternative. Conservative assumptions were used in the

emissions analysis (loading factors) to determine the overall levels of control and mitigation that will be required. The emissions calculations do not address emissions generated by land-based equipment such as hydraulic unloader, on- and off-road vehicles, cranes and light towers; such emissions would be minimal and are included under DMCF operations emission assessments.

Table 6-1 summarizes the results of the Air Quality Conformity Analysis. Based on the results, dredging the West Seagirt Loop Channel would remain below air conformity *de minimis* thresholds for each NAAQS pollutant analyzed for each year of the project (October 2025–October 2027) and is therefore exempt from the General Conformity rules. The equipment usage and schedule assume one clamshell dredge will be used to complete the project construction This is based on prior deepening and widening of the adjacent West Dundalk Loop and on capacity constraints at the Cox Creek DMCF. However, there is the potential that two dredges will be utilized during construction. In this case the overall air quality impacts would not change; however, increased productivity could result in a reduced timeline. Additional equipment included in the analysis include tending tugs, transport tugs that move scows to the placement site, and crew and survey boats. Details on the construction equipment, including horsepower and hours of operation, and the complete Air Conformity analysis are included in Appendix D. Air quality impacts from implementation of the Preferred Alternative would be temporary and minor and would be similar to impacts of the No Action Alternative.

TABLE 6-1: SUMMARY OF AIR EMISSIONS FROM THE PREFERRED ALTERNATIVE IN TONS PER YEAR (2025-2027)

CRITERIA POLLUTANT	NONATTAINMENT LIMITS (TPY)	TOTAL EMISSIONS FOR WEST SEAGIRT BRANCH CHANNEL DREDGING OPERATION (TPY)		
		2025	2026	2027
NOx	100	77.37	84.04	77.37
VOC	50	2.44	2.66	2.44
CO	100	17.68	19.20	17.68
SOx	100	0.04	0.04	0.04
PM10	100	2.40	2.61	2.40
PM2.5	100	2.33	2.54	2.33

6.14 Greenhouse Gases

6.14.1 No Action Alternative/FWOP

The GHG emissions produced related to normal maintenance are considered baseline and are not evaluated. GHGs produced during maintenance dredging and released from vessel emissions are anticipated to continue to increase with projected increases in calls to the Port. In the long-term, potential reductions in the production of GHG's related to reduced idling and more efficient vessels may not be realized under the No Action Alternative.

6.14.2 Preferred Alternative

The CEQ 2014 guidance on the consideration of GHGs in NEPA reviews focuses on two key points: 1) the potential effects of the proposed action on climate change as indicated by its GHG emissions, and 2) the implications of climate change for the environmental effects of the proposed action. Projects that emit more than 25,000 metric tons of CO2e emissions on an annual basis should provide quantitative estimates. Table 6-2 provides the annual CO2 emissions by year, in tons related to the proposed action. The primary GHG emitted from diesel-fueled equipment is carbon dioxide (CO2). Although nitrous oxides (N2O) and methane (CH4) have significantly higher global warming potentials (298 times CO2 for N2O and 25 times CO2 for CH4), they are emitted at significantly lower rates, resulting in minimal fractional increases in carbon dioxide equivalents (CO2e) when compared with CO2 alone (USEPA 2015).

TABLE 6-2: GHG EMISSIONS BY CALENDAR YEAR (IN METRIC TONS)

ESTIMATED EMISSIONS, METRIC TONS PER YEAR			
	2025	2026	2027
CO2	4,066	4,066	4,066

Implementation of the Preferred Alternative is not anticipated to exceed the 25,000 metric tons of CO2e, the CEQ 2014 indicator level. The study analysis followed best practices described by USEPA when calculating GHG emissions related to the project construction schedule, which is anticipated to occur across three years with two mobilizations and demobilizations (USEPA 2009). The work components and estimated GHG emissions for the project are detailed in Table 6-3 below, with additional details related to horsepower and hours of operation included in Appendix D. The equipment usage and schedule assume one clamshell dredge will be used to complete the project construction. This is based on prior deepening and widening of the adjacent West Dundalk Channel and on potential capacity constraints at the Cox Creek DMCF. However, there is the potential that two dredges will be utilized during construction. In this case the overall GHG emission would not change; however, increased productivity could result in a reduced timeline.

TABLE 6-3: TOTAL TONS OF CO2 EMISSIONS GENERATED BY THE PREFERRED ALTERNATIVE BY CONSTRUCTION COMPONENT

WORK COMPONENT		TONNES CO2
Mobilization/Demobilization		**1,319**
Mechanical Dredging and Transport		**10,878**
	Clamshell Dredge	2,126
	Tending Tug	3,279
	Transport Tug	5,137
	Crew boat/Survey boat	336
Total		**12,197**

Impacts related to increased vessel callings to the Port were not addressed by the GHG evaluation. The fleet forecast shows an increase in vessels calling to the Port with and without project conditions. However, improvements to the Seagirt Loop Channel will allow more efficient passage of post-Panamax vessels. Generally, these classes of vessels will be newer and more efficient. Ship Technology reports that the Marco Polo's electronically controlled engine consumes less fuel and lubricant oil on average and includes other features, such as improved rudder and hull design that improve its productivity and reduce its GHG output (Ship Technology 2012). As the Port moves more cargo using transported by post-Panamax vessels, reductions in GHG emissions per ton of cargo is expected due to reduced idling time, less need for tug assist when leaving the terminal, and more efficient vessels; however, overall increases in vessels calling to the Port (with or without the proposed action) are anticipated to result in an overall increase in GHG emissions.

When considering long-term cumulative impacts, the Preferred Alternative is part of a large-scale modernization effort at the Port. Fleet forecast projections show an increase in cargo moving through the Port with increased demand and efficiency; however, studies related to the SMT (MDOT MPA 2018) and the Howard Street Tunnel Improvement Project both show reduced GHG emissions per ton of cargo related to modernization of landside equipment and increased reliance on cargo transport by double-stacked rail rather than trucks.

6.15 Noise and Vibration

6.15.1 No Action Alternative/FWOP

Current maintenance operations would continue to generate construction-related noise from vessels and equipment (e.g., dredge operation, pumps, transportation). Recreational use of the study area waters is also expected to continue, such as

recreational fishing and cruise liners calling at Port facilities. The Baltimore Harbor is a region of major shipping and recreational boat traffic and background noises, both in air and underwater, and current background noise from these activities are expected to continue.

6.15.2 Preferred Alternative

Noise produced during new work dredging would be the same as that generated during normal maintenance dredging but would continue for a longer duration. The noise would be temporary and minor during construction. Additional noise related to an increase in calls by post-Panamax vessels is not expected to be significant and is expected to be similar to normal Port operations, with most increases in activity occurring during daytime hours. All Port activities would continue to be regulated by local, State and Federal regulations and follow the guidance provided in the MDOT MPA Noise Guidance document (MDOT MPA 2020).

6.16 Compensatory Mitigation

No significant adverse environmental effects are anticipated as a result of implementing the Preferred Alternative. For dredging and dredged material placement, recommended measures such as time of year restrictions will be implemented to avoid and minimize negative environmental impacts. No additional mitigation related to the proposed project is required.

7 Coordination and Compliance with Environmental Requirements*

7.1 Table of Environmental Compliance, Executive Orders, and Permitting Requirements

Compliance with the environmental laws (and implementing regulations) and Executive Orders is required for the project alternatives under consideration. Pertinent public laws applicable to the Seagirt Study are presented below. In some situations, the laws have been previously discussed and prior section references are provided. Tables 7-1 and 7-2 list the current compliance status for each environmental requirement that was identified and considered for this study. However, this is not necessarily an exhaustive list of all applicable environmental requirements.

TABLE 7-1: ENVIRONMENTAL COMPLIANCE

TITLE OF LAW	U.S. CODE	COMPLIANCE STATUS
Bald and Golden Eagle Protection Act of 1962, as amended	16 U.S.C. 668	N/A
Archaeological and Historic Preservation Act of 1974	Public Law 93-291 and 16 U.S.C.469-469c	In Progress
Clean Air Act of 1970, as amended 1977 & 1990	42 U.S.C. 7401 et seq.	Full
Clean Water Act of 1972, as amended	33 U.S.C. 1251 et seq.	In Progress
Coastal Barrier Resources Act of 1982	Public Law 114-314	N/A
Coastal Zone Management Act of 1972, as amended	16 U.S.C. 1451 et seq.	In Progress
Comprehensive Environmental Responses, Compensation and Liability Act of 1980	42 U.S.C. 9601	Full
Endangered Species Act of 1973	16 U.S.C. 1531	Full
Fish and Wildlife Coordination Act of 1958, as amended	16 U.S.C. 661	Full
Magnuson-Stevens Fishery Conservation and Management Act	16 U.S.C. 1801	Full
Marine Mammal Protection Act of 1972, as amended	16 U.S.C. 1361	N/A
National Environmental Policy Act of 1969, as amended	42 U.S.C. 4321 et seq.	In Progress
Noise Control Act of 1972, as amended	42 U.S.C. 4901	Full
Resource Conservation and Recovery Act of 1976	42 U.S.C. 6901 et seq.	Full
Rivers and Harbors Act of 1899	33 U.S.C. 401 et seq.	N/A
Wild and Scenic Rivers Act of 1968	16 U.S.C. 1271 et seq.	N/A

TABLE 7-2: EXECUTIVE ORDERS

TITLE OF EXECUTIVE ORDER	EXECUTIVE ORDER NUMBER	COMPLIANCE STATUS
Protection and Enhancement of Environmental Quality	11514/11991	Full
Protection and Enhancement of the Cultural Environment	11593	In Progress
Floodplain Management	11988	N/A
Protection of Wetlands	11990	N/A
Federal Actions to Address Environmental Justice and Minority and Low-income Populations	12898	Full
Protection of Children from Environmental Health Risks and Safety Risks	13045	Full
Invasive Species	13112	N/A
Consultation and Coordination with Indian Tribal Governments	13175	Full
Responsibilities of Federal Agencies to Protect Migratory Birds	13186	N/A

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

NEPA requires that all federal agencies use a systematic, interdisciplinary approach to protect the human environment. This approach promotes the integrated use of natural and social sciences in planning and decision-making that could have an impact on the environment. This document follows the "Update to the Regulations Implementing the Procedural Provisions of the National Environmental Policy Act", published by the Council on Environmental Quality in the Federal Register on July 16, 2020. The update affects all NEPA processes that began after September 14, 2020 (85 FR 43304). NEPA requires the preparation of an Environmental Impact Statement for any major federal action that could have a significant impact on the quality of the human environment, and the preparation of an EA for those federal actions that do not cause a significant impact but do not qualify for a categorical exclusion.

NEPA regulations provide for a scoping process to identify the scope and significance of environmental issues associated with a project. The process identifies and eliminates from further detailed study issues that are not significant. USACE used this process to comply with NEPA, and it was determined that an EA was the appropriate NEPA document to prepare for this project.

Upon completion of the Final Feasibility Report/Environmental Assessment and the signing of the FONSI, the project will be in full compliance with the NEPA. A draft Finding of No Significant Impact is provided in Appendix A1.

7.3 Clean Water Act

Coordination is underway to ensure the Preferred Alternative is in compliance with the Clean Water Act of 1972 and subsequent amendments. The USACE will obtain a Section 401 CWA Water Quality Certification from the MDE following feasibility during the pre-construction engineering and design phase. The MDE, after review of the Draft Feasibility Report/Environmental Assessment, will submit a letter stating it contains sufficient information to demonstrate that the recommended plan complies with the Clean Water Act (see Appendix A2).

7.4 Wetlands

Section 404 of the Clean Water Act and the 404(b)(1) Guidelines at 40 CFR Part 230 require that USACE avoid, minimize, and mitigate impacts to wetlands. No direct or indirect impacts to intertidal or freshwater wetlands are anticipated with implementation of the Preferred Alternative.

7.5 Federal Coastal Zone Management Act, 16 U.S.C. 1451 et seq.

The proposed project is located within the coastal zone, which is managed under MDDNR's CZMP. The Federal Coastal Zone Management Act (CZMA) of 1972, as amended in 1990, aims to "preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone" (CZMA 1972). To achieve this directive, CZMA requires that all federal agency activity affecting land or water use, or natural resources of the coastal zone (whether the activity is performed within or outside of the coastal zone), be carried out in a manner that is consistent with the enforceable policies of state management programs, consistent with the minimum Federal standards.

To implement the CZMA and establish procedures for compliance with its federal consistency provisions, NOAA promulgated regulations in 15 CFR Part 930. As per 15 CFR 930.37, a federal agency may use its NEPA documents as a vehicle for its consistency determination. The CZMP for the State of Maryland was approved by NOAA in 1978, with the MDDNR acting as the lead agency. The CZMP is composed of several state planning and regulatory programs that enforce policies to protect coastal resources and manage coastal uses, including the CBCA. Maryland's coastal zone follows the inland boundary of the counties and Baltimore City bordering the Atlantic Ocean, Chesapeake Bay, and the Potomac River (as far as the municipal limits of Washington,

D.C), and includes all local jurisdictions within the counties and Baltimore City (NOAA 2012).

A Federal consistency determination in accordance with 15 CFR Part 930 Subpart C has been made that states that the Preferred Alternative is consistent with the enforceable policies of the State of Maryland's federally approved coastal management program. Compliance with State and Federal CZMA and CZMP is detailed in Appendix A3. MDDNR must review USACE's determination of consistency with Maryland CZMP's enforceable policies. The draft EA will be submitted for review by the State concurrent with public review.

7.6 Clean Air Act, as amended, 42 U.S.C. 7401 et seq.

An Air Emissions Inventory has been provided as part of this EA and can be found in Appendix D: Air Quality. The analysis determined that the construction activities within the State of Maryland do not fall under the requirements of General Conformity. Project related emissions as proposed do not exceed the NOx emission threshold of 100 tons per year that would require mitigation and/or offsetting. Upon completion of the draft EA, EPA and MDE will be forwarded a copy for their review to confirm compliance with Section 309 of the Clean Air Act.

7.7 Magnuson-Stevens Fishery Conservation and Management Act (MSA), 16 U.S.C.1801 et seq.

This Act requires federal action agencies to consult with the NMFS if a proposed action may affect EFH. USACE evaluated potential project impacts on NMFS-managed fish species and their EFHs. Pursuant to Section 305 (b)(2) of the Magnuson-Stevens Fishery Conservation & Management Act, USACE is required to prepare an EFH Assessment for the Seagirt Study. The draft assessment is provided in Sections 2.5 and 6.5 of this report. Coordination with NFMS for EFH will be ongoing through the remainder of the study.

7.8 U.S. Fish and Wildlife Coordination Act, 16 U.S.C.661-666(c)

The Fish and Wildlife Coordination Act (FWCA) requires Federal agencies to consult with the USFWS, NMFS, and the state fish and wildlife agencies where the "waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted or otherwise controlled or modified" by any agency under a federal permit or license. Consultation is to be undertaken for the purpose of "preventing loss of and damage to wildlife resources." The intent is to give fish and wildlife conservation equal consideration with other purposes of water resources development projects.

Coordination with USFWS and NMFS for the FWCA will be ongoing through the remainder of the study.

7.9 Endangered Species Act

The Preferred Alternative will be in compliance with the Endangered Species Act of 1973 (ESA). Pursuant to Section 7 of the ESA, a draft Biological Assessment (BA) has been prepared. Relevant sections of the BA have been integrated into the EA impact analysis. The Preferred Alternative is not anticipated to affect rare, threatened, or endangered species. Coordination with the NMFS (jurisdiction over Atlantic and shortnose sturgeon), pursuant to Section 7 of the Endangered Species Act of 1973, is in progress.

7.10 Marine Mammal Protection Act, 16 U.S.C. 1631 et seq.

The Marine Mammal Protection Act prohibits the take of marine mammals. No Incidental Take or Incidental Harassment Authorizations from the NMFS is anticipated with implementation of the Preferred Alternative.

7.11 Section 106 and 110(f) of the National Historic Preservation Act, 16 U.S.C. 470 et seq.

The National Historic Preservation Act applies to properties listed in or eligible for listing in the National Register of Historic Places; these are referred to as “historic properties.” Historic properties eligible for listing in the National Register of Historic Places include prehistoric and historic sites, structures, buildings, objects, and collections of these in districts. Under Section 106 of the National Historic Preservation Act and its implementing regulations at 36 Code of Federal Regulations Part 800, the USACE assessed potential effects on historic properties that are within the proposed project’s APE. Coordination with SHPO will continue through the study period.

7.12 Resource Conservation and Recovery Act (RCRA), as amended, 42 U.S.C. 6901 et seq.

RCRA is the Act that controls hazardous waste management and disposal. Under 40 CFR 261.4(g), 33 CFR 336.1 and 33 CFR 336.2, the dredged material from USACE projects is not considered hazardous waste.

7.13 Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or Superfund), 42 U.S.C. 9601 et seq.

The liability, compensation, cleanup, and emergency response for hazardous substances released into the environment and the cleanup of inactive hazardous substance disposal sites is governed by CERCLA. The material to be excavated or dredged during the project would not be considered a hazardous substance under CERCLA.

7.14 Executive Order 11988, Floodplain Management

This Executive Order states that federal agencies shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out agency responsibilities. The proposed project has no effect on floodplains.

7.15 Executive Order 11990, Protection of Wetlands

This Executive Order directs all federal agencies to minimize the destruction, loss, or degradation of wetlands and preserve and enhance the natural beneficial values of wetlands in the conduct of the agency's responsibilities. No direct or indirect impacts to jurisdictional wetlands are anticipated with implementation of this project.

7.16 Executive Order 12898, Federal Actions to Address Environmental Justice

In accordance with this Executive Order, the USACE has determined that no group of people would bear a disproportionately high share of adverse environmental consequences resulting from the proposed work.

7.17 Executive Order 13045, Protection of Children from Environmental and Safety Risks

This Executive Order ensures that all federal actions address the unique vulnerabilities of children. In accordance with this Executive Order, the USACE has determined that no children would bear a disproportionately high share of adverse environmental consequences resulting from the proposed work and there should be no effect on children.

7.18 Migratory Bird Treaty Act, 16 U.S.C. 703 et seq.; Executive Order 13186 Responsibilities of Federal Agencies to Protect Migratory Birds

The Migratory Bird Treaty Act (MBTA) prohibits the taking or harming of any migratory bird, its eggs, nests, or young without an appropriate Federal permit. Almost all native birds are covered by this Act and any bird listed in wildlife treaties between the United States and several other countries. A “migratory bird” includes the living bird, any parts of the bird, its nest, or eggs. The take of all migratory birds is governed by the MBTA’s regulation of taking migratory birds for educational, scientific, and recreation purposes and requiring harvest to be limited to levels that prevent over-utilization. Section 704 of the MBTA states that the Secretary of the Interior is authorized and directed to determine if, and by what means, the take of migratory birds should be allowed and to adopt suitable regulations permitting and governing take. Disturbance of the nest of a migratory bird requires a permit issued by the USFWS pursuant to Title 50 of the CFR. The preferred

alternative would have no effect on migratory birds. Therefore, the Preferred Alternative is in compliance with the MBTA and Executive Order 13186.

7.19 Rivers and Harbors Act, 33 U.S.C. 401, et seq.

Section 9 of the Rivers and Harbors Act (RHA) of 1899 (as amended) and its implementing regulations prohibit the construction of any bridge, dam, dike, or causeway over or in navigable waters of the U.S. without Congressional approval. The U.S. Coast Guard administers Section 9 and issues bridge crossing permits over navigable waters. Section 10 of the RHA requires authorization from the Secretary of the Army, acting through the Corps of Engineers, for the construction of any structure in or over any navigable water of the United States, or dredging in navigable waters of the United States. The Preferred Alternative does not propose construction of any structure in or over navigable waters of the United States but does involve dredging. USACE does not issue permits to itself for dredging but does comply with related provisions of the Clean Water Act by performing a 404(b)(1) analysis and seeking a Section 401(c) water quality certification, where applicable. The Proposed Action would be in compliance with the RHA.

7.20 List of Preparers

The project delivery team for the study included team members from the USACE, MDOT MPA, and MES (Table 7-3). The team members listed below provided substantial text to the Draft Feasibility Report/EA.

TABLE 7-3: LIST OF PREPARERS

NAME	AFFILIATION
Amanda Peñafiel	Senior Project Manager, MDOT MPA
Andrew Roach	Plan Formulation, CENAB-PL-P
Bertrand Djiki	Transportation Engineer, MDOT MPA
Damian LeBron	Civil Engineer, CENAB-ENC-E
David Bibo	Chief of Operations, MDOT MPA
David Peters	Lead Environmental Specialist, MES
Constantine J. Ditsious	Chemist, CENAB-ENE-T
Ethan Bean	Archaeologist, CENAB-PL-P
Holly Miller	Deputy Director, Harbor Development, MDOT MPA
Ian Delwiche	Geotech Engineer, CENAB-ENG-G
Jeremiah Spiga	Lead Navigation Specialist, CENAB-OPT-N
Joseph Bieberich	Project Manager, CENAB-CIV
Julie McGuire	Lead Economist, CESAM-PD-D
Kenna Oseroff	Acting Division Chief, EDR, MES
Kristina May	Biologist, CENAB-PL-P
Luan Ngo	Cost Engineer, CENAB-END-T
Luis Santiago	Study Manager, CENAB-PL-P
Megan O'Hara	Lead Environmental Specialist, MES
Michelle Osborn	Senior Lead Environmental Specialist, MES
Tanveer Chowdhury	Hydrology and Hydraulics Engineer, CENAB-ENC-W
Thomas Craig	Civil Realty Specialist, CENAB-REC
Triet Nguyen	Supporting Economist, CENAO-WRP-R

8 Plan Implementation

8.1 Institutional Requirements

Federal implementation of the recommended project would be subject to the non-Federal sponsor agreeing to comply with applicable Federal laws and policies, including, but not limited to, the items discussed in the following sections in Chapter 8.

8.2 Real Estate Requirements

USACE projects require the non-Federal sponsor to provide lands, easements, rights-of-way, relocations and disposal areas (LERRD) for navigation projects. All the alternatives considered in this study are within the existing anchorages and channels below the ordinary highwater mark and are underwater. The Chesapeake Bay and Baltimore Harbor bottom are owned by the State of Maryland. These areas are also within navigable waters of the United States and fall under navigational servitude. Baltimore Harbor sediments contain contaminants from industrial and municipal sources as well as non-point sources. The Maryland Dredged Material Management Act of 2001 restricted dredged material placement from Baltimore Harbor Channels to approved contained placement sites. Due to these restrictions and continued sediment testing, materials from Baltimore Harbor are unsuitable for open ocean disposal and most beneficial uses. The only two available sites for Baltimore Harbor materials are the Cox Creek DMCF and Masonville DMCF, both owned by the non-Federal sponsor. All the necessary real estate is currently owned by the non-Federal sponsor in fee simple. The Project Partnership Agreement (PPA) for the proposed project only provides credit for the value of the LERRDs and acquisition costs incurred within five years of execution of the PPA. Also, the non-Federal sponsor may only receive credit for those costs that have not already been credited to a previous federal project. Therefore, no LERRD credits will be forthcoming to the non-Federal sponsor for this modification. Furthermore, there are no known facility or public utility relocations to be performed. Details on cost sharing are provided in Section 8.4: Cost Sharing and Non-Federal Partner Responsibilities. Details on real estate requirements are provided in Appendix F – Real Estate Plan.

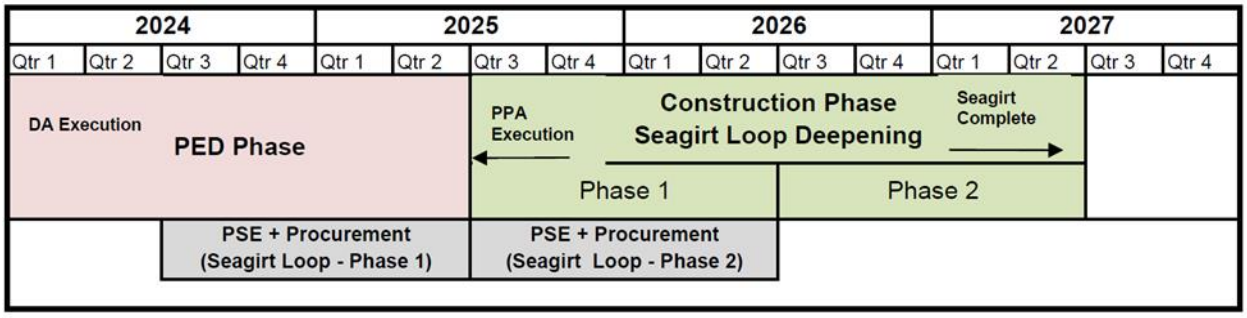
8.3 Implementation Schedule

Implementation would occur provided that sufficient funds are appropriated to design and construct the project. For PED to be initiated, USACE must sign a Design Agreement with a non-Federal sponsor. The PED phase is cost shared 75 percent federal and 25 percent non-Federal. This project would require congressional authorization prior to construction. To initiate construction, a PPA would be entered with a non-Federal sponsor to cost share construction of the project. In addition to the 75 percent federal and 25 percent non-Federal cost share for construction, an additional 10 percent of the total costs of general

navigation features up to the NED plan costs will be repaid by the non-Federal sponsor over a period not to exceed 30 years. Should an LPP be pursued and implemented, costs in excess of the NED plan are 100 percent borne by the non-Federal sponsor and are not included in the 10% pay back costs as detailed in this section.

The draft schedule for plan implementation was developed for planning and cost estimating purposes (Table 8-1).

TABLE 8-1: DRAFT TENTATIVELY SELECTED PLAN IMPLEMENTATION SCHEDULE



8.4 Cost Sharing and Non-Federal Partner Responsibilities

Cost sharing for the TSP - NED Plan are summarized in Table 8-2 and cost sharing for the potential LPP is summarized in Table 8-3. Cost sharing will be done in accordance with Section 101 of the Water Resources Development Act of 1986, as amended, and cost shared as a general navigation feature. The cost share is based on all recommended channel depths being -50 feet or less. Channel depths of -50 feet or less are cost shared 75 percent federal and 25 percent non-Federal. Costs in excess of the NED plan are borne 100 percent by the non-Federal sponsor. All required lands are currently owned by the non-Federal sponsor and no LERRD is required. Disposal necessary for the project is cost-shared as a general navigation feature. An additional 10 percent of the total costs of general navigation features will be repaid by the non-Federal sponsor over a period not to exceed 30 years. The sponsor's costs for LERRD[3] are credited against the additional cash contributions.

[31] Any conclusion or categorization that an item is a utility or facility relocation to be performed by the non-Federal sponsor as part of its lands, easements, rights-of-way, and relocations responsibilities is preliminary only. USACE will make a final determination of the relocations necessary for the construction, operation, or maintenance of the project after further analysis and completion and approval of a Final Attorney's Opinion of Compensability for each of the impacted utilities and facilities.

TABLE 8-2: COST-SHARING BREAKDOWN FOR THE TSP - NED PLAN, DEEPENING DOWN TO -47 FEET

CONSTRUCTION ITEM	FEDERAL COST	NON-FEDERAL COST	TOTAL
MODIFICATION OF SEAGIRT LOOP CHANNEL TO -47 FEET MLLW			
Construction Item			
01 LANDS AND DAMAGES	-	-	-
02 RELOCATIONS	-	-	-
06 FISH AND WILDLIFE FACILITIES	-	-	-
12 NAVIGATION PORTS AND HARBORS	$25,308,750	$8,436,250	$33,745,000
18 CULTURAL RESOURCE PRESERVATION	-	-	-
Subtotal	$25,308,750	$8,436,250	$33,745,000
30 PLANNING, ENGINEERING AND DESIGN	$288,000	$96,000	$384,000
31 CONSTRUCTION MANAGEMENT	$153,000	$51,000	$204,000
Subtotal	$441,000	$147,000	$588,000
Total Project First Costs*	$25,749,750	$8,583,250	$34,333,000
Associated Costs[1]	-	-	-
Non-Federal Sponsor Additional 10% GNF Contribution	$-3,433,300	$3,433,300	-
Project Cost Plus Associated Cost	$22,316,450	$11,869,550	$34,333,000

TABLE 8-3: COST-SHARING BREAKDOWN FOR THE POTENTIAL LPP, DEEPENING DOWN TO -50 FEET

CONSTRUCTION ITEM	FEDERAL COST	NON-FEDERAL COST	TOTAL
MODIFICATION OF SEAGIRT LOOP CHANNEL TO -50 FEET MLLW			
Construction Item			
01 LANDS AND DAMAGES	-	-	-
02 RELOCATIONS	-	-	-
06 FISH AND WILDLIFE FACILITIES	-	-	-
12 NAVIGATION PORTS AND HARBORS	$25,308,750	$18,972,750	$44,281,500
18 CULTURAL RESOURCE PRESERVATION	-	-	-
Subtotal	$25,308,750	$18,972,750	$44,281,500
30 PLANNING, ENGINEERING AND DESIGN	$288,000	$96,500	$384,500
31 CONSTRUCTION MANAGEMENT	$153,000	$133,000	$286,000
Subtotal	$441,000	$229,500	$670,500
Total Project First Costs*	$25,749,750	$19,202,250	$44,952,000
Associated Costs[1]	-	-	-
Non-Federal Sponsor Additional 10% GNF Contribution	$-3,433,300	$3,433,300	-
Project Cost Plus Associated Cost	$22,316,450	$22,635,550	$44,952,000

Any conclusion or categorization that an item is a utility or facility relocation to be performed by the non-Federal sponsor as part of its lands, easements, rights-of-way, and relocations responsibilities is preliminary only. USACE will make a final determination of the relocations necessary for the construction, operation, or maintenance of the project after further analysis and completion and approval of a Final Attorney's Opinion of Compensability for each of the impacted utilities and facilities.

8.5 Views of the Non-Federal Sponsor and Other Agencies

The non-Federal sponsor for the implementation of the project is MDOT MPA. CENAB has been a continuous coordination with MDOT MPA in carrying out the feasibility study.

The proposed action is required to be in compliance with environmental protection statutes and other environmental requirements including, but not limited to, NEPA, CZMA, Clean Water Act, Clean Air Act, Endangered Species Act, FWCA, Magnuson-Stevens Fishery Conservation and Management Act, and the NHPA.

USACE has initiated and continues consultation in accordance with Section 106 of the NHPA of 1966, as amended, and its implementing federal regulations, 36 CFR 800. The areas proposed for deepening and widening would need to be surveyed for their potential to contain cultural resources. Due to funding and scheduling constraints, a Phase I

Archeological Investigation cannot take place during the feasibility phase of the project. To satisfy the requirements under Section 106 of the NHPA, USACE has drafted a Programmatic Agreement (PA) pursuant to 36 CFR § 800.14 (b)(ii). The purpose of the PA would be to allow the Draft Feasibility Report/EA to move forward, while stipulating Phase I Archaeological Investigation requirements during the PED phase when funding can be obtained for this effort. The MHT [the SHPO] has agreed with this approach. To assess potential visual effects the proposed project may have on architectural resources, USACE, in consultation with MHT and the NPS, have conducted a viewshed analysis. The results of the viewshed analysis are currently being reviewed by USACE and will be forwarded to MHT and NPS for their review.

Two agency coordination calls were conducted on 14 January 2021 and 13 September 2021 to gather comments on environmental and cultural resources of concern within the study area. Draft NEPA sections that include discussions on environmental justice, air quality, and greenhouse gas emissions will be sent to the Environmental Protection Agency for their review prior to public release of the draft Feasibility Report. Additional coordination with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service will also occur prior to public release of the Draft Feasibility Report/EA. All other agencies, the public, and other interested stakeholders will be able to review the draft Feasibility Report during the 30-day public review period anticipated to commence on 9 February 2022.

The MDOT MPA has also coordinated with the Association of Maryland Pilots (Pilots) who use the Harbor through the formulation process. The Pilots' input was considered and incorporated into the measures and alternatives considered during plan formulation. The feedback received from the Pilots was positive.

The MDOT MPA supports releasing this report for public and agency input. The MDOT MPA's support for the Tentatively Selected Plan will be confirmed through a letter of support following public and agency reviews.

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9 Draft Recommendation

Added after Agency Decision Milestone (May 2022)

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