Oakland Harbor Turning Basins Widening Navigation Study

Draft Integrated Feasibility Report and Environmental Assessment

December 2021

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U.S. Army Corps of Engineers

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Executive Summary

The Oakland Harbor Turning Basins Widening Integrated Feasibility Report and Environmental Assessment documents the U.S. Army Corps of Engineers (USACE) feasibility study planning process for channel improvements of the existing Oakland Harbor Navigation Improvement (-50 Foot) Project and complies with the National Environmental Policy Act (NEPA) as incorporated into the planning process.

The Oakland Harbor Navigation Improvement (-50 Foot) Project Final Feasibility Study of November 1998 was authorized by Water Resources Development Act (WRDA) of 1986 § 203 (Pub. L. No. 99-662, 100 Stat. 4098 (Nov. 17, 1986), 33 United States Code (U.S.C.) § 2231). The study and resulting Chief's Report recommended a 50-foot deep channel in the Oakland Harbor based on a design vessel with 1,139 length overall, 140 foot beam, 48 foot draft, and 6,500 twenty-foot equivalent unit (TEU) carrying capacity. The recommended plan was authorized for construction in Section 101(a)(2) of WRDA 1999 (Pub. L. No. 106-53, 113 Stat. 275 (Aug. 17, 1999)). Construction of the project channels was completed in 2009. The completed channels are maintained at -50 feet mean lower low water (MLLW).

Today, vessels with nearly triple the capacity of the original design vessel call at the Port. The superseding of the channel dimensions has a significant adverse effect on the economics and engineering design of the existing -50 Foot Project.

In October 2018, a Section 216 Initial Appraisal Report, Compliance with Section 216 of Rivers and Harbors Act of 1970 was conducted to determine if there is potential federal interest to undertake modifications to the constructed -50 Foot Project. The Section 216 Initial Appraisal Report concluded the problems in Oakland Harbor are caused by length limitations in the inner and outer turning basins and are not caused by depth limitations nor by landside capacity. The vessels routinely calling on the Oakland Harbor today have nearly triple the capacity as the -50 Foot Project's design vessel. The *MSC Sveva*, a 19,224 TEU container vessel, called at the Port of Oakland in late 2020 and 2021. While the vessel was able to call, the existing turning basins are insufficiently sized for ULCVs to operate efficiently and provide no margin for error during turning operations. The superseding of the channel dimensions has a significant adverse effect on the economics and design of the completed -50 Foot Project and its usage.

Pursuant to Section 216 of the Rivers and Harbors Act of 1970, the Oakland Harbor study evaluates proposed modifications to the completed -50 Foot Project, specifically the existing turning basins. The need for this investigation arises from inefficiencies currently experienced by vessels in harbor, specifically the turning basins, where the current fleet exceeds the maximum dimensions of the constructed -50 Foot Project. These inefficiencies are projected to continue in the future as vessel sizes increase to meet requirements for operational efficiencies and environmental compliance.

Utilizing the USACE Planning Process as specified in Engineer Regulation (ER) 1105-2-100, plan formulation was conducted with a focus on achieving the federal objective of water and related land resources project planning, which is to contribute to the Nation's national economic development (NED) consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable Executive Orders, and other federal planning requirements.

Plan formulation also considers all effects, beneficial or adverse, to each of the four evaluation accounts identified in the Principles and Guidelines (1983): NED, environmental quality, regional economic development, and other social effects.

The Oakland study's purpose is to determine if there is a technically feasible, economically justified, and environmentally acceptable recommendation for federal participation in a navigation improvement project in the Oakland Harbor. Based on a forecast of the future fleet, the study team, which includes the Deep Draft Navigation Planning Center of Expertise, has determined the design vessel for this study is a vessel with 1,310 feet length overall, 193 foot in beam, 52.5-foot maximum summer loadline draft, and 19,000 TEUs nominal intake. USACE considered a range of nonstructural and structural measures that have the potential to improve navigation efficiencies within the Oakland Harbor. These measures included, but were not limited to, channel widening, channel deepening, bend easing, improving vessel scheduling, relocating navigation aids, and increasing tugboat assistance.

Various footprint variations were considered, including two Outer Harbor footprints, four Inner Harbor footprints, and two new locations for the Inner Harbor turning basin. Through an iterative planning process, a focused array of alternatives was identified, evaluated, and compared. During plan formulation, the study team identified the Federal Base Plan (Base Plan), or the least costly dredged material placement alternative consistent with sound engineering practices and meeting all federal environmental requirements. The Base Plan includes landfills (for material not suitable for beneficial use), a local upland beneficial use site for the protection, restoration, or creation aquatic wetland habitats (for material not suitable for aquatic placement at San Francisco Deep Ocean Disposal Site), as well as open water placement at the San Francisco Deep Ocean Disposal Site (for materials suitable for either unconfined aquatic disposal or cover material at upland beneficial use site). After identifying the Base Plan, the study team assessed beneficial use opportunities beyond the Base Plan to determine whether there would be appropriate matches of sources and uses of dredged material. It was established that the incremental cost to place materials as cover material at an upland beneficial use site as compared to placement at San Francisco Deep Ocean Disposal Site was reasonable in relation to the environmental benefits to be achieved. The alternatives, where applicable, include the additional beneficial use (BU) site.

The preliminary analysis presented in this report identifies Alternative D-1 – Inner and Outer Harbor modifications using diesel dredges and beneficial placement as the NED/BU Plan because it reasonably maximizes net benefits. The analysis identifies Alternative D-2 – Inner and Outer Harbor modifications using electric dredges and beneficial placement as the Comprehensive Benefits Plan because it maximizes benefits across all 1983 Principles and Guidelines Accounts.

After careful evaluation of the alternatives and their tradeoffs, the study team and non-federal sponsor, the Port of Oakland, selected the Tentatively Selected Plan as Alternative D-2 – Inner and Outer Harbor Modifications with electric dredges and beneficial placement. The Tentatively Selected Plan would modify the Inner Harbor Turning Basin and Outer Harbor Turning Basin. These improvements will allow vessels to operate within the Oakland Harbor more efficiently and allow large vessels to call more frequently. The increase in cargo per vessel call yields economic benefits by allowing for more efficient use of containerships.

Channel configurations were designed to avoid and minimize environmental and cultural resource impacts while still meeting navigation safety requirements. The Tentatively Selected Plan would require an estimated 2,500 linear feet of bulkhead and the removal and placement of approximately 1,983,000 cubic yards of aquatic dredged and terrestrial excavated material. The modifications would impact approximately 4.9 acres of fast land (land that is above the high-water mark) at the Alameda site, 0.2 acres of fast land at Schnitzer Steel, and 2.3 acres of fast land at Howard Terminal.

The Tentatively Selected Plan beneficially places all eligible dredged material in compliance with 33 U.S.C. § 2326 (WRDA 1992 § 204(d)). Of the approximate 1,983,000 cubic yards of dredged and excavated material that is anticipated to be removed as part of the Tentatively Selected Plan, approximately 1,676,000 cubic yards or 85% of the material is estimated to be suitable for and would go to a beneficial placement site. Optimization, or refinement of the Tentatively Selected Plan, will occur before the Final Integrated Report is released.

The Tentatively Selected Plan will not significantly adversely impact physical and biological environmental resources; cultural resources; public health and safety; or the quality of the human environment. The use of the electric dredges will provide a benefit to environmental quality and other social effects.

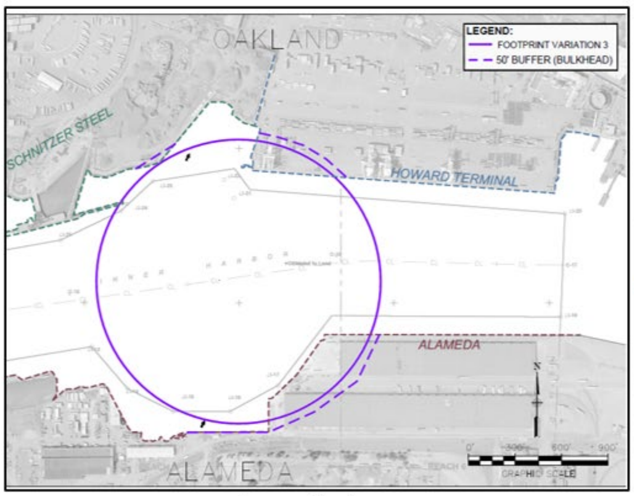
At current price levels (Fiscal Year 2021 price level and 2.25% discount rate), the Tentatively Selected Plan has an estimated project first cost of $462.4 million, provides an estimate of $33.5 million in Average Annual Equivalent (AAEQ) net benefits, and has a benefit-cost ratio of 3.0. The non-federal costs for the value of lands, easements, rights-of-way, and relocations are estimated to be $151.9 million. The cost of operation and maintenance is estimated to cost an incremental $1.1 million annually. The non-federal sponsor, the Port of Oakland, has indicated their support for releasing this report for public and agency input.

Pertinent Data

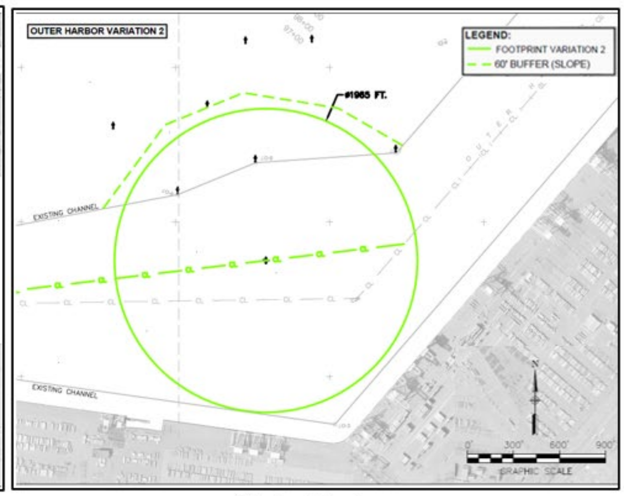
Tentatively Selected Plan Features

The Tentatively Selected Plan would modify the Inner Harbor Turning Basin and Outer Harbor Turning Basin to allow vessels to operate within the Oakland Harbor more efficiently and allow large vessels to call more frequently. The increase in cargo per vessel call yields economic benefits by allowing for more efficient use of containerships. The Tentatively Selected Plan would require 2,500 linear feet of bulkhead and the removal and placement of approximately 1,983,000 cubic yards of aquatic dredged and terrestrial excavated material. The modifications would impact 4.9 acres of fast land (land that is above the high-water mark) at an Alameda site, 0.2 acres of fast land at Schnitzer Steel, and 2.3 acres of fast land at Howard Terminal.

The Tentatively Selected Plan places material at Keller Canyon landfill, Kettleman Hills landfill, and at a beneficial use site for the protection, restoration, or creation aquatic wetland habitats as either non-cover or cover material in compliance with Section 204(d) of WRDA 1992.



Inner Harbor



Outer Harbor

Construction

The project assumes a construction start date of June 2027 with an overall duration of approximately 2.5 years, ending December 2029. Construction years are assumed for the economics evaluation in this study and are subject to report and project approvals and funding requirements, including federal and non-federal funds. Construction will take place within the applicable environmental work windows.

Real Estate Requirements

Federal law requires that the non-federal sponsor, here the Port of Oakland, provide the lands, easements, rights-of-way, and relocations necessary for a USACE project[1]. The Tentatively

[1] 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.

Selected Plan's lands, easements, and rights-of-way costs are $149.5 million, with relocation costs at $2.4 million, for a total of $151.9 million. These costs will be borne by the Port of Oakland.

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. The project first cost for the Tentatively Selected Plan is estimated to be $462.4 million.

		TENTATIVELY SELECTED PLAN
First Cost		**$462,400,000**
1	Lands and Damages	$149,480,000
2	Relocations	$2,384,000
6	Fish and Wildlife Facilities	$4,410,000
12	Navigation Ports and Harbors	$238,810,000
18	Cultural Resource Preservation	$0
30	Planning, Engineering and Design	$47,670,000
31	Construction Management	$19,650,000
Economic Cost [1]		**$475,643,000**
12	Navigation Aids (associated cost)	$0
12	Local Service Facilities (associated cost)	$0
	Interest During Construction	$13,244,000
Average Annual Equivalent (AAEQ)		
	Operation and Maintenance	$1,105,000
	AAEQ Costs [2]	$16,673,000
	AAEQ Benefits [3]	$50,150,000
	AAEQ Net Benefits [3]	$33,476,000
	Benefit-Cost Ratio [3]	3.0

FY22 price level and discount rate of 2.25%.
[1] Includes first cost, interest during construction, and associated costs.
[2] Includes operation and maintenance
[3] Excludes environmental quality benefits

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Sections of the report that implement the environmental assessment requirements of the National Environmental Policy Act (NEPA) of 1970 are marked with an asterisk (*) in the headings.

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Acronyms

ACRONYM	DEFINITION
AAEQ	Average Annual Equivalent
ACHP	Advisory Council on Historic Preservation
ADT	Average Daily Traffic
APE	Area of Potential Effects
ASA(CW)	Assistant Secretary of the Army for Civil Works
BAAQMD	Bay Area Air Quality Management District
BART	San Francisco Bay Area Rapid Transit
BCDC	San Francisco Bay Conservation and Development Commission
BGS	Below Ground surface
BMP	Best Management Practices
BU	Beneficial Use
CAA	Clean Air Act
CAPP	Community Air Protection Program
CARB	California Air Resource Board
CCC	Central California Coast
CDF	Cumulative Distribution Function
CDFW	California Department of Fish and Wildlife
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CHC	Commercial Harbor Craft
CLT	Container Loading Tool
CO	Carbon Monoxide
COC	Constituents of Concern
CRHR	California Register of Historic Resources
CSPS	Container Shipping Planning Service
CT	Census Tract
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dB	Decibels
dBA	A-weighted decibels
DC	Distribution Centers
DMMO	Dredged Material Management Office
DNL	Day-Night Average Noise Level
DPM	Diesel Particulate Matter
DPS	Distinct Population Segment
DTSC	Department of Toxic Substances Control
DWT	Deadweight Tons

ACRONYM	DEFINITION
EFH	Essential Fish Habitat
EGM	Economic Guidance Memorandum
EO	Executive Order
EPA	Environmental Protection Agency
EQ	Environmental Quality
ER	Engineer Regulation
ESL	Environmental Screening Level
ESU	Evolutionarily Significant Unit
FHWA	Federal Highway Administration
FISC	Fleet Industrial Supply Center
FMP	Fisheries Management Plan
FTA	Federal Transportation Administration
FWCA	Fish and Wildlife Coordination Act
FY	Fiscal Year
HAPs	Hazardous Air Pollutants
HOPs	Hydrocarbon Oxidation Products
HRA	Health Risk Assessment
HTRW	Hazardous, Toxic, Radioactive Waste
I-880	Interstate 880
IDC	Interest During Construction
IPCC	Intergovernmental Panel on Climate Change and National Research Council
IWR	Institute for Water Resources
LERR	Lands, Easements, Rights of Ways, Relocations
LFA	Load Factor Analysis
LOA	Length Overall
LTMS	Long-Term Management Strategy
LUC	Land Use Covenant
MBTA	Migratory Bird Treaty Act
MHEA	Middle Harbor Enhancement Area
MHHW	Mean Higher High Water
MLLW	Mean Lower Low Water
MMPA	Marine Mammal Protection Act
MRF	Material Recovery Facility
MXSLLD	Maximum Summer Loadline Draught
NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission
NAICS	North American Industry Classification System
NAS	Naval Air Station
NAVD	North American Vertical Datum
NED	National Economic Development
NED/BU	National Economic Development/Beneficial Use

ACRONYM	DEFINITION
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO_2	Nitrogen Dioxide
NO_X	Nitrous Oxides
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NTU	Nephelometric Turbidity Units
NWIC	Northwest Information Center
O&M	Operations & Maintenance
OHT	Outer Harbor Terminal
OSE	Other Social Effects
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PED	Pre-construction Engineering and Design
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter - less than 2.5 microns
PM_{10}	Particulate Matter - 10 microns in diameter or less
PPV	Peak Particle Velocity
PPX	Post-Panamax
PPX Gen I	Post-Panamax Generation I
PPX Gen II	Post-Panamax Generation II
PPX Gen III	Post-Panamax Generation III
PPX Gen IV	Post-Panamax Generation IV
PX	Panamax
RCRA	Resource Conservation and Recovery Act
RED	Regional Economic Development
RMS	Root Mean Square
RNA	Regulated Navigation Area
ROG	Reactive Organic Gasses
SFRWQCB	San Francisco Regional Water Quality Control Board
SHPO	State Historic Preservation Office
SJVAB	San Joaquin Valley Air Basin
SLF	Sacred Lands File
SO_2	Sulphur Dioxide
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TACs	Toxic Air Contaminants

ACRONYM	DEFINITION
TEU	Twenty-foot Equivalent Unit
TMP	Traffic Management Plan
TPH	Total Petroleum Hydrocarbons
U.S.C.	United States Code
ULCV	Ultra-large Container Vessel
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
USDOT	United States Department of Transportation
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
VdB	Vibration Decimals
VMT	Vehicle Miles Traveled
VTS	Vessel Traffic Service
VOC	Volatile Organic Compounds
WQC	Water Quality Certification
WRDA	Water Resources Development Act

Chapter 1: Introduction

1.1 Integrated Feasibility Report and Environmental Assessment

The Oakland Harbor Turning Basins Widening Study (Oakland Harbor Study) Draft Integrated Feasibility Report and Environmental Assessment (Draft Integrated Report) documents the U.S. Army Corps of Engineers (USACE) feasibility study planning process for channel improvements of the existing Oakland Harbor Navigation Improvement (-50 Foot) Project. This study document is structured to integrate the requirements of the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. § 4321 *et seq*), as amended, the Council on Environmental Quality (CEQ) 2020 Regulations for Implementing the Procedural Provisions of the NEPA (40 C.F.R. §§1500-1508), and USACE Procedures for Implementing NEPA (Engineer Regulation (ER) 200-2-2), with the requirements of the USACE plan formulation and selection process. The feasibility report and NEPA documentation are integrated because the study planning process informs NEPA, and NEPA compliance informs study planning. Sections marked with an asterisk (*) next to their title are denoted to assist readers in identifying information that would commonly be provided as part of a standalone NEPA document.

1.2 Study Purpose & Scope and NEPA Purpose & Need for Action*

Deep draft navigation is one of the USACE's primary mission areas. According to 33 U.S.C. § 540, "Federal investigations and improvements of rivers, harbors, and other waterways shall be under the jurisdiction of and shall be prosecuted by the Department of the Army…" Making channel improvements that would increase the efficiency of containerships and their operations would yield national economic development (NED) benefits.

The purpose of the Oakland Harbor Study is to investigate and determine if there is a technically feasible, economically justifiable, and environmentally acceptable recommendation for federal participation in a navigation improvement project to the constructed -50 Foot Project (Figure 1 and Table 1).

The existing -50 Foot Project consists of the main navigation channels in the Port of Oakland (Figure 1). Today, vessels with nearly triple the capacity of the original design vessel call at the Port. Pursuant to Section 216 of the Rivers and Harbors Act of 1970, the Oakland Harbor Study evaluates proposed modifications of the constructed -50 Foot Project.

The purpose and need for the action, as required by NEPA (40 C.F.R. § 1502.13); specifies the underlying purpose and need to which an agency is responding in proposing the study alternatives, including the proposed action. In proposing the study alternatives herein, the USACE is responding to the underlying need to address navigation inefficiencies currently experienced by vessels in the Oakland Harbor that arise from the fact that the current fleet of vessels utilizing the Oakland Harbor exceed the maximum dimensions of the constructed turning basins. An initial appraisal report conducted in 2018 pursuant to Section 216 of River and Harbor Act of 1970 determined the problems in Oakland Harbor are caused by length limitations in the inner and outer turning basins as opposed to depth limitations or landside capacity. The existing federal navigation channel was designed for a 6,500 twenty-foot equivalent units (TEU) capacity ship with a 1,139 length overall, 140-foot beam, and 48-foot draft as part of the Oakland Harbor Navigation Improvement (-50-foot) Project Study. The vessels routinely calling on the Oakland Harbor today are longer and wider than the design vessel from that study. These inefficiencies are projected to continue in the future as vessel sizes are expected to increase. The purpose of the action alternatives evaluated in this study is to provide navigation improvements that address this need through modifications to the existing Oakland Harbor.

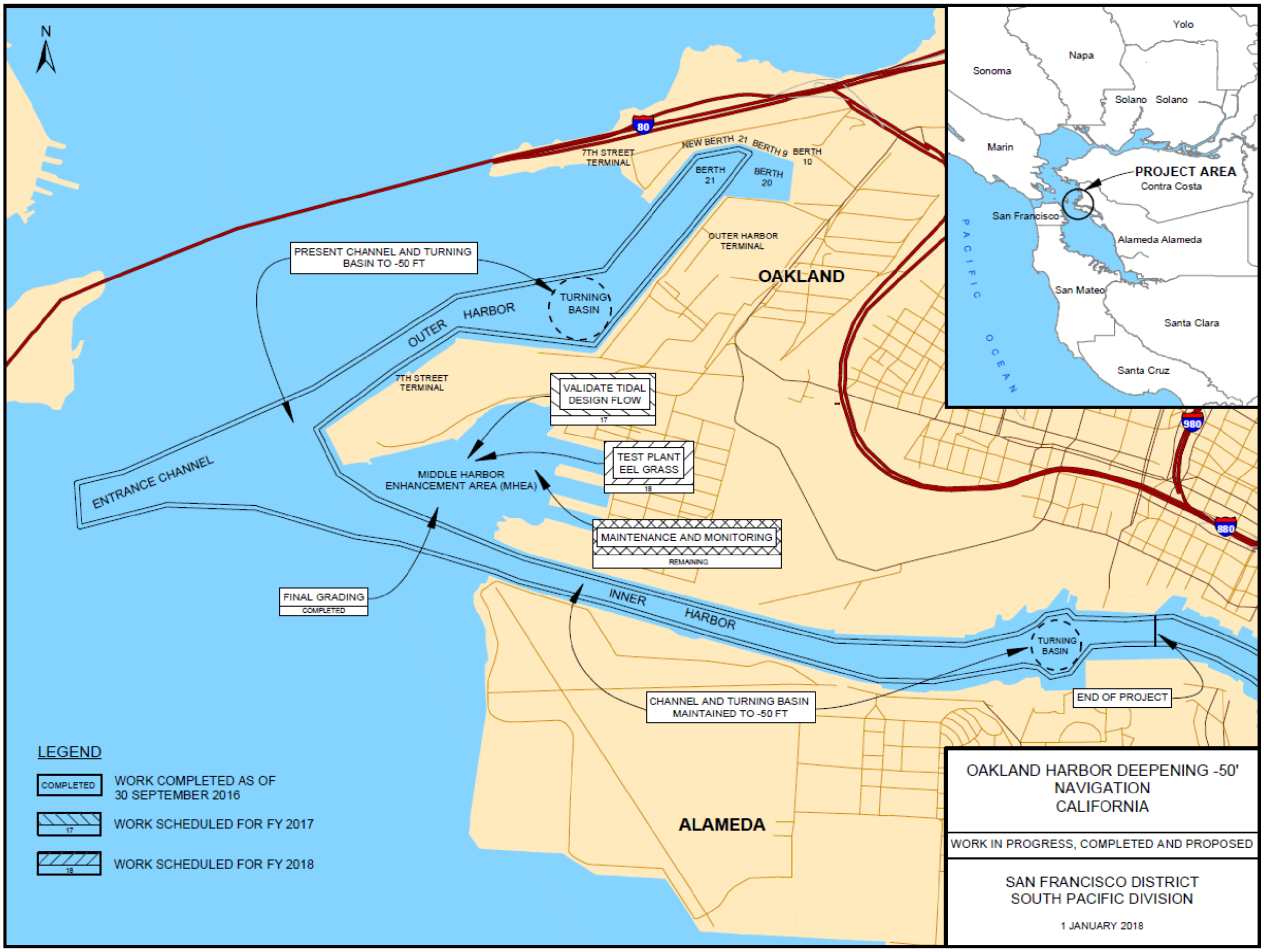


Figure 1: Current Port of Oakland Navigation Features

Table 1: Project Channel Dimensions

CHANNEL	AUTHORIZED OR REGULATORY DEPTH (MLLW)	LENGTH (FT.)	WIDTH (FT.)	AREA (ACRES)
Entrance Channel	-50	3,600	900	86.9
Outer Harbor Channel	-50	16,500	900	373.9
Inner Harbor Channel	-50	20,000	800	402.1

1.3 Study Authority*

The study authority for this study is Section 216 of Rivers and Harbors Act of 1970, related to the -50 Foot Project.

The study authority for the 1998 Oakland Harbor Navigation Improvement (-50-foot) Project Study is Section 203 of the Water Resources Development Act (WRDA) of 1986 (Pub. L. No. 99-662, 100 Stat. 4098 (Nov. 17, 1986), 33 U.S.C. § 2231). It reads:

SEC. 203 STUDIES OF PROJECTS BY A NON-FEDERAL INTEREST

1. *Submission to Secretary.- A non-Federal interest may on its own undertake a Feasibility Study of a proposed harbor or inland harbor project and submit it to the Secretary. To assist non-Federal interests, the Secretary shall, as soon as practicable, promulgate guidelines for studies of harbors or inland harbors to provide sufficient information for the formulation of studies.*
2. *Review by Secretary.- The Secretary shall review each study submitted under subsection (a) for the purpose of determining whether such study and the process under which such study was developed comply with Federal laws and regulations applicable to Feasibility Studies of navigation projects for harbors or inland harbors.*
3. *Submission to Congress.- Not later than 180 days after receiving any study submitted under subsection (a), the Secretary shall transmit to the Congress, in writing, the results of such review and recommendations the Secretary may have concerning the project described in such plan and design.*
4. *Credit and Reimbursement.- If a project for which a study has been submitted under subsection (a) is authorized by any provision of Federal law enacted after the date of such submission, the Secretary shall credit toward the non-Federal share of the cost of construction of such project an amount equal to the portion of the cost of developing such study that would be the responsibility of the United States if such study were developed by the Secretary.*

The study conducted pursuant to Section 203 above resulted in a Chief's Report dated April 21, 1999, recommending a 50-foot deep channel and wider turning basins in the Oakland Harbor based on a design vessel with 1,139 length overall, 140 foot beam, 48 foot draft, and 6,500 twenty-foot equivalent unit (TEU) carrying capacity. The recommended plan was authorized for construction in Section 101(a)(2) of WRDA 1999 (Pub. L. No. 106-53, 113 Stat. 275 (Aug. 17, 1999)), which reads in part:

SEC. 101. PROJECT AUTHORIZATIONS.

(a) PROJECTS WITH CHIEF'S REPORTS

The following projects for water resources development and conservation and other purposes are authorized to be carried out by the Secretary substantially in accordance with the plans, and subject to the conditions, described in the respective reports designated in this subsection:

(7) OAKLAND HARBOR, CALIFORNIA

The project for navigation, Oakland Harbor, California: Report of the Chief of Engineers dated April 21, 1999, at a total cost of $252,290,000, with an estimated federal cost of $128,081,000 and an estimated non-Federal cost of $124,209,000.

In October 2018, a Section 216 Initial Appraisal Report, Compliance with Section 216 of Rivers and Harbors Act of 1970, was completed to determine if there is potential federal interest to undertake modifications to the existing -50 Foot Project. The Initial Appraisal Report found that, "based on the data provided, the vessels currently calling on Oakland are not constrained by draft, nor by landside capacity, but by length. An increase in the widths of the turning basins would create a transportation cost savings benefit by allowing future ultra large container vessels (ULCVs) to call at Oakland… The accelerating expansion of the volume of trade that has taken place over the recent past has led to the design vessel in the Oakland Harbor Navigation Improvement (-50-foot) Feasibility Study being superseded in use in the Port much sooner than expected. This has a material effect on the economic conditions and engineering design incurring economic inefficiency associated with ULCV's operations and navigational safety hazards at Project." The Initial Appraisal Report made the recommendation to "investigate and determine if there is a Federal interest in continuing the project with the preparation of cost-shared feasibility report for analyzing alternatives to address the identified problems through possible modifications of the project."

The resulting study is called the Oakland Harbor Turning Basins Widening Navigation Feasibility Study (Oakland Harbor Study). Section 216 of the Rivers and Harbors Act of 1970 limits the analysis of this Oakland Harbor Study to the constructed 50-foot Oakland Harbor Navigation Project.

1.4 Non-Federal Sponsor

A Feasibility Cost Sharing Agreement was executed on July 1, 2020 with the Port of Oakland as the non-federal sponsor. The Oakland Harbor Study is cost shared 50% federal and 50% non-federal.

1.5 Existing Harbor Deepening Project

Oakland Harbor includes the Entrance Channel—Oakland Bar, the Outer Harbor Channel and its Outer Harbor turning basin, and the Inner Harbor Channel and its Inner Harbor turning basin. It provides access to the Port of Oakland's berthing areas, which serve deep-draft vessels including container, break-bulk, bulk, roll-on/roll-off, and U.S. government vessels. The Inner Harbor is also maintained to -50 feet MLLW through the Howard Terminal, which is approximately 2.5 miles from the Inner Harbor entrance. The deepening of the Inner and Outer Harbor from -42 to -50 feet MLLW was completed in 2009.

1.6 Prior Studies and Reports

Numerous studies and reports related to the Oakland Harbor have been conducted. A detailed list of these report can be found in the 1998 Oakland Harbor Navigation Improvement (-50-foot) Project Report (Port of Oakland and USACE, 1998).

Relevant studies, reports, and authorizations since 1998, are listed below:

- Oakland Harbor Navigation Project, Section 216 Initial Appraisal Report (USACE, March 2018)
- Oakland Harbor Navigation Improvement (-50 Foot) Project Revised Final Feasibility Study (Port of Oakland and USACE, November 1998)

1.7 Study Area*

The Oakland Harbor study area includes the existing 50-foot federal navigation channel and the immediately surrounding areas (Figure 1). The study area is located on the eastern side of the San Francisco Bay, about 35 miles northwest of San Jose, in the counties of Alameda and San Francisco, California and within California's 13th congressional district (Representative Barbara Lee). The federally authorized Oakland Harbor navigation project is located about 8 miles inside the Golden Gate Bridge and consists of an Outer and Inner Harbor. The channel is maintained to a depth of -50 feet MLLW. The existing 50-foot federal navigation channel includes the Entrance Channel, Outer Harbor Channel, Inner Harbor Channel, the Outer Harbor Turning Basin, the Inner Harbor Turning Basin, and the Middle Harbor. The existing navigation channels provide access to four active container terminals:

1. TraPac Terminal
2. Ben E. Nutter Terminal
3. Oakland International Container Terminal
4. Matson Terminal

The planning area is a geographic space with an identified boundary that includes the area identified in the study authorizing document and the locations of alternative plans which are often called project areas. The locations of resources that would be directly, indirectly, or cumulatively affected by alternative plans are often called the affected area.

1.8 National Environmental Policy Act Coordination*

This Draft Integrated Report contains the components of a Draft NEPA Environmental Assessment - a concise public document prepared by a federal agency to determine whether the proposed action has the potential to cause significant environmental effects (40 Code of Federal Regulations (C.F.R.) § 1508.9(a)). The purposes of an Environmental Assessment are to:

- provide evidence and analysis sufficient to determine whether an Environmental Impact Statement is required;
- aid a federal agency's compliance with NEPA when no Environmental Impact Statement is necessary;
- facilitate preparation of an Environmental Impact Statement when applicable; or
- serve as the basis to justify a finding of no significant impact, when applicable.

An Environmental Assessment must discuss:

- the need for the proposed action;
- the proposed action and the reasonable alternatives;

- the probable environmental impacts of the proposed action and reasonable alternatives; and,
- the agencies and persons consulted during preparation of the EA.

Pursuant to 40 C.F.R. § 1501.6, USACE requested the involvement of the following federal agencies as cooperating agencies in the NEPA process for the Oakland Harbor Study: Environmental Protection Agency (EPA), National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS), and United States Fish and Wildlife Service (USFWS). The USACE also requested the involvement of the following non-federal agencies as participating agencies: California Department of Fish and Wildlife, California State Historic Preservation Office (SHPO), California State Lands Commission, City of Oakland, San Francisco Bay Conservation and Development Commission (BCDC), and the San Francisco Bay Regional Water Quality Control Board (SFRWQCB). The USACE additionally requested the involvement of the following tribes as participating tribal entities: Indian Canyon Mutsun Band of Costanoan, Amah Mutsun Tribal Band, Esselen Tribe of Monterey County, and Ohlone Indian Tribe. The EPA, NMFS, and USFWS provided responses accepting the USACE's request they serve as cooperating agencies. The SHPO provided a response stating they would engage in the study through the Section 106 process but could not serve as a participating agency under NEPA and BCDC provided a response stating they would engage in the NEPA process, but their review of the project would be governed by the Coastal Zone Management Act and its implementing regulations. No other responses were received.

The USACE and Port of Oakland held resource agency working group meetings throughout the course of the study process to date to engage and obtain input from those invited as cooperating or participating entities, as well as additional agency stakeholders such as the Bay Area Air Quality Management District, Department of Toxic Substances Control, California Department of Fish and Wildlife, and the United States Coast Guard. These meetings were held October 2020, May 2021, and August 2021. Additionally, USACE and the Port held a community stakeholder engagement meeting in August 2021. Another community meeting will be scheduled during the public comment period in January 2022.

Chapter 2: Existing and Future Economic and Navigation Conditions

The existing conditions are defined in this report as the project conditions that exist today plus any changes that are expected to occur prior to project year one, anticipated in 2030, which is referred to as the base year for comparison of alternatives to the without project condition and among proposed alternatives. It is the year the project is expected to be operational and accrue benefits. The year 2018 is the most recent year for which complete data was available for containerized cargo volumes at the time of the analysis and is used as the baseline for the commodity forecast. The compilation of this complete data typically takes 18 months to 2 years. Utilizing this data for this study allows for more “normalized”, pre-COVID pandemic data to drive long-term forecasts.

The existing condition and future without-project condition of the project area is described herein. The existing and future conditions will later be compared, as they relate to navigation and influence of such on the local and national economies. This comparison is integral to the selection of the Tentatively Selected Plan.

2.1 Existing Conditions

2.1.1 Facilities and Infrastructure

The Oakland Seaport is made up of 1,543 acres of waterfront land and nearby properties including container terminals, general purpose/cargo terminals, break-bulk cargo and refrigerated cargo and storage. There are four active container terminals in the Port of Oakland, as well as several other facilities. The Port of Oakland’s four active container terminals, shown in Figure 2 are:

- TraPac Terminal
- Ben E. Nutter Terminal
- Oakland International Container Terminal
- Matson Terminal

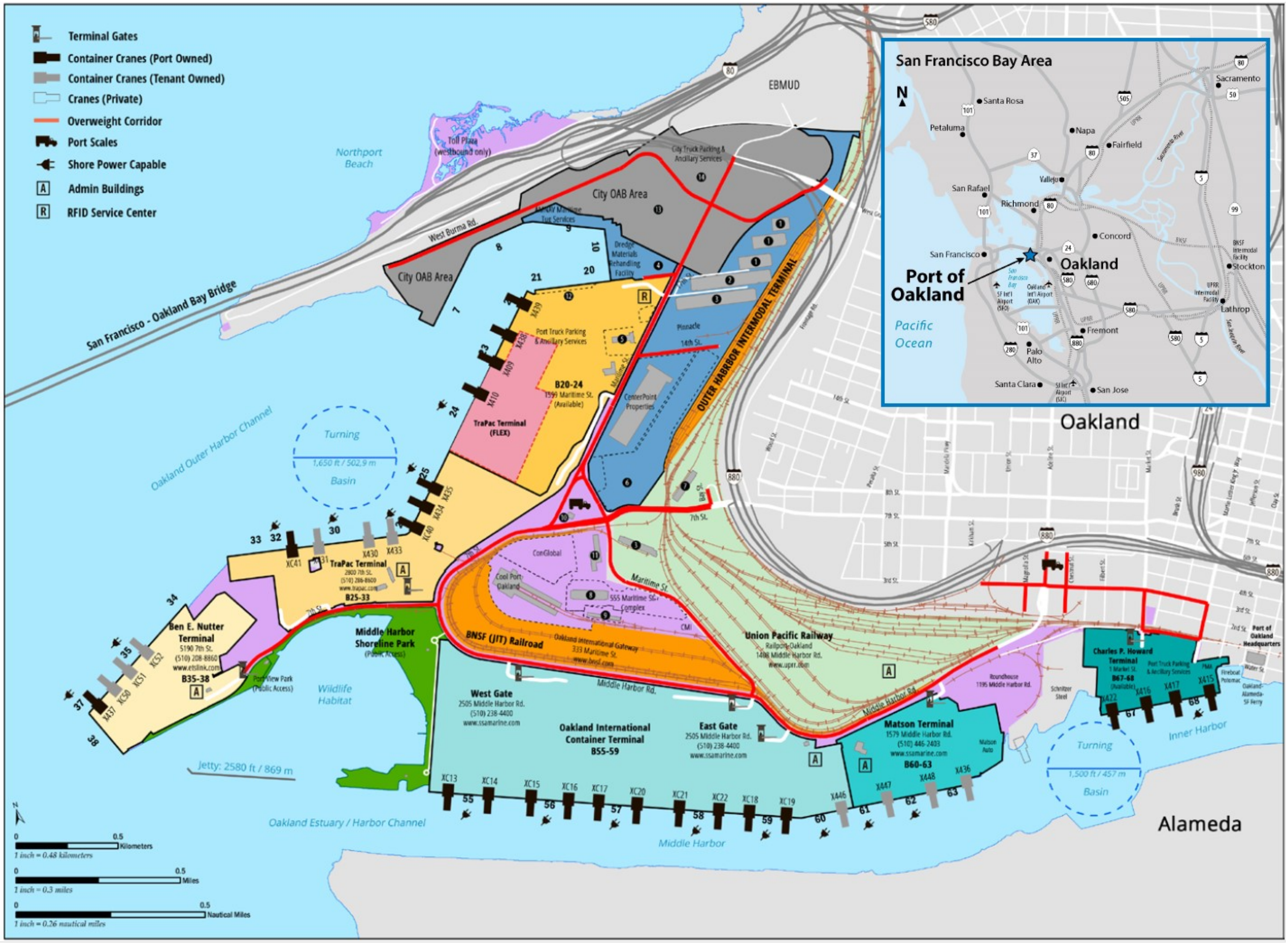


Figure 2: Port of Oakland Terminal Facilities

TraPac Terminal

The TraPac Terminal is a container terminal located in the northern end of the Outer Harbor, adjacent to the Outer Harbor Turning Basin. It is operated by TraPac. The terminal size is 123 acres (50 hectares). This terminal includes four container berths with an overall length of 4,263 feet. All berths are maintained a depth of -50 feet MLLW. This terminal includes seven Post-Panamax cranes and can accommodate large containerships with an outreach 13 to 18 boxes wide (144 feet). There are typically 6 container vessel calls to this terminal per week, which keeps the terminal at or near its throughput capacity. Refer to section 3.1 on future improvements to TraPac to accommodate ultra large containerships. Additionally, this terminal has refrigerated container capacity with 860 electric plug connections.

Ben E. Nutter Terminal

The Ben E. Nutter Terminal is a container terminal located at the junction of the Entrance Channel and the Outer Harbor Channel, at the western edge of the port. It is operated by Everport Terminal Services, a subsidiary of Evergreen. The terminal size is 75 acres (30.5 hectares). This terminal includes two container berths with an overall length of 2,157 feet. All berths are currently maintained to a depth of -50 feet MLLW. This terminal includes four cranes, all of which can accommodate large containerships with an outreach 23 boxes wide (203 feet). There are typically 3 container vessel calls to this terminal per week. Additionally, this terminal has refrigerated capacity with 346 electric plug connections.

Oakland International Container Terminal

The Oakland International Container Terminal is a container terminal located on the north side of the Inner Harbor Channel near downtown Oakland. It is operated by Stevedoring Services of America Terminals. The terminal size is 270 acres (109 hectares). This terminal has five berths with an overall length of 6,000 feet. All berths are currently maintained to a depth of -50 feet MLLW. This terminal typically sees 18-25 container vessel calls per week, utilizing all five berths simultaneously. This terminal includes ten Super Post-Panamax cranes, all of which can accommodate large containerships. Oakland International Container Terminal has recently raised and replaced its existing cranes to accommodate even larger containerships. Oakland International Container Terminal is adjacent to two Class I rail yards: Oakland International Gateway – Joint Intermodal Terminal (BNSF), and Railport Oakland (Union Pacific). Additionally, this terminal has refrigerated container capacity with 1,503 electric plug connections.

Matson Terminal

The Matson Terminal is a container terminal located along the Inner Harbor Channel, adjacent to the Inner Harbor Turning Basin. It is operated by Stevedoring Services of America Terminals, Inc. The terminal size is 80 acres (32 hectares). All berths are currently maintained to a depth of -42 feet MLLW, and four Post-Panamax cranes. This terminal is mainly used for domestic shipping to Alaska and Hawaii. Summary information for all Oakland Harbor container terminals is shown in Table 2.

Table 2: Oakland Harbor Container Terminals

CONTAINER TERMINAL	BERTHS	LENGTH	WATER DEPTH (MLLW)
TraPac Terminal	25-33	4,263.3 ft.	50 ft.
Ben E. Nutter Terminal	35-38	2,157 ft.	50 ft.
Oakland International Container Terminal	55-56	2,400 ft.	50 ft.
	57-59	3,600 ft.	50 ft.
Matson Terminal	60-63	2,743 ft.	42 ft.

2.1.2 Historical Commerce

The year 2018 is the most recent year for which complete data was available for containerized cargo volumes at the time of the analysis and is used as the baseline for the commodity forecast. The compilation of this complete data typically takes 18 months to 2 years. Utilizing this data for this study allows for more "normalized", pre-COVID pandemic data to drive long-term forecasts. Based on 2018 data, Oakland's cargo volume makes it the eighth busiest container port in the United States in twenty-foot equivalent units (TEU), and ranks San Francisco Bay among the three principal Pacific Coast gateways for U.S. containerized cargoes, along with San Pedro Bay in southern California and Puget Sound in the Pacific Northwest. The Port of Oakland loads and discharges more than 99% of the containerized goods moving through Northern California (Port of Oakland, 2020). In 2018, about 78% of Oakland's trade was with Asia. Europe accounted for about 11%, Australia/New Zealand and Oceania accounted for about 2%, and other foreign economies accounted for about 2%. About 7% of Oakland's trade is domestic (primarily Hawaii). In 2018, over 17 million short tons of cargo moved through the Port for import or export (USACE, 2020). Figure 3 below shows the levels of tonnage by major commodity between 2009-2018.

Most of the commodities passing through the Port of Oakland include food and farm products, followed by crude materials (pulp/wastepaper and scrap metal) and manufactured equipment. Port volumes have been trending higher since the low point of the 2009 recession, with all-time highs reached in 2018. Flat trade growth in 2011 and a labor dispute in 2015 resulted in the only interruptions to this upward trend.

The Port's container vessel calls account for about 95% of total vessel calls in 2019 (Port of Oakland, 2020). Figure 4 provides a summary of the Port's commerce measured in TEUs from 2009 through 2018, closely mirroring tonnage volumes over the same time period.

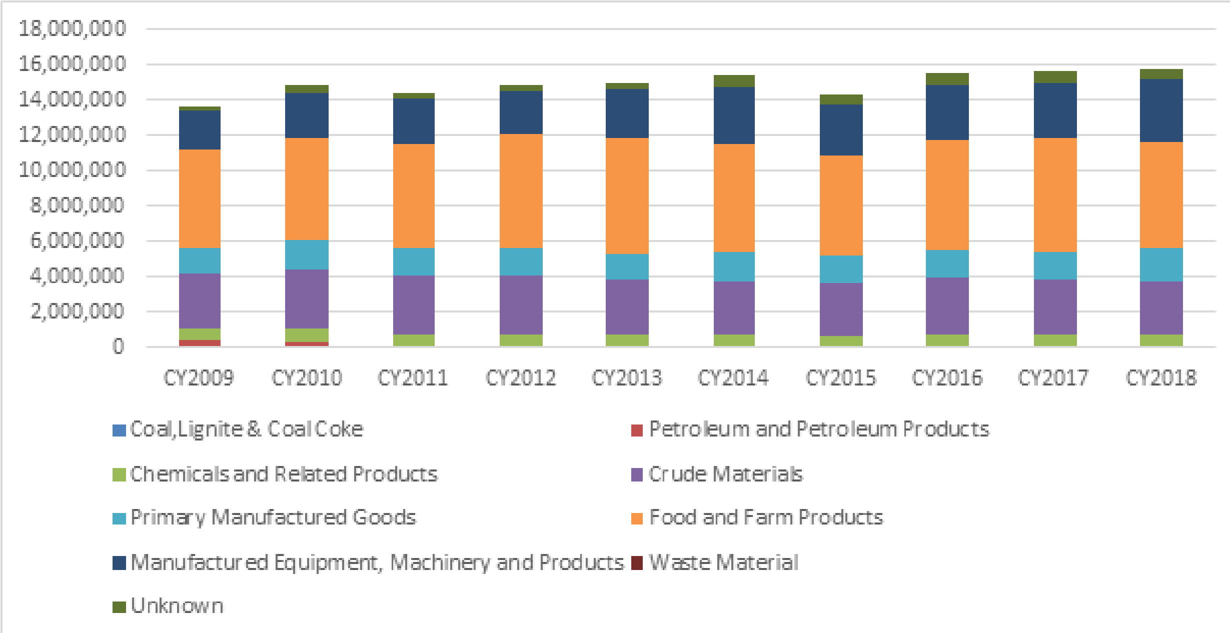


Figure 3: Oakland Distribution of Commodities, Metric Tons
Source: USACE WCSC, 2018

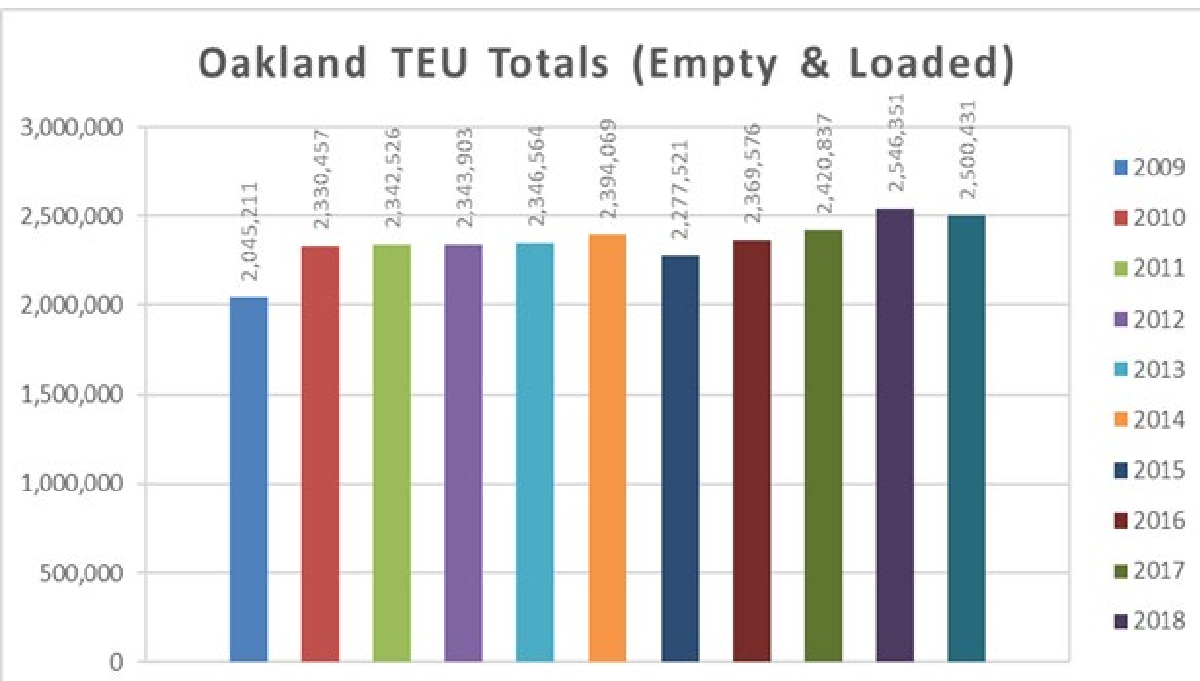


Figure 4: Oakland TEUs, Empty and Loaded, Years 2009-2018
Source: Port of Oakland 2020

There has been an almost even split of the TEU volumes between imports and exports since 2009. Imports have averaged around 1.1 million TEUs per year since 2009, and exports have averaged around 1.3 million TEUs per year, as shown in Figure 5. Machinery, toys and sports equipment, furniture and bedding, clothing, footwear, plastic, and iron/steel products were among the greatest value of imported commodities in 2018. High value export commodities included a variety of food products (grain, fish and seafood, preserved food, meat, fruit, dairy, vegetables, cereals, etc.), paper products, and wood products. California is a top national producer of fruit and nuts, fresh and frozen vegetables, and wine. Imports and exports in 2018 were valued at $28.1 billion and $19.2 billion, respectively, and about 45% of the trade value is with China alone (USACE, 2020). This larger volume in exports from Oakland is one reason that it has been able to maintain more steady throughput volumes during the trade conflict with China and other uncertainties surrounding Trans-Pacific trade.

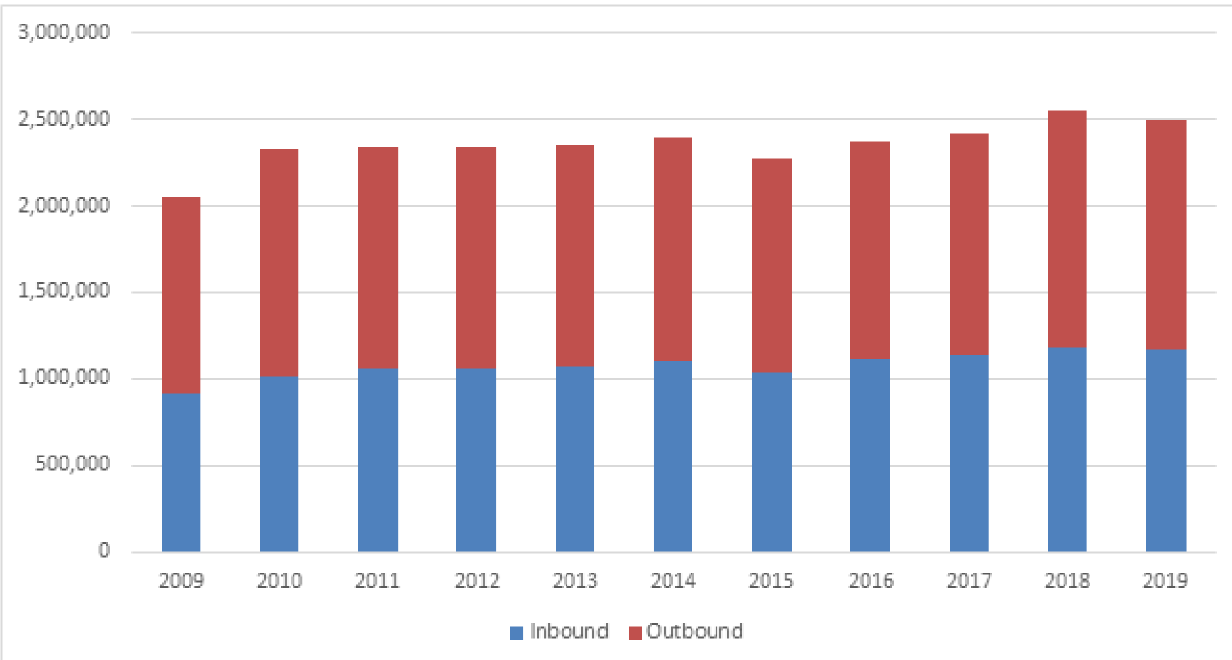


Figure 5: Oakland TEUs Inbound/Outbound, Years 2009-2019
Source: Port of Oakland 2020

2.1.3 Existing Container Services

The majority of Port of Oakland's container traffic is handled at Oakland International Container Terminal. Annual throughput capacity at active terminals is over 2 million TEUs and expected to increase with the completion of landside infrastructure improvement and expansion projects at all terminals. According to the Port, in summer 2020, there were 61 different container services at Oakland.

The Port of Oakland is typically a second port of call for several of the Asian – West Coast U.S. routes, usually after stops in San Pedro Bay (Los Angeles or Long Beach). Most services call from Asia via trans-Pacific routes. Major lines include COSCO, CMA CGM, OOCL, Hyundai, Maersk, and APL. Figure 6 below is a snapshot showing one ocean carrier's trans-Pacific route, and, in this case, all services call at San Pedro Bay before stopping at Oakland. These example service rotations are similar to the other trans-Pacific carriers calling at the Port of Oakland.

However, in 2020 and 2021, the Port has added multiple services that call directly from Asia to Oakland as its first U.S. West Coast stop.

THE Alliance	Hapag-Lloyd, ONE, Yang Ming, Hyundai			
OCEAN CARRIER	SERVICE NAME	TERMINAL	VESSEL SIZE	ROTATION
1 **ONE** Hapag-Lloyd Hyundai	FP1	TRAPAC	9,000	Singapore(‡)–Kobe–Nagoya–Tokyo–San Pedro Bay–**Oakland**–Tokyo–Shimizu(‡)–Kobe–Nagoya–Tokyo
CMA CGM(‡)	*FUJI*			
COSCO(‡)	*JPSW*			
OOCL(‡)	*JPX*			
Evergreen(‡)	*PS1*			
2 **ONE** Hapag–Lloyd Yang Ming Hyundai(‡)	FP2	OICT	14,000	Jeddah(‡)–Singapore–Laem Chabang–Vung Tau/Cai Mep–Hong Kong–Yantian–San Pedro Bay–**Oakland**–Yokohama–Hong Kong–Laem Chabang–Vung Tau/Cai Mep–Singapore
3 **ONE** Hapag–Lloyd Yang Ming Hyundai	PS3	TRAPAC	8,500	Nhava Sheva–Pipavav–Colombo–Port Klang–Singapore–Vung Tau/Cai Mep–Haiphong–San Pedro Bay–**Oakland**–Busan–Shanghai–Ningbo–Shekou–Singapore–Port Kelang–
4 **Yang Ming** ONE Hapag-Lloyd Hyundai	PS4	TRAPAC	6,500	Xiamen–Yantian–Kaohsiung–Keelung–San Pedro Bay–**Oakland**–Keelung–Kaohsiung–
5 **ONE** Hapag-Lloyd Yang Ming Hyundai	PS6	TRAPAC	9,000	Qingdao–Ningbo–Busan–San Pedro Bay–**Oakland**–Kobe–
6 **ONE** Hapag-Lloyd Yang Ming Hyundai	PS8	TRAPAC	8,600	Shanghai–Kwangyang–Busan–San Pedro Bay–**Oakland**–Busan–Kwangyang–Incheon

Figure 6: Example Trans-Pacific Route

2.1.4 Existing Fleet

Data for the container fleet was obtained from IHS Maritime's Sea-web database. From 2014 to 2019 a variety of different container ships called on the Port of Oakland. These ships are classified for this study as Sub-Panamax, Panamax, Post-Panamax Generation 1 (PPX Gen I), Post-Panamax Generation II (PPX Gen II), Post-Panamax Generation III (PPX Gen III), and Post-Panamax Generation IV (PPX Gen IV) depending on their capacity. The vessels are distinguished based on physical and operational characteristics, including length overall (LOA), design draft, beam, speed, and TEU capacity.

The original design vessel (circa 1998) for the Oakland Harbor Deepening Study was a 1,139-foot-long containership with a 6,500 TEU capacity. Today's vessels are nearly triple that capacity. Table 3 displays the fleet mix and associated dimensions of container ships that call at the Port of Oakland. The table displays the fleet in order of size, smallest to largest. Sub-Panamax (SPX) and Panamax (PX), generally 4,800 TEUs and below, refer to those vessels that fit through the Panama Canal locks prior to its redesign. Post-Panamax Generation I and II (PPX Gen I and Gen II), generally 9,900 TEUs and below, refer to those vessels that were too large to fit through the original Panama Canal. Post-Panamax Generation III (PPX Gen III), generally 15,000 TEUs and below, refers to the "New Panamax" vessels that were designed to fit through the expanded Panama Canal locks, which opened in 2016. Finally, Post-Panamax Generation IV (PPX Gen IV) refers to those vessels that are too large to fit through the expanded Panama Canal (i.e., the "new" Post-Panamax vessels), with capacities generally above 15,000 TEUs. All vessel classes listed in Table 3 regularly call at the Port.

Table 3: Container Vessel Fleet Subdivisions and Dimensions

VESSEL FLEET SUBDIVISION (CONTAINERSHIPS)		FROM	TO
Sub Panamax	Beam		98
	Draft	8.2	38.1
	LOA	222	813.3
	TEUs		2,800
Panamax	Beam	98	106
	Draft	30.8	44.8
	LOA	572	970
	TEUs	2,801	4,800
Post-Panamax Generation I (Post-Panamax)	Beam	106	138
	Draft	35.4	47.6
	LOA	661	1045
	TEUs	4,801	6,800
Post-Panamax Generation II (Super Post-Panamax)	Beam	138	144
	Draft	39.4	49.2
	LOA	911	1,205
	TEUs	6,801	9,900
Post-Panamax Generation III (New Panamax, or Ultra Post-Panamax)	Beam	144	168
	Draft		51.2
	LOA	Up to	1220
	TEUs	9,901	15,000
Post-Panamax Generation IV (New Post-Panamax)	Beam	168	200
	Draft		52.5
	LOA	1,295	1,315
	TEUs	15,000	23,000

Table 4 displays the number of container calls by vessel class at the Port of Oakland between 2014 and 2019. Over this period, the use of Panamax vessels at the Port of Oakland is trending downward while the use of larger vessels is trending upward. The majority of vessel calls shifted from PPX Gen I in 2014 to PPX Gen II by 2019. This shift can be attributed to smaller vessels (i.e., Panamax) being replaced with larger vessels that carry more tonnage on a single voyage, as evidenced by the increase in cargo tonnage and TEUs, and decrease in vessel calls, since 2014. The trend to reduce voyages is an effort to realize economies of scale in the container shipping market.

Table 4: Container Vessel Fleet Port Calls by Class, 2014-2019

	SUB-PANAMAX	PANAMAX	PPX GEN I	PPX GEN II	PPX GEN III	PPX GEN IV	TOTAL
2014	109	485	518	273	174	0	1,558
2015	76	277	424	268	208	0	1,252
2016	112	316	508	378	247	3	1,563
2017	99	232	492	416	205	0	1,442
2018	96	163	498	398	231	0	1,386
2019	175	140	352	371	210	0	1,248

Sources: USACE, 2018; Port of Oakland, 2020

While no PPX Gen IV vessels called from 2017-2019, there were four calls in 2020 (over 1,295 ft LOA), with more scheduled for 2021, according to the Port.

Finally, Figure 7 shows the progression of containerships calling the Port of Oakland from 1955 to present day. It should be noted that the 18,000 nominal TEU capacity ship CMA CGM Benjamin Franklin called the Port of Oakland on February 29, 2016 as part of a trial deployment of these ultra-large containerships to U.S. West Coast ports from Asia. Since then, many of these large capacity ships called on Oakland for spot charters in 2020.

Oakland is already handling a significant number of Post-Panamax ships. From 2014 through 2018, about 80% of all calls were Post-Panamax calls. Of all containership calls in this same period, 1,656 inbound or outbound transits were longer than current PPX Gen II length overall (1,115 ft), which represents 12% of all containership transits over that period. Table 5 displays percent cargo by vessel class for years 2014 to 2018. Total cargo movements on PPX Generation II or larger containerships grew from 38% in 2014 to 45% in 2018.

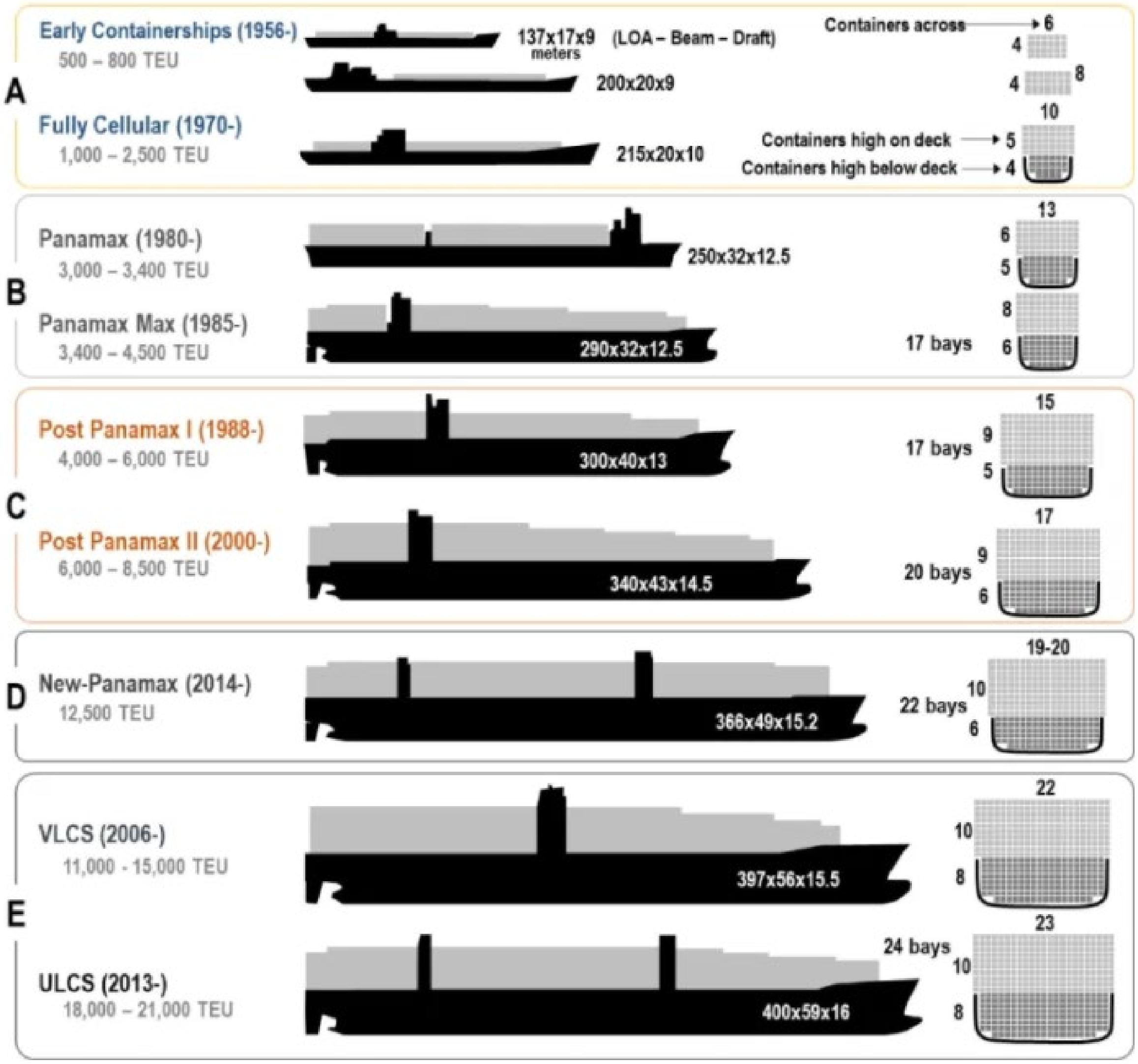


Figure 7: Progression of Containerships

Table 5: Percent Cargo by Vessel Class, 2014-2018

	2014	2015	2016	2017	2018
Sub Panamax	6%	5%	5%	6%	5%
Panamax	9%	10%	10%	8%	7%
PPX Gen I	46%	43%	37%	41%	42%
PPX Gen II	21%	28%	32%	28%	28%
PPX Gen III	17%	14%	16%	17%	17%
PPX Gen IV	0%	0%	0.3%	0%	0%

Source: USACE, 2020

Vessels currently calling at the Port of Oakland include 1,210-foot long vessels in both the Inner and Outer Harbors, including 14,354 TEU capacity Evergreen vessels and 13,892 TEU capacity APL vessels. In Spring 2016, the 18,000 TEU CMA CGM Benjamin Franklin called both Inner and Outer Harbors. As previously mentioned, in 2020, four 19,000 TEU vessels called, with lengths of over 1,300 feet. Although these 18,000 -19,000 TEU vessels already call on Oakland, the dimensions of the current turning basins result in them maneuvering with many restrictions, as outlined in Section 2.1.5.

2.1.5 Pilot Restrictions on Large Container Vessels

Ships calling at the Port of Oakland are subject to the San Francisco Bar Pilot (Pilots) guidelines. Below are general guidelines for containership operations at the Port.

Though the PPX Gen IV vessel class is expected to call with increased frequency on the U.S. west coast, it cannot call at the Port of Oakland without extensive restrictions, particularly in the Inner Harbor, due to the size of the turning basins. PPX Gen IV vessels typically range from 1,295-1,315 feet in length; therefore, they require additional tugs, pilots, and specific schedules to operate safely. Additionally, large tides and strong resulting currents can cause navigation issues for larger vessels transiting to and from Oakland's harbors.

In late 2015 and 2016, an 18,000 TEU container vessel, the CMA CGM Benjamin Franklin, called at the Port, in anticipation of PPX Gen IV vessels being deployed on Asia-West Coast routes. This PPX Gen IV vessel has a length overall of 1,310 feet, a breadth of 178 feet, and a design draft of 52.5 feet. It was able to call at the Port's Outer and Inner Harbor, but required the following limitations:

- Outer Harbor:
    - Daylight transits only
    - Move only during slack water
    - Have an additional pilot onboard
    - Did not use turning basin to dock (berthed adjacent to the turning basin, blocking it for other traffic); swung through the basin from the dock to depart
- Inner Harbor
    - Daylight transits only
    - Move only during slack water
    - Have an additional pilot onboard
    - Did not use turning basin to dock (drove straight to berth, bow-in)
    - Backed out of berth with multiple tugs and turned outside the Inner Harbor Channel
    - No other movements into Outer or Inner Harbors during transits; resulting in 2-3-hour delays in scheduled arrivals and departures

These limitations have been adopted as standard practice for the pilots when handling PPX Gen IV vessels at the Port since 2016, including the four calls that occurred in 2020.

2.2 Future Without-Project Conditions

2.2.1 Terminal Facilities

The Ben E. Nutter Terminal is located on a peninsula and qualifies as a berth expansion area. Oakland International Container Terminal is effectively fully built out at 290 acres, sharing its eastern boundary with the Matson terminal.

Despite its recent partial rehabilitation and expansion to 123 acres, the TraPac terminal, located next the vacant 150-acre Outer Harbor Terminal (former Ports America) site has space to expand. Recent discussions regarding such an expansion support the assumption in this analysis that TraPac will expand at least an additional 50 acres in the without-project condition.

The Matson terminal presently occupies 80 acres. The Howard Terminal, presently used for ancillary support functions, covers 50 acres. There are no significant expansion options for Howard, and, if implemented, the proposed widening of the Inner Harbor Turning Basin could reduce the available land to 40 acres.

The Port has three parcels of land contiguous with marine terminals available for terminal expansion, including:

- Berths 33–34. The unused area at Berths 33–34, between the Ben E. Nutter and TraPac terminals, totals 23 acres. This is the only possible expansion space for the Nutter terminal, and the study team has treated it as part of a full build-out for that facility. The area at Berth 34 is not usable as a vessel berth due to the presence of BART's Transbay Tube about 20 feet below water level.
- Roundhouse Site. The adjacent Roundhouse site of 39 acres could be used to extend Matson's terminal to a total of 95 acres, although it does not provide additional berth length.
- Berths 20-21 and 22-24. The Berth 22–24 Outer Harbor Terminal (OHT) site is what remains of the former Ports America terminal after a portion was used to expand TraPac. The site covers 150 acres, and this analysis treats it as potential future TraPac expansion. Based on the Port's September 2019 release of a Notice of Preparation of a Draft Supplemental Environmental Impact Report to develop a dry bulk terminal on 20 acres of land at Berths 20-21, that land may not be available for near-term container terminal use, leaving 130 usable acres. The Port intends to use the Berth 20-21 land for dry bulk over the next 15 years, with potential reversion to container use thereafter.

Current California Air Resources Board (CARB) emission goals generally target zero emissions or near-zero emissions at marine terminals by 2030. With current and foreseeable technologies, achieving these goals requires electrification. Existing electrification technologies place two additional requirements on terminal land:

- Space for a battery exchange and servicing building. At Long Beach Container Terminal in Long Beach, this function consumes about 1 acre.
- Additional electric service, potentially including a local substation. The study team has allowed an additional acre for this function.

The post-electrical acres therefore reduce the available size of each terminal by 2 acres. Since automation effectively requires electrification, the capacity estimates below reduce the working acres of each terminal as automation is added.

The Port also has about 126 acres of undeveloped off-dock space, part of the former Oakland Army Base. All existing planning documents anticipate this land being used for ancillary support uses, rail infrastructure, or commercial development like the CenterPoint and CoolPort projects. This analysis therefore excludes this site from the terminal capacity estimates.

It should be noted that whether the Berth 33–34 site becomes part of the Nutter terminal or the TraPac terminal does not make a difference in the planning-level capacity estimates. Nor does it matter whether Outer Harbor Terminal becomes a separate terminal or part of TraPac. The only relevant size distinction is that automation strategies favor larger terminal sizes. While that factor may influence the sequence in which terminals are automated under some scenarios, the long-term potential capacity is a function of the total acres available.

2.2.2 Port Operations and Economic Considerations

The future without-project port operations consist of container storage capacity, cargo composition, fleet composition, container services, and route groups.

Commodity Forecast

An essential step when evaluating navigation improvements is to analyze the types and volumes of cargo moving through the port. Trends in cargo history can offer insights into a port's long-term trade forecasts and thus the estimated cargo volume upon which future vessel calls are based. Under future without and future with project conditions, the same volume of cargo is assumed to move through Oakland Harbor. However, a modification project will allow shippers to better take advantage of larger vessels. This efficiency translates to savings and is the main driver of NED. For the Port of Oakland, containerized cargo was inventoried and forecasted to provide estimates of future container volumes that could be seen at the Port. This data was provided by the Port of Oakland in a seaport forecast prepared in 2020 by an external consulting firm (Bay Area Seaport Forecast, The Tioga Group and Hackett Associates, Prepared for the San Francisco BCDC, May 22, 2020).

The international TEU forecasts for imports and exports provided in the BCDC report are driven by projections of economic growth developed by Moody's and Caltrans, including sub-components of national-level Gross Domestic Product, industrial output, and Gross Metro Product.

Fleet Forecast

In addition to a commodity forecast, a forecast of the future fleet is required when evaluating navigation projects. To develop projections of the future fleet calling at Oakland, the study team developed a world fleet forecast of containerships, a methodology to forecast total capacity calling at Oakland Harbor based on previous USACE studies at other West Coast ports and future throughput capacity at the Port, and a breakdown of that capacity calling into containership size and TEU classes. The methodology was then linked to the commodity forecast data for U.S. West Coast and Oakland. The commodity forecasts were unconstrained forecasts and consequently the fleet forecast model is similarly unconstrained in respect to inter-port competition on the U.S. West Coast. Further, the study team did not consider land-based infrastructure as a limiting factor in its projections of the World Fleet.

By combining information from the commodity forecast with forecasted fleet capacity and Oakland's average share of cargo on a containerized vessel, the study team was able to allocate several post- Panamax, Panamax, and sub-Panamax vessels calls to Oakland's fleet. The number of transits, particularly those made by larger vessels, is a key variable in calculating the transportation costs. The study team's forecasting technique begins with performing a detailed review of the current world fleet and how it is deployed on the trade routes of the world.

When evaluating data on vessel composition, vessel age, and container markets, the study team considered the "order book" to estimate new deliveries to the fleet into the future. Vessel scrapping is accounted for based on historical scrapping rates by vessel class and age. Containerships, particularly the largest ones, are relatively new, so widespread scrapping is not expected to take place until well into the future. Likewise, when economies are strong, vessel owners are more likely to hold onto their existing vessels (or build new ones) and less likely to scrap them. The forecasted world fleet provides a frame of reference to verify the validity of the Oakland fleet forecast and is provided as background information.

As new larger vessels become a greater percentage of the world fleet and are deployed to Oakland, they replace smaller vessels which are redeployed to shorter routes, which may utilize the smaller vessels more efficiently.

There is a strong relationship between the economic condition of a port and its total nominal vessel capacity. As an economy grows, exports from the port often increase (from the increased output) or demand for imports increase (from increased consumer purchasing power). Vessels respond accordingly to satisfy this increased level of trade. As the tonnage in Oakland grows over time, the nominal TEU vessel capacity, i.e., the total number of available container slots, grows. Capacity is adjusted by operators to match demand. Once the forecasted nominal TEU vessel capacity at Oakland was determined, the future containers were allocated to various vessel classes (post-Panamax, Panamax, and sub-Panamax). The allocation to vessel classes was based on the examination of historical utilization of all container vessels, current trends in vessel design and orders, and the worldwide redeployment of vessels affected by the expansion of the Panama Canal.

Chapter 3: Existing Environmental Conditions*

This chapter describes the existing conditions of the physical and human environment found within the study action area. This is not a comprehensive discussion of every resource within the study area, but rather focuses on those aspects of the environment that may be affected by the study alternatives. Resource aspects that would not be affected by the study alternatives include the following: currents, circulation, or drainage patterns; erosion and accretion patterns; aquifer recharge; water supplies and conservation; land use classification; floodplains; prime and unique farmland; public facilities, utilities and services; public health and safety (other than as discussed as a factor in the resource analyses that are included); and energy consumption or generation. Because there would be no effect to these resources, they are not analyzed further in these existing environmental conditions or the environmental effects analysis presented in Chapter 6.

This chapter has been prepared in accordance with the NEPA and the Council on Environmental Quality's NEPA Implementing Regulations. The existing (baseline) conditions of the affected environment provide a sound basis for plan formulation as described in Chapter 4 and the impact analysis that is provided in Chapter 6. The description of the affected environment is used as the baseline to forecast the changes that would be expected without USACE action to address inefficiencies in the federal navigation system at Oakland Harbor. The topics in Chapter 6, where the environmental consequences of the future without-project (or no action) and future with-project alternatives are evaluated and compared, are structured to mirror the topics presented in this section,

3.1 Environmental Justice

Executive Order (EO) 12898 (59 Fed. Reg. 762, February 16, 1994) directs federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. Consistent with this mandate, an evaluation of the population in the vicinity of the Oakland Harbor was conducted to examine the minority and low-income characteristics. This section describes environmental justice populations of concern in the Oakland Harbor vicinity.

3.1.1 Regulatory Setting

Presidential EO 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

The basis for environmental justice lies in the Equal Protection Clause of the United States Constitution. The Fourteenth Amendment expressly provides that the states may not "deny to any person within [their] jurisdiction the equal protection of the laws" (United States Constitution, amendment XIV, § 1). On February 11, 1994, President Clinton signed EO 12898, titled "*Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.*" EO 12898 requires all federal agencies to "…make achieving environmental justice part of [their] mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." The EO directs federal agencies to perform the following activities:

- Analyze the environmental effects, including human health, economic, and social effects, of federal actions, including the effects on minority and low-income communities, when required by NEPA.
- Provide opportunities for community input during the NEPA process, including potential effects and mitigation measures.
- Ensure that the public, including minority and low-income communities, have adequate access to public information relating to human health or environmental planning, regulations, and enforcement.

Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000)

Title VI prohibits discrimination based on race, color, sex, and national origin in the provision of benefits and services resulting from federally assisted programs and activities.

EO 13045, Protection of Children from Environmental Health Risks and Safety Risks

EO 13045 requires federal agencies to prioritize the identification and assessment of environmental health risks and safety risks that may disproportionately affect children; and ensure that policies, programs, and standards address disproportionate environmental health or safety risks to children that result from a project (62 Fed. Reg. 19885, April 23, 1997).

Definitions of Minority and Low-Income Environmental Justice Populations

The federal definition of a minority environmental justice community requires that the minority population (or total of all minority groups) of that community (at the Census block group, Census County Division [CCD], or reservation level) either 1) exceed 50% of the total population of the community; or 2) is meaningfully greater than the general population (CEQ 1997; USEPA 2016).

Minority status is composed of both race and ethnicity.

As defined in EO 12898 and Council on Environmental Quality guidance, a minority population occurs where one or both of the following conditions are met in a given geographic area:

- the American Indian, Alaskan Native, Asian, Pacific Islander, Black, or Hispanic population of the affected area exceeds 50%; or
- the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

Neither EO 12898 nor any subsequent federal regulations on environmental justice provide specific criteria for determining the poverty level threshold necessary for meeting the definition of a low-income environmental justice community. The United States EPA's guidance criteria suggest that identification and analysis of low-income populations can be accomplished by selecting and disclosing the appropriate poverty thresholds as defined by the Census, the poverty guidelines as defined by the Department of Health and Human Services, or other appropriate sources, and identifying an appropriate geographic unit of analysis for identifying low-income populations in the affected environment (USEPA 2016).

For a community to meet the federal definition of an environmental justice community for its low-income status, the percentage of people with an income below the Federal Poverty Level in the census tract would need to be meaningfully greater than the countywide average.

An affected geographic area is considered to consist of a low-income population (i.e. below the poverty level for purposes of this analysis) where the percentage of low-income persons:

- is at least 50% of the total population; or
- is meaningfully greater than the low-income population percentage in the general population or other appropriate unit of geographic analysis.

Coastal Zone Management Act (16 U.S.C. § 1451 et seq.)

The *San Francisco Bay Plan* (Bay Plan) (BCDC 1969, as amended) is the approved Coastal Zone Management Plan that governs actions in San Francisco Bay in accordance with the Coastal Zone Management Act. In 2017 the Bay Plan was amended to include policies for management of Bay resources designed to promote environmental justice and social equity (see section 3.4.1 for further CZMA regulations applicable to the study).

3.1.2 Minority and Low-Income Environmental Justice Populations in the Study Area

Minority Environmental Justice Populations

This analysis used Alameda County to represent the general population, and “meaningfully greater” was defined as 10% points or more. This threshold was selected, consistent with federal guidance, as a reasonable and frequently used measure, providing a more inclusive identification of minority communities of concern for environmental justice analysis (USFS 2014). As a result, given the total minority population county-wide of 17.4%, a community with a total minority population of 27.4% or more would meet the definition criteria even though its minority population is less than 50% of the community’s total population.

Low-Income Environmental Justice Populations

This analysis considered a Census block group to meet the definition of low income if the percentage of people in the Census block group whose income was below the federal poverty level was 10% points higher than that of the reference population. As a frame of reference, the federal poverty level in 2019 was $26,500 for a family of four (HHS 2021).

Given the total low-income population Alameda county-wide of 9.9%, a block group with a total low-income population of 19.9% or more would meet the definition criteria even though its low-income population is less than 50% of the community’s total population.

Potential Environmental Justice Populations of Concern

Data for this analysis was derived from the United States Census Bureau’s 2015-2019 American Community Survey, the most recent data available at the Census block group level at the time of this study (Census 2021). The American Community Survey data consist of “period” estimates that represent data collected over a period of time (as opposed to “point-in-time” estimates, such as the decennial census, that approximate the characteristics of an area on a specific date) (Census 2018). This data was used to determine whether environmental justice communities occur in the analysis area

Using United States Census data, the study team identified the racial and income characteristics for census tract (CT) within or significantly intersecting both a 0.5-mile and 1-mile radius. Figure 8 shows the census tracts within those distances of the Inner Harbor Turning Basin and Outer Harbor Turning Basin study sites. Table 6 shows the race, ethnicity, and poverty percentages for each community (by census tract) in the analysis area. The table also shows the corresponding demographics for both Alameda County and California’s statewide populations. Alameda County is applied as the general reference population for evaluating whether a community has a meaningfully greater (i.e., 10 percentage points or more) minority or low-income population.

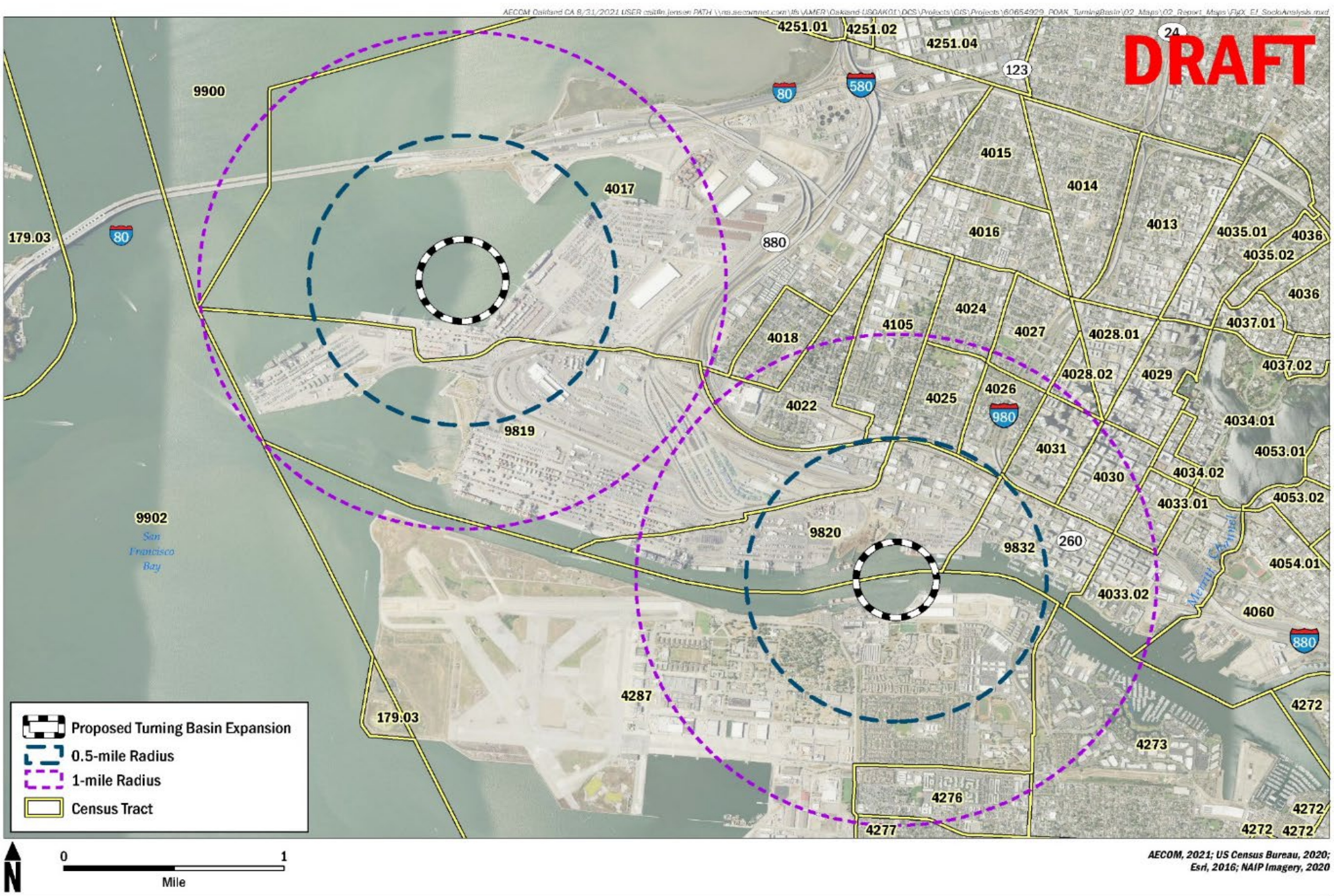


Figure 8: Census Tracts in the Vicinity of the Project Alternatives

Table 6: Key Demographic Data for Census Tracts within a One Mile Radius of the Project

Location	Total Pop.	Total Minority %	Total Minority Pop.	White Non-Hispanic Alone %	White Non-Hispanic Alone Pop.	Low-Income %	Low-Income Pop.
California	39,283,497	62.3	24,678,185	37.2	14,605,312	13.4	5,149,742
Alameda County	1,656,754	68.6	1,136,307	31.4	520,447	9.9	161,581
Alameda, City of	77,624	57.3	44,478	42.7	33,145	7.3	5,667
Oakland, City of	433,031	71.7	310,483	28.3	122,548	16.7	72,316
0.5-Mile Radius:							
Outer Harbor Turning Basin							
CT 4017[a]	3,018	61.1	1,845	38.9	1,173	10.8	323
CT 9819	58	13.8	8	86.2	50	0.0	0
Inner Harbor Turning Basin							
CT 9819	58	13.8	8	86.2	50	0.0	0
CT 9820	63	84.1	53	15.9	10	19.0	12
CT 9832	583	47.2	275	52.8	308	8.4	49
CT 4287	4,472	72.6	3,246	27.4	1,226	20.1	842
One-Mile Radius:							
Outer Harbor Turning Basin – all census tracts included in 0.5-mile radius							
Inner Harbor Turning Basin							
CT 4022	2,477	70.1	1,737	29.9	740	25.9	631
CT 4025	1,781	89.1	1,587	10.9	194	35.2	627
CT 4026	1,243	85.6	1,064	14.4	179	35.2	438
CT 4030	2905	93.5	2,716	6.5	189	31.8	923
CT 4031	2,101	72.2	1,516	27.8	585	26.8	486
CT 4033	4,178	73.8	3,085	26.2	1,093	26.7	1,116
CT 4105	2,705	85.1	2,302	14.9	403	38.6	1045
CT 4273	5,346	62.7	3,350	37.3	1,996	8.1	434
CT 4276	5,200	71.5	3,717	28.5	1,483	12.7	658

Notes:
CT = census tract
Data above from Census 2021; minority data from Tables B02001 (Race) and B03002 (Hispanic or Latino Origin by Race); low-income data calculated from Table C17002 (Ratio of Income to Poverty Level in Past 12 Months).(United States Census Bureau, 2021)
Blue text: CT above minority threshold (above 50% or at least 10% greater than County)
Purple text: CT above both minority and low-income thresholds (above 50% or at least 10% greater than County)
[a] While this CT overlaps the 0.5-mile radius, no residents live within the 0.5-mile radius.

Based on the environmental justice criteria thresholds identified above in section 3.1.1, three minority environmental justice communities (CTs) of concern were identified within the project's 0.5-mile study area:

- **CT 4017 (West Clawson)** is a small residential area that was predominantly working class but recently has undergone some urban revitalization, with a new population moving into the area. The community has a 61% minority population, which is well over the 50% minority threshold, making it an area of concern for environmental justice. The high minority percentage primarily consists of Hispanic or Latino, African American, Asian, and Some Other Race residents. However, the portion of the CT within the 0.5-mile radius of the project is nonresidential, with the nearest residence of this community about 1 mile east of the Outer Harbor Turning Basin.

- **CT 9820 (West Jack London Square)** has a very small residential population because it is home to many industrial and commercial uses, with few residential dwellings. The small residential population of 63 is 84.1% minority, which is well above the 50% threshold, making it an area of concern for environmental justice. The high minority percentage primarily consists of African American, Asian, and Hispanic or Latino residents.
- **CT 4287 (West Alameda)** is a largely residential area but also includes the College of Alameda and commercial uses. The population is 72.6% minority, which is well over the 50% threshold, making it an area of concern for environmental justice. The high minority percentage primarily consists of Asian, African American, and Hispanic or Latino residents.

Based on the environmental justice criteria thresholds identified above, one low-income environmental justice community of concern was identified within the 0.5- mile study area. The community of West Alameda (CT 4287) has a low-income population 10.2% points above that of the reference population of the County of Alameda (9.9%). It is also a minority environmental justice community of concern as described above.

There are two other census tracts within the 0.5-mile radius of the study area which are not considered to be environmental justice communities of concern. CT 9819 and CT 9832 are primarily white non-Hispanic, and their percentages of low-income residents are below the countywide average.

While the primary study area is the 0.5-mile radius, when considering the nexus between environmental justice and resources such as air quality which may be impacted over a wider area, it is contextually relevant to note that nine additional census tracts within 1 mile of the Inner Harbor Turning Basin are shown in Table 6; all are minority environmental justice communities of concern. Seven of these census tracts are also low-income environmental justice populations of concern. Another five census tracts have only a very small portion of their total area within the outer limits of the Inner Harbor Turning Basin 1-mile radius and are consequently not shown in Table 7. No additional census tracts are within 1 mile of the Outer Harbor Turning Basin.

3.2 Socioeconomics

The socioeconomics characteristics of the community in the vicinity of Oakland Harbor are summarized in this section. The parameters used to describe the demographic and socioeconomic environment include recent trends in population for Alameda County and the cities of Oakland and Alameda.

3.2.1 Regulatory Setting

Under NEPA, economic or social effects must be discussed if they are interrelated to the natural or physical environmental effects of a project (40 C.F.R. § 1508.14). Because there are potential economic effects of the proposed alternatives that are related to the physical environmental effects of the alternatives, a socioeconomics analysis is required.

No federal plans, policies, regulations, or laws related to socioeconomics (including population, housing, and employment) apply to the alternatives under consideration.

3.2.2 Population and Housing Setting

Table 7 shows the local population, housing, and occupancy rates for the county and census tracts intersecting a 0.5-mile economic study area used for this analysis. The census tracts and their data shown in Table 7 are for their full jurisdiction and consequently may include households and homes outside the project's 0.5-mile economic study area. For example, the community of Clawson (CT 4017) has a total population of 1,295 households. However, the nearest of these households is approximately 1 mile east of the Outer Harbor Turning Basin.

Table 7: Population and Housing of the Census Tracts in the Project Site's Vicinity

Location/Tract	Population	Households	Housing Units	Occupied Housing Units	Vacancy Rate
Alameda County	1,656,591	585,049	617,415	585,588	5%
Oakland	435,514	167,913	178,207	167,680	6%
CT 9819	58	27	27	27	0%
CT 9820	63	32	32	32	0%
CT 4017	3,018	1,295	1,435	1,292	10%
CT 9832	583	340	384	342	11%
Alameda	80,884	32,000	33,272	32,054	4%
CT 4287	4,472	1,380	1,609	1,384	14%

Source: DOF 2021

Note: CT = census tract

3.2.3 Labor Force and Unemployment Conditions

Table 8 shows the current labor force and employment for the cities of Oakland and Alameda, as well as the corresponding Alameda County and national levels. The employment data in Table 8 indicate the number of employed residents and not the number of jobs in those locations; job numbers are discussed under Major Industry Sector Employment, below. Current unemployment levels in the City of Oakland are higher than the county's unemployment rate but slightly below the statewide average. The City of Alameda's unemployment rate of 4.8% is less than the county's rate of unemployment.

Table 8: Labor Force and Employment (2021)

Area	Labor Force	Employment	Unemployed	Rate
California	19,041,600	17,825,000	1,216,600	6.4%
Alameda County	805,200	763,000	42,200	5.2%
City of Oakland	207,700	194,600	13,100	6.3%
City of Alameda	38,900	37,000	1,900	4.8%

Source: EDD 2021

3.2.4 Major Industry Sector Employment

Table 9 shows the job employment by major industry sector for the cities of Oakland and Alameda, as well as Alameda County, in 2020 and projected for 2035. Alameda County and its cities provide more jobs than their corresponding number of employed residents, which is common for urban areas.

Table 9: Employment by Major Industry Sectors (2020 and 2035)

	Oakland		City Of Alameda		Alameda County	
Industry Sector	2020	2035	2020	2035	2020	2035
Natural resources and agriculture	300	270	20	20	1,245	1,250
Construction, government and information	68,360	66,125	11,215	10,850	201,420	205,505
Finance and professional	61,415	66,955	9,805	11,695	205,570	217,245
Health and educational	82,245	98,495	12,260	14,225	247,645	295,175
Manufacturing and wholesale	22,440	21,280	3,460	3,355	128,240	134,145
Retail	12,545	14,115	2,140	2,090	74,560	80,405
Total	**247,310**	**267,240**	**38,905**	**42,235**	**858,685**	**933,725**

Source: ABAG 2018

The health and educational services sectors are the largest industries in all three jurisdictions and account for the largest share of future job growth expected to occur by 2035. Construction, government, and information services jobs are currently the second-largest employment sector in Oakland and Alameda. However, job levels in these sectors are expected to decrease over the next 10 to 15 years. The finance and professional services sector currently provides slightly fewer jobs than the combined construction and government sector. Finance sector jobs are expected to grow over the next 10 to 15 years and become the second-largest job sectors in both the City of Oakland and the City of Alameda.

Port of Oakland

The Port is an important economic center in the study area. Over the past 30 years, the Port has seen steady employment growth, an increase in personal income and local consumption, an increase in business revenue, and an increase in generated state and local taxes. Port operations are estimated to support a total of 27,732 direct, induced, and indirect jobs in California. Of the

Port's 11,393 direct jobs, 4,115 are for surface transportation, 6,777 are maritime services, and 501 jobs belong to the Port Authority (Table 10). Trucking and warehouse/distribution industries account for the most Port-related jobs (Port 2018).

Table 10: Port of Oakland Employment

Port of Oakland Direct Jobs by Category	
Job Category	**Direct Jobs**
Maritime Services	
ILWU	1,808
Freight forwarders	1,613
Warehouse/distribution centers	1,980
Other maritime services	1,376
Port Authority and Government	**501**
Surface Transportation	
Rail	203
Truck	3,912
Total	**11,393**

Source: Port 2018
Note:
ILWU = International Longshore and Warehouse Union

Table 11 shows the local residency of the approximately 11,400 workers directly employed by the Seaport activities at the Port. Alameda County residents account for a majority (53.5%) of the workers directly employed by the Seaport. Of the workers directly employed by the Seaport activities, 22.9% (2,612) live in Oakland and 4.9% (557) are Alameda residents.

Table 11: Residency of Employees Directly Employed by Seaport Activities

Residency of Direct Seaport Workers		
Municipalities	**Direct Jobs**	**Percent**
Alameda	557	4.9
Fremont	93	0.8
Hayward	443	3.9
Oakland	2,612	22.9
San Leandro	454	3.9
Other Alameda County	1,938	17.0
Total Alameda County	**6,098**	**53.5**
Non-Alameda County Residents	**5,295**	**46.5**

Source: Port 2018.

3.3 Geology, Soils, and Seismicity

3.3.1 Regulatory Setting

No federal plans, policies, regulations, or laws related to geology, soils, or seismicity apply to the alternatives under consideration.

3.3.2 Existing Geology, Soils, and Seismic Conditions

This section provides an overview of the geology, soil, and seismicity, features in the vicinity of the study area.

Physiography

Oakland Harbor lies along the eastern margin of San Francisco Bay within the Coast Ranges Geomorphologic Province of California. The Province is defined by the north to northwest trending Coast Ranges, which are traversed by numerous faults of the San Andreas fault system. The dominant geologic processes that have shaped the San Francisco Bay Area region are active faulting along the San Andreas, Hayward, and other faults; uplift and erosion of the East Bay and peninsular hills; and subsidence of the San Francisco Bay basin.

The San Francisco Bay is an approximately 400-square-mile body of water between the Sacramento Delta system and the Pacific Ocean. Drainage from the Central Valley region enters the Bay through the Carquinez Strait at San Pablo Bay and is discharged to the Pacific Ocean through the Golden Gate. Shallow water reclamation by infilling along the margins has reduced the original Bay from approximately 700 square miles to its present size. Approximately 85% of the Bay is less than 30 feet deep; the deepest waters lie at the Golden Gate where depths exceed 340 feet.

Geologic Structure

The geology of the Bay Area region is characterized by three structural blocks bounded roughly by the San Andreas and Hayward faults. The three structural blocks are the San Francisco and Marin peninsular hills, rocks underlying San Francisco Bay, and the East Bay hills. Basement rocks underlying sediments in the San Francisco Bay, where Oakland Harbor is located, are Franciscan Formation units. The Franciscan Formation is a late Mesozoic terrane of heterogenous rocks found throughout the California Coast Ranges and is bound on the west by the San Andreas Fault.

Aquatic Sediments

The following is a description of the primary sediments that underlie a large part of the San Francisco Bay, sources of current sediment input in the Bay, and terrestrial soils in the study areas.

Alameda Formation

The initial unit deposited on the Franciscan Formation basement was the Alameda Formation, a complex variety of a lower non- marine alluvial fan, fluvial (streams and floodplains) and lacustrine (lake) deposits, and an upper marine unit. The lower and upper units range in thickness from 300 to 600 feet, and 200 to 400 feet, respectively.

Old Bay Mud (Yerba Buena Formation)

Approximately 115,000 years ago, the Pacific Ocean fully entered the region depositing the Old Bay Mud on top of the Alameda Formation. The Old Bay Mud is thicker than 50 feet beneath the central part of the Bay, with a maximum thickness of more than 100 feet just east of Yerba

Buena Island.

San Antonio Formation
During the Wisconsin glacial stage (90,000 to 11,000 years ago), the sea level fell, exposing the Old Bay Mud. Estuarine and alluvial sediments named the San Antonio Formation were deposited on top. The San Antonio sediments, typically 25 feet thick, were deposited in individual units that are discontinuous and difficult to correlate regionally. There are three mappable units: wind-blown and beach sands called the Merritt Sand; sandy clays underlain by sandy channel fill materials collectively called the Posey Sand; and unnamed alluvial deposits overlying the Old Bay Mud. The Merritt and Posey sands form the uppermost aquifer beneath the East Bay shoreline, confined by the Young Bay Mud (see below). In some areas, such as the shipping channel, the Young Bay Mud has been removed by past dredging operations, exposing the underlying Merritt/Posey aquifer.

Young Bay Mud
Another rise in sea level beginning between 11,000 and 8,000 years ago inundated the region and deposited on top of the San Antonio Formation an estuarine mud known as Young Bay Mud. The Young Bay Mud infills reached a maximum thickness east of Hunters Point of about 120 feet.

Current Sediment Inputs
Sources of new sediment into the San Francisco Bay estuary system include the Sacramento and San Joaquin Rivers, which flow through the Carquinez Strait into the northeastern end of San Pablo Bay; the Napa, Sonoma, and Petaluma Rivers; and a variety of smaller streams and other drainages (including storm drains and flood control channels). As observed in a study from 1995-2010, small tributaries adjacent to San Francisco Bay supply 61 percent of the new suspended sediment to San Francisco Bay (McKee et al. 2013). Recent research also reinforces that episodic sediment loads, primarily during storm events, dominate the sediment supply to San Francisco Bay (Barnard et al. 2013). In the Oakland Harbor, sediment is contributed from vicinity shorelines and creeks, and carried via tidal currents, which cause siltation of the existing turning basins and shipping channels.

The USACE performs annual operation and maintenance dredging of shoaled sediment in the federal navigation channels at Oakland Harbor to return the channels to their authorized depth of –50 feet. As part of USACE's maintenance dredging, sediments in the channel are sampled and tested regularly to determine the suitability of the material for placement at dredge material placement sites (which may include in-bay, Ocean, or upland beneficial reuse sites). Historically, shoaled sediments in the channel have tested clean and suitable for aquatic or upland beneficial use sites. The Inner and Outer Harbor Turning basin Widening areas contain aquatic sediment outside of the federal channels. The potential characteristics of these sediments is discussed further in Section 3.12 Contaminants in Dredge or Fill Material.

Terrestrial soils

Most of the uplands in and surrounding the turning basins are surfaced in concrete, asphalt, or other impermeable surfaces associated with industrial and marine support developments. The underlying material on which these impermeable surfaces and associated above ground facilities are built is largely fill. The proposed action area for alternatives that involve the Inner Harbor Turning Basin expansion, includes areas approximately -17 feet below ground surface at Howard Terminal, Schnitzer Steel, and Alameda Gateway. The long history of industrial and marine support land uses in the project vicinity has impacted subsurface soil conditions at Howard Terminal and Schnitzer Steel, and potentially at Alameda Gateway. Conditions of these soils are discussed further in section 3.11 .

Seismicity

The San Francisco Bay area lies within the active San Andreas fault system. Major faults in the area include the San Andreas, Hayward, Calaveras, and Concord faults. The region is therefore subject to potential significant ground shaking due to earthquakes along these faults and other faults within the San Andreas system.

The Alquist-Priolo Special Studies Zones Act of 1972, administered by the California Division of Mines and Geology, is designed to prohibit the location of most structures for human occupancy across the traces of active faults and to mitigate thereby the hazard of fault rupture. Development projects are regulated if they fall within one of these zones. The Oakland Harbor turning basin sites and the proposed upland placement locations for dredged and excavated materials are not within a special studies zone, and no active faults are mapped at any of the sites based on the Fault Map of California (Jennings 1994).

3.4 Water Quality

3.4.1 Regulatory Setting

Clean Water Act (33 U.S.C. § 1257 *et seq*.)

The Clean Water Act (CWA) established the federal structure for regulating surface water quality standards and discharges of pollutants into waters of the United States The objective of the CWA is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. The CWA requires states to set standards to protect water quality. Specific sections of the CWA control discharge of pollutants and wastes into marine and aquatic environments.

Section 303 – Water Quality Standards and Implementation Plans (40 C.F.R. § 131.2)

This section of the CWA describes water quality standards as the water quality goals for a particular water body. The water quality goals are the designated uses for the water, and the criteria to protect those uses. States adopt water quality standards that are approved by EPA to protect public health or welfare, enhance the quality of water, and serve the purposes of the CWA. California's water quality is governed by the Porter-Cologne Water Quality Control Act (Wat. Code § 13000 *et seq.*) which provides for the establishment of approved implementation plans, here, the San Francisco Bay Basin Plan (SFRWQCB 2019).

Section 401 – Water Quality Certification

Under Section 401 of the CWA, Water Quality Certification (WQC) is required for any activity that requires a federal permit or license, and that may result in discharge into navigable waters. To receive certification under Section 401, an application must demonstrate that activities or discharges into waters are consistent with state effluent limitations (CWA Section 301), water quality effluent limitations (CWA Section 302), water quality standards and implementation plans (CWA Section 303), national standards of performance (CWA Section 306), toxic and pretreatment effluent standards (CWA Section 307), and “any other appropriate requirements of State law set forth in such certification” (CWA Section 401).

Section 402 – National Pollutant Discharge Elimination System Permitting

Under Section 402 of the CWA, discharge of pollutants to navigable waters is prohibited unless the discharge complies with general or individual National Pollutant Discharge Elimination System (NPDES) permits. This includes both point-source and nonpoint-source (i.e., stormwater) discharges. NPDES stormwater regulations are intended to improve the quality of stormwater discharged to receiving waters to the “maximum extent practicable” through the use of structural and nonstructural best management practices (BMPs). BMPs can include educational measures, regulatory measures, public policy measures, or structural measures. Implementation and enforcement of the NPDES program is conducted through the SWRCB and the nine SFRWQCBs. The SFRWQCB has set standard conditions for each permittee in the San Francisco Bay Area, which includes effluent limitation and monitoring programs.

Section 404 – Discharge of Dredged or Fill Material

Section 404 of the CWA regulates the discharge of dredged or fill material (e.g., fill, pier supports, and piles) into waters and wetlands of the United States, which includes San Francisco Bay. The USACE implements Section 404 of the CWA, and EPA has oversight authority. Section 404(b)(1) of the CWA establishes procedures for the evaluation of permits for discharge of dredged or fill material into waters of the United States. In situations where the USACE proposes work that involves discharge of dredged or fill material into waters of the United States, the USACE must comply with the requirements of the Section 404(b)(1) Guidelines, although the USACE would not issue a permit for its own activities. Any discharge under Section 404 must also obtain a Section 401 WQC.

Rivers and Harbors Act of 1899 (33 U.S.C. § 403)

The Rivers and Harbors Act of 1899 was the first federal water pollution act in the United States that focused on protecting navigation, protecting waters from pollution, and acted as a precursor to the CWA of 1972. Section 10 of the Rivers and Harbors Act regulates alteration of, and prohibits unauthorized obstruction of, navigable waters of the United States. The Rivers and Harbors Act covers construction, excavation, or deposition of materials in, over, or under navigable waters, or any work that would affect the course, location, condition, or capacity of those waters unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of the Army. Original construction of the Oakland Harbor channels was authorized under the Rivers and Harbors Act and by other Congressional authorities. The USACE maintains the navigability of the channels in accordance with their authorized dimensions. The USACE, as the implementing authority of Section 10 of Rivers and Harbors Act, ensures its work or structures do not impede navigation in waters of the United States, and, therefore, is not subject to Section 10.

Coastal Zone Management Act (CZMA, 16 U.S.C. § 1451 *et seq.*)

The CZMA, established in 1972 and administered by NOAA's Office of Ocean and Coastal Resource Management, provides for management of the nation's coastal resources, including water quality. The overall purpose of the act is to balance competing land and water issues in the coastal zone. The San Francisco BCDC is the regional coastal zone management agency and is responsible for issuing concurrence with consistency determinations under the CZMA. The Bay Plan is BCDC's policy document specifying goals, objectives, and policies for BCDC jurisdictional areas. Pursuant to the federal CZMA, USACE is required to be consistent to the maximum extent practicable with the enforceable policies of the Bay Plan.

3.4.2 Surface Water Characteristics

The study area for surface waters includes the proposed Inner Harbor Turning Basin and Outer Harbor Turning Basin expansion areas and adjoining waters, which occur in the Central San Francisco Bay (Central Bay). Central Bay hydrology is most strongly influenced by tidal currents because of its proximity to the Pacific Ocean. The Central Bay is characterized by Pacific Ocean waters that are cold, saline, and low in total suspended sediment. Net circulation patterns in the San Francisco Bay are influenced by Sacramento-San Joaquin Delta (Delta) inflows, gravitational currents, and by tide- and wind-induced horizontal circulation (Long-Term Management Strategy (LTMS) 1998). The proposed action area footprints do not include wetlands or non-Bay water features, although upland stormwater drainage patterns and infrastructure likely to affect surface waters are in the proposed action areas.

Freshwater inflow to the Oakland-Alameda Estuary is provided from natural creeks, human-made stormwater drainage facilities, and direct surface runoff. Tidal and wind-driven currents also influence the estuary. Sediment to the Oakland-Alameda Estuary is contributed from other portions of the San Francisco Bay Estuary, as well as vicinity shorelines and creeks, which cause siltation of the existing turning basins and shipping channels.

Vessel traffic, industrial activity, and annual dredging activities affect the condition of surface waters in the project area. Most of the uplands in and surrounding the turning basins are surfaced in concrete, asphalt, or other impermeable surfaces associated with industrial and marine support developments. Operations at these facilities are subject to applicable regulatory oversight for stormwater conveyance, treatment, and discharge.

Physical and Chemical Characteristics

Temperature

Temperature affects water chemistry and exerts a major influence on biological activity and growth in San Francisco Bay. Seasonally, water temperatures in the San Francisco Bay range from about 8 degrees Celsius to about 23 degrees Celsius. Water depths also influence small irregular temperature changes.

Salinity

The salinity of the San Francisco Bay estuary varies considerably by location and is most strongly influenced by river inflow and ocean tides. In Suisun Bay, salinity averages about 7 parts per thousand; at the Presidio in San Francisco near the Golden Gate, it averages about 30 parts per thousand; and in the southern reaches, salinities remain at near-ocean concentrations (32 parts per thousand) during much of the year. In winter, high flows of freshwater from the Delta lower the salinity throughout the San Francisco Bay estuary's northern reaches. In contrast, during the summer, when freshwater inflow is low, saline water from the San Francisco Bay estuary intrudes into the Delta (USACE et al. 2009).

pH

The pH (measure of the acidity or basicity of an aqueous solution) of waters in San Francisco Bay is relatively constant and typically ranges from 7.8 to 8.2 (LTMS 1998; SFEI 2013). As reported by LTMS, pH has remained relatively constant throughout the San Francisco Bay estuary regardless of maintenance dredging projects that have occurred (USACE et al. 2009).

Dissolved Oxygen

The water in the Central Bay, in the vicinity of the Port of Oakland, is considered to be generally well oxygenated. Typical concentrations of dissolved oxygen in most of San Francisco Bay range from 9 to 10 milligrams per liter (mg/L) during high periods of river flow, 7 to 9 mg/L during moderate river flow, and 6 to 9 mg/L during the late summer months, when flows are lowest (SFEI 2008).

Environmental factors other than river flows can also affect dissolved oxygen concentrations. This includes increases in dissolved oxygen by the mixing action of wind, waves and tides; photosynthesis of phytoplankton and other aquatic plants; and high dissolved oxygen levels in freshwater inflow. Dissolved oxygen concentrations are lowered by plant and animal respiration, chemical oxidation, and bacterial decomposition of organic matter (USACE et al. 2009).

Suspended Sediments/Turbidity

Turbidity is an optical property related to clarity of water; it causes light to be scattered and absorbed rather than transmitted in straight lines. Turbidity is caused by the presence of suspended and dissolved matter such as clay, silt, finely divided organic matter, plankton, other microscopic organisms, organic acids, and dyes. Factors affecting turbidity include shape, size, refractive index, color, and absorption spectra of particles. Turbidity is expressed in Nephelometric Turbidity Units (NTUs). Total suspended solids (TSS), on the other hand, are a measure of the amount of dry-weight mass of nondissolved solids suspended per unit of water (often measured in mg/L). TSS include inorganic solids (clay, silt, and sand) and organic solids (algae and detritus). Increased suspended solids increase turbidity and affect aquatic ecosystems in several ways, such as reduced light transmission, exposure to chemicals in suspended solids, and resettling effects.

Sediment inputs to the Bay are discussed in the Geology, Soils, and Seismicity section above and can contribute to TSS and turbidity in the bay. Aside from new sediment, existing deposits of typical fine-grained surface sediments in the extensive shallow areas of the San Francisco Bay estuary are subject to hydraulic movement (resuspension) by riverine, tidal, and wind-driven currents, and are the primary source of suspended particulate matter and turbidity.

TSS levels in the San Francisco Bay estuary vary greatly, typically ranging from 10 mg/L to over 100 mg/L, and as high as 200 mg/L (SFEI 2011). In general, higher TSS results in more turbid water. Although the Central Bay generally has the lowest TSS concentrations (LTMS 1998), waters in the navigation channel and turning basins are naturally turbid because of the resuspension of sediments from wind, waves, and tides. In addition, suspended sediment generated by vessel movement contributes to ambient conditions. Seasons also play an important role in suspended sediment loads, with generally higher TSS levels in the summer, and lower levels in the winter (USACE et al. 2009).

3.4.3 Groundwater

The proposed action area for alternatives that involve the Inner Harbor Turning Basin expansion, includes areas approximately -17 feet below ground surface at Howard Terminal, Schnitzer Steel, and Alameda Gateway. Groundwater elevations at these locations occur at various depths from -8 to -11.2 feet below ground surface (Apex 2021). The industrial and marine support land uses in the project vicinity have impacted groundwater conditions at Howard Terminal and Schnitzer Steel, and potentially at Alameda Gateway. Site-specific groundwater contamination information is available from the EnviroStor and GeoTracker databases maintained by the Department of Toxic Substances Control and the SFRWQCB, respectively. For the Schnitzer Steel and Howard Terminal portions of the proposed Inner Harbor Turning Basin expansion area, additional site-specific information has been collected during recent planning efforts. Groundwater conditions for each of the three upland areas where excavation is proposed are described below.

Howard Terminal

The historical depth to groundwater has ranged from about -5 to -12 feet below ground surface, and groundwater depths are subject to tidal fluctuation of several feet daily (ENGEO 2018). These conditions were observed during geotechnical investigations completed in support of the proposed Waterfront Ballpark District at Howard Terminal (ENGEO 2018; 2019b). Groundwater at Howard Terminal is diverted by a concrete quay wall that bisects the southern portion of the parcel, which directs flows towards a wood bulkhead where two monitoring wells are situated.

Numerous investigations and cleanup actions pertaining to groundwater conditions have occurred at Howard Terminal, most recently including a Site Investigation Report in support of the proposed Waterfront Ballpark District at Howard Terminal (ENGEO 2019a, City of Oakland 2021). The Site Investigation Report included grab groundwater samples at nine boring locations. Per the Site Investigation Report, onsite areas with constituents of concern (COCs) in groundwater at concentrations above ecological screening levels were observed in two areas in the center of the Howard Terminal parcel: at the shoreline, and adjacent to the Embarcadero West roadway. In addition, three Howard Terminal test locations were observed to contain petroleum hydrocarbon product floating in groundwater, as observed during the most recent biennial groundwater monitoring event conducted on October 17, 2018. These locations occur north of the existing quay wall and wood bulkhead, outside of the Inner Harbor Turning Basin expansion excavation area (Baseline 2019, City of Oakland 2021).

Recent ecological risk assessment and fate and transport modeling indicate that aquatic receptors in the Oakland Inner Harbor are not being adversely affected by the contaminants identified in the groundwater currently underlying Howard Terminal. Monitoring wells near the wood bulkhead indicate that contaminants in groundwater inland of the concrete quay wall and wood bulkhead are not migrating to the Inner Harbor at detectable concentrations (Baseline 2018, City of Oakland 2021).

The entire 50-acre Howard Terminal site is under Department of Toxic Substances Control purview and has land use restrictions applied to the entire site, some of which affect groundwater management. In compliance with these restrictions and associated plans, all dewatered groundwater is to be contained in storage tanks, tested, and discharged at an appropriate location.

Schnitzer Steel

Groundwater at the Schnitzer Steel site has been encountered at depths between 8 and 10 feet below ground surface. Groundwater likely occurs in the area of young bay mud present between approximately 5 to 10 feet below ground surface. Approximately one-third of the Schnitzer Steel site is covered by either buildings or pavement. The rest of the ground surface is unpaved dirt. Impervious surfaces may limit the potential for contaminant leaching to groundwater.

Groundwater at the Schnitzer Steel facility has been sampled since 1991 (Terraphase 2019b). Groundwater samples have been tested for TPH as diesel and motor oil, metals, and PCBs. Concentrations of TPH as diesel have been below the saltwater ecotoxicity environmental screening level (ESL), except for one sample collected in 2017. TPH as motor oil is usually not detected or is detected at concentrations below ESLs. Minor exceedances of the nickel saltwater ecotoxicity ESL have been observed in three shoreline wells. Minor exceedances of the saltwater ecotoxicity ESLs for arsenic, copper, lead, and zinc were measured in one shoreline well. Petroleum-hydrocarbon oxidation products (HOPs; often referred to as “polar compounds”) have been detected in several wells at concentrations that exceed the saltwater ecotoxicity ESL. The highest concentrations of HOPs are found in wells in the southeastern portion of the Schnitzer Steel facility, including in wells along the southeastern shoreline along the Oakland Harbor and adjacent to the Inner Harbor Turning Basin. Schnitzer is currently awaiting approval from the SFRWQCB to implement a work plan to evaluate whether groundwater discharging to the San Francisco Bay from the Schnitzer Steel facility poses an ecological risk (City of Oakland 2021). Soil evaluations completed for the facility concluded that given the shallow depths to groundwater, it is reasonable to assume that TPH and metals (specifically nickel) detected in groundwater are from the fill materials beneath the Schnitzer Steel facility (City of Oakland 2021).

Leaching of COCs from soil to groundwater due to surface infiltration may be occurring in unpaved areas of the Schnitzer Facility (Terraphase 2019b). Historically, a larger portion of the Schnitzer Facility was unpaved, and the potential for leaching to groundwater was greater. The site is currently under a Cleanup and Abatement Order issued by Department of Toxic Substances Control and Schnitzer is in the process of capping the entire facility with 12 inches of reinforced concrete to effectively eliminate potential leaching of COCs from soil to groundwater (City of Oakland 2021). Schnitzer installed water treatment system as part of their site remediation. The removal of soil and the repair of the cap and water treatment system would require Department of Toxic Substances Control approval (Apex 2021).

Alameda Property

The southeastern edge of the proposed Inner Harbor Turning Basin expansion area would encroach on a portion of Alameda. The -50-Foot Project previously removed a corner of the same Alameda property to expand the Inner Harbor Turning Basin to its current dimension. Based on sampling conducted for the -50-Foot Project, current ground elevation is approximately 9.5 feet MLLW, and groundwater was encountered at approximately 11.2 feet below ground surface. There is no indication of groundwater contamination above regulatory thresholds (DMMO 1998, Apex 2021).

3.5 Wildlife

3.5.1 Regulatory Setting

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

Under the Fish and Wildlife Coordination Act, any federal agency that proposes to control or modify any body of water must first consult with the United States Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS), as appropriate, and with the head of the appropriate state agency exercising administration over wildlife resources of the affected state.

3.5.2 Terrestrial Wildlife

Developed, landscaped, and ruderal areas at and in the vicinity of Oakland Harbor can provide cover, foraging, and nesting habitat for a variety of common birds, as well as some reptiles and small mammals, especially those that are tolerant of disturbance and human presence. These types of habitat are, however, of limited value compared to natural habitat. Developed areas are also unlikely to provide habitat for federally-listed terrestrial species potentially occurring in the study area.

Avian species common to highly develop urban areas have potential to nest in ruderal shrubs, street trees, or building roofs in the study area. Potentially present species include the non-native house sparrow (*Passer domesticus*), rock pigeon (*Columba livia*), and European starling (*Sturnus vulgaris*), and native species such as house finch (*Haemorhous mexicanus*), American goldfinch (*Spinus tristis*), white-crowned sparrow (*Zonotrichia leucophrys*), Brewer's blackbird (*Euphagus cyanocephalus*), and mourning dove (*Zenaida macroura*).

Small mammals may also occur in industrial and maritime support facilities in the study area. Species common to developed areas include striped skunk (*Mephitis mephitis*) and raccoon (*Procyon lotor*), and non-natives such as Virginia opossum (*Didelphis virginiana*), Norway rat (*Rattus norvegicus*), black rat (*Rattus rattus*), and feral cat (*Felis silvestris catus*). Bat roosting may occur in vacant or infrequently used buildings that may be present, and could potentially include the common Mexican free-tailed bat (*Tadarida brasiliensis*) (City of Oakland 2021).

3.5.3 Pelagic (Open Water) Fauna

Pelagic communities occupy the open waters of the Bay above the substrate. Pelagic food webs are primarily based on the consumption of plankton, which includes many species of microscopic algae and protozoa, as well as larval mollusks, crabs, and fish, and other larger floating organisms.

Deep estuarine pelagic waters may provide habitat to free-swimming invertebrates such as California Bay shrimp (*Crangon franciscorum*), and fishes such as Brown Rockfish (*Sebastes auriculatus*), halibut, sturgeon (*Acipenser* sp.), and Longfin Smelt. Deepwater habitat may also serve as a migratory pathway for anadromous fish such as Chinook Salmon and steelhead. Waterbirds such as surf scoter (*Melanitta perspicillata*), scaups (*Aythya* spp.), brown pelican, and terns (*Sterna* spp.) may roost or loaf in these open waters, particularly in areas protected from strong winds and waves. Marine mammals, such as Pacific harbor seal and California sea lion, also use pelagic waters of the Bay.

The shallowest portions of the project area occur on the northern margins of the Outer Harbor Turning Basin and at the outer margins of the Inner Harbor Turning Basin. Although observed depths are deeper than the Baylands Ecosystem Habitat Goals Report[1] definition of shallow open bay habitat, there are likely small portions at the margins of the proposed expansion areas that meet Goals Report shallow open bay habitat definition.

Shallow open bay habitat may function as a feeding area for Pacific herring (*Clupea pallasii*), northern anchovy (*Engraulis mordax*), bat ray, and jacksmelt (*Atherinopsis californiensis*), as well as at least 40 other species of fish, crabs, and shrimp. Spawning habitat for Pacific Herring occurs on hard substrates and eelgrass (*Zostera marina*) along the shallow margins of the Central Bay. Shallow bay habitat is also a nursery area for juvenile halibut and sanddabs *(Citharichthys stigmaeus*), shiner perch (*Cymatogaster aggregata*) and other fishes. Similar to deep estuarine pelagic waters, anadromous fish may use shallow open bay waters as migratory pathways. Shallower waters also provide important avian foraging habitat for diving bird species. Marine mammals may also be present, such as Pacific harbor seals.

Although not protected under the federal ESA or CESA, Pacific herring are a CDFW managed species and are protected within the San Francisco Bay under the state Marine Life Management Act which provides guidance, in the form of Fisheries Management Plans, for the sustainable management of California's historic fisheries.

The Pacific herring is a small schooling marine fish that enters estuaries and bays to spawn. This species is known to spawn along the Oakland and San Francisco waterfronts and attach its egg

[1] The Goals Report (Goals Project, 1999) subdivides the open bay habitats into two habitat subunits: deep bay and shallow bay. Deep bay habitat is defined as those portions of San Francisco Bay deeper than 18 feet below MLLW, including the deepest portions of San Francisco Bay and the largest tidally influenced channels. Shallow bay, which includes the vast majority of San Francisco Bay, is defined as that portion of San Francisco Bay between 18 feet below MLLW and MLLW.

masses to eelgrass, seaweed, and hard substrates such as pilings, breakwater rubble, and other hard surfaces. An individual can spawn only once during the season, and the spent female returns to the ocean immediately after spawning. Spawning usually takes place between October and March with a peak between December and February. After hatching, juvenile herring typically congregate in the San Francisco Bay during the summer and move into deeper waters in the fall.

Portions of the Oakland-Alameda Estuary have been identified as a potential herring spawning locations with habitat consisting man-made riprap, pilings, and boat hulls and subtidal eelgrass, hard sand, and oysters (Watters et al. 2004). However, while suitable habitat exists, no herring spawning has been observed along the study area portion of the Oakland waterfront since CDFW began mapping the herring spawn in the 2012-2013 survey year (CDFW 2019). Annual reporting on herring spawning within San Francisco Bay has consistently observed herring spawning on the Central Bay-facing side of Alameda Island, adjacent to the Ballena Isle Marina, but it has not observed herring within the Estuary (CDFW 2019).

3.5.4 Benthic Fauna

Benthic habitat includes the channel bottom and associated biota in and adjacent to the navigation channels and turning basins. In subtidal areas, the predominant benthic habitat in the Central San Francisco Bay is composed of unconsolidated soft sediment with a mixture of mud, silt, and clay; and lesser quantities of sand, pebbles, and shell fragments (NOAA, 2007). Sediment in the Oakland Harbor is predominately fine-grained (USACE 2019). Areas outside of the turning basins and navigation channels, where dredging does not occur, are typical of San Francisco Bay waters and have primarily silty mud and sand substrates that are naturally no more than 25 feet deep (City of Oakland 2021). Benthic habitat also less commonly includes hard substrates such as piers, breakwaters, and riprap.

Intertidal (located between MLLW and MHHW) benthic habitats are very limited in the study area, consisting of seawalls, piles, and rock riprap. In the Outer Harbor, intertidal habitat is limited to portions of the existing vertical seawall that are exposed and inundated during tidal cycles. Intertidal habitat in the Inner Harbor Turning Basin is also predominantly seawall surfaces, but may also include piles that support above-water structures. This area also includes short lengths of rock riprapped shoreline in the intertidal zone, occurring at the Schnitzer Steel site, under Howard Terminal, and under the waterfront facilities on Alameda at the Bay Ship and Yacht Company. Benthic hard substrates such as piers, breakwaters, and riprap provide colonization habitat for benthic invertebrates. Common species include green algae, barnacles (*Balanus glandula* and *Chthamalus fissus*), mussels, tunicates, bryozoans, cnidarians, and crabs.

Subtidal benthic communities in the Oakland Harbor and channel areas of the Central San Francisco Bay are affected by increased water flow and sedimentation. Relatively high numbers of subsurface deposit feeding worms (polychaetes and oligochaetes) inhabit these areas, including *Tubificidae* spp., *Mediomastus* spp., *Heteromastus filiformis*, and *Sabaco elongatus*. Community complexity and abundance also supports relatively high abundances of three carnivorous polychaete species: *Exogone lourei*, *Harmothoe imbricata*, and *Glycinde armigera* (City of Oakland 2021). Other commonly occurring benthic species in the Central San Francisco Bay include the obligate amphipod filter-feeder *Ampelisca abdita,* the tube dwelling polychaete

Euchone limnicola (City of Oakland 2021), clams (including the overbite clam, *C. Amurensis* or *Corbula*), amphipods such as *Monocorophium* and *Ampelisca*, polychaete worms, and Bay mussels (SFEP 1992). Larger mobile benthic invertebrate organisms are also present in the Central San Francisco Bay, such as blackspotted shrimp (*Crangon nigromaculata*), bay shrimp (*Crangon franciscorum*), Dungeness crab (*Metacarcinus magister*), and the slender rock crab (*Cancer gracilis*)(City of Oakland 2021).

Several common benthic species in Central San Francisco Bay were accidentally or intentionally introduced, such as the eastern oyster (*Crassostrea virginica*), the Japanese littleneck clam (*Tapes philippinarum*), and the soft-shelled clam. Some of these non-indigenous species serve ecological functions similar to those of the native species that they have displaced, while other species have reduced phytoplankton populations and consequently impacted the zooplankton populations and organisms that depend on them.

Benthic biota provides an important food source for carnivorous fishes, marine mammals, and birds in San Francisco Bay's food web. Communities of benthic organisms also play a vital role in maintaining sediment and water quality, and are important indicators of environmental stress, because they are particularly sensitive to pollutant exposure.

3.6 Special Status Species and Protected Habitat

3.6.1 Regulatory Setting

Endangered Species Act (16 *U.S.C. § 1531 et seq.), as amended*

The federal Endangered Species Act (ESA) protects threatened and endangered species and their designated critical habitat from unauthorized take. Section 9 of the ESA defines take as to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." In accordance with Section 7 of the ESA, federal agencies are required to consult with the USFWS and/or NMFS on actions may affect listed species to ensure that any action authorized, funded, or carried out by them is not likely to jeopardize threatened or endangered species, or result in the destruction or adverse modification of designated critical habitat.

As part of the implementation of the LTMS management plan for dredged material disposal in the San Francisco Bay region, the LTMS agencies initiated ESA consultation with NMFS and USFWS for maintenance dredging and disposal. These consultations reduced the need for individual consultation for maintenance dredging projects through the establishment of programmatic work windows. These programmatic work windows are based on presence/absence information for various sensitive species, and establish times and locations wherein maintenance dredging and disposal activities may take place without further (formal or informal) consultation. Although the work windows were established for maintenance dredging projects, these work windows are also considered when evaluating potential project impacts associated with new dredging.

Marine Mammal Protection Act (16 U.S.C. § 1361 *et seq*.)

Under the Marine Mammal Protection Act (MMPA), all species of marine mammals are protected. The MMPA prohibits, with certain exceptions, the “take” of marine mammals. Under the MMPA, take is defined as the means “to hunt, harass, capture, or kill, or attempt to hunt, harass, capture, or kill.” Under Section 101(a)(5)(D), an incidental harassment permit may be issued for activities other than commercial fishing that may impact small numbers of marine mammals. Amendments to this act in 1994 statutorily defined two levels of harassment. Level A harassment is defined as any act of pursuit, torment, or annoyance that has the potential to injure a marine mammal in the wild. Level B harassment is defined as harassment having potential to disturb marine mammals by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.

Migratory Bird Treaty Act (16 U.S.C. §§ 703-712)

The Migratory Bird Treaty Act (MBTA) established special protection for migratory birds by regulating hunting or trade in migratory birds. Furthermore, this act prohibits anyone to take, possess, buy, sell, purchase, or barter any migratory bird listed in 50 C.F.R. Part 10, including feathers or other parts, nests, eggs, or products, except as allowed by implementing regulations (50 C.F.R. Part 21). Definition of “take” includes any disturbance that causes nest abandonment and/or loss of reproductive effort (e.g., killing or abandonment of eggs or young).

California Endangered Species Act of 1974 (Cal. Fish & G Code §§ 2050-2115.5), as amended

The California Endangered Species Act (CESA) operates in a similar fashion to the federal ESA, but is administered by the California Department of Fish and Wildlife (CDFW). Certain species that are federally listed may not be listed on the CESA—or vice-versa—or may have a different listing status. As a federal agency the USACE is not subject to CESA and does not consult under state endangered species regulations. However, CESA is noted here because the Port of Oakland is the project sponsor and is a non-federal entity and may be subject to CESA. Like the federal ESA, CESA and the Native Plant Protection Act authorize CDFW to designate, protect, and regulate the taking of protected species in the State of California. CESA § 2080 prohibits the taking of state-listed plants and animals. However, CESA § 2081 allows CDFW to issue permits for the minor and incidental take of species by an individual or permitted activity listed under the act.

Magnuson-Stevens Fishery Conservation *and Management Act (16 U.S.C. § 1801* et seq.*)*

Essential fish habitat (EFH) is defined under the Magnuson – Stevens Fishery Conservation and Management Act (MSA) as those waters (i.e., aquatic areas and associated physical, chemical, and biological properties) and substrate (i.e., sediments, hardbottom, structures underlying the waters, and associated biological communities) necessary to fish for spawning, feeding, or growth to maturity. In accordance with the MSA, federal agencies are required to consult with NMFS on proposed actions authorized, funded, or undertaken by the agency that may adversely affect EFH for fish species covered under a fisheries management plan (FMP). NMFS is required to comment and provide conservation recommendations for any federal or state activity that could impact EFH.

3.6.2 Federally Threatened and Endangered Species and Designated Critical Habitat

Table 12 identifies federal ESA and CESA-listed endangered and threatened species, California fully protected species, and marine mammals known to occur or with potential to occur in the project area. As noted above, the USACE exercises federal sovereignty and does not consult under state endangered species regulations but CESA status is noted here because the Port of Oakland, the project sponsor, is a non-federal entity. Designated critical habitat under the federal ESA has been established in the study area for two aquatic species: Southern Population of North American Green Sturgeon Distinct Population Segment (DPS) and Steelhead Central California Coast (CCC) DPS. There is no designated critical habitat for terrestrial species in the study area.

Table 12: Federal and State Endangered, Threatened, and Fully Protected Species and Marine Mammals Known to Occur or Potentially Occurring in the Project Area

Species	Federal Status	State Status
Birds		
California least tern (*Sternula antillarum browni*)	FE	SE
Fish		
Southern Population of North American Green Sturgeon DPS (*Acipenser medirostris*)	FT/CH	—
Steelhead, Central California Coast DPS (*Oncorhynchus mykiss*)	FT/CH	—
Steelhead, Central Valley DPS (*Oncorhynchus mykiss*)	FT	—
Chinook Salmon, Sacramento winter-run ESU (*Oncorhynchus tshawytscha*)	FE	SE
Chinook Salmon, Central Valley spring-run ESU (*Oncorhynchus tshawytscha*)	FT	ST
Longfin smelt (*Spirinchus thaleichthys*)	FC	ST
Marine Mammals		
Pacific harbor seal (*Phoca vitulina richardii*)	MMPA	—
California sea lion (*Zalophus californianus*)	MMPA	—
Harbor porpoise (*Phocoena phocoena*)	MMPA	—

1. Federal Status: CH = Critical Habitat; FC – Federal Candidate Species for Listing; FE = Federally Listed Endangered; FT = Federally Listed Threatened; MMPA = Marine Mammal Protection Act
2. State Status: FP = Fully Protected SE = State Listed Endangered; ST = State Listed Threatened

California Least Tern

The California least tern (*Sterna antillarum*) is a federally listed and state-listed endangered species. Least terns typically feed in shallow estuaries or lagoons where small fish are abundant. Its most common prey species include jacksmelt (*Atherinopsis californiensis*), topsmelt (*Atherinops affinis*), and northern anchovy (Engraulis mordax) (Elliott et al., 2007).

The least tern breeds in California from mid-May to August. The least tern typically departs California in August and winters in Latin America. California least tern breeding colonies are at the former Alameda Naval Air Station on Alameda Island, located approximately 1.5 miles southwest of the Inner Harbor Turning Basin. The Naval Air Station on Alameda Point has hosted a breeding colony since at least 1976, and possibly earlier (CDFW 2021). Least terns have been observed to forage primarily along the breakwaters and shallows of the southern shoreline of Naval Air Station Alameda, and in Alameda's Ballena Bay from May through August. Least terns are known to use the MHEA for foraging and roosting.

In the Port, the LTMS maintenance dredging work window for California least tern is August 1 through March 15 (LTMS 2021). This window applies to all areas within 1 mile of the coastline from Berkeley Marina to San Lorenzo Creek.

North American Green Sturgeon Southern Distinct Population Segment (DPS)

Green Sturgeon are the most widely distributed members of the sturgeon family and the most marine-oriented of the sturgeon species, entering rivers only to spawn. The southern DPS spawns only in the Sacramento River system and is federally listed as threatened. Adult Green Sturgeon migrate into freshwater beginning in late February, with spawning occurring March through July, with peak activity in April and June. After spawning, juveniles remain in fresh and estuarine waters for 1 to 4 years, and then begin to migrate out to sea (Moyle et al. 1995). According to studies, Green Sturgeon adults begin moving upstream through the Bay during winter (Kelly et al. 2003). During periods of migration, adults occur throughout the Bay and Delta.

Juvenile distribution and habitat use are still largely unknown. Juveniles in the southern Bay are mostly south of the Dumbarton Bridge, but Juveniles are presumed present year-round in all parts of the San Francisco Bay Estuary in low densities (Israel and Klimley 2008). As a result, Green Sturgeon are potentially present throughout all marine portions of the study area at any time of the year. However, their preferred migration routes do not traverse the study area. Adult Green Sturgeon typically take the more direct migratory route from San Pablo Bay, past Raccoon Strait adjacent to Angel Island, and out to the Golden Gate Bridge (Kelly et al. 2007, City of Oakland 2021).

Sub-adult and adult Green Sturgeon occupy a diversity of depths within bays and estuaries for feeding and migration, although most of the study area waters are maintained to depths that exceed observed benthic foraging depths for this species (i.e., -33 feet MLLW; Miller and Kaplan 2001). No spawning or rearing habitat for Green Sturgeon exist in or near the study action areas.

Federal ESA designated Critical habitat for the Green Sturgeon includes the Sacramento River, the Delta, and Suisun and San Pablo Bays, along with all of the San Francisco Bay below the higher high-water elevation. This includes the study aquatic action areas.

Steelhead

Steelhead are anadromous and there are two DPSs known to occur in Central San Francisco Bay: the Central California Coastal (CCC) DPS (federally listed as threatened), and the Central Valley DPS (federally listed as threatened). The CCC steelhead DPS occupies a large area that includes the drainages of San Francisco, San Pablo, and Suisun Bays eastward to Chipps Island, at the confluence of the Sacramento and San Joaquin Rivers. The Central Valley Steelhead DPS includes the Sacramento and San Joaquin Rivers and their associated tributaries.

Typically, individuals migrate to freshwater for spawning after spending anywhere from 1 to 4 years in marine habitats. Steelhead typically enter the Bay in early winter, using the main channels in the Bay and Delta to migrate to upstream spawning habitat, as opposed to small tributaries. Studies conducted by NMFS (2001) and CDFW (Baxter et al. 1999) indicate that the primary migration corridor is through the northern reaches of the Central Bay (Raccoon Straight and north of Yerba Buena Island).

The CCC DPS steelhead has small spawning runs in multiple Bay tributaries, including San Leandro Creek, approximately 5 miles southeast of the study area (Goals Project 2000). Fish migrating to and from these spawning grounds may occur in the Oakland-Alameda Estuary. Juvenile steelhead travel episodically from natal streams during fall, winter, and spring high flows, with peak migration occurring in April and May (Fukushima and Lesh 1998). No spawning or rearing habitat for steelhead exists in the study area.

Federal ESA designated Critical habitat for CCC steelhead includes all river reaches and estuarine areas accessible to steelhead in coastal river basins, from the Russian River to Aptos Creek (inclusive), and the drainages of San Francisco and San Pablo Bays. Also included are adjacent riparian zones, all waters of San Pablo Bay west of the Carquinez Bridge, and all waters of San Francisco Bay to the Golden Gate. Therefore, critical habitat for this DPS includes the waters in the study aquatic action areas.

The in-water work window for steelhead and other salmonids established through the LTMS program ESA consultation is June 1 through November 30.

Chinook Salmon

The Chinook Salmon is the largest and least abundant species of Pacific salmon. Like all salmonids, the Chinook Salmon is anadromous, but unlike steelhead, Chinook Salmon are semelparous (i.e., they die following a single spawning event). Chinook Salmon have three distinct runs, referred to as Evolutionarily Significant Units (ESUs), that use San Francisco Bay. These ESUs are distinguished by the seasonal differences in adult upstream migration, spawning, and juvenile downstream migration. The Sacramento River winter-run ESU is listed as an endangered species under the federal ESA and CESA. The Central Valley spring-run ESU is listed as threatened under the federal ESA and CESA. The Central Valley fall-run ESU is not protected under the federal ESA, but NMFS classifies it as a Species of Concern and it is a state-designated species of special concern.

In San Francisco Bay, Chinook migrate through the Golden Gate, Central Bay, North Bay, San Pablo Bay, and Suisun Bay, and into the Sacramento River. Out-migrating juveniles follow the same path in reverse. Studies conducted by NMFS (2001) and CDFW (Baxter et al. 1999) indicate that the primary migration corridor is through the northern reaches of the Central Bay (Raccoon Straight and north of Yerba Buena Island).

Sacramento River winter-run Chinook ESU enter the Bay between November and May or June. Their migration into the Sacramento River begins in December and continues through early August, with the majority of the run occurring between January and May, and peaking in mid-March (Hallock and Fisher 1985). They are suspected to forage in Central Bay shallow water areas (less than 30 feet deep) during in-migration and out-migration transits. No spawning or quality rearing habitat for this species exists near the Port.

While migrating through San Francisco Bay, the Central Valley spring-run Chinook ESU has a similar life history to the Sacramento winter-run Chinook ESU. The Central Valley spring-run Chinook ESU are primarily present during in-migration and out-migration periods and are known to forage in Central Bay shallow water areas. . No spawning or quality rearing habitat for this species exists near the Port.

The in-water work window for salmonids established through the LTMS program ESA consultation is June 1 through November 30.

Longfin Smelt

Longfin smelt is a small anadromous fish that was historically among the most abundant fish in the San Francisco Bay estuary and the Delta. Longfin smelt is currently a candidate species for listing under the federal ESA and is state-listed as threatened. Significant declines in Longfin Smelt abundance have occurred throughout its range during the past quarter century. As they mature in the fall, adults found throughout San Francisco Bay migrate to brackish or freshwater in Suisun Bay, Montezuma Slough, and the lower reaches of the Sacramento and San Joaquin Rivers. Spawning occurs primarily from January through March, after which most adults die (CDFG 2009). In April and May, juveniles are believed to migrate downstream to San Pablo Bay.

Longfin smelt are most likely to occur within the Central San Francisco Bay during the late summer months before migrating upstream in fall and winter. During CDFW's Bay surveys, Longfin Smelt have been predominantly observed in observation stations in or upstream of San Pablo and Suisun Bays. At observation stations nearest the study area (Stations 110 and 142), Longfin Smelt were last observed in 2007, with additional observations in 2001, 2000, 1988, 1987, and 1985. Between 2014 and 2018 (the most recent survey year), no Longfin Smelt were recorded south of San Pablo Bay; and from 2009 through 2013, none were observed between the southern limit and the entrance to San Pablo Bay. Based on these findings, there is a low likelihood of Longfin Smelt in the study area.

3.6.3 Marine Mammals

There are three species of marine mammals that are likely to occur in the vicinity of the study area: Pacific harbor seal (*Phoca vitulina richardii*), California sea lion (*Zalophus californianus*), and harbor porpoise (*Phocoena phocoena*). There are several other species of marine mammals that uncommonly occur in the central portion of the San Francisco Bay Estuary, such as northern elephant seal (*Mirounga angustirostris*), common bottlenose dolphin (*Tursiops truncatus*), and gray whale (*Eschrichtius robustus*). None of these species are federally or state listed as threatened or endangered; however, all marine mammals are protected under the MMPA.

Pacific Harbor Seal

Pacific Harbor seal is the most common marine mammal species observed in San Francisco Bay and is also commonly seen near the San Francisco-Oakland Bay Bridge (SFOBB) east span (Caltrans 2018), as well as the western shoreline of Alameda Island. Foraging can occur throughout the Bay and prey abundance and distribution affect where harbor seals will forage.

Harbor seals in the Bay typically haul out in groups ranging from a few individuals to several hundred seals. In the central portion of the Bay, there is an active haul-out site the southern side of Yerba Buena Island, approximately 2 miles west of the Outer Harbor Turning Basin, and another on the far side of Alameda Island at the Alameda Point Marina, about 1.5 miles south of the Inner Harbor Turning Basin. There are other areas in the central portion of the Bay that may occasionally be used as a haul-out, but there are no records of harbor seal hauling out at the Port, and the shorelines of the Port generally do not provide suitable haul-out locations due to the developed nature of the shoreline.

California Sea Lion

California sea lion breeds on the offshore islands of southern California and Mexico from May through July (Heath and Perrin 2008). During the non-breeding season, adult and sub-adult males and juveniles migrate northward along the California, Oregon, Washington, and Vancouver Island coastlines.

California sea lions have been observed occupying docks near Pier 39 in San Francisco, about 3.2 miles from the study area, since 1987. Occurrence of sea lions here typically is lowest in June (breeding season) and highest in August. Pier 39 is the only regularly used haul-out site in the Central Bay, but sea lions occasionally haul out on human-made structures, such as bridge piers, jetties, or navigation buoys (Caltrans 2018). Foraging can occur throughout the Bay.

Harbor Porpoise

Harbor porpoise are the smallest cetacean found in California waters and inhabit nearshore waters as well as estuaries. Harbor porpoises began to re-enter the Bay in 2008, following a long absence of several decades. Keener et al. (2012) reports sightings of harbor porpoises from just inside the Bay, northeast to Tiburon, and south to the Bay Bridge west span.

3.6.4 Species Protected under the Migratory Bird Treaty Act

There are a variety of sea birds, such as the double-crested cormorant (*Phalacrocorax auritus*), and Caspian tern (*Hydroprogne caspia*), that are protected under the MBTA, relatively common in the central portion of San Francisco Bay, and may occur on or above the waters of the Port. With the exception of at the MHEA, wading shorebirds are unlikely to occur at the Port because shallow water habitat is generally absent. Shoreline structures at the Port and on Alameda Island also support loafing gulls. Recent surveys at the Howard Terminal recorded presence of ring-billed gull (*Larus delawarensis)*, California gull (*Larus californicus)*, and western gull (*Larus occidentalis)* (City of Oakland 2021). Common species of terrestrial migratory birds may also be present, as described in section 3.6.2 above.

3.6.5 Magnuson-Stevens Fishery Conservation Act - Fisheries Management Plans in the Affected Area

All waters and intertidal areas of San Francisco Bay and its tributaries are designated as EFH under the following FMPs:

- Pacific Coast Groundfish
- Coastal Pelagic Species
- Pacific Salmon

The Pacific Coast Groundfish FMP covers the groundfish fishery in California, Oregon, and Washington, and protects habitat for dozens of species of sharks and skates, roundfish, rockfish, and flatfish. The extent of Pacific Coast Groundfish EFH includes all waters and substrates with depths less than or equal to 3,500 meters (approximately 11,500 feet) to Mean Higher High Water (MHHW) level, or the upriver extent of saltwater intrusion in estuaries The entirety of the San Francisco Bay Estuary below MHHW is designated as EFH for Pacific Coast Groundfish.

The Coastal Pelagic FMP protects and manages northern anchovy, Pacific sardine, Pacific (chub) mackerel, jack mackerel, market squid, and all krill species that occur in the West Coast exclusive economic zone.[1] Coastal Pelagic EFH includes all marine and estuarine waters from the shoreline along the coasts of California, Oregon, and Washington; offshore to the limits of the exclusive economic zone; and above the thermocline, where sea surface temperatures range between 10 and 26 degrees Celsius. The entirety of the San Francisco Bay Estuary below MHHW is designated as EFH for Coastal Pelagic Species.

The Pacific Coast Salmon FMP guides the management of commercial and recreational salmon fisheries off the coasts of Washington, Oregon, and California, and includes Chinook Salmon (*Oncorhynchus tshawytscha*) and Coho Salmon (*O. kisutch*). Pacific Coast Salmon freshwater EFH includes all rivers or creek currently or historically occupied by Chinook Salmon or Coho Salmon. Estuarine and marine areas such as San Francisco Bay are also included in this essential fish habitat designation. In estuarine and marine areas, Pacific Coast Salmon EFH extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone offshore of California, north of Point Conception. The FMP also defines five Habitat Areas of Particular Concern for the Pacific Coast Salmon essential fish habitat: complex channels and floodplain habitats, thermal refugia, spawning habitat, estuaries, and marine and estuarine submerged aquatic vegetation.

3.6.6 Vegetation, Wetlands, and Submerged Aquatic Vegetation

No areas of wetlands or other terrestrial vegetation are in the action area footprint or the vicinity of the Outer Harbor Turning Basin, aside from the shoreline 2,000 feet to the north, near the touchdown of the San Francisco-Oakland Bay Bridge. There, a strip of ruderal upland vegetation is present between Interstate 80 and the intertidal waters of the Bay. No wetlands are present.

No areas of wetlands or significant upland vegetation are in the footprint or the vicinity of the

[1] The U.S. exclusive economic zone extends 200 nautical miles offshore, encompassing diverse ecosystems and vast natural resources, such as fisheries and energy and other mineral resources.

Inner Harbor Turning Basin, aside from small, landscaped areas adjacent to buildings and roadways. The natural vegetation present is limited to ruderal growth along the shoreline fill adjacent to Schnitzer Steel.

In the vicinity of the turning basins, there are small patches of eelgrass, a type of submerged aquatic vegetation. Eelgrass colonies provide an important and highly productive habitat in San Francisco Bay, and serve as important nursery and feeding grounds to many species of wildlife that inhabit the estuary. Eelgrass is also an important habitat for Pacific Herring, which lay their eggs on the eelgrass blades. Due to the climate and depths of light penetration in the Bay, eelgrass beds in San Francisco Bay are generally limited to a depth range of approximately +1 to -6 feet MLLW (USACE, EPA, and LTMS 2009). The patches of eelgrass that are present just north of the Outer Harbor in Key Route Basin are used as a reference site for eelgrass surveys that are conducted at the Port. The most recent eelgrass survey was conducted in April 2021. The results of that survey are provided in Appendix A-1. Small patches of eelgrass are present in both the Inner and Outer Harbors, as shown on Figures 1 and 2 of Appendix A-1.

The nearest patches at the Outer Harbor are approximately 820 feet north of the proposed Outer Harbor Turning Basin expansion. The nearest patch in the Inner Harbor occurs approximately 1,640 feet west of the proposed Inner Harbor Turning Basin expansion, adjacent to the Alameda Island Shoreline (Merkel and Associates 2021). The Inner Harbor showed increases in both the vegetated aerial extent (+10%) and the unvegetated aerial extent (+130%) from 2018 to 2019 (Tierra Data 2019), and again increased in both the vegetated aerial extent (+181%) and the unvegetated aerial extent (+9.3%) from 2019 to 2020 (Tierra Data 2020). In 2019, many new small patches were observed, which account for the relatively large proportional increase in the unvegetated aerial extent. Outside of the proposed turning basin expansion areas but within the Oakland Harbor is the 180-acre Middle Harbor Enhancement Area (MHEA) adjacent to Middle Harbor Shoreline Park. The MHEA is approximately 1,500 feet south of the proposed Outer Harbor Turning Basin expansion footprint and 10,500 feet northwest of the proposed Inner Harbor Turning Basin expansion footprint. Enhancement within the MHEA entails creation of shallow wildlife habitats through beneficial reuse of dredged material. Habitats present include intertidal and shallow subtidal soft-bottom habitat, eelgrass, and emergent wetlands. Least terns are known to use the MHEA for foraging and roosting (USACE and SFRWQCB, 2015)

3.7 Cultural Resources

3.7.1 Regulatory Setting

National Historic Preservation Act *(16 U.SC. § 470 et seq.)*

Under the National Historic Preservation Act (NHPA) federal agencies are required to consider the effects of their undertakings on historic properties. A historic property is the federal term that refers to cultural resources (e.g., prehistoric or historical archaeological sites, maritime historical resources including shipwrecks, buildings, bridges and tunnels, and architectural features and cultural resources that are 50 or more years old, possess integrity, and meet the criteria of the National Register of Historic Places (NRHP). The lead federal agency for an undertaking is responsible for federal compliance with Section 106 of the NHPA and its implementing regulations at 36 C.F.R. Part 800. The NHPA also designates the State Historic Preservation Officer as the individual responsible for administering state-level programs and creates the President's Advisory Council on Historic Preservation (ACHP). Federal agencies are required to allow the ACHP a reasonable opportunity to comment on their undertaking's adverse effects to historic properties.

Abandoned Shipwrec*k Act (43 U.S.C. §§ 2101–2106)*

The Abandoned Shipwreck Act is a federal legislative act that protects shipwrecks found in state waters. The Abandoned Shipwreck Act also states that the laws of salvage and finds do not apply to abandoned shipwrecks protected by the act. Under the Abandoned Shipwreck Act, the United States asserts title to abandoned shipwrecks in state waters that are either:

- Embedded in state-submerged lands;
- Embedded in the coralline formations protected by a state on submerged lands; or
- Resting on state-submerged lands and are either included in or determined eligible for the NRHP.

The Abandoned Shipwreck Act also has a provision for the simultaneous transfer, by the federal government, of title for those abandoned shipwrecks to the state(s) in whose waters the wrecks are located.

American Indian Religious Freedom Act *(42 U.S.C. § 1996,* et seq.*)*

The American Indian Religious Freedom Act (42 U.S.C. § 1996, *et seq*.), regulated under 43 C.F.R. Part 7, has been established to protect religious practices, ethnic heritage sites, and land uses of Native Americans. The Act makes it a policy to protect and preserve for American Indians, Eskimos, Aleuts, and Native Hawaiians their inherent right of freedom to believe, express, and exercise their traditional religions. The Act allows them access to sites, use and possession of sacred objects, and freedom to worship through ceremonial and traditional rights. It further directs various federal departments, agencies, and other instrumentalities responsible for administering relevant laws to evaluate their policies and procedures in consultation with Native American traditional religious leaders to determine changes necessary to protect and preserve Native American cultural and religious practices.

3.7.2 Cultural Setting

Cultural resources, both archaeological and historic architecture, are identified and assessed in association with their natural and cultural contexts. A brief discussion of the cultural settings of the study area and vicinity are provided below. A more detailed discussion of the cultural setting is provided in appendix A-6.

San Francisco Bay, as we now know it, was formed during a period of relatively rapid sea-level rise. After 4,000 B.C. the sea-level rise slowed and marshes began to develop around the Bay. During this post-4,000 B.C. period, numerous shell middens were created as a result of human activity in the Bay Area (Stright 1990:451). Marshes are particularly productive ecosystems and most of the San Francisco Bay shell middens were near marshes (Nelson 1909; Bickel 1978). The area's prehistoric populations took advantage of this productivity by harvesting fish, shellfish, birds, and land mammals that live or feed in or near the marsh, as well as the marsh plants themselves (Bickel 1978:12). Prior to historic-period development, both the inner and outer harbor turning basins were undeveloped marshlands.

By around 1500 B.C., Costanoans entered the Bay Area from the Sacramento River Delta region and occupied most of the eastern shore of San Francisco Bay, presumably displacing or assimilating older Esselen language speakers as they advanced (Moratto 1984:554). The study area is situated within the *Chochenyo* territory of the Costanoan Indians. Costanoan is not a native term, but rather is derived from the Spanish word *Costanos*, meaning coast people (Kroeber 1925:462). The term Ohlone is preferred by tribal groups representing the area.The basic unit of the Ohlone political organization was the tribelet, consisting of one or more socially linked villages and smaller settlements within a recognized territory (Moratto 1984:225). Subsistence activities emphasized gathering berries, greens, and bulbs; harvesting seeds and nuts—of which acorn was the most important; hunting for elk, deer, pronghorn, and smaller animals; collecting shellfish; and taking varied fishes in stream, bay, lagoon, and open coastal waters (Moratto 1984:225).

The population and traditional lifeways of the Ohlone were severely affected by the influences of the Spanish colonists and the Mission system. Spanish explorers first sighted San Francisco Bay in 1769, and a Spanish supply ship entered it in 1775. The first settlers—Spanish soldiers and missionaries—arrived in the Bay Area in 1776. The native Ohlone culture was radically transformed when European settlers moved into northern California, instituting the mission system and exposing the native population to diseases to which they had no immunity. By 1800, few if any Ohlone remained on the land or subsisted in native lifeways; in fact, native population had declined in some areas by as much as 90% . By the 1820s, the Bay Area had a Spanish fort, town, and five missions in the region. During this period, large tracts of land were granted to individuals for cattle ranches. the King of Spain granted Don Luis Maria Peralta the Rancho San Antonio (also known as the Peralta Grant), which comprised approximately 44,800 acres, and all of the present-day cities of Oakland, Piedmont, Berkeley, Emeryville, Alameda, Albany, and part of San Leandro (Archaeological/Historical Consultants 1993; Minor 2000; LSA 2011).

Peralta's land grant was confirmed after Mexico's independence from Spain in 1822, and the title would be honored again when California entered the Union in 1848. In 1850, Colonel Henry S. Fitch attempted to make the first purchase of land that would become Oakland; a year later, William Worthington Chipman and Gideon Aughinbaugh purchased from the 160-acre "Encinal" on the peninsula of what is now the island of Alameda. The township of Oakland was incorporated in 1852. During the 1850s and 1860s, Oakland developed as a small residential and industrial center. In 1863, a wharf was constructed at the foot of 7th Street to provide ferry service to San Francisco. By1869, Oakland was the western terminus for the first transcontinental railway (Hoover and Kyle 2002).

Following passage of the Rivers and Harbors Act of 1873, USACE began the planning of improvements in what was to ultimately become Oakland Harbor. The Act authorized improvements to San Antonio Creek, including deepening the channel leading to the Oakland

Estuary and the Brooklyn Basin. USACE's first project was to build parallel "training walls," running 750 to 1,000 feet apart, to direct (i.e., train) the tides in such a way as to scour the bottom of the newly created channel. Construction of the two training walls commenced in 1875 and appears to have been completed by 1896. The first infill behind the walls was the construction of the railroad moles. The Southern Pacific Railroad built a mole on the Alameda side in the late 19th century; the Western Pacific Railroad built their mole behind the northern training wall in the mid-1910s. The two cities and some private parties gradually filled in (i.e., reclaimed) land behind the moles. During the late 1930s and early 1940s, the Army and Navy filled in thousands of acres behind the two training walls, creating the land in Alameda for both Naval Air Station (NAS) Alameda and the Fleet Industrial Supply Center (FISC). The training walls ultimately established the boundaries for the future development of the area, including what was to become Alameda to the south of the channel and the Western Pacific Railroad rail yards (now Union Pacific Railroad), the Naval Supply Center, and the Oakland Army Base on the Oakland side of the channel. In time, the tidelands and waterways south of the Alameda Training Wall and north of the Oakland Training Wall would be infilled, and this infill obscured from view the surfaces of the two training walls (JRP 1996: 7-8). With the completion of the Bay Bridge in 1936 and the increasing reliance on automobiles for routine transportation needs, suburbs expanded, leading to land use changes across the East Bay.

3.8 Aesthetics

Visual resources consist of the natural and manmade features that give a particular environment its aesthetic qualities. These features may be natural-appearing or modified by human activities. Together, they form the overall impression of an area, referred to as its landscape character. Landforms, water surfaces, vegetation, and manmade features are treated as characteristic of an area if they are inherent to the formation, structure, and function of the landscape. Visual resources also include public values, goals, awareness, and concern regarding visual quality. The concept of visual sensitivity encompasses the relative degree of public interest in visual resources and concern over adverse changes in the quality of that resource. Some visual resources may be generally described as Scenic vistas - panoramic views of a large geographic area for which the field of view can be wide and extend into the distance. Scenic vistas are experienced from publicly accessible locations and include urban skylines, valleys, mountain ranges, or large bodies of water (including large waterfalls).

This section describes the existing visual character of the area through representative key viewpoints with photographs from in and around the study area. Additional viewpoint descriptions and photographs are included in appendix A-9. The locations of the key viewpoints and the direction of the views are shown in Figure 9 and Figure 10.

Figure 9: Key Observation Points and Parks, Outer Harbor Turning Basin Study Area

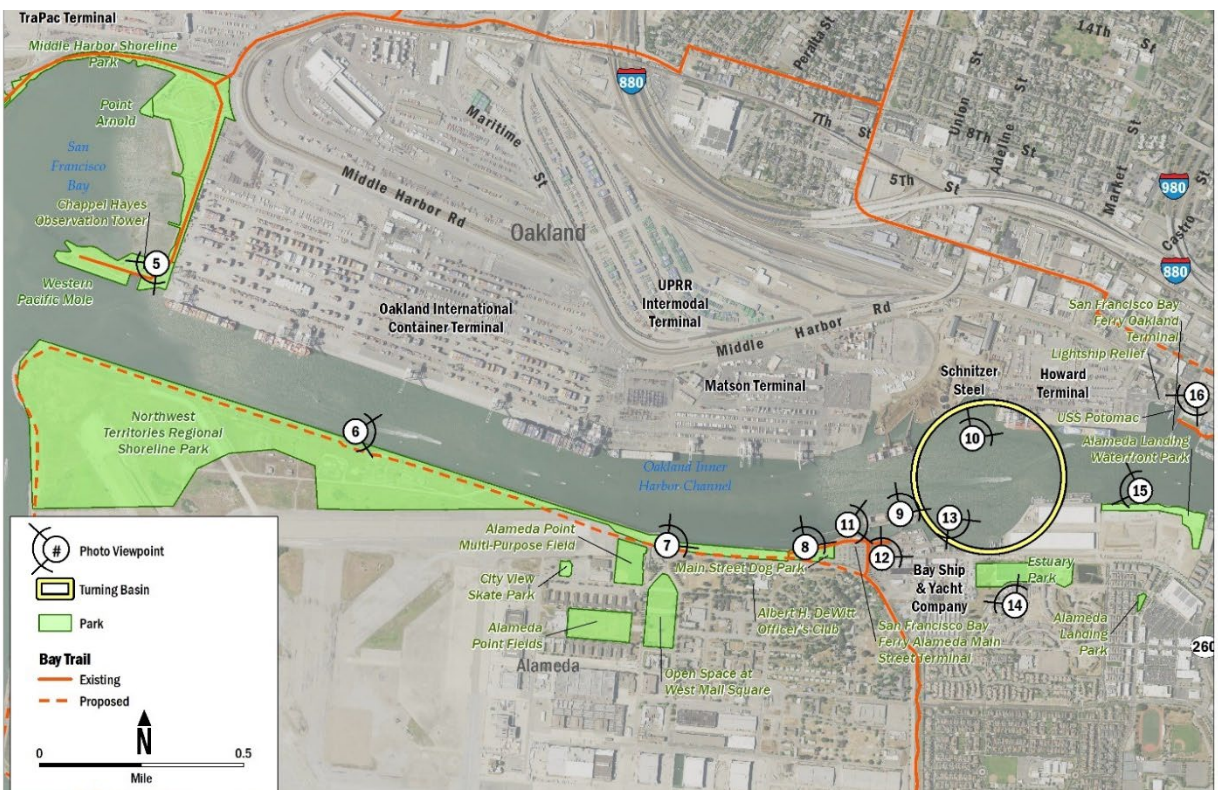


Figure 10: Key Observation Points and Parks, Inner Harbor Turning Basin Study Area

3.8.1 Regulatory Setting

Coastal Zone Management Act (16 U.S.C. § 1451 et seq.) (see section 3.4.1)

The Bay Plan includes policies for managing Bay resource appearance, design, and scenic views to avoid visual impacts and promote scenic views. Additionally, the Bay Plan's public access policies include policies related to public visual access to the Bay.

3.8.2 Existing Visual Character

The viewsheds in the immediate area of the turning basins are characterized by an industrial waterfront. Although limited scenic features are observed from some viewpoints, such as views of the channel waterways and San Francisco Bay, City of Oakland skyline, and San Leandro Hills, the viewsheds at the turning basins are generally dominated by cranes, container storage, warehouses, and docked cargo ships. The Port of Oakland white container cranes that line the Seaport shoreline are a notable scenic feature in the Oakland skyline; however, they can be viewed from various vantage points and are not unique to the viewsheds afforded from or specifically toward the project sites. Nearby locations such as Middle Harbor Shoreline Park, Port View Park, and the southwestern Alameda shoreline provide expansive and unobstructed high-quality views of the Bay, surrounding hills, and San Francisco skyline. Therefore, the viewsheds associated with the turning basin project sites are relatively low in quality and value compared to other viewsheds in the vicinity.

Outer Harbor Channel and Turning Basin

There are two major active marine terminals along the Outer Harbor, with one of them adjacent to the Outer Harbor Turning Basin. The Outer Harbor include 17 berths for large ships, mechanized cranes, container storage areas, and large paved parking lots for employees. The large ocean-going cargo vessels that dock at these terminals, along with the berths, cranes, container storage, and nearby warehouses give the area a distinct industrial waterfront visual character (see photographs from viewpoints 1-3 (Figure 11 through Figure 13, below). The elevated Bay Bridge East Span including the pedestrian path (also known as the Alexander Zuckerman Bay Bridge Trail) provides expansive views to the east of this industrial waterfront visual character at the Outer Harbor (including the Turning Basin) and the Inner Harbor entrance for millions of motorists yearly, as well as recreationists. Floodlighting on high-mast structures is present for operations and security and is visible at night throughout the immediate Bay Area.

Figure 11: Viewpoint 1

View of the Outer Harbor Turning Basin and Port Marine Terminals from the Bay Bridge and Bay Bridge Trail, looking east. Source: Google Earth 2021

Figure 12: Viewpoint 2

View of the Outer Harbor Turning Basin and Port Marine Terminals from the Judge John Sutter Shoreline Park (Gateway Park) entrance, looking south. Source: Google Earth 2021

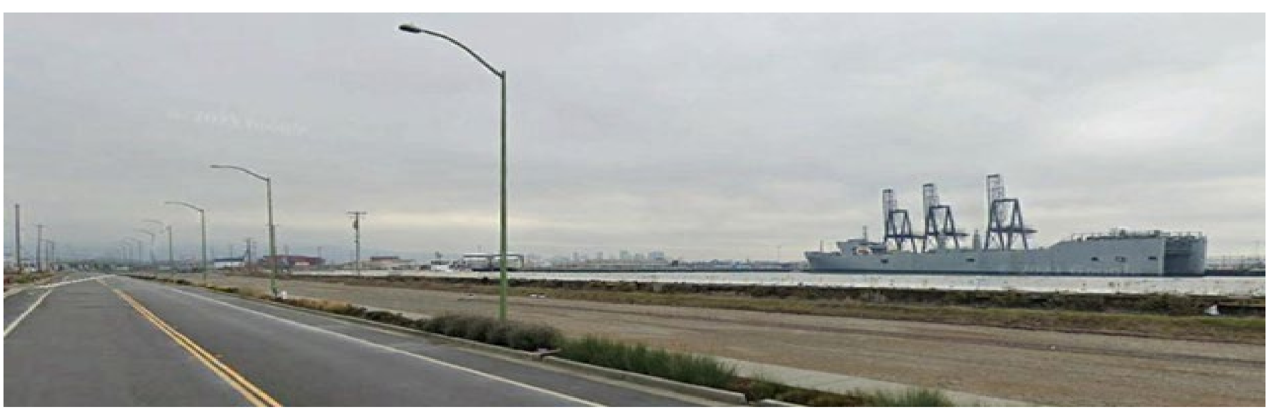


Figure 13: Viewpoint 3

View of tugboats at Berths 8/9, Berth 10, and the Outer Harbor and Marine Terminals from the Judge John Sutter Shoreline Park Bridge Yard Building and Observation Deck at Burma Road, looking east. Source: Google Earth 2021

On the northwestern side of the Outer Harbor, the 22.5-acre Judge John Sutter Shoreline Park (Gateway Park) has been developed between the Oakland Harbor and I-80. There is a pedestrian observation pier, constructed by Caltrans, at the western end of the park that provides expansive views of the Bay Bridge, the San Francisco skyline to the west, and the Outer Harbor (including the Turning Basin) to the south and east. The Bay Trail is immediately adjacent to and north of the Judge John Sutter Shoreline Park, and the shoreline in this area is flat, so park visitors and recreationists on the Bay Trail have expansive views to the south of the Outer Harbor and the associated ships and cranes. The Park includes the historic Bridge Yard Building, which is available for event rentals, and has an associated elevated viewing platform with views to the northeast of Berth 10, and views to the southwest of the Outer Harbor Turning Basin.

The area around Berth 10 is heavy industrial in nature, consisting of international shipping containers, dredged material stockpiles, industrial buildings and warehouses, metal fencing, paved roadways, construction equipment, gravel equipment yards, truck parking, and high-mast light standards (Figure 14).

Figure 14: Viewpoint 4

View of cargo containers, dredged materials at Berth 10, and the Outer Harbor Marine Terminals from the Bay Trail/Burma Road, looking south. Source: Google Earth 2021

Inner Harbor Channel and Turning Basin

The Inner Harbor is bordered to the north by the Port (in the City of Oakland) and to the south by the City of Alameda. The Port's Middle Harbor is located between the western entrance to the Inner Harbor and the Ben E. Nutter Terminal. Middle Harbor includes Port View Park and Middle Harbor Shoreline Park (MHSP). The Western Pacific Mole, located within MHSP, includes the Chappel Hayes observation tower, which provides scenic views of the surrounding landscape, including the Inner Harbor, the Oakland International Container Terminal, the City of Alameda, the Oakland Hills, San Francisco Skyline, and the Coast Ranges to the southwest. Port View Park includes a fishing and observation pier, which provides a vantage point similar to the observation tower, but from a lower elevation (Figure 15).

Figure 15: Viewpoint 5
View of the Entrance to Inner Harbor, San Francisco Skyline, and Chappel Hayes Observation Tower, from Middle Harbor Shoreline Park, looking southwest. Source: Google Earth 2021

Port facilities at the western end of the Inner Harbor include two marine terminals and views are characterized by similar industrial waterfront visual character as the outer harbor. The southern side of this portion of the Inner Harbor includes the former NAS Alameda, which is planned and approved for redevelopment as the Northwest Territories Regional Shoreline Park—a 158-acre open space that will include an extension of the San Francisco Bay Trail and benches for seated viewing opportunities. The Inner Harbor Turning Basin is not visible from the planned park or the planned extension of the Bay Trail in this area (Figure 16). Similar views consisting of typical maritime industrial activities associated with the Port along the inner harbor channel from NAS Alameda and Alameda's Main Street are included as viewpoints 7 and 8 in Appendix A9.

Figure 16: Viewpoint 6
View of Inner Harbor Channel and the planned Northwest Territories Regional Shoreline Park, from the Inner Harbor Channel, looking east. Source: Google Earth 2014

Views of the northern portion of the Inner Harbor Turning Basin are primarily heavy industrial in nature and associated with maritime operations. Schnitzer Steel owns an approximately 29-acre property that abuts the northwestern side of the existing Inner Harbor Turning Basin and includes a large, black, wharf affixed crane near the shoreline (Figure 17). The western edge of the Howard Terminal abuts the northeastern side of the Inner Harbor Turning Basin (Figure 18).

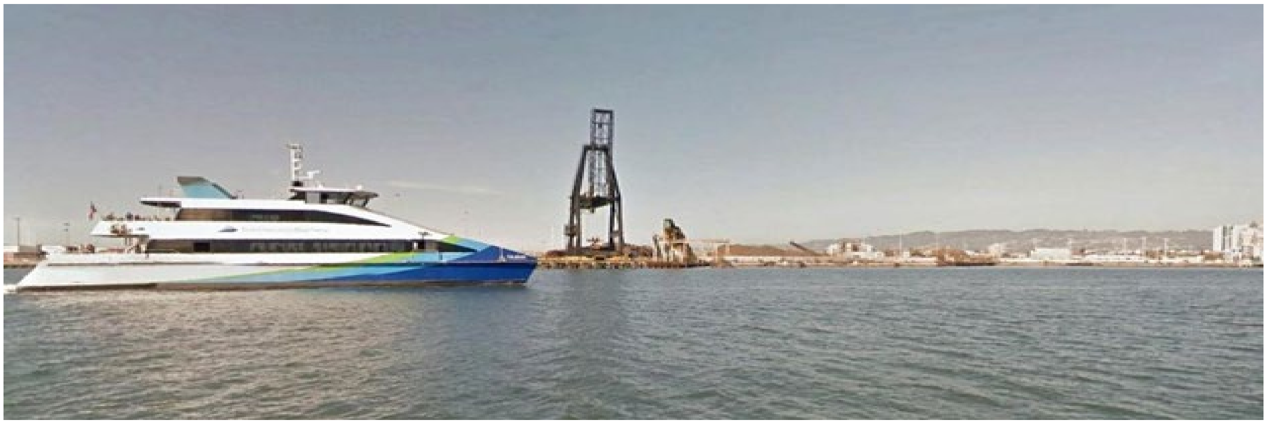


Figure 17: Viewpoint 9

View of Schnitzer Steel Facility with black mechanized crane, northwestern corner of Inner Harbor Turning Basin from the Inner Harbor Channel, looking north. Source: Google Earth 2014

Figure 18: Viewpoint 10

View of northeastern Inner Harbor Turning Basin, Howard Terminal from the Inner Harbor Channel, looking northeast. Source: Google Earth 2014

The southwestern side of the Inner Harbor Turning Basin is also dominated by views of heavy industrial maritime shipbuilding operations, equipment, and warehouses. These views are exemplified by Viewpoints 11, 12, 13, and 15 in Appendix A9 from the San Francisco Bay Alameda Ferry Terminal, the Bay Trail at Bay Ship & Yacht Company, and planned Alameda Landing Waterfront Park location. The City of Alameda's Estuary Park, created in 2017, is adjacent to and south of the maritime industrial operations. The northwestern corner of the park includes a limited view (partially blocked by vegetation, warehouses, and berthed boats) into the Inner Harbor Turning Basin (Viewpoint 14 in Appendix A9). Outside the project area to the northeast are the San Francisco Bay Ferry Oakland Terminal and Jack London Square (a pedestrian-oriented mixed-use office, retail, and entertainment area). Boardwalks along the shore, waterfront restaurants, and a hotel provide opportunities for panoramic views of the working maritime industrial visual character of the Inner Harbor and the opposite shore. From upper-story levels, the area provides westward views of the Inner Harbor Channel, Inner Harbor Turning Basin, and the Port; ground-level views are blocked or dominated by the Howard Terminal (Figure 19).

Figure 19: Viewpoint 16
View of the southern side of the Inner Harbor Turning Basin from the Public Plaza at the San Francisco Bay Oakland Ferry Terminal and Historic Ship Dock, looking southwest. Source: Google Earth 2019

3.9 Recreation

3.9.1 Regulatory Setting

Coastal Zone Management Act (16 U.S.C. § 1451 et seq.) (see section 3.4.1)

The Bay Plan includes policies for management of Bay resources designed to promote water-oriented recreation facilities such as marinas, launch ramps, beaches, and fishing piers, in addition to landside parks along the shoreline.

3.9.2 Recreation Resources and Activities

Recreational resources in the study area vicinity include public parks and open spaces; pedestrian and bicycle trails; playfields; fishing and observational piers; and water-oriented recreational activities, including fishing, boating, and two historic ship museums that are open for public viewing. On-street bicycle routes are considered transportation facilities and therefore are not considered recreational facilities for the purposes of this analysis.

Recreational activities in the study area consist of boating and fishing in the Outer and Inner Harbors, walking and bicycling along portions of the Bay Trail, and a variety of activities at several existing and planned landside public parks in Oakland and Alameda. These activities and recreational facilities are described in further detail below. The names and locations of recreational resources considered in this analysis are shown in Figure 9 and Figure 10.

Boating and Fishing

Recreational boating for privately owned pleasure craft is available throughout the Inner and Outer Harbor Turning Basins. The San Francisco Bay Water Trail was created to promote recreational boating access throughout the Bay, including these study areas. Approximately 0.5 mile east of the Inner Harbor Turning Basin, there are numerous private marinas with boat docks on both sides of the Oakland Estuary, particularly the Jack London Square area in Oakland and the Mariner Square Drive area in Alameda. Recreational boating and sightseeing are also available in the form of ferry trips through the Inner Harbor and across the Bay from the San Francisco Bay Ferry terminals at the Oakland Terminal and the Alameda Main Street Terminal.

The USS Potomac, former President Roosevelt's presidential yacht, is moored in the Inner Harbor at Jack London Square, approximately 0.3 mile northeast of the Inner Harbor Turning Basin. The ship is open to the public for tours and cruises in the Bay. The Lightship Relief, which served as a lighthouse station to aid maritime navigation along the coast of Delaware and in California at Cape Mendocino, is moored in the Inner Harbor at Jack London Square next to the USS Potomac. The ship is open to the public for tours on weekends.

Fishing boats may not stop or anchor within the federal navigation channel or turning basins to fish. Landside recreational fishing is available from the pier in the Judge John Sutter Shoreline Park (Outer Harbor); from Point Arnold, the Western Pacific Mole, and the fishing pier in the Middle Harbor Park Complex (Inner Harbor); and from the area around the Main Street Dog Park and near the Alameda Ferry Terminal (Inner Harbor). Fish species commonly reported by recreational fisherman in the area include jacksmelt, perch, rays, small sharks, rockfish, and striped bass (among others).

San Francisco Bay Trail

In the City of Oakland, portions of the Bay Trail have been constructed across the San Francisco-Oakland Bay Bridge, along the Judge John Sutter Regional Shoreline Park, along Burma Road and Maritime Street, and in the Middle Harbor Shoreline Park complex. A portion of the Bay Trail has been constructed along the Main Street Dog Park to the Main Street Alameda Ferry Terminal, immediately adjacent to the Inner Harbor Channel, and from the Alameda Ferry Terminal to the western end of the Bay Ship & Yacht Company. The Bay Trail provides walking and bicycling opportunities, as well as scenic viewing and birdwatching.

Landside Public Parks

Several public parks in Oakland and Alameda are either fully constructed and operational, or planned and approved, in the vicinity of the study area. Table 13 describes the size, recreational amenities provided, and distance of the landside public parks from features in the study area.

Table 13: Public Parks in the Project Area

Resource Name	Amenities	Size	Approximate Distance from Study Area	Nearest Feature
Oakland				
Judge John Sutter Regional Shoreline Park (Gateway Park)	Observation and fishing pier, Bridge Yard Building and Observation Deck (available for special events), walking path, restrooms, and day use parking for the Alexander Zuckerman Bay Bridge Trail	22.5 acre	0.35 mile	Outer Harbor Turning Basin
			0.35 mile	Berth 10 Staging Area
Middle Harbor Shoreline Park Complex (Port View Park, Point Arnold, Western Pacific Mole)	Surrounds the Middle Harbor Basin. Includes pedestrian/bicycle paths, open space, beach, fishing pier, amphitheater, Chappel Hayes Observation Tower, historical exhibits, benches, viewing telescopes, restrooms and water fountains, picnic tables, children's play structure, and parking	45 acres	0.25 to 0.75 mile	Outer Harbor Turning Basin
Alameda				
Alameda Point Fields	Soccer fields	6.5 acres	0.75 mile	Inner Harbor Turning Basin
City View Skate Park	Skate park, picnic tables, water fountains, and parking	1.5 acres	0.8 mile	Inner Harbor Turning Basin
Alameda Point Multi-Purpose Field	Multi-purpose athletic field and restrooms	4.6 acres	0.70 mile	Inner Harbor Turning Basin
Open Space at West Mall Square (former Parade Grounds)	Open space with walking paths; Douglas A-4 Skyhawk Display	7.5 acres	0.64 mile	Inner Harbor Turning Basin
Northwest Territories Regional Shoreline Park (Planned and Approved)	Open space, wildlife preserve, walking and bicycle paths (Bay Trail), viewing and seating areas, restrooms, drinking foundations, and parking	158 acres	0.37 mile	Inner Harbor Turning Basin
Albert H. DeWitt Officer's Club	Former Naval Officer's Club now available for event rentals	2.0 acres	0.37 mile	Inner Harbor Turning Basin
Main Street Dog Park	Fenced grass dog park, picnic tables, and parking	1.5 acres	0.36 mile	Inner Harbor Turning Basin
Estuary Park	Baseball/softball field, soccer field, wetland area, grassy open space, and walking path (additional amenities are planned)	12.5 acres	60 feet	Inner Harbor Turning Basin and Alameda Staging Area
Alameda Landing Waterfront Park (Planned and Approved)	Reuse of existing historic wharf as public park with landscaped promenade, plaza, greenspace, dock, kayak launch, fitness area, children's play area, picnic tables, Bay Trail, and parking	5.4 acres	375 feet	Inner Harbor Turning Basin
Alameda Landing Park	Walking path, benches, picnic tables, grassy open space, and landscaping	0.75 acre	0.32 mile	Inner Harbor Turning Basin

Source: Data Compiled by AECOM in 2021

3.10 Navigation and Transportation

3.10.1 Regulatory Setting

United States Coast Guard

Under 14 United States Code (U.S.C.) and 33 U.S.C., and other portions of the Code of Federal Regulations (C.F.R.), the United States Coast Guard (USCG) has authority for maritime law enforcement on the navigable waters of the United States, as well as responsibilities for search and rescue. Inland Waters Navigation Regulations (33 C.F.R. Part 162) identifies regulations for navigation by both commercial and noncommercial vessels.

Inland Navigational Rules Act of 1980

The Inland Navigational Rules Act of 1980 (Pub. L. 96-591, 94 Stat. 3415, 33 C.F.R. Part 83), more commonly known as the Inland Rules, governs many rivers, lakes, harbors, and inland waterways. The International Regulations for Preventing Collision at Sea have also been incorporated into federal law (Pub. L. 95-75, 91 Stat. 308, 33 U.S.C. § 1601 *et seq.*). Together, these regulations (known as the Rules of the Road) govern open bodies of water to promote navigational safety, including requirements for steering and sailing practices, navigation lights and day-shapes, and sound signals for both good and restricted visibility.

Regulated Navigation Areas

The USCG has established regulated navigation areas (RNAs) in the San Francisco Bay region to reduce vessel congestion where maneuvering room is limited. These RNAs increase navigational safety by organizing traffic flow patterns; reducing meeting, crossing, and overtaking situations between large vessels in constricted channels; and limiting vessel speed. The RNAs apply to all large vessels (defined as any power-driven vessels of 1,600 or more gross tons, or tugs with a tow of 1,600 or more gross tons).

Ports and Waterways Safety Act of 1972

The Ports and Waterways Safety Act of 1972 (33 U.S.C. § 1221) authorized the USCG to establish, operate, and maintain vessel traffic services for ports, harbors, and other waters subject to congested vessel traffic. As a result, in 1972, the USCG established the Vessel Traffic Service (VTS) for San Francisco Bay, and designated traffic lanes for inbound and outbound vessel traffic, specified separation zones between vessel traffic lanes, and set up rules to govern vessels entering and leaving ports. The VTS, which is on Yerba Buena Island, controls marine traffic throughout the San Francisco Bay Area. Although some small and private vessels are not required to coordinate their movements by contacting the VTS, the USCG monitors all commercial, United States Navy, and private marine traffic in San Francisco Bay and local coastal waters.

America's Marine Highway Program

The Marine Highway Program was established by Section 1121 of the Energy Independence and Security Act of 2007 to reduce landside congestion through the designation of Marine Highway Routes. Section 405 of the Coast Guard and Maritime Transportation Act of 2012 further expanded the scope of the program beyond reducing landside congestion to efforts that generate public benefits by increasing the use or efficiency of domestic freight or passenger transportation on Marine Highway Routes between ports in the United States. The study area includes the Marine Highway 580 Connector, a spur of Marine Highway 5, which serves the entire West Coast. Marine Highway 580 begins in Oakland, California, includes the San Joaquin and Sacramento Rivers, and connects commercial navigation channels, ports, and harbors in Central California.

3.10.2 Land-Based Transportation

This section describes the existing land-based transportation network in the study area, including roadways, transit service, bicycle facilities, pedestrian facilities, freight rail facilities, and emergency access. Figure 20 and Figure 21 show the Inner Harbor and Outer Harbor tuning basin study areas (respectively) with roadways, freight way facilities, and navigation facilities in the vicinity.

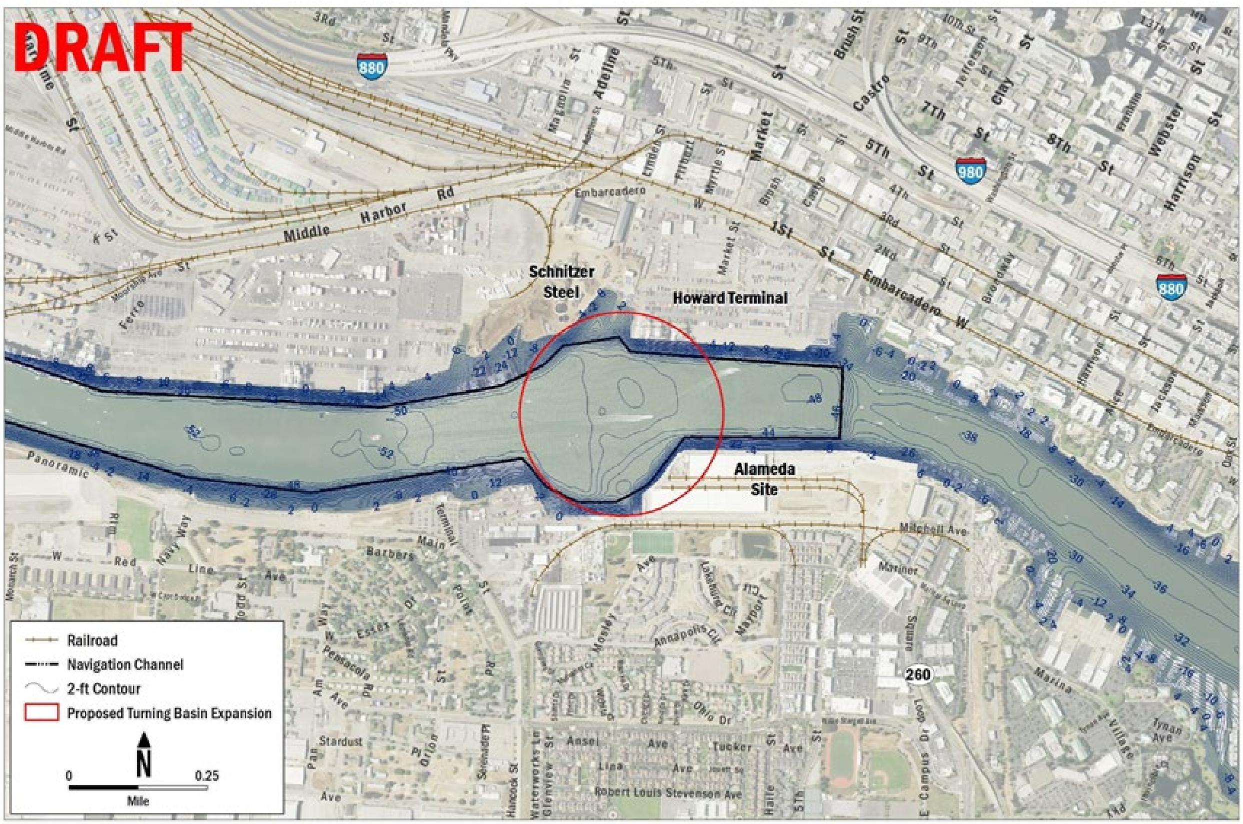


Figure 20: Transportation and navigation facilities around the Inner Harbor Turning Basin

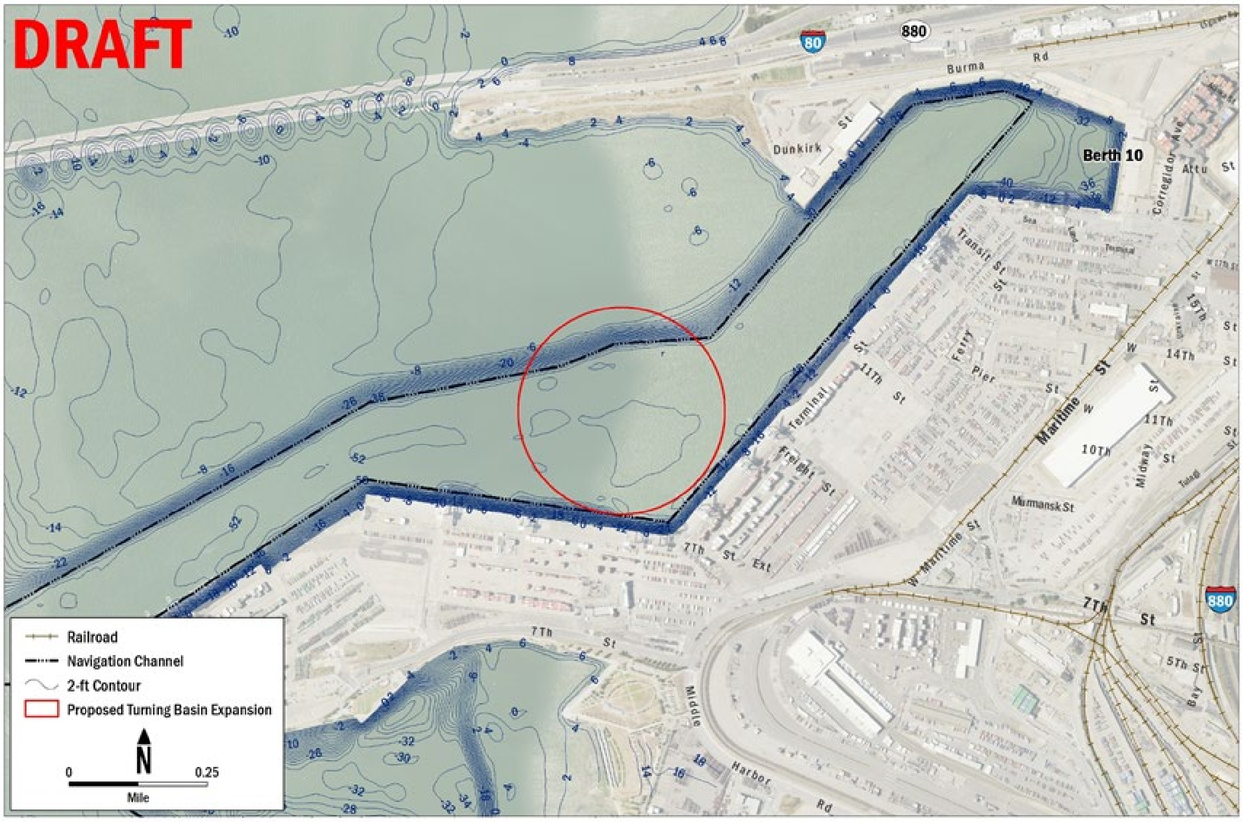


Figure 21: Transportation and navigation facilities around the Outer Harbor Turning Basin

Roadways

Regional Roadways

Primary regional access to the study area is provided by Interstate 880 (I-880), an auxiliary Interstate Highway connecting Interstate 80 and Interstate 580 in Oakland (near the Emeryville border) with Interstate 280 in San Jose Through the study area, I-880 generally follows a northwest-southeast orientation, with at least three travel lanes in each direction. I-880 provides the primary freeway access for the Port's maritime facilities, including the container terminals and intermodal yards, and generally serves as the dividing line between the industrial and residential areas of West Oakland. In the case of I-880 between the Adeline Street/Union Street interchange and the Interstate 980 junction, average daily traffic levels are on the order of 124,000 vehicles per day.

Local Roadways

Local roadways in the vicinity of the Inner and Outer Harbor study areas are briefly described below. Roadway classifications are as defined by the relevant local jurisdiction (City of Oakland 2021a; City of Alameda 2020). In general, existing average daily traffic levels for most of these local roadway segments are on the order of 5,000–10,000 vehicles or more daily. Roadways closer to the study areas are primarily used for Port-related traffic, such as Market Street south of

3rd Street and Maritime Street south of Burma Street, and existing average daily traffic on these streets is less than 5,000 vehicles daily. Existing average daily traffic levels on all these roadways are below—in some cases, well below—the existing capacity of the roadways. Conversely, existing average daily traffic levels through the Webster and Posey tubes is on the order of 66,500 vehicles daily (Caltrans 2021). Local streets that would likely be used as truck routes are identified in the "Truck Routes" section immediately following this section. The capacity and existing average daily traffic for truck route segments is identified in detail in section 6.10 .

Local roadway access for the Oakland (i.e., northern) side of the Inner Harbor Turning Basin is generally provided by the following streets:

- **Adeline Street** is oriented north-south and connects South Berkeley with West Oakland (where it continues into the Port as Middle Harbor Road, a non-public roadway). In the study area, Adeline Street is classified as a Principal Arterial and accommodates two travel lanes in each direction.
- **Market Street** is oriented north-south and connects North Oakland (where it diverges from Sacramento Street near Alcatraz Avenue) with West Oakland (where it terminates at the main access for Howard Terminal at Embarcadero West). In the study area, Market Street is classified as a Local Street south of 3rd Street, and as a Minor Arterial north of 3rd Street. It generally accommodates two travel lanes in each direction, although the portion between 3rd Street and Embarcadero West through the at-grade crossing with the Union Pacific Railroad (UPRR) Niles Subdivision is striped with three travel lanes in the southbound direction and one travel lane in the northbound direction.
- **Martin Luther King Jr. Way** is oriented north-south and connects Uptown at San Pablo Avenue[1] with Howard Terminal. In the study area, Martin Luther King Jr. Way is classified as a Local Street south of Embarcadero West and as a Minor Arterial north of Embarcadero West. It accommodates and two travel lanes in each direction.
- **Embarcadero West** is oriented east-west and extends from the Schnitzer Steel facility (immediately west of Howard Terminal) to Oak Street, where it continues across the Lake Merritt Channel into the Brooklyn Basin and East Peralta neighborhoods as Embarcadero. In the study area, Embarcadero West is classified as a Local Street west of Martin Luther King Jr. Way and as a Collector east of Martin Luther King Jr. Way. It functions as a frontage road for properties on either side of the UPRR Niles Subdivision through the Jack London Square area, and generally accommodates one travel lane in each direction. West of Martin Luther King Jr. Way, both travel lanes are provided along the southern side of the railroad tracks; east of Jefferson Street, the westbound travel lane is shifted to the northern side of the tracks.
- **3rd Street** is oriented east-west and connects West Oakland (where it begins as a continuation of Mandela Parkway) and the Jack London Square area (where it terminates at Oak Street). In the study area, 3rd Street is classified as a Local Street between Mandela Parkway and Magnolia Street, as a Collector between Magnolia Street and Market Street, and as a Minor Arterial east of Market Street. It generally accommodates one travel lane in each direction and includes a Class II bikeway (on-street bicycle lane) in each direction west of Brush Street. 3rd Street also serves as part of a dedicated and

approved heavy container transit permit corridor.

- **5th Street** is oriented east-west and connects West Oakland (where it begins at Peralta Street) and the Jack London Square area (where it terminates in a dead-end just east of Franklin Street near the north portal of the Webster Tube). In the study area, 5th Street is classified as a Local Street west of Market Street, as a Minor Arterial between Market Street and Broadway, and as a Local Street east of Broadway. West of Market Street, 5th Street generally accommodates two travel lanes in each direction; east of Market Street, it becomes an eastbound-only roadway, generally with three travel lanes. The portion between Adeline Street and Market Street is designed as two travel lanes on the northern side, separated from a one-lane "frontage road" on the southern side by structural supports for the San Francisco Bay Area Rapid Transit (BART) aerial guideway.

Local roadway access for the Alameda (i.e., southern) side of the Inner Harbor Turning Basin include the following roadways:

- **Webster and Posey Tubes** are separate (i.e., one-way) underwater tunnels connecting Alameda with Oakland. The Webster Tube runs in the southbound direction, with entrances from the 5th Street/Broadway and 7th Street/Webster Street intersections in Oakland and exits to the Webster Street/Willie Stargell Avenue and Constitution Way/ Marina Village Parkway intersections in Alameda. The Posey Tube runs in the northbound direction, with entrances from the Webster Street/Willie Stargell Avenue and Constitution Way/Mariner Square Drive intersections in Alameda and an exit to the 7th Street/Harrison Street intersection in Oakland. Each tube accommodates two lanes. Currently, the Webster and Posey Tubes are temporarily closed to vehicles with three or more axles for maintenance work for up to five years, reopening to these vehicles by approximately 2026.
- **Willie Stargell Avenue** is oriented east-west and connects Webster Street with Main Street, where it continues west into Alameda Point as West Midway Avenue. Stargell Avenue is classified as an Island Arterial, and it generally accommodates two lanes in each direction east of 5th Street and one lane in each direction west of 5th Street. A Class II bikeway (on-street bicycle lane) is also provided in each direction east of 5th Street, transitioning to Class III bikeways (shared lanes with sharrow markings) west of 5th Street.
- **5th Street** is oriented north-south and connects Mitchell Avenue with Ralph Appezzato Memorial Parkway. North of Stargell Avenue, 5th Street is classified as an Island Arterial and generally accommodates one travel lane in each direction. South of Stargell Avenue, 5th Street is classified as an Island Collector and generally accommodates two travel lanes in each direction. A Class II bikeway (on-street bicycle lane) is also provided in each direction of 5th Street.
- **Mitchell Avenue** is oriented east-west and connects Bette Street with Mariner Square Drive, where it continues east as Marina Village Parkway. At Bette Street, a short cul-de-sac provides access to the project's Alameda site. Mitchell Avenue is classified as an Island Arterial and generally accommodates one travel lane and a Class II bikeway (on-street bicycle lane) in each direction.

- **Webster Street** is oriented north south and connects the Webster / Posey Tubes with Central Avenue. Webster Street is classified as a Regional Arterial and generally accommodates three lanes in each direction north of Ralph Appezzato Memorial Parkway and two lanes in each direction south of Ralph Appezzato Memorial Parkway. The outermost lane in the northbound direction between Willie Stargell Avenue and Ralph Appezzato Memorial Parkway is signed and striped as a bus-only lane at all times. Webster Street and the Webster / Posey Tubes are formally designated as part of State Route 260.
- **Ralph Appezzato Memorial Parkway** is oriented east–west and connects Ferry Point within the former Naval Air Station (NAS) Alameda with Webster Street, where it continues east as Atlantic Avenue. Ralph Appezzato Memorial Parkway is classified as an Island Arterial west of Main Street and a Regional Arterial east of Main Street. It generally accommodates two travel lanes in each direction.
- **Main Street** is generally oriented north–south and connects Navy Way within the former NAS Alameda with Pacific Avenue and Central Avenue. Main Street generally features one travel lane and one Class II bikeway (on-street bicycle lane) in each direction, with a two-way center left-turn lane. Near the Alameda Main Street Ferry Terminal, however, the cross-section transitions to two travel lanes in each direction with no dedicated bikeway facilities, which continues west to the terminus at Navy Way. including Webster street, Ralph Appezzato Memorial Parkway, and Main Street.

Local roadway access to the Outer Harbor, including Berth 10, is provided by the following streets:

- **Maritime Street** is oriented north-south and connects West Grand Avenue (where it continues north as Wake Avenue to Engineer Road) with Middle Harbor Road. Maritime Street is classified as a Minor Arterial and generally accommodates two travel lanes in each direction, with a two-way center left-turn lane. Maritime Street is one of the primary thoroughfares through the Port’s maritime facilities, in conjunction with 7th Street/ Middle Harbor Road. Berth 10 is accessed from Maritime Street via 17th Street.
- **West Grand Avenue** is oriented east-west and connects Maritime Street/Wake Avenue in West Oakland with Broadway in Uptown, where it continues as Grand Avenue. In the study area, West Grand Avenue is classified as a Principal Arterial and generally accommodates two travel lanes in each direction.
- **7th Street** is oriented east-west and extends from the Port’s Ben E. Nutter Terminal to Downtown Oakland, continuing east across the Lake Merritt Channel as East 8th Street. In the study area, 7th Street is classified as a Minor Arterial east of Maritime Street and as a Collector west of Maritime Street. In the study area, 7th Street accommodates two to three travel lanes in each direction.

Local Truck Routes

Both the City of Oakland and the City of Alameda have designated several local streets as “local truck routes” for use by commercial trucks. In Alameda the routes are governed by the City of Alameda General Plan’s Transportation Element, which includes designated truck routes (City of

Alameda n.d.) designed to maintain a limited number of streets on which through truck traffic is allowed. Truck traffic is allowed to use non-truck route streets when it is necessary to reach a destination. In Oakland, local truck routes are identified in the Oakland Municipal Code and City of Oakland truck route map. Relevant truck routes are described below; the capacity and existing average daily traffic for truck route segments is identified in detail in Table 45 in Section 6.10 .

City of Oakland local truck routes in the Inner Harbor Turning Basin study area include the following roadways:

- 3rd Street between Market Street and Adeline Street
- 5th Street between Union Street and Broadway
- 6th Street between Brush Street and Adeline Street
- 7th Street between Wood Street and the Ben E. Nutter Terminal in the Port of Oakland
- Adeline Street south of 8th Street
- Castro Street between 7th Street and 12th Street
- Market Street between Howard Terminal and 7th Street

City of Alameda truck routes in the Inner Harbor Turning Basin study area include the following roadways (City of Alameda 2009):

- Webster and Posey Tubes
- Marina Village Parkway
- Constitution Way north of Atlantic Avenue
- Atlantic Avenue/Ralph Appezzato Memorial Parkway
- Main Street

City of Oakland truck routes in the Outer Harbor study area include the following roadways:

- Maritime Street between 7th Street and West Grand Avenue
- West Grand Avenue between Maritime Street and Northgate Avenue
- 7th Street west of Wood Street

Public Transit Services

Local bus service in Oakland and Alameda is provided by the Alameda–Contra Costa Transit District. High-frequency local and regional rail service is provided by BART (with the closest stations at West Oakland, 12th Street/Oakland City Center, Lake Merritt, and MacArthur), supplemented by less-frequent regional and intercity mainline rail services on the Amtrak *Capitol Corridor* and *San Joaquin*, with the closest stations at Oakland (Jack London Square) and Emeryville.

There are no existing transit services in the immediate vicinity of the Oakland/northern side of the Inner Harbor Turning Basin.

The 72, 72M, and 72R bus lines are the closest services, operating on Broadway through Downtown Oakland and following a clockwise loop via 3rd Street, Clay Street, and 2nd Street to a terminus at 2nd Street/Washington Street, the closest stop to the Oakland Inner Harbor Turning

Basin sites. The 12 also operates along Broadway, but continues to Embarcadero West, Webster Street, and 2nd Street to/from Amtrak's Oakland (Jack London Square) station. The 62 operates along the 7th Street/8th Street couplet, with the closest stops at 7th Street/Market Street, 7th Street/Jefferson Street (eastbound only), and 8th Street/Jefferson Street (westbound only).

For the Alameda/southern side of the Inner Harbor Turning Basin, the closest bus service is the 96 (Alameda Point – 14th Avenue – Dimond), which operates along Mitchell Avenue and 5th Street. The closest stops are at 5th Street/Singleton Avenue, 5th Street/Mitchell Avenue (northbound only), and 5th Street/Diller Street (southbound only). The 19 (Buena Vista – Fruitvale) also operates along Marina Village Parkway in the vicinity of the Alameda site, with the closest stops at Marina Village Parkway/Mariner Square Loop (eastbound only) and Marina Village Parkway/Mariner Square Drive.

There are no existing transit services in the immediate vicinity of the Outer Harbor. The closest bus service is the NL (MacArthur Transbay Limited), which runs along West Grand Avenue, 1.5 miles away. The closest NL stops to the Outer Harbor are 1.75 miles away along West Grand Avenue at Mandela Parkway.

Bicycle Facilities

Bikeway Network

There are existing and planned bikeways in the vicinity of the inner and outer harbor turning basins. Nearby existing and proposed bikeways in the vicinity of the Inner Harbor Turning Basin are summarized in Table 14 for Oakland and in Table 15 for Alameda. Nearby existing and proposed bikeways in the vicinity of the Outer Harbor are summarized in Table 16.

Bikeway facilities are classified based on their level of separation from vehicle traffic:

- **Class I facilities (bicycle paths)** are off-street paved paths completely separated from vehicle traffic, often designed for shared use between bicyclists and pedestrians.
- **Class II facilities (bicycle lanes)** are on-street facilities designated specifically for bicyclists using pavement markings (striping and stencils). Some Class II facilities (referred to as Class IIB) offer an added level of protection through use of a buffer zone between bicyclists and vehicle traffic.
- **Class III facilities (bicycle routes)** are lanes shared with vehicle traffic, usually denoted by signage or pavement markings.
- **Class IV facilities (separated bicycle lanes or "cycle tracks")** are on-street bicycle lanes separated from motorized traffic through grade separation, flexible posts, inflexibly physical barriers, on-street parking, or other means.

In addition to bikeway facilities, the Bay Wheels bikeshare program provides a public bikeshare program for the inner East Bay in the vicinity of the Inner Harbor. The closest bikeshare stations for the Oakland Inner Harbor are at Jack London Square (Clay Street south of Embarcadero West), Webster Street/2nd Street, and Market Street/8th Street. There are no Bay Wheels bikeshare stations in the City of Alameda or the vicinity of the Outer Harbor.

Table 14: Bikeway Network – Inner Harbor Turning Basin (Oakland Sites)

Bikeway Class	**Oakland Routes** – *Italics* denotes a proposed route
Class I (bike path)	• Bay Trail: Water Street/Clay Street to Estuary Park • *Bay Trail: Water Street/Clay Street to Embarcadero West/Filbert* • *Howard Terminal portions of Bay Trail (proposed as part of the proposed Oakland A's Waterfront Ballpark District Project)* • *Water Street: Martin Luther King Jr. Way to Clay Street* • *Brush Street: 2nd Street to Embarcadero West* • *Clay Street: Embarcadero West to waterfront* • *Washington Street: Embarcadero West to waterfront*
Class II (bike lane)	• Brush Street: 3rd Street to 2nd Street • 2nd Street: East of Brush Street • Market Street: North of 3rd Street • Clay Street: Embarcadero West to Water Street • Washington Street: North of 3rd Street • *Clay Street: 3rd Street to 2nd Street* • *Washington Street: 2nd Street to Embarcadero West*
Class IIB (buffered bike lane)	• 3rd Street: Brush Street to Mandela Parkway/5th Street • Clay Street: 2nd Street to Embarcadero West • *Broadway: 6th Street to Embarcadero West*
Class III (bike route)	• Martin Luther King Jr. Way: North of Embarcadero West
Class IV (cycle track)	• *Market Street: North of Embarcadero West* • *Martin Luther King Jr. Way: North of Embarcadero West* • *3rd Street: Market Street to Oak Street*

Source: City of Oakland 2021b

Table 15: Bikeway Network – Inner Harbor Turning Basin (Alameda Site)

Bikeway Class	**Alameda Routes** – *Italics* denotes a proposed route
Class I (bike path)	• Posey Tube (substandard) • Mariner Square Drive: Mitchell Avenue/Marina Village Parkway to Atlantic Avenue • *Bay Trail: Mariner Square Marina to Alameda Main Street Ferry Terminal*
Class II (bike lane)	• Mitchell Avenue: East of Bette Street • Marina Village Parkway • 5th Street/East Campus Drive: South of Mitchell Avenue • Mariner Square Loop: South of Mitchell Avenue • Singleton Avenue: 5th Street to Annapolis Circle • Willie Stargell Avenue: Webster Street to 5th Street • Mitchell Avenue: Bette Street to Main Street • 5th Street: Mitchell Avenue to waterfront • Willie Stargell Avenue: West of 5th Street
Class III (bike route)	• Willie Stargell Avenue: West of 5th Street

Source: Bike Walk Alameda 2015; City of Alameda 2010

Table 16: Bikeway Network – Outer Harbor Turning Basin

Bikeway Class	Routes – *Italics* denotes a proposed route
Class I (bicycle path)	• Maritime Street: North of 7th Street • 7th Street: West of Wood Street • Burma Road: South of Bay Bridge Trail • *West Grand Avenue: Maritime Street/Wake Avenue to Wood Street*
Class II (bicycle lane)	• Admiral Toney Way: East of Maritime Street • Burma Road: West of Bay Bridge Trail

Source: City of Oakland 2021b

Pedestrian Facilities

Pedestrian facilities and access in the immediate vicinity of the Inner Harbor Turning Basin study area on the Oakland side—specifically, south of the UPRR tracks and west of Clay Street—are quite limited. The heavy industrial nature of this area, however, means that pedestrian activity is generally low. Direct pedestrian access to/from the Inner Harbor Turning Basin study area on the Oakland side is provided by Embarcadero West, but pedestrians must cross the UPRR tracks running down the center of Embarcadero West, and the nearest crossing opportunities are limited to those at Market Street and Martin Luther King Jr. Way. Several at-grade crossings and three grade-separated pedestrian bridges are available east of Martin Luther King Jr. Way for pedestrians to cross the UPRR tracks. There are no sidewalks present along Embarcadero West west of Martin Luther King Jr. Way, with only a south-side sidewalk provided east of Martin Luther King Jr. Way until Clay Street. Crosswalk markings are missing in some locations, and many curb ramps do not appear to be Americans with Disabilities Act (ADA)-compliant. The area east of Clay Street to Broadway consists primarily of commercial land uses, generally with good pedestrian facilities. Similarly, pedestrian facilities and access along the Alameda side of the Inner Harbor Turning Basin study area are generally good, with sidewalks provided along both sides of most streets. In the residential communities immediately southeast of the study area, many intersections include crosswalk markings and traffic-calming treatments such as bulb-outs.

Near the Outer Harbor, pedestrian facilities and access are limited due to the prevalence of industrial uses in the immediate vicinity, the extensive freeway infrastructure for the MacArthur Maze and connecting freeways, and the Union Pacific Railroad and Burlington Northern Santa Fe Railway tracks. Sidewalks and/or multi-use paths with ADA-compliant curb ramps and crosswalk treatments have been installed along most of the length of Maritime Street. A multi-use path is also provided along 7th Street within the Seaport. Sidewalks are unimproved in many other locations within the Seaport. Pedestrian activity is quite low due to the heavy industrial nature of the area.

Freight Rail Facilities

The Port's maritime facilities are served by UPRR mainline tracks running north-south as part of the Martinez Subdivision (extending from the Port north to Richmond and beyond) and the Niles Subdivision (extending south from the Port to Hayward and beyond). Major intermodal facilities in the Port area include two railyards—Railport Oakland (operated by UPRR) and the Oakland International Gateway/Joint Intermodal Terminal (operated by BNSF Railway)—and a manifest and support yard (the Seaport Logistics Complex and Outer Harbor Intermodal Terminal [OHIT], occupying land formerly part of the Oakland Army Base).

Near the Inner Harbor Turning Basin study area, Schnitzer Steel and Howard Terminal are immediately adjacent to the UPRR's Niles Subdivision, which includes two mainline tracks and an additional third track (siding and yard lead) operating down the center of Embarcadero West. Both sites have access to the two mainline tracks via the siding. At grade crossings across the UPRR tracks are provided at Market Street, Martin Luther King Jr. Way, and Clay Street. There are no freight rail facilities in the vicinity of the Alameda side of the Inner Harbor Turning Basin.

There are no freight rail facilities in immediate proximity to the Outer Harbor Turning Basin and Berth 10, although the UPRR Martinez Subdivision and the Seaport Logistics Complex/OHIT are a short distance away to the south and east. Grade separation is provided between the railroad tracks and major local roadways serving the area, including West Grand Avenue and 7th Street.

Emergency Access

Emergency access for the Inner Harbor Turning Basin and Outer Harbor Turning Basin study area would generally be provided by the existing street network.

For the Inner Harbor Turning Basin Oakland side, the nearest Oakland Fire Department station is Station No. 2, at 47 Clay Street (south of Embarcadero West), just east of the Howard Terminal site; there are no other Oakland Fire Department stations within 0.5 mile. Oakland Police Department headquarters are at 455 7th Street (at Broadway); there are no other Police Department stations within 0.5 mile. There are no hospitals within 0.5 mile of the Inner Harbor Turning Basin on the Oakland side. The closest hospitals are the Alta Bates Summit Medical Center Summit Campus (2.2 miles away at 350 Hawthorne Avenue) and the Kaiser Permanente Oakland Medical Center (2.5 miles away at 3600 Broadway), both in the Pill Hill neighborhood along Broadway.

On the Alameda side of the Inner Harbor Turning Basin there are no emergency service providers within 0.5 miles. The closest Alameda Fire Department station is Station No. 2, at 635 Pacific Avenue (1.5 miles away, west of Webster Street). The closest and only Alameda Police Department station is the headquarters building, at 1555 Oak Street (3 miles away at Lincoln Avenue). The closest hospital is Alameda Hospital, at 2070 Clinton Avenue (2.7 miles away at Willow Street).

There are also no emergency service providers within 0.5 mile of the Outer Harbor Turning Basin and Berth 10. The closest Oakland Fire Department station is Station No. 3, 1.5 miles away at 1445 14th Street (at Castro Street). The closest Oakland Police Department station is the headquarters building, 2.7 miles away at 455 7th Street. The closest hospitals are the Alta Bates Summit Medical Center Summit Campus (4.5 miles away) and the Kaiser Permanente Oakland Medical Center (3.5 miles away).

3.10.3 Waterway Navigation

Container Services

Existing facilities, fleets, and navigation conditions at the Port of Oakland are described in Section 2.1 of this report.

Passenger Ferry Service

There are two existing passenger ferry terminals in the study area: the Oakland terminal, at 10 Clay Street in Oakland's Jack London Square area and the Alameda Main Street terminal, at 2990 Main Street on Alameda Island. Ferry service to both terminals is operated by San Francisco Bay Ferry as a combined Oakland and Alameda route. The ferry service runs 7 days a week to/from the Downtown San Francisco Ferry Terminal at 2990 Main Street on Alameda Island, both adjacent to the Inner Harbor Turning Basin. Ferry service to both terminals is operated by San Francisco Bay Ferry as a combined Oakland and Alameda route, with the ferry service running 7 days a week to/from the Downtown San Francisco Ferry Terminal.

Twenty daily roundtrips are provided on weekdays, although only some of the trips serve Alameda (with the remainder serving only Oakland). On weekends and holidays, 13 daily roundtrips are provided, with all trips serving both Oakland and Alameda, except for one westbound trip serving only Oakland.

United States Coast Guard Facilities

To the east of the Inner Harbor Turning Basin in Brooklyn Basin lies Coast Guard Island Alameda, only accessible by Coast Guard Island Bridge off of Dennison Street and Embarcadero. The Coast Guard operates vessels from the island and into San Francisco Bay by way of the Inner Harbor Channel.

Marinas

There are several public and private marinas in operation to the east of the Inner Harbor Turning Basin that accommodate the berthing and operation of privately-owned recreational boats, which may traverse through the Inner Harbor Turning Basin and Channel. From west/north to east/ south, they are Jack London Square Marina, Portobello Marina, 5th Avenue Marina, Embarcadero Cove Marina, and Union Point Marina on the Oakland side of the channel; and Mariner Square and Drystack Marina, ISB, Dock Q, Marina Village Yacht Harbor, Fortman Marina, Grand Marina, and Alameda Marina on the Alameda side of the channel.

3.11 Hazardous, Toxic, and Radioactive Wastes

This section describes the existing conditions for hazardous materials in the study area.

3.11.1 Regulatory Setting

Resource Conservation and Recovery Act (42 U.S.C. § 6901 et seq.)

The Resource Conservation and Recovery Act (RCRA) controls the management and disposal of hazardous waste. "Hazardous and/or toxic wastes," classified by RCRA, are materials that may pose a potential hazard to human health or the environment due to quantity, concentration, chemical characteristics, or physical characteristics. This applies to discarded or spent materials that are listed in 40 C.F.R. §§ 261.31-34 and/or that exhibit one of the following characteristics: ignitability, corrosivity, reactivity, or toxicity. Radioactive wastes are materials contaminated with radioactive isotopes from anthropogenic sources (e.g., generated by fission reactions) or naturally occurring radioactive materials (e.g., radon gas or uranium ore).

Comprehensive Environmental Response, Compensation and Liability Act/Superfund Amendments and Reauthorization Act (42 U.S.C. § 9601 et seq.)

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or Superfund) governs the liability, compensation, cleanup, and emergency response for hazardous substances released into the environment and the cleanup of inactive hazardous substance disposal sites. The National Oil and Hazardous Substances Pollution Contingency Plan outlines CERCLA's implementing regulations and provides the guidelines and procedures needed to respond to releases and threatened releases of hazardous substances at sites identified on the National Priority List.

Toxic Substances Control Act (15 U.S.C. §§ 2601–2629)

The Toxic Substances Control Act limits or prohibits the manufacture, processing, distribution, use, and disposal of certain toxic substances. The Toxic Substances Control Act contains requirements specific to asbestos, indoor radon abatement, and lead exposure reduction. Hazardous materials transported through the study area would be subject to these regulations.

Transportation of Hazardous Materials and Waste (40 C.F.R. Part 263)

Transportation of hazardous materials and hazardous waste is carried out by individuals or entities that move hazardous materials and waste from one site to another by highway, rail, water, or air (refer to 40 C.F.R. § 260.10). This includes transporting hazardous waste from a generator's site to a facility that can recycle, treat, store, or dispose of the waste. It can also include transporting treated hazardous waste to a site for further treatment or disposal. Transportation of hazardous materials is required by law to occur in accordance with the Hazardous Waste Manifest System, which is a set of forms, reports, and procedures that track hazardous waste from the time it leaves the generator facility until it reaches the waste management facility that receives it. Transportation of hazardous materials by truck and rail is regulated by the United States Department of Transportation. The United States Department of Transportation regulations include transporter requirements for labeling, marking, placarding, and usage of appropriate storage containers, and requirements for responding to spills, among others.

3.11.2 Hazardous, Toxic, and Radioactive Waste Conditions

Hazardous materials are present at the Port as part of normal operations. As part of regular shipping operations, cargo containing hazardous materials may be shipped into and out of the Port. The Port can only require that shippers follow applicable laws and regulations in shipping their cargo. Various vessels calling at the Port may also use or generate small quantities of hazardous materials as part of their routine operations (e.g., on-board maintenance). A material can be classified as a hazardous waste only after it is generated, i.e., after it has been designated as a waste by its owner. The RCRA defines hazardous wastes as those wastes classified as ignitable, corrosive, reactive, or toxic. Any materials that meet the statutory definition of hazardous wastes generated at the Port are taken off Port property for treatment or disposal, as appropriate.

Terrestrial soils on land adjacent to the Inner Harbor Turning Basin, as well as associated groundwater, have previously been found to contain hazardous, toxic, radioactive waste (HTRW). A number of industrial land uses in the vicinity are likely to have historically contributed to this existing contamination. Since the early 1900s the Inner Harbor area was used as a shipyard and numerous types of industrial and related activities could have contaminated the soils. These include ship building and repair, a lumber yard, creosoting, paint production, tanneries, pesticide storage, foundries, light and power production facilities, coal storage and distillation, petroleum refineries, oil distribution plants, rail repair and cleaning, and naval aviation operations. The potential for presence of HTRW in terrestrial soil in the areas proposed for expansion of the Inner Harbor turning basin footprint are discussed in detail below. There are no terrestrial lands or soils in the proposed expansion area for the Outer Harbor Turning Basin.

Howard Terminal Soils

The entire 50-acre Howard Terminal site is under Department of Toxic Substances Control and has land use restrictions applied to the entire site. The land use covenant (LUC) restrictions require notice and prior approval before any excavation or changes in land use. An underground waste oil storage tank was previously removed from the general area proposed for excavation for the Inner Harbor Turning Basin expansion. Monitoring of various hydrocarbons through the fill is ongoing. The most likely source of site contamination is movement of liquid contaminants through the fill into groundwater. Ongoing data collections by the Port indicate low levels of hydrocarbons in the fill at or near the range of groundwater tidal movement (ENGEO 2019a). Low concentrations of total petroleum hydrocarbons (TPH) in the diesel range, TPH in the motor oil range, and low levels of benzene were detected, but not above regional beneficial reuse criteria as non-residential fill or as wetland non-cover. Various Polycyclic Aromatic Hydrocarbons (PAHs) were also detected, but at generally low concentrations (ENGEO 2019a) In addition, metals have been detected in soils from the ground surface to the groundwater interface; however, they are present at concentrations consistent with Merritt/Posey soil formation sands that were likely mined for fill (Apex 2021).

Schnitzer Steel Soils

This site is currently under a Cleanup and Abatement Order issued by the Department of Toxic

Substances Control. A variety of contaminants have been detected at various levels on the site, including dioxin PAHs, PCBs, heavy metals, benzene, and asbestos (Apex 2021). Soil evaluations completed for the facility concluded that given the shallow depths to groundwater, it is reasonable to assume that TPH and metals (specifically nickel) detected in groundwater are from the fill materials beneath the Schnitzer Steel facility (City of Oakland 2021). Schnitzer Steel installed a cap and a water treatment system as part of their site remediation. The removal of soil and the repair of the cap and water treatment system would require Department of Toxic Substances Control approval (Apex 2021).

Alameda Soils

The -50-Foot Project previously removed a corner of the Alameda property to expand the Inner Harbor Turning Basin to its current dimension. Sampling conducted for that project is directly relevant to the current potential expansion of the Inner Harbor Turning Basin, with samples collected very near the current potential expansion area. Testing of the material for the -50 Foot Project indicated that fill material from grounds surface to 3 feet below ground surface contained elevated levels of PAHs (EVS 1998). Based on sampling conducted for the -50-Foot Project there is no indication of contamination above regulatory thresholds in material below 3 feet below ground surface to groundwater (11.2 feet below ground surface). This material has no known additional or new sources of contamination, and therefore should be similar to the material removed for the -50-Foot Project.

3.12 Contaminants in Dredge or Fill Material

3.12.1 Regulatory Setting

Clean Water Act (33 U.S.C. § 1257 et seq.) (see section 3.4.1)

Coastal Zone Management Act (16 U.S.C. § 1451 et seq.) (see section 3.4.1)

San Francisco Bay Long Term Management Strategy Dredged Material Management Office

The Long Term Management Strategy (LTMS) program for San Francisco Bay provides a framework for federal and state agencies to coordinate dredged material disposal policies and regulations. The Dredged Material Management Office (DMMO) was established as part of the LTMS program to consolidate the process for obtaining approvals for dredged material disposal. The DMMO is led by USACE and staffed by USEPA, BCDC, SFRWQCB, and California State Lands Commission with participation from CDFW, NMFS, and USFWS.

As part of the approval process, an applicant must submit results from recent sediment testing or sufficient data to support a finding by the DMMO agencies (a suitability determination) that the sediments are suitable for the applicant's proposed placement location(s). Based on this information, the DMMO will determine the location(s) at which dredge materials can be placed.

3.12.2 Dredge Material Characteristics

Sediments in the existing federal channel at Oakland Harbor are regularly dredged by USACE as part of Operation and Maintenance dredging to the authorized channel depth. Historic sampling and analysis of this material has shown it to be suitable for placement at aquatic locations and as wetland cover. However, aquatic sediment in the potential Tuning Basin Expansion areas may contain levels of contaminants that render this material unsuitable for placement at aquatic or wetland sites (as either cover or non-cover). In a generalized sense, aquatic sediment that is sampled, analyzed, and found to contain chemical constituent concentrations and bioaccumulation characteristics at or below aquatic (in-bay or Ocean) or wetland cover material screening criteria is considered to be relatively “clean” material. Material that exceeds criteria for aquatic or wetland cover placement may meet less stringent criteria for Wetland non-cover (also known as foundation) material that is placed and capped with clean material. As used in this section, "contaminated sediment" refers to aquatic sediment that exceeds the chemical criteria for wetland non-cover material (Wolfenden and Carlin 1992) but does not refer to the presence of regulated HTRW (as discussed in Section 3.12). In general, contaminated sediment may be rehandled at a designated location and reused at an upland location for construction fill (if suitable) or disposed of at an appropriate landfill. Contaminated aquatic sediment may require treatment prior to reuse as construction fill, due to elevated levels of soluble compounds.

While the aquatic sediments in the study area have not been sampled and analyzed for this study, the USACE and the Port of Oakland have reviewed sampling and testing results from other actions occurring within or near the study area to make informed assessments of the potential for contaminants in the aquatic sediment. These assessments are presented below.

Howard Terminal Dredging Footprint

Metals have been detected in soils from the ground surface to the groundwater interface; however, they are present at concentrations consistent with Merritt/Posey soil formation sands that were likely mined for fill (Apex 2021). Old Bay Mud (OBM)/Merritt Sand (MS) Formation material is likely present in fills below the groundwater elevation at Howard Terminal. While there is no specific data regarding the fill quality between groundwater, which occurs at approximately 8-10 feet below ground surface and the underlying OBM/MS interface where dredging would occur as part of the alternatives considered in this study, there is no apparent mechanism for contaminants to be transported to depths between -10 feet below ground surface and -60 feet below ground surface (Apex 2021). Because the fill is marine-derived and the overlying soil and groundwater are relatively clean, it is unlikely that the deeper fill is contaminated. It would likely be suitable for beneficial reuse at a wetland site.

Schnitzer Steel Dredging Footprint

This site is currently under a Cleanup and Abatement Order issued by the Department of Toxic Substances Control. A variety of contaminants have been detected at various levels on the site, including dioxin, hydrocarbons, PCBs, and heavy metals (Apex 2021). OBM/MS Formation material is likely present in fills below the -10-foot below ground surface groundwater elevation, including below -17 feet below ground surface where dredging would occur as part of the alternatives considered in this study. Similar to Howard Terminal, there is little or no information available regarding the sediment quality of the material below groundwater at Schnitzer Steel. Regulators who have required testing at the site do not see a mechanism for the contaminants to be transported below groundwater (Apex 2021). It is anticipated that the native material (OBM/MS), which begins at -10 feet below ground surface, would be suitable for a beneficial reuse site (Apex 2021).

Alameda Dredging Footprint

The -50-Foot Project previously removed a corner of the Alameda property to expand the Inner Harbor Turning Basin to its current dimension. Sampling conducted for that project is directly relevant to the Inner Harbor Turning Basin alternative, with samples collected very near the proposed expansion area. Young Bay Mud (YBM) is likely present from -5.5 feet below ground surface to -29.3 feet below ground surface, and material below -29.3 feet below ground surface likely consists of OBM/MS (EVS 1998). The material that would be removed where dredging would occur as part of the alternatives considered in this study is adjacent to the material removed for the -50-Foot Project and has no additional or new sources of contamination. Therefore, it should be similar to the material removed for the -50-Foot Project. Based on the previous testing results, it is unlikely that the material below groundwater would contain any contaminants at levels making it unsuitable for beneficial reuse (Apex 2021).

Inner Harbor Turning Basin Expansion Area Open Water Dredging Footprint

There are two areas in the proposed Inner Harbor Turning Basin expansion study area that are subtidal: the basin between Howard Terminal and Schnitzer Steel, and a portion of the current Port of Oakland Berth 67.

During the -50-Foot Project, the Port investigated the need for deepening their non-federal berths as well. Berth 67 was tested to allow deepening from the currently maintained depth of -42 feet MLLW with 2 feet of overdepth allowance, to -50 feet MLLW with 2 feet of overdepth allowance; however, the dredging was not completed by the Port. The material tested to support Berth 67 dredging was approved by the DMMO agencies for beneficial reuse as wetland non-cover (USACE 1998). Because the deepening material has not been exposed to any new contaminant sources since the testing was completed, it is assumed that the material from Berth 67 would still be suitable for wetland non-cover (Apex 2021).

There is a lack of site-specific information about the quality of the sediment in the basin between Howard Terminal and Schnitzer Steel. However, a few things can be assumed from the site history and the stratigraphy. First, as with other areas of the Inner Harbor, the OBM/MS formation underlying the basin should be free of contaminants and suitable for any beneficial reuse. This was true for the -50 Foot Project even in areas that contained significant contamination in the overlying areas such as the drydock pits on the Alameda side of the channel. Second, uses of the basin area were similar to those of the Drydock Pits off Alameda removed for the -50-Foot Project. Although testing will be needed to confirm the condition of these sediments, it is a reasonable assumption that this material above OBM/MS contains contaminants that would preclude open water disposal or beneficial reuse as cover. If the material is similar to the Drydock Pits, it would also not be suitable for use as wetland non-cover. It is reasonable and conservative to assume the material above OBM/MS would require landfill disposal in a Class II (non-hazardous) landfill (Apex 2021).

Outer Harbor Turning Basin Expansion Area Open Water Dredging Footprint

The Outer Harbor Turning Basin expansion area is divided into two definable units: a young bay mud layer, and an underlying OBM/MS layer. Data from samples collected for the -50-Foot Project close to the proposed Outer Harbor Turning Basin expansion area suggest that the young bay mud layer sediments would be suitable for habitat creation, non-cover, and the OBM/MS strata should be considered clean and suitable for any disposal or reuse (Apex 2021).

3.13 Air Quality

3.13.1 Regulatory Setting

Clean Air Act and National Ambient Air Quality Standards (42 U.S.C. § 7401 *et seq.*)

The Federal Clean Air Act is the comprehensive federal law that regulates air emissions from stationary and mobile sources. Last amended in 1990, it requires the United States Environmental Protection Agency (USEPA) to set National Ambient Air Quality Standards (NAAQS or "national standards") for six principal pollutants (termed as "criteria" air pollutants) prevalent in the atmosphere and found to be harmful to public health and the environment: ground-level ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable particulate matter (PM), and lead. Separate standards have been established for particulate matter less than 10 microns in diameter (PM_{10}) and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$). Pursuant to the 1990 Clean Air Act amendments, the USEPA classifies air basins (or portions thereof) as "attainment" or "nonattainment" for each criteria air pollutant, based on whether the NAAQS have been achieved.

Table 17 shows the current NAAQS for each pollutant as well as the attainment status of the San Francisco Bay Area Air Basin (SFBAAB or Bay Area) with respect to these standards. The Bay Area is designated as nonattainment for the national 8-hour ozone and 24-hour $PM_{2.5}$ standards and is considered in maintenance for CO, but the region has not exceeded that CO standard for many years.

The federal Clean Air Act requires each state to prepare an air quality control plan referred to as the State Implementation Plan (SIP), and for states containing areas that violate the NAAQS to incorporate additional control measures to reduce air pollutants that are in violation of the standards. The EPA has responsibility to review all SIPs to determine if they meet federal requirements and will achieve air quality goals when implemented.

Table 17: Ambient Air Quality Standards and Attainment Status for the SFBAAB

Pollutant	Averaging Time	National Standard	SFBAAB Attainment Status (National)
Ozone	8 Hour	0.070 ppm	Non-Attainment (Marginal)
Carbon Monoxide	8 Hour	9 ppm	Attainment (Maintenance)
	1 Hour	35 ppm	Attainment (Maintenance)
Nitrogen Dioxide	Annual Average	0.053 ppm	Attainment
	1 Hour	0.100 ppm	Unclassified
Sulfur Dioxide	Annual Average	0.030 ppm	Attainment
	24 Hour	0.14 ppm	Attainment
	1 Hour	0.075 ppm	Attainment
Respirable Particulate Matter (PM_{10})	24 Hour	150 mg/m^3	Unclassified
Fine Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	12.0 mg/m^3	Unclassified/Attainment
	24 Hour	35 mg/m^3	Non-Attainment (Moderate)
Lead	Calendar Quarter	1.5 mg/m^3	Attainment
	3-Month Rolling Average	0.15 mg/m^3	Unclassified

NOTES:
ppm = parts per million; mg/m^3 = micrograms per cubic meter
PM_{10} = particulate matter 10 microns in diameter or less; $PM_{2.5}$ = particulate matter 2.5 microns in diameter or less
SOURCE: USEPA, Nonattainment Areas for Criteria Pollutants, last updated on August 31, 2021. Available: https://www.epa.gov/green-book.

General Conformity (40 C.F.R. Part 93 Subpart B)

The regulatory framework for General Conformity applies to federal actions that occur in a nonattainment area (or an area previously classified as nonattainment and operating under a maintenance program) if annual emissions totals from the action exceed applicability thresholds known as de minimis levels. The General Conformity Rule is designed to ensure that air emissions associated with federal actions do not contribute to air quality degradation or prevent achievement of state and federal air quality goals. General Conformity refers to the process of evaluating federal plans, programs, and projects to determine and demonstrate that they meet the requirements of the Clean Air Act and the applicable SIP.

The de minimis levels are established in the General Conformity Rule in 40 C.F.R. § 93.153, and the levels vary by severity of the nonattainment designation of the region. Emissions used for comparison to de minimis levels include both direct and indirect emissions that are reasonably foreseeable.

Actions that are potentially subject to General Conformity can follow a series of steps to determine the level of analysis that is required. The initial phase of this process includes an applicability analysis, as described in 40 C.F.R. Part 93 Subpart B, which requires a comparison of pollutant-specific annual emissions to de minimis levels. If the applicability analysis demonstrates that General Conformity does not apply to the project, then no additional analysis or documentation is required under the regulations. If General Conformity is applicable to the project, additional steps include a detailed evaluation for the applicable pollutants as described in the regulations, publication of a draft General Conformity determination, consideration of public comments, and publication of a final General Conformity determination. The methodology of the assessment for the determination is described in detail in the regulations and is specific to the pollutant or pollutants that are identified as applicable.

The Bay Area is classified as nonattainment with respect to the federal standards for ozone (marginal nonattainment) and $PM_{2.5}$ (moderate nonattainment). The de minimis level for ozone precursors (nitrogen oxides [NO_X] and volatile organic compounds [VOCs]) for areas in marginal nonattainment is 100 tons per year. The de minimis level for a region designated as moderate nonattainment with respect to the $PM_{2.5}$ standard is 100 tons per year.

Hazardous Air Pollutants (42 U.S.C. § 7412(b))

Federal law uses the term "hazardous air pollutants" (HAPs) to refer to the same types of compounds that are referred to as "toxic air contaminants" (TACs) under state law; HAPs are a subset of TACs. Currently, 187 substances are regulated as HAPs. The federal Clean Air Act requires the USEPA to identify the National Emission Standards for Hazardous Air Pollutants (NESHAP) to protect public health and welfare. More than 125 types of stationary sources are regulated under the NESHAP, while mobile-source emissions of HAPs are regulated through vehicle and fuel standards.

3.13.2 Existing Air Quality Conditions

Topography, Meteorology, and Climate

Climate and meteorological conditions such as wind speed, wind direction, and air temperature gradients interact with the physical features of the landscape to determine the movement and dispersal of air pollutants. The climate of the Bay Area is determined largely by a high-pressure system that is often present over the eastern Pacific Ocean off the West Coast of North America. The combination of abundant sunshine under the restraining influences of topography and subsidence inversions creates conditions that are conducive to the formation of photochemical pollutants, such as ground-level ozone and secondary particulates, including nitrates and sulfates. The study area lies in the Northern Alameda and Western Contra Costa Counties climatological subregion. In this subregion, marine air traveling through the Golden Gate, as well as across San Francisco and the San Bruno Gap (a gap in the Coastal Range between the ocean and the San Francisco Airport), is a dominant weather factor. Average wind speeds vary from season to season, with the strongest average winds occurring during summer and the lightest average winds during winter. Summer temperatures in Oakland average at a low of 57 degrees Fahrenheit (°F) and a high of 72°F, while winter temperatures average at a low of 46°F and a high of 59°F.

Regional Criteria Air Pollutant Conditions

The Bay Area Air Quality Management District (BAAQMD) operates a regional monitoring network that measures the ambient concentrations of the six federal criteria air pollutants. Existing and probable future levels of air quality in Oakland can generally be inferred from the historical ambient air quality measurements at the nearby BAAQMD monitoring stations. The monitoring station closest to the study area is the Oakland West station, approximately 1.3 miles north. The Oakland West station monitors ozone, NO_2, SO_2, CO, and $PM_{2.5}$. Measurement of PM_{10} is not conducted at any of the monitoring stations in Oakland, and data from stations farther away would not be representative of conditions in the project area.

Pollutants of concern in the Bay Area include ozone and PM; the SFBAAB is non-attainment with respect to the federal and state standards for these pollutants (Table 18). Ozone is a secondary air pollutant produced in the atmosphere through a complex series of reactions involving ROG and NO_X in the presence of sunlight. The main sources of ROG and NO_X, often referred to as ozone precursors, are the evaporation of solvents, paints, and fuels, and combustion processes. In the Bay Area, automobiles are the single largest source of ozone precursors. Sources of PM in the Bay Area include wood burning in fireplaces, demolition and construction activities, wildfire smoke, and vehicular traffic. $PM_{2.5}$ in particular includes diesel exhaust particles, referred to as diesel particulate matter.

Table 18 shows a 5-year summary of monitoring data (2016 through 2020) for ozone and $PM_{2.5}$ from the Oakland West station, as well as NO_2, an ozone precursor, and CO, for which the Bay Area is in attainment maintenance status. Table 18 also compares measured pollutant concentrations with the CAAQS and the NAAQS.

Table 18: Air Quality Data Summary for the West Oakland Monitoring Station

Pollutant	Standard[1,2]	Average Daily Emissions (pounds per day)				
		2016	2017	2018	2019	2020
Ozone						
Highest 8-Hour Average (ppm)	0.070 ppm	0.052	0.068	0.050	0.072	0.056
National/ State Standard Exceedance Days		0	0	0	1	0
Fine Particulate Matter ($PM_{2.5}$)						
Highest 24-Hour Average (µg/ m^3)	35 µg/ m^3	23.9	56.0	169.2	29.3	159.7
Measured Exceedances over National Standard[3]		0	7	14	0	8
National Annual Average (µg/ m^3)	12.0 µg/ m^3	8.6	12.8	14.3	7.7	10.2
Nitrogen Dioxide (NO_2)						
Highest Hourly Average (ppm)	0.18 ppm	0.049	0.052	0.076	0.050	0.048
Measured Exceedances over State Standard		0	0	0	0	0
Carbon Monoxide (CO)						
Highest 8-Hour Average (ppm)	9.0 ppm	2.2	2.1	3.1	1.7	NA
Measured Days over National/ State Standard		0	0	0	0	NA

Notes:

1. Generally, state standards and national standards are not to be exceeded more than once per year.
2. A violation occurs only if the standard is exceeded. Because 0.091 rounds to 0.09, it is not considered a violation. A recorded concentration of 0.095 or greater would constitute a violation of the state standard.
3. 2017, 2018, and 2020 exceedances were largely due to the California wildfires.

NA = Not Available

ppm = parts per million

µg/ m^3 = micrograms per cubic meter

Source: Table compiled by ESA in 2021 based on data from CARB (2021f).

West Oakland Community Air Pollution Burden

The community of West Oakland is identified as an area with disproportionate impacts from air quality under the State of California's Community Air Protection Program (AB 617). West Oakland has a high cumulative exposure burden to air pollution due to numerous existing sources of air pollution in the community. These include heavy-duty trucks, diesel locomotives, off-road equipment, stationary sources, and water-borne vessels associated with the Port, major highways (including Interstates 80, 580, 880, and 980), Schnitzer Steel, freight and passenger rail, and numerous industrial and commercial stationary sources. These sources all contribute to the exposure of residents to harmful air pollutants and toxic air contaminants (TACs) that accumulate and lead to health effects. For instance, a 2008 CARB health risk assessment found that West Oakland residents are exposed to air concentrations of diesel pollution (a TAC) that are almost three times higher than average background levels in the Bay Area. Along with its high pollution exposure burden, the community experiences some of the highest asthma and cardiovascular disease impacts in the region (CARB 2008).

Diesel Particulate Matter (DPM)

Diesel emissions are of particular concern in West Oakland. CARB identified DPM as a TAC in 1998. The exhaust from diesel engines includes hundreds of different gaseous and particulate components, many of which are toxic. Health risks from ambient concentrations of DPM are much higher than the risk associated with any other TAC routinely measured in the West Oakland region. Recent BAAQMD health risk modeling for West Oakland shows that for 2017, the total average annual $PM_{2.5}$ concentration from local and background sources combined was 8.61 $\mu g/m^3$.

As one of the communities in the State of California most impacted by TAC emissions, West Oakland was designated in 2017 as one of ten initial Community Air Protection Program (CAPP) communities under California law. CAPP communities are focus areas for reducing human health risk levels by reducing air toxics exposure and the West Oakland community has taken a very active role in seeking such reductions. For example, the West Oakland Environmental Indicators Project – a resident led, community-based environmental justice organization – developed *Owning Our Air: The West Oakland Community Air Action Plan* (WOCAAP) which focuses on reducing exposure to fine particulate matter ($PM_{2.5}$), DPM, and other TACs from sources such as port-related activities, trucks, industrial sources, road dust, and residential burning.

Air Pollution Sensitive Receptors in the Study Area

Some receptors are considered more sensitive than others to air pollutants. The reasons for greater-than-average sensitivity include age, pre-existing health conditions, proximity to emissions sources, or duration of exposure to air pollutants. Residential areas are considered sensitive to poor air quality because people usually stay home for extended periods of time, with greater associated exposure to ambient air quality. Schools, hospitals, and convalescent homes are considered to be relatively sensitive to poor air quality because children, elderly, and infirm persons are more susceptible to respiratory distress and other air quality-related health problems compared to the general public. Recreational uses are also considered sensitive due to the greater exposure to ambient air quality conditions because vigorous exercise associated with recreation places a high demand on the human respiratory system.

Sensitive receptors in the study area are presented in Table 19, along with their approximate distance to the Inner Harbor Turning Basin and Outer Harbor Turning Basin boundaries. With respect to the Inner Harbor Turning Basin locations, the northernmost sensitive receptors in the area consist of the residential receptors at Phoenix Lofts, the potential live-aboards at the Jack London Square Marina, and future residential uses proposed for Howard Terminal in the City of Oakland. The southernmost sensitive receptors in the Inner Harbor Turning Basin area consist of a multi-family residential neighborhood at the terminus of Mitchell Avenue, multi-family housing south of Mosely Avenue, and former Navy housing to be redeveloped with multi-family housing south of Main Street in the City of Alameda.

There are no residential receptors within 2,000 feet of the Outer Harbor Turning Basin. The nearest recreational receptors in the area consist of Middle Harbor Shoreline Park and Port View Park, which are approximately 1,800 feet from the Outer Harbor Turning Basin.

Table 19: Existing and Proposed Sensitive Receptors in the Project Vicinity

Receptor / Address	Type / Public or Private	Distance from Turning Basin (at closest point)
Oakland Receptors		
Phoenix Lofts, 737 2nd Street, Oakland	Private	1,300 feet from Inner Harbor Turning Basin
Jack London Square Marina (live-aboards), Oakland	Public	1,400 feet from Inner Harbor Turning Basin
Potential Howard Terminal Multi-family Residences, Oakland	Private	100 feet from Inner Harbor Turning Basin
Middle Harbor Shoreline Park, Port of Oakland	Public	1,800 feet from Outer Harbor Turning Basin
Alameda Receptors		
Admiral's Cove Residential Development, 250 Mosley Avenue	Private	500 feet from Inner Harbor Turning Basin
Alameda Landing Residential Development / 400 Block of Mitchell Avenue and southward, Alameda	Private	1,000 feet from Inner Harbor Turning Basin
Navy Housing, Alameda (future Main Street Residential Development)	Private	1,100 feet
Future Breeze at Bay 37 Residential Development North of Mitchell Avenue, Alameda	Private	800 feet from Inner Harbor Turning Basin

Notes:
Source: Table compiled by ESA in 2021.

3.14 Noise and Vibration

3.14.1 Regulatory Setting

Federal Noise Standards

In 1972, the Noise Control Act (42 U.S.C. § 4901 *et seq*.) was passed by Congress to promote limited noise environments in support of public health and welfare. It also established the United States Environmental Protection Agency (USEPA) Office of Noise Abatement and Control to coordinate federal noise control activities. The USEPA established guidelines for noise levels that would be considered safe for community exposure without the risk of adverse health or welfare effects. Table 3-1 presents the important noise exposure levels highlighted by the guidelines.

Table 20: Summary of Noise Levels Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety

Effect	Level	Area
Hearing loss	< 70 dBA[a] (L_{eq}, 24 hour)	All areas
Outdoor activity interference and annoyance	< 55 dBA (L_{dn})	Outdoor residential areas and farms, other outdoor areas where people spend varying amounts of time, and places where quiet is a basis for use
Outdoor activity interference and annoyance	< 55 dBA (L_{eq}, 24 hour)	Outdoor areas where people spend limited amounts of time, such as school yards or playgrounds
Indoor activity interference and annoyance	< 45 dBA (L_{dn})	Indoor residential areas
Indoor activity interference and annoyance	< 45 dBA (L_{eq}, 24 hour)	Other indoor areas with human activities, such as schools

Notes:

[a] Yearly average equivalent sound levels in decibels; the exposure period that results in hearing loss at the identified level is 40 years.

dBA = A-weighted decibel

L_{dn} = day-night average sound level

L_{eq} = equivalent continuous sound level

Source: USEPA 1974

USEPA found that, to prevent hearing loss over the lifetime of a receptor, the yearly average L_{eq} (average sound level) should not exceed 70 A-weighted decibels (dBA), and the L_{dn} (day-night average sound level) should not exceed 55 dBA in outdoor activity areas or 45 dBA indoors to prevent interference and annoyance (USEPA 1974).

Additionally, federal noise standards directly regulate noise related to the operation of a project with regard to noise exposure of workers. The United States Occupational Safety and Health Administration has established worker noise exposure limits that vary with the duration of the exposure; and require implementation of a hearing conservation program if employees are exposed to noise levels in excess of 85 dBA.

Federal Transit Administration Vibration Standards

The Federal Transit Administration (FTA) has adopted vibration standards that are used to evaluate potential building damage impacts related to construction activities. The vibration damage criteria adopted by FTA are shown in Table 21.

Table 21: Construction Vibration Damage Criteria

Building Category	PPV (in/sec)
I. Reinforced concrete, steel, or timber (no plaster)	0.5
II. Engineered concrete and masonry (no plaster)	0.3
III. Non-engineered timber and masonry buildings	0.2
IV. Buildings extremely susceptible to vibration damage	0.12

Notes:
in/sec = inches per second
PPV = peak particle velocity
Source: U.S. DOT and FTA 2018

3.14.2 Noise Conditions

Airborne Noise

Noise is generally defined as unwanted sound. Sound, traveling in the form of waves from a source, exerts a sound pressure level that is measured in decibels (dB). Pressure waves traveling through air exert a force registered by the human ear as sound. A sound at 0 dB corresponds roughly to the threshold of human hearing and 120 to 140 dB corresponds to the threshold of pain. Airborne sound pressure levels are typically measured to be between 30 and 110 dB.

Sound pressure fluctuations can be measured in units of hertz (Hz), which correspond to the frequency of a particular sound. The typical human ear has decreased sensitivity to extremely low and extremely high frequencies. When assessing potential noise impacts, sound is measured in units of A-weighted decibels (dBA) following standard methodology typically applied to community noise measurements that involves deemphasizing frequencies to which the human ear is not sensitive. All noise levels presented in this report are A-weighted unless otherwise stated.

An individual's noise exposure is a measure of noise over time. Community noise varies continuously over time with respect to the contributing sound sources of the community noise environment. What makes community noise variable throughout a day, besides the slowly changing background noise, is the addition of short-duration, single-event noise sources (e.g., aircraft flyovers, motor vehicles, or sirens), which are readily identifiable to the individual. These successive additions of sound to the community noise environment change the community noise level from instant to instant, requiring the measurement of noise exposure over time to legitimately characterize a community noise environment. The equivalent-continuous sound level (L_{eq}) is used to describe noise over a specified period of time and may be considered the "average sound level." The maximum instantaneous noise level experienced during a given period of time is referred to as the L_{max}. The average A-weighted noise level during 24-hours (L_{dn}) is referred to as the "day-night average noise level" (DNL).

Underwater Noise

Underwater sound pressure levels are commonly expressed in dB. However, all underwater sound levels are in dB referenced to 1 micro Pascal (µPa), whereas airborne sound pressure levels are referenced to 20 μPa. The speed of sound relates primarily to the temperature and density of a medium. The speed of sound in sea water at a standard temperature of 21 degrees Celsius is equal to 4.4 times the speed of sound in air at standard temperature and pressure. Therefore, underwater and airborne sound pressure levels are not interchangeable. While airborne sound pressure levels are typically measured to be between 30 and 110 dB, Underwater sound pressure levels are typically measured to be between 100 and 210 dB.

Noise Sources and Levels

Transportation sources, such as automobiles, trucks, trains, and aircraft, are the principal sources of airborne noise in the urban environment. However, noise levels on roadways, like all areas, can be affected by intervening development, topography, or landscaping. The study area is approximately 1,300 feet south of I-880. Observations during a site reconnaissance indicated that local truck noise is prominent and traffic along I-880 corridor is only audible during the quietest periods, due to the presence of intervening structures and distance from the site.

Industrial and commercial equipment and operations also contribute to the ambient noise environment in their vicinities. Primary noise sources in the study areas include locomotive and railcar activity along the UPRR tracks, including horn soundings at the two at-grade crossings in the vicinity of the northern Inner Harbor Turning Basin boundary; heavy-duty container truck traffic in the Port terminals and roadways and along the Embarcadero West north of Howard Terminal; and the heavy metal recycling center (Schnitzer Steel). Underwater ambient noise is also generated by the operation of vessels in the Oakland Harbor channels and turning basins in the study area.

To characterize the noise environment in the project sites and surrounding area, both long-term (48 hours or more) and short-term (20-minute) noise monitoring was conducted. Long-term noise monitoring was conducted at seven locations, and short-term noise monitoring was conducted at three locations. Table 23 presents a summary of the noise data collected during the noise monitoring effort. Long-term noise monitoring locations (see Figure 16) were selected based on the proximity of potential residential locations to different noise sources: UPRR rail tracks, Schnitzer Steel, and vessel operation in the Inner Harbor Channel.

Table 22: Monitored Noise Environments within the Project Area

Long-Term Noise Monitoring Location	Day-Night Average Noise Level (DNL)	Noise Levels in dBA	
		Daytime Hourly Average L_{eq}	Nighttime Hourly Average L_{eq}
LT-1 Residential Uses on Barbers Point Road	67	63	60
LT-2 Residential Uses on Mosley Avenue	58	55	50
LT-3 Residential Uses on Mitchell Avenue	60	58	52
LT-4 Terminus of Clay Street adjacent to Port Offices	77	73	70
LT-5 Southeastern End of Howard Terminal Wharf	65	59	58
LT-6 Howard Terminal Adjacent to Schnitzer Steel	75	69	69
LT-7 Southeastern End of Matson Terminal Wharf	70	66	63
Short-Term Airborne Noise Monitoring Location	**Maximum 1-Minute Average Noise Level L_{eq} with Vessel in Turning Basin**	**1-Minute Average Noise Level L_{eq} with no Vessel in Turning Basin**	
ST-1 Southwestern End of Howard Terminal Wharf During Vessel Turn in Inner Harbor Turning Basin	69 (vessel at 68 meters)[1]	59	
ST-2 Middle Harbor Shoreline Park	NA	58	
ST-3 Northern End of TraPac Terminal Wharf During Vessel Turn in Outer Harbor Turning Basin	70 (vessel at 200 meters)[2]	65	
Short-Term Underwater Noise Monitoring Location	**Maximum Underwater Recorded Sound Pressure Level (dB) with Vessel in Turning Basin**	**RMS Underwater Sound Level (dB) with Vessel in Turning Basin**	
ST-1 Southwestern End of Howard Terminal Wharf During Vessel Turn in Inner Harbor Turning Basin	174	151	
ST-3 Northern End of TraPac Terminal Wharf During Vessel Turn in Outer Harbor Turning Basin	175	141	

Notes:

[1] Average noise level over the entirety of the 25-minute vessel turn = 66.5 dBA.

[2] Monitored noise levels are influenced substantially by ground-based trucks and service equipment on the TraPac Terminal and do not represent the sole contribution of the turning vessel.

dB = decibel

dBA = A-weighted decibel

DNL = day-night average noise level

L_{eq} = equivalent-continuous sound level

Port = Port of Oakland

RMS = root mean square

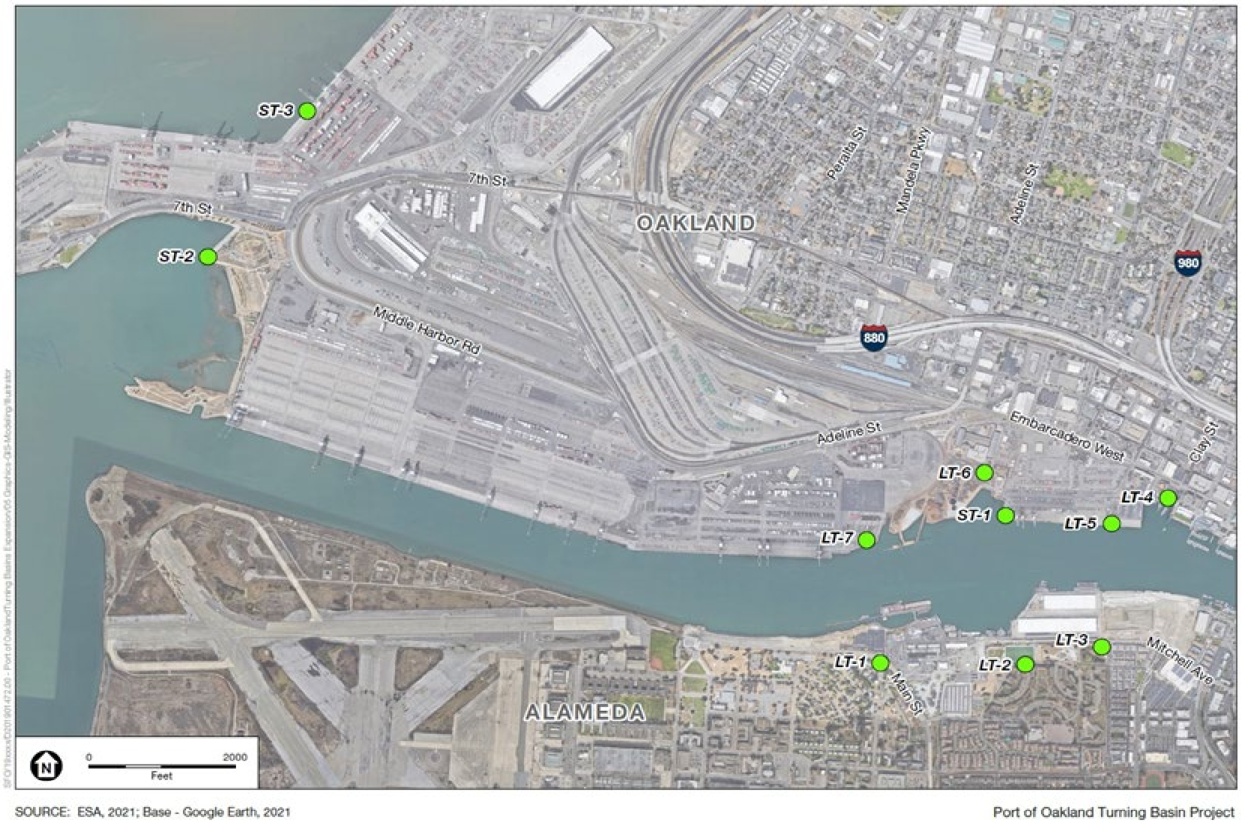


Figure 22: Noise Monitoring Locations

3.14.3 Vibration

In contrast to airborne noise, it is unusual for vibration from sources such as buses and trucks to be perceptible, even in locations close to major roads. However, some common sources of groundborne vibration are trains; buses on rough roads; and construction activities such as blasting, pile-driving, and operation of heavy earth-moving equipment. As described in the Federal Transit Administration's (FTA's) Transit Noise and Vibration Impact Assessment (U.S. DOT and FTA 2018), groundborne vibration can cause buildings to shake and rumbling sounds to be heard.

Several different methods are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts on buildings. The root mean square (RMS) amplitude is most frequently used to describe the effect of vibration on the human body and is commonly measured in vibration decimals (VdB). Typically, groundborne vibration generated by man-made activities attenuates rapidly with distance from the source of the vibration. Sensitive receptors for vibration include structures (especially older masonry structures), people (especially residents, the elderly, and the sick), and vibration-sensitive equipment.

Primary sources of vibration in the project vicinity include Amtrak and freight railroad operations, approximately 3,000 feet north of the Inner Harbor Turning Basin. FTA has published generalized ground-surface vibration curves for locomotive-powered passenger and freight trains, which are presented in Table 23. It should be noted that most freight activity terminates at the Port. Amtrak trains stop at the Oakland Station and, given that there are several at-grade crossings in the area, train speeds along the rail line are generally in the range of 5 to 20 miles per hour.

The only other sources of groundborne vibration in the project site vicinity are heavy-duty vehicular travel (e.g., refuse trucks and haul trucks) on local roadways. Trucks traveling at a distance of 50 feet typically generate groundborne vibration velocity levels of approximately 0.006 in/sec PPV, and these levels could reach approximately 0.016 in/sec PPV where trucks pass over discontinuities in the roadway (U.S. DOT and FTA 2018).

Table 23: Generalized Vibration Levels from Locomotive-Powered Passenger or Freight Trains (Peak Particle Velocity)

Train Speed	Distance from Tracks				
	30 Feet	50 Feet	100 Feet	150 Feet	200 Feet
10 mph	0.051 PPV	0.040 PPV	0.019 PPV	0.016 PPV	0.013 PPV
20 mph	0.085 PPV	0.066 PPV	0.031 PPV	0.026 PPV	0.022 PPV
30 mph	0.12 PPV	0.092 PPV	0.043 PPV	0.037 PPV	0.03 PPV
50 mph	0.17 PPV	0.13 PPV	0.060 PPV	0.024 PPV	0.043 PPV

Notes:
mph = miles per hour
PPV = peak particle velocity in inches per second.
Source: U.S. DOT and FTA 2018

3.14.4 Sensitive Noise Receptors

Receptors occupying certain land uses are considered more sensitive to noise than others due to the amount of noise exposure (in terms of both exposure duration and insulation from noise) and the types of activities in which those receptors are typically involved. Residences, motels and hotels, schools, libraries, churches, hospitals, nursing homes, and auditoriums generally have receptors that are more sensitive to noise than are receptors at commercial and industrial land uses. Land uses with potentially sensitive noise receptors within 2,000 feet of the generalized Inner Harbor Turning Basin and Outer Harbor Turning Basin boundaries were identified and found to be the same as the air quality sensitive receptors identified in the study area. These receptors are described in section 3.15.3 and presented in Table 22 above, along with their approximate distance from the Inner Harbor Turning Basin and Outer Harbor Turning Basin boundaries.

Chapter 4: Plan Formulation

Plan formulation for the Oakland Harbor Study is being conducted following the six-step planning process described in *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (U.S. Water Resources Council, 1983) and the *Planning Guidance Notebook* (USACE, 2000b).

To formulate alternative plans, the study team identifies problems and opportunities (section 4.2), establishes the planning goals and objectives (section 4.3), identifies the planning constraints and key uncertainties (section 4.4), and then identifies measures which are developed into an array of alternatives that can be evaluated and compared. This evaluation and comparison ultimately leads to a tentative selection of an alternative, which is reviewed by the public, resource agencies, stakeholders, and agency technical reviewers. Once input obtained through review is addressed and incorporated, the recommended plan can be finalized.

The period of analysis for this study is 50 years, from 2030 – the estimated end of a project's construction – to 2079. The characteristics of the design vessel will be used to inform the channel dimensions and alignment needs for the study's period of analysis. Further refinement of the dimensions and alignment of the channels is expected through application of ship simulations during the Preconstruction Engineering and Design phase. The study team, with the endorsement of the Deep Draft Navigation Planning Center of Expertise, selected the design vessel for this study. The specifications of the design vessel are:

- 1,310 feet length overall
- 193 foot in beam
- 52.5-foot maximum summer loadline draft
- 19,000 TEUs nominal intake

Per the 1983 Principles and Guidelines by the U. S. Water Resources Council, the federal objective of water and related land resources project planning is to "contribute to NEDs consistent with protecting the Nations' environment, pursuant to national environmental statutes, applicable EOs, and other Federal planning requirements" (U.S. Water Resources Council, 1983). The 1983 Principles and Guidelines recommends that plans are formulated in consideration of four criteria and four accounts. The four criteria and four accounts are used iteratively in the plan formulation process as the alternatives are developed, and as they are evaluated and screened, to help in the selection of an alternative for recommendation. The identification and evaluation of measures and components, further described below, were informed by discussions with the San Francisco Bar Pilots and stakeholders.

4.1 Problem Identification and Opportunities

As discussed in section 2.1.5, large container vessels are subject to operational restrictions and experience significant operational inefficiencies. These limitations have been adopted as standard practice for the San Francisco Bar Pilots when handling PPX Gen IV vessels at the Port since 2016. No PPX vessels that have called Oakland have reported issues with draft limitations nor tidal restrictions from the -50-foot MLLW channel depth. On average, vessels operated at around 76% of their design draft at the Port in 2019. Of all vessels calling at Oakland Harbor in 2019 that had a design draft greater than 45 feet, 74% drafted less than 40 feet, 24% drafted between 40 and 44 feet, and 2% drafted over 45 feet. These data suggest that vessels are not constrained by their drafts at Oakland. Multiple discussions with the San Francisco Bar Pilots revealed the turning basins' widths are the source of operational inefficiencies. The limited width of the turning basins not only cause navigation inefficiencies, but also may increase the risk of groundings which could result in safety and environmental risks, such as oil spills.

There is an opportunity to improve these inefficiencies. Altering the configuration of the turning basins would improve the efficiency of vessel operations within the Oakland Harbor and help realize economies of scale through the transition of the fleet to larger vessels. Additionally, there is an opportunity to benefit the environment through decreased emissions with improved vessel transit efficiencies.

Another key opportunity for navigation projects in San Francisco Bay is beneficially using dredged material to keep material in the ecosystem. San Francisco Bay's wetlands and mudflats are the first line of defense from sea level rise for many of the San Francisco Bay's shoreline communities and for critical infrastructure. They are resilient and adaptive to sea level rise and they provide both cost-effective protection and many essential ecological and recreational benefits for the people of the Bay AreaThere is broad scientific consensus that for much of the Bay's shoreline, wetlands provide the most effective and beneficial method to protect infrastructure from sea level rise and storm surge.

Bay wetlands and mudflats can grow vertically as sea level rises, which is what makes them so resilient. However, they need enough sediment (dirt carried by the tides) to do so. As sea level rises, the amount of sediment needed to maintain wetlands (current and restored) and mudflats at the right elevation will increase. New reports estimate that more than 450 million cubic yards of sediment will be necessary between now and 2100 to maintain existing wetlands and mudflats and to restore these habitats at areas purchased and slated for restoration. Even with an optimistic future of a wetter climate providing high sediment supply, under current watershed management approaches natural sediment supply will likely not come close to meeting the amount needed to maintain wetlands and mudflats through the end of the century. There is an opportunity to beneficially use the suitable dredged material created from the implementation of any turning basin improvement project this study recommends; this would keep sediment in the ecosystem and improve resilience.

In summary, the existing federal navigation channel was designed for a 6,500 TEU vessel; this vessel is 1,139 feet long, 140 feet wide, and has a static draft of 48 feet. The vessels routinely calling on the Oakland Harbor today have nearly triple the capacity as the -50 Foot Project's design vessel. The *MSC Sveva*, a 19,224 TEU container vessel, called at the Port of Oakland in late 2020 and 2021. While *MSC Sveva* was able to call, vessel movements were heavily restricted and required extensive coordination. Since vessels of this size are unable to maneuver in the Inner Harbor turning basin, restrictions are imposed that include a limitation to only berthing portside to Oakland International Container Terminal and a restricted stern first departure where the vessel is turned near the Entrance Channel at slack water (a period between tidal changes where water movement is minimal). The Entrance Channel is not a designated turning basin and has the greatest exposure to current and wind effects in the Oakland Harbor.

The existing turning basins are insufficiently sized for ULCVs to operate efficiently and provide no margin for error during turning operations. These larger vessels have a greater risk of marine casualty and have resulted in operational limitations within the Oakland Harbor. These problems and inefficiencies are projected to continue and to increase in the future as a larger share of the cargo shifts to the larger vessel fleet, and these vessels call Oakland more often. The largest vessels in the fleet will continue to be delayed due to restrictions and cause delays for the rest of the fleet that must accommodate them. Discussions with representatives from the San Francisco Bar Pilots revealed current inefficiencies and navigational challenges in the Oakland Harbor. The overall problems and opportunities experienced in the turning basins are found in Table 24.

Table 24: Problems and Opportunities

PROBLEMS	OPPORTUNITIES
• navigation inefficiencies due to turning basin width limitations • increased safety and environmental risks due to turning basins' width limitations	• increase navigation efficiencies • benefit the economy and realize economies of scale • beneficially use dredged material • increase navigation safety for all vessels • reduce emissions and environmental risks

4.2 Planning Goal and Objectives

The goal of the project is to improve navigation in the Oakland Harbor. Plans are formulated to achieve planning objectives during the 50-year period of analysis from 2030 – the estimated end of a project's construction – to 2079. Objectives provide a clear statement of the study purpose.

In support of this project's goal, the planning objectives are:

1. Improve the efficiency of operations of containerships within the Oakland Harbor. This will be measured through decreased transportation costs from in-harbor transit time savings. For example, an improvement made as part of this project may decrease the amount of time it takes for a vessel to transit to and from the Oakland Harbor and its desired berth; that time saved equates to a project benefit. Additionally, this would result in a decreased risk of groundings and decreased emissions from reduced transit time, thus resulting in benefits to the environment and the surrounding communities.
2. Allow more efficient use of containerships. An improvement made as part of this project would result in fleet transitions to larger vessels to call the Port more efficiently realizing economies of scale. These larger vessels can hold more cargo per trip and are more efficient; this efficiency equates to a decrease in transportation costs and is considered a project benefit.

4.3 Planning Constraints and Considerations

Constraints are restrictions that limit the extent of the planning process. They can be divided into universal constraints and study-specific constraints. For brevity, only project-specific constraints are included here. The study's constraints are:

- the project cannot increase shoreline erosion
- the turning basin expansion must stay within the dedicated land reserved at Howard Terminal

Considerations are issues or matters that should be accounted for during the planning process, but do not necessarily limit the extent of the process. The following considerations are taken into account:

- impacts to structures/ bulkheading/on-land facilities
- impacts to environmental and cultural/historic resources
- impacts to existing utilities
- impacts to the other navigation traffic in the Oakland Harbor
- impacts to proposed land development
- impacts to businesses
- hazardous, toxic, and radioactive waste

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 data are sufficient to distinguish between the alternatives considered. Collecting new data was deferred to the next phase, Preconstruction Engineering and Design. The Oakland Harbor has been thoroughly studied. The availability of existing data enables the study team to work more efficiently, however, existing data may not be tailored exactly to the study team's needs, and assumptions or interpolations may be made to cover any 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, however this was determined to be an acceptable risk.

Detailed sediment Testing and characterization was also deferred to the Preconstruction Engineering and Design phase because the study team was able to evaluate potential impacts and estimate mitigation costs using existing information and local proxies. The decision to use existing information may result in environmental impacts and mitigation costs that differ from the actual which would be determined in the next phase based on new information; this was determined to be an acceptable risk.

The commodity and fleet forecast developed for the study also contains uncertainty. Commodity flows are subject to the ups and downs of the business cycle, individual commodity markets, and political influence.

Total container cargo throughput is expected to increase in the future. Past TEU volumes have grown at an average rate of 2.1% per year, and that rate of growth is expected to persist throughout the forecast period, which ends in 2050. This will roughly double the TEU volumes handled by the Port of Oakland by the end of the forecast period. The commodity growth was limited to twenty years after the base year of the project, consistent with USACE practice for long-term commodity forecasts, and due to the uncertainty surrounding such long-term forecasts. However, benefit levels remain constant through the remaining period of analysis.

There is also uncertainty with the model used to calculate benefits, HarborSym. Port and individual operations are subject to change based on various conditions including weather, congestion, labor availability, schedule, pilot practices, and other factors leading to variability. The HarborSym model included variations or ranges for many of the variables involved in the vessel costs, loading, distances, speeds, etc.

Sea level change is also an uncertainty that presents the potential for more frequent occurrences of extreme water levels. USACE ER 1100-2-8162 (USACE 2019) provides guidance on determining the direct and indirect physical effect of future sea level change on all USACE planning studies and engineering designs. It requires planning studies and engineering designs to evaluate the entire range of possible future rates of sea level change, represented by three scenarios of "low", "intermediate", and "high" sea-level change. The three scenarios presented in the Engineering Regulation incorporate new information, including projections by the Intergovernmental Panel on Climate Change and National Research Council (IPCC 2007, NRC 2012). Sea level change varies by region, this is due to the direction and magnitude of the local vertical land movement and how it relates to the global sea level change rate. At any location, changes in local relative sea level reflect the integrated effects of global mean sea level change plus local or regional changes of geologic, oceanographic, or atmospheric origin.

ER 1100-2-8162 recommends that a National Oceanic and Atmospheric Administration (NOAA) water level station should be used with a period of record of at least 40 years. The water level station used for this study; NOAA Station 9414750 Alameda, CA, has an 81-year period of record. Utilizing the USACE Sea-Level Change Curve Calculator (Version 2021.12) and the relative sea level trend of 0.87 mm/yr (.00285 ft/yr) from NOAA station 9414750 Alameda, California (Figure 23), a projection can be made for each of the three SLC scenarios from the base year of 1992. The low USACE scenario represents historical trend, uses 1992 as a base year, and estimates relative sea level change using 0.00285 ft/yr. Projected rates for all three scenarios (low, medium, and high) from 1992 to 2130 are shown in Table 25 and Figure 23. With respect to deep draft navigation channel depth, sea level rise is seen as a net positive due to the increased channel depth and reduced channel maintenance needs.

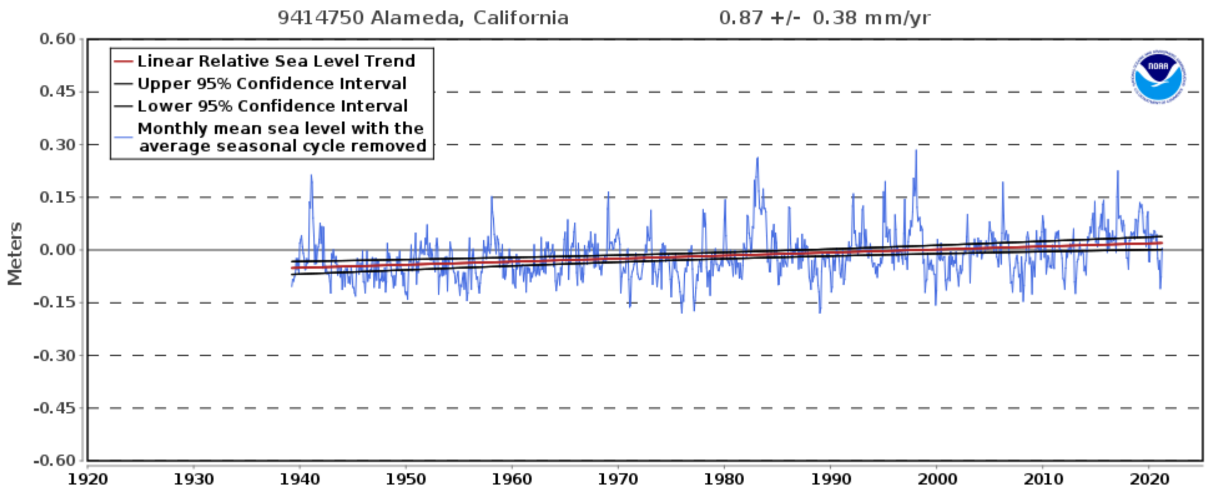


Figure 23: Relative Sea Level Trend for NOAA Station 9414750 Alameda, CA

Table 25: Predicted Relative Sea Level Change Alameda, CA, NOAA gage 9414750.

Year	USACE Low	USACE Int	USACE High
1992	0	0	0
2000	0.02	0.03	0.05
2010	0.05	0.08	0.17
2020	0.08	0.15	0.37
2030	0.11	0.24	0.64
2040	0.14	0.34	0.99
2050	0.17	0.46	1.41
2060	0.19	0.61	1.91
2070	0.22	0.76	2.48
2080	0.25	0.94	3.12
2090	0.28	1.13	3.84
2100	0.31	1.35	4.63
2110	0.34	1.57	5.5
2120	0.37	1.82	6.44
2130	0.39	2.09	7.45

Epoch: 1983 to 2001. All values are expressed in feet relative to local mean sea level.

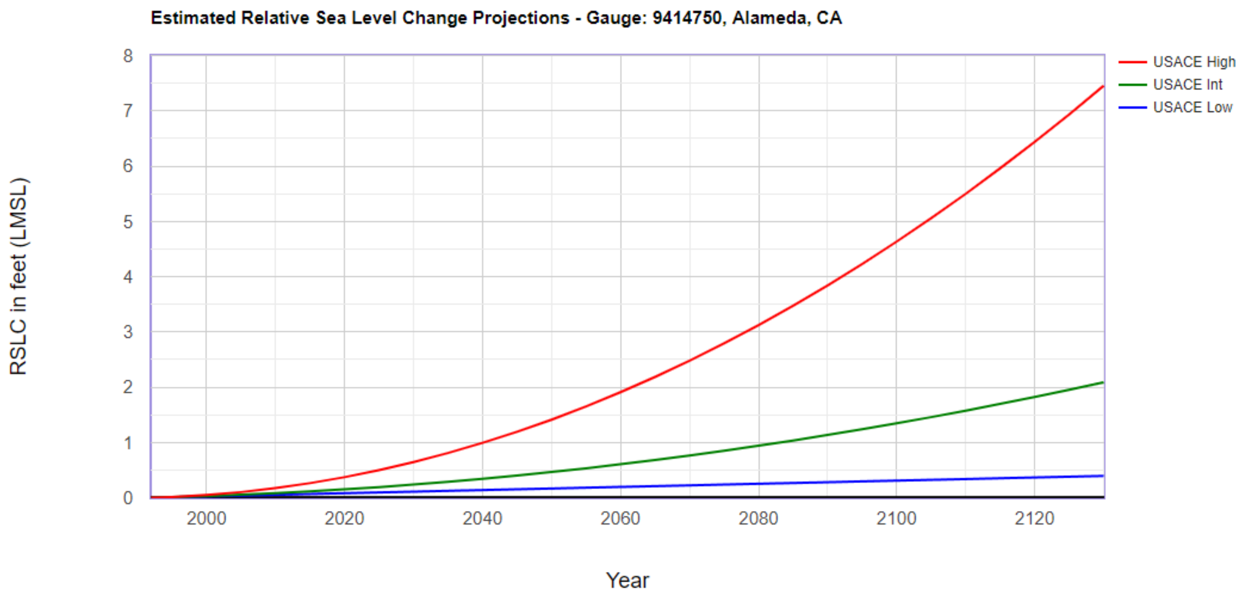


Figure 24: Relative Sea Level Rise Projections, Alameda, CA, NOAA gage 9414750

4.5 Material Placement

During plan formulation, the study team identified the Base Plan, or the least costly dredged and terrestrial material placement alternative that meets all federal requirements (Table 26) and is consistent with sound engineering practices. It is anticipated that some of the material encountered will potentially require class I (hazardous) and class II (non-hazardous) landfill disposal. Only terrestrial soils are expected to potentially require class I landfill disposal and neither class I or II landfill material would be eligible for beneficial placement; landfill placement is the least cost placement option for this type of material. Other material anticipated to be encountered is eligible to go to an upland beneficial use site as foundation material; this is considered beneficial placement and is the least cost placement option for this material. The cleanest material anticipated to be encountered would be dredged material eligible for either placement at San Francisco Deep Ocean Disposal Site or an upland beneficial use site as cover material; of these options, placement at San Francisco Deep Ocean Disposal Site is the least cost dredged material placement option but is not considered beneficial placement.

Table 26: Federal Base Plan for Anticipated Material to be Encountered

MATERIAL	FEDERAL BASE PLAN
Materials requiring Class I landfill placement -Potentially classified as hazardous -Terrestrial soils only, not aquatic dredge sediments	Kettleman Hills landfill
Materials requiring Class II landfill placement* - Non-hazardous but not suitable for beneficial use foundation or aquatic disposal	Keller Canyon landfill
Materials not suitable for aquatic placement at San Francisco Deep Ocean Disposal Site - Also unsuitable for cover material at upland beneficial use site	Upland beneficial use site, foundation
Materials suitable for either unconfined aquatic disposal at San Francisco Deep Ocean Disposal Site or cover material at upland beneficial use site - Cleanest material	San Francisco Deep Ocean Disposal Site

After identifying the Base Plan, the study team assessed beneficial use opportunities beyond the Base Plan to determine whether there would be appropriate matches of sources and uses of dredged material. It was determined that the incremental cost to place materials as cover material at an upland beneficial use site as compared to placement at San Francisco Deep Ocean Disposal Site was reasonable in relation to the environmental benefits to be achieved.

The additional (i.e. incremental) cost of placing the material at an upland beneficial placement site for the alternatives developed for this study, beyond the cost of placing it at San Francisco Deep Ocean Disposal Site is estimated to be $8 per cubic yard. Using Section 204(d) of WRDA 1992, this additional cost is reasonable for the environmental benefits the placement would provide[1]. These benefits include keeping sediment in system, accelerating wetland accretion, and creating habitat for endangered species. Therefore, the NED/Base Plan was not carried forward as part of the final array for NEPA review.

The alternatives, where applicable, include the additional beneficial use (BU) site.

4.6 Management Measures and Components

Measures are types of actions that accomplish the study objectives when implemented. A variety of structural/ physical modification and nonstructural/ operational measures were considered to satisfy the study objectives and constraints in consultation with the Port and San Francisco Bar Pilots. Consideration of the various measures was conducted consistent with federal water resources policies and practices. Measures were evaluated for compatibility with local conditions and relative effectiveness in meeting planning objectives. They are presented below by category. A summary of the analysis is presented in Table 27.

Nonstructural/Operational Measures: The implementation of nonstructural/ operational measures

[1] In FY19 and FY21, the California State Coastal Conservancy contributed slightly over $13 per cubic yard to redirect material to beneficial use for the Redwood City Operation and Maintenance project.

have the potential to improve navigation within the Oakland Harbor without the physical modification of the channels. The nonstructural measures considered are listed below. Several measures are currently in use in the Port and are discussed in section 2.2.2. Since many of these nonstructural measures are already being implemented within the Oakland Harbor, only limited further benefits could be realized. These measures were therefore not carried forward.

- Alternative sites for, or means of, commerce delivery: This non-structural measure generally refers to an alternative site either within or outside the port. Existing sites within the port are already being used for other types of cargo transportation (e.g., bulk cargo). Additionally, if container vessels were to travel to and from other terminal locations within the port, they would still be subject to the inefficiencies of the port and the narrow turning basins. Sites outside the port would require transportation back to the region by other means. The scope of this study considers the land and the function of all container terminal sites in the port, including existing, expanded, and planned terminals. No alternative terminal sites have been identified. Therefore, no additional port terminal sites have been identified or proposed for cargo routing or handling. Accordingly, this measure has not been included for further analysis.
- Increase tugboat assistance: Tugboats are used to improve the maneuverability of vessels that have reduced speed during channel transits, to turn vessels, and to dock and undock vessels. The standard operating practices in Oakland Harbor for tug assistance are sufficient for vessels currently using the channel. The Port of Oakland is already utilizing additional tugs in the turning basins and when vessels back out of a channel. Additional tug assistance would not improve the efficiency of vessels transiting the channel and this measure was not carried forward.
- Timing of vessel transits: Improving vessel scheduling and timing of transits is typically used to reduce delays and inefficiencies related to transit restrictions. However, vessels calls and transit are already monitored and scheduled and it is unlikely that further improvements in vessel scheduling and timing of transits can be achieved in the busy Port. Therefore, this measure does not meet the planning objectives and is not carried forward.

Structural Measures: Structural measures are those measure that modify the physical attributes of the navigation channels. Since the vessels currently calling at the port are constrained by the dimensions of the turning basin channel width, one structural measure was carried forward.

- Turning basin and channel widening: Turning basin and channel widening consists of increasing the size of the federal navigation channel for improved navigation when turning. Widening the turning basins would allow for more efficient operation of the vessels within the Oakland Harbor and for the ULCVs to call the Port of Oakland more frequently. This measure would address the problems of width limitations and objectives. Therefore, this measure was carried forward.
- Channel deepening: This measure would involve deepening the existing federal navigation channels beyond the currently maintained depth of -50 feet MLLW. Channel deepening would not address the problems nor objectives because the Port of Oakland is not depth constrained for ULCVs. Therefore, this measure is not carried forward.

Table 27: Measure Analysis Summary

MEASURE	ANALYSIS SUMMARY	MOVES FORWARD?
NON-STRUCTURAL MEASURES		
Alternative sites for commerce delivery	No additional sites identified	No ×
Increase tugboat assistance	Already implemented	No ×
Timing of vessels transits	Already implemented	No ×
STRUCTURAL MEASURES		
Turning basin and channel widening	Addresses problems, likely federal interest	Yes ✓
Channel deepening	Does not address problems or objectives	No ×

4.7 Alternative Plan Formulation and Screening*

The plan formulation strategy for this study was conducted in three phases, as described in the following sections. Throughout the plan formulation process, a broad range of measures and footprints were considered and then certain measures and footprints were eliminated from further consideration to arrive at the final array of alternatives, which were carried forward for the NEPA effects analysis. Key assumptions included during the formulation of alternatives are provided below. Additional assumptions are presented in the appendices.

For this navigation study, all non-structural measures that are currently implemented are assumed to remain in place over the period of analysis. For example, all additional harbor pilot and assist tug operations will continue in the current manner used to mitigate large container vessel turning operations with the existing turning basin dimensions.

The Port of Oakland has completed improvements to the Port and has additional plans underway that are included in the future conditions. This includes terminal upgrades, crane raisings, crane upgrades, and wharf upgrades. Additional plans to improve truck traffic flows in and out of the Port are also scheduled to be completed by 2022. These changes will increase the Port's container throughput capacity over the study period of analysis.

The period of analysis is 50 years, beginning with the base year of 2030, the first year after project completion, to 2079. The Fiscal Year 2022 Federal discount rate of 2.25% is used to discount benefits and costs. This report uses methodology from ER 1105-2-100, transportation savings accruing to deep draft vessels.

Total container cargo throughput is expected to increase in the future. Past TEU volumes have grown at an average rate of 2.1% per year, and that rate of growth is expected to persist throughout the forecast period, which ends in 2050. This will roughly double the TEU volumes handled by the Port by the end of the forecast period. The commodity growth was limited to twenty years after the base year of the project, consistent with USACE practice for long-term commodity forecasts, and due to the uncertainty surrounding such long-term forecasts. However, benefit levels remain constant through the remaining period of analysis as well.

The Port will see an increase in vessel traffic to accommodate this increase in volume. In 2019, the Port saw 1,248 vessel calls, a decrease of 10% from 2018. While smaller vessels are being replaced by larger ones to carry more cargo on a single voyage, the overall number of vessels will have to increase to match increasing TEU volumes over time. Also, the depth of the channels at Oakland are not expected to change over the study period, so loading practices and load factors are assumed to be unchanged from the existing condition. Vessels significantly larger than the previous study's design vessel, such as the Post-Panamax Generation III, currently carry about 20% of Oakland's TEU cargo and make up about 16% of the total vessel calls to the Port. The largest vessels in the current container fleet, Post-Panamax Generation IV vessels, have called infrequently at the Port historically. However, both types of vessels will call more often over the forecast period to help accommodate future TEU volume increases, while helping suppliers and shippers take advantage of economies of scale. Gen IV vessels already in the world fleet are assigned to services from Asia to either the Middle East or Northern Europe because of its long voyage duration. The largest container vessels typically start their service on those routes and cascade into the trans-Pacific routes later. It is reasonable to assume that upwards of 40% of Oakland's TEU volume would be shifted to these larger classes of vessels by the end of the forecast period.

If Gen IV vessels cascade to Asia-Northern Europe to Pacific services, then they will likely call at San Pedro Bay, then Oakland next. To see the same vessel utilization rates as currently on the Asia-Europe routes, there needs to be double the TEU volumes in the Pacific, while maintaining their current service frequencies. So, a gradual approach to cascading seems more likely, when shifting to larger vessels. Once the volumes have nearly doubled, by the end of the forecast period, utilization rates and frequencies of Gen IV vessel movements in the Pacific may more closely resemble those currently found on Asia to Northern Europe or Middle East services. Frequency is important at Oakland, given its reliance on agricultural exports, so they may keep weekly services to maintain speed to market.

The existing vessel fleet experiences operational inefficiencies due the turning basins' dimensions. These inefficiencies are projected to continue and increase in the future as a larger share of the cargo is shifted to the larger vessel fleet, and these vessels call on Oakland more often. Because of these inefficiencies and delays, the total number of Gen IV vessels to call on Oakland will be lower than it would have been if the turning basins had been widened. Economies of scale will be easier to realize if the turning basins are widened, and longer, higher capacity vessels can call more efficiently. The largest vessels in the fleet will continue to be delayed due to restrictions and produce delays for the rest of the fleet that must accommodate them. Based on inputs from the Port's operators and Harbor Pilots, each Gen IV vessel creates delays of around 3-4 hours per transit—which could create additional delays if Gen III vessels are tide and current restricted already.

These assumptions and projections are made within the context of a "multiport analysis," i.e., a systematic determination of alternative routing possibilities, regional port analyses, and intermodal networks given the absence of a project.

All alternatives assume the beneficial placement of suitable dredged material, consistent with Section 204(d) of WRDA 1992. This assumption applies to alternatives that are estimated to produce material that is suitable for placement at the San Francisco Deep Ocean Disposal Site. Placement at San Francisco Deep Ocean Disposal Site is not considered a beneficial placement.

Material suitable for placement at San Francisco Deep Ocean Disposal Site is also eligible to be placed at a beneficial use site for the protection, restoration, or creation aquatic wetland habitats. The incremental cost of placing material at a beneficial use site as cover material is estimated to be about $8 per cubic yard more than the cost of placement at San Francisco Deep Ocean Disposal Site for the proposed alternative. This was determined to be reasonable for the environmental benefits the placement would provide. These benefits include keeping sediment in system, accelerating wetland accretion, and creating habitat for endangered species.

4.7.1 Developing and Preliminary Screening Footprint Variations

The study team conceptually developed the footprints presented in this section to assess the feasibility of different turning basin locations based on their ability to meet objectives, avoid constraints, and their anticipated benefits compared to costs.

Inner Harbor Variation 1: Shifted East

Inner Harbor Variation 1 is a circular turning basin that is shifted East and overlays the existing turning basin (Figure 25). Inner Harbor Variation 1 minimizes impacting anticipated contaminated fast land on the Oakland side. This variation uses a turning basin multiplier of 1.4 (e.g., 1.4 times the length of the design vessel). The variation would impact approximately 10.0 acres of total fast land at Alameda and Howard Terminal and would require installation of about 2,400 feet of bulkheading along Alameda and Howard Terminal.

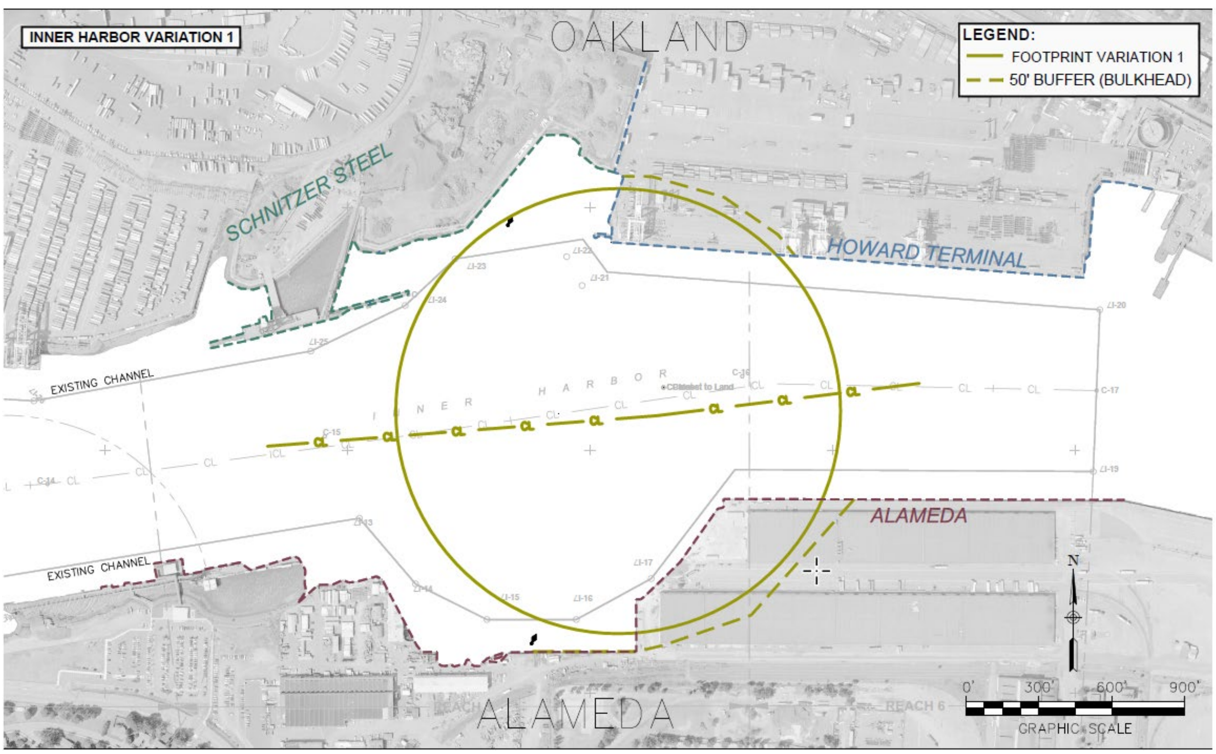


Figure 25: Inner Harbor Variation 1 - Shifted East

Inner Harbor Variation 1 would require a significant amount of dredging and excavating; this would result in a significant cost. This variation avoids anticipated contaminated materials in Oakland fast land, which can be costly and environmentally risky to remove and properly dispose of. The structural demolition required for the warehouses at Alameda (Annex Terminals) would be significant. Inner Harbor Variation 1 would impact five warehouse bays. Additional Alameda businesses that would be impacted include Centerline Logistics - a tug and barge company- and Marine Express. If this footprint were to be implemented, the Alameda warehouses, Centerline Logistics, and Marine Express would require modifications to their operations which would likely have a negative impact to jobs.

It is assumed that Inner Harbor Variation 1 would provide a high amount of NED benefits. This is assumed because Inner Harbor Variation 1 is within the vicinity of the existing Inner Harbor turning basin east of all marine terminals, and would require only a minor modification to the existing channel centerline.

While the amount of land required to implement Inner Harbor Variation 1 is significant and modifications to local business' operations would be required, this footprint is unlikely to prohibit future operations of any business assuming impacted businesses can either consolidate or shift operations. Combined with the high amount of anticipated NED benefits, Inner Harbor Variation 1 was carried forward for further analysis.

Inner Harbor Variation 2: Shifted North

Inner Harbor Variation 2 is a circular turning basin that is shifted North and overlays the existing turning basin. Inner Harbor Variation 2 minimizes impacting fast land on the Alameda site. While this variation avoids impacting fast land at Alameda, it impacts land at Howard Terminal and Schnitzer Steel. This variation uses a turning basin multiplier of 1.4. The variation would impact a total of about 10.1 acres of fast land at Schnitzer Steel and Howard Terminal and would require the installation of about 2,500 feet of bulkheading at Howard Terminal and Schnitzer Steel.

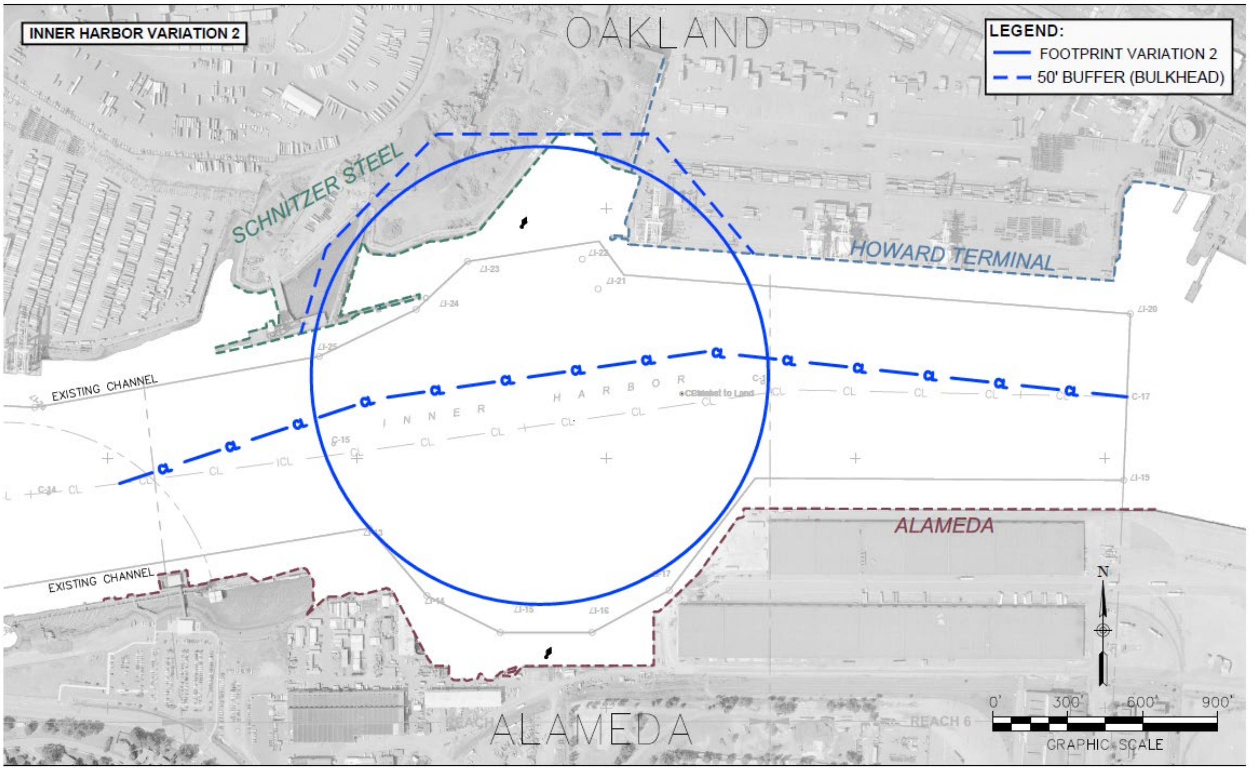


Figure 26: Inner Harbor Variation 2 - Shifted North

Inner Harbor Variation 2 requires the majority of Schnitzer Steel's property, including the wharf structure imperative to Schnitzer Steel's operations. This footprint would impact Schnitzer Steel's business significantly, with the possibility of ending Schnitzer Steel's operations entirely. The impacts would require the wharf structure to be relocated or rebuilt, and compensation for business loss would be a significant cost. Additionally, the sediment on the fast lands at Schnitzer Steel is assumed to be contaminated; this increases the cost of the placement of the material and total project cost.

It is assumed that Inner Harbor Variation 2, similarly to Inner Harbor Variation 1, would provide a high amount of NED benefits because this variation is within the vicinity of the existing inner harbor turning basin east of all the terminals and would require only a minor modification to the existing channel centerline.

The amount of land required to implement Inner Harbor Variation 2 is significant and assumed to be contaminated, resulting in a high cost. Additionally, the impacts to Schnitzer Steel may be significant enough to prohibit their operation from continuing. Compared to Inner Harbor Variation 1 and 3, Inner Harbor Variation 2 is estimated to have similar benefits but higher costs, resulting in it being less economically-competitive. Therefore, this footprint did not move forward for further evaluation.

Inner Harbor Variation 3: Centered

Inner Harbor Variation 3 is a circular turning basin that is centered over the existing Inner Harbor turning basin (Figure 27). This variation was designed to minimize the total amount of fast land impacted. While Inner Harbor Variation 3 impacts the least amount of land, it impacts three properties: Howard Terminal, Schnitzer Steel, and Alameda. This variation uses a turning basin multiplier of 1.4. It is estimated this variation would impact about 6.5 acres of fast land and would require the installation of about 3,000 feet of bulkheading.

Figure 27: Inner Harbor Variation 3 – Centered

Compared to Inner Harbor Variations 1 and 2, it is estimated Inner Harbor Variation 3 would impact approximately 3.5 acres less fast land, but require about 500 linear feet more bulkheading. This footprint would impact three bays of the Alameda warehouses. The impacts to Howard Terminal, Schnitzer Steel, and Alameda would require modifications to their business operations and may result in loss of jobs, but would likely not be prohibitive to their operations assuming impacted business can consolidate or shift operations.

It is assumed that Inner Harbor Variation 3, similarly to Inner Harbor Variation 1 and 2, would provide a high amount of NED benefits because this variation is within the vicinity of the existing inner harbor turning basin East of all the terminals, and would not require a change to the existing channel centerline.

This footprint impacts the least amount of land compared to the other inner harbor footprint variations and, while it would impact local business's operations, this variation would not prevent operations from continuing. Therefore, Inner Harbor Variation 3 was carried forward for further analysis.

Inner Harbor Variation 4: Non-Circulator Turning Basin

Inner Harbor Variation 4 is non-circular turning basin that impacts land at Howard Terminal while minimizing impacts to fast land at Alameda and Schnitzer Steel (Figure 28). The footprint for this variation is based on ship simulation modeling the Port of Oakland conducted with the San Francisco Bar Pilots at CSU Maritime Academy (CSU Maritime Academy, 2019). It is estimated this variation would impact approximately 12 acres of land at Alameda and Oakland, including Howard Terminal and Schnitzer Steel, and is estimated to require the installation of 2,400 feet of bulkheading.

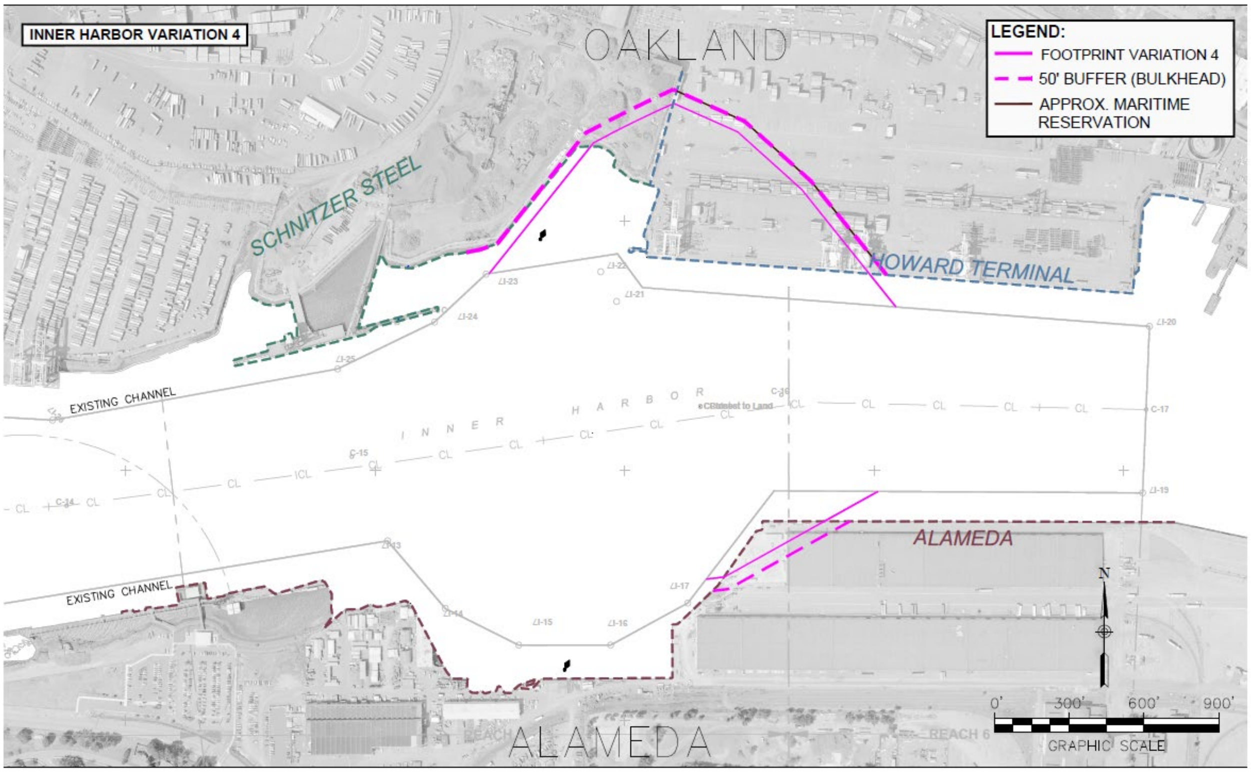


Figure 28: Inner Harbor Variation 4 - Non-Circular

The majority of the land impacted by this alternative would be Port of Oakland-owned property at Howard Terminal, with additional land being required at Alameda and Schnitzer Steel.

Inner Harbor Variation 4 is anticipated to provide a moderate amount of NED benefits. The non-circular configuration would create challenges for the pilots that would not otherwise be anticipated as compared to a circular turning basin option. This variation would require ULCVs to make a multipoint turn, maneuver in a tight space, and would restrict the turning direction of a ULCV. It is estimated the time required to turn a vessel within the Inner Harbor Variation 4 turning basin would be greater than the time required to turn in a circular turning basin. This variation is therefore estimated to produce less benefits than Inner Harbor Variations 1, 2, and 3.

Inner Harbor Variation 4 was carried forward for further analysis because of cost uncertainties and the likely support from local businesses.

Inner Harbor Variation 5: New Location West Of Existing

Inner Harbor Variation 5 is a circular turning basin located west of the existing Inner Harbor turning basin in the Middle Harbor, across from the Oakland International Container Terminal (Figure 29). It impacts the land designated as open space at the former naval base in Alameda. This variation uses a turning basin multiplier of 1.4. It is estimated this variation would impact approximately 54 acres of fast land and would require the installation of about 4,100 feet of bulkheading.

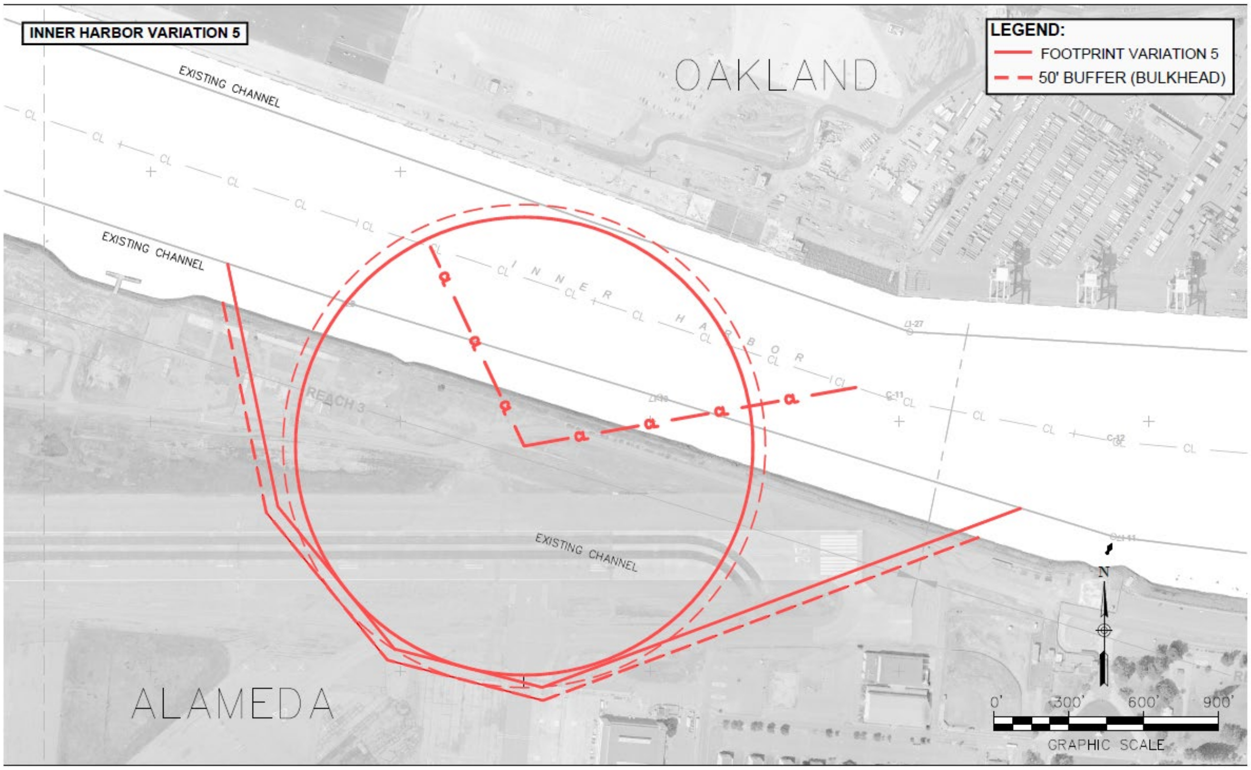


Figure 29: Inner Harbor Variation 5 - New Location West Of Existing

Although the cost to acquire the land to implement Inner Harbor Variation 5 would be less per acre than acquiring the land adjacent to the existing Inner Harbor variations, Inner Harbor Variation 5 would require between four and eight times the amount of land as Variations 1 through 4.

Inner Harbor Variation 5 would result in limited benefits because it is located west of the existing Inner Harbor turning basin and would therefore still require vessels calling terminals east of Oakland International Container Terminal to back down the Inner Harbor channel, a cause of in-harbor transit inefficiencies. Additionally, the location of Variation 5 adds restrictions to adjacent deep-water berths (berths 58 and 59), such as limiting vessel size and operations at these berths to accommodate ULCV transits, resulting in further reduced benefits. Variations 1 through 4 do not add these new berth limitations.

Due to the large amount of fast land impacts and associated costs for Inner Harbor Variation 5, combined with the berth restrictions that would be required at Oakland International Container Terminal and limited potential for gaining NED benefits, Inner Harbor Variation 5 was not carried forward for further consideration.

Inner Harbor Variation 6: New Location Outside Middle Harbor

Inner Harbor Variation 6 is a non-circular turning basin located west of the Inner Harbor Channel off Alameda Point and nearby Middle Harbor Shoreline Park. This variation is an elongated circle or oval to account for the currents and winds that would put forces on the vessels. The Variation 6 footprint would not have any fast land impacts, but would likely require additional features, such as a breakwater, to mitigate the forces the current and wind would place on ULCVs as they used the turning basin. Without detailed hydrologic and hydraulic modeling, those additional features that may be required are unknown and therefore are not included in Figure 30.

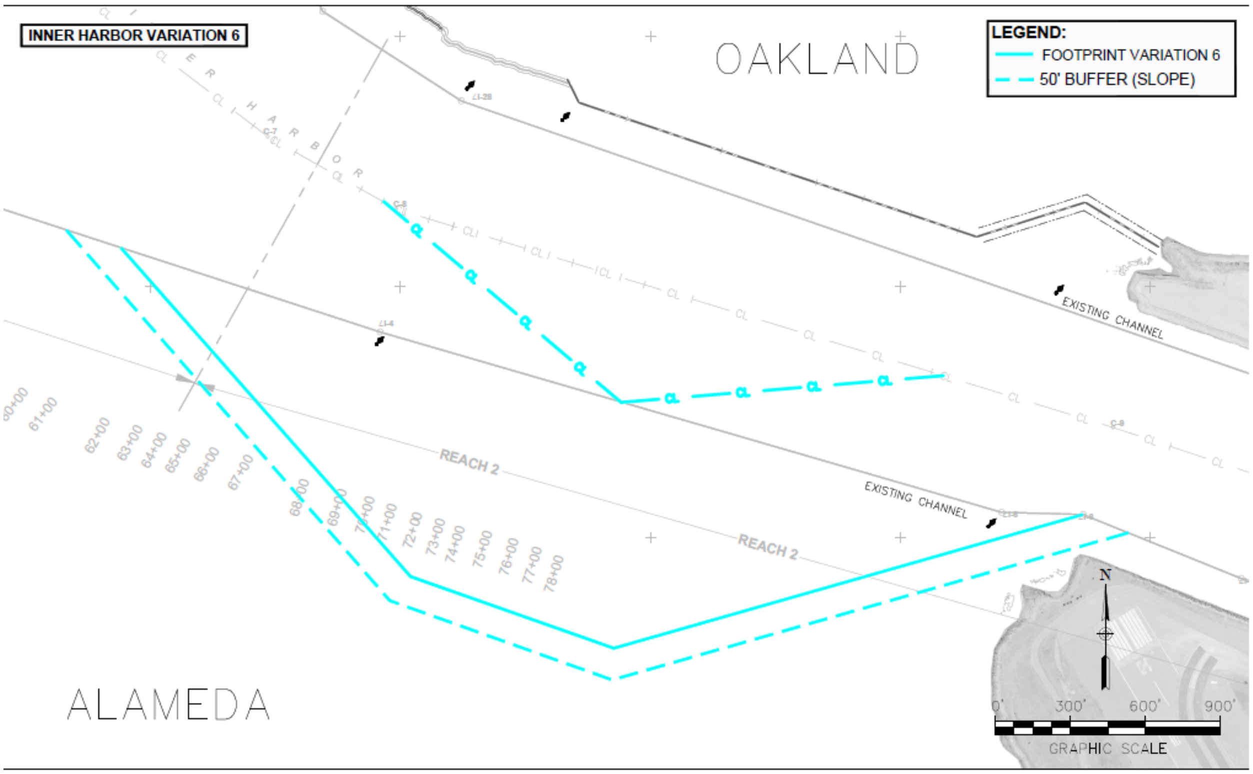


Figure 30: Inner Harbor Variation 6 - New Location Outside Middle Harbor

USACE and the Port of Oakland met with the San Francisco Bar Pilots to discuss the possibility of a turning basin located outside of the Inner Harbor. The San Francisco Bar Pilots stated a turning basin in this location would not be beneficial to the majority of ULCVs, leave vessels exposed to the elements requiring additional operational restrictions, and block the channel for other vessel traffic. Additionally, Inner Harbor Variation 6 would likely require additional efforts and maintenance costs due to the currents increasing the sedimentation rate.

Due to anticipated significant costs and minimal to nominal benefits, the Inner Harbor Variation 6 was removed from further consideration.

Outer Harbor Variation 7: Shifted East

Outer Harbor Variation 7 is shifted east of the existing Outer Harbor turning basin. This variation uses a turning basin multiplier of 1.5 to account for currents experienced in the Outer Harbor. This variation would not impact fast land nor require bulkheading.

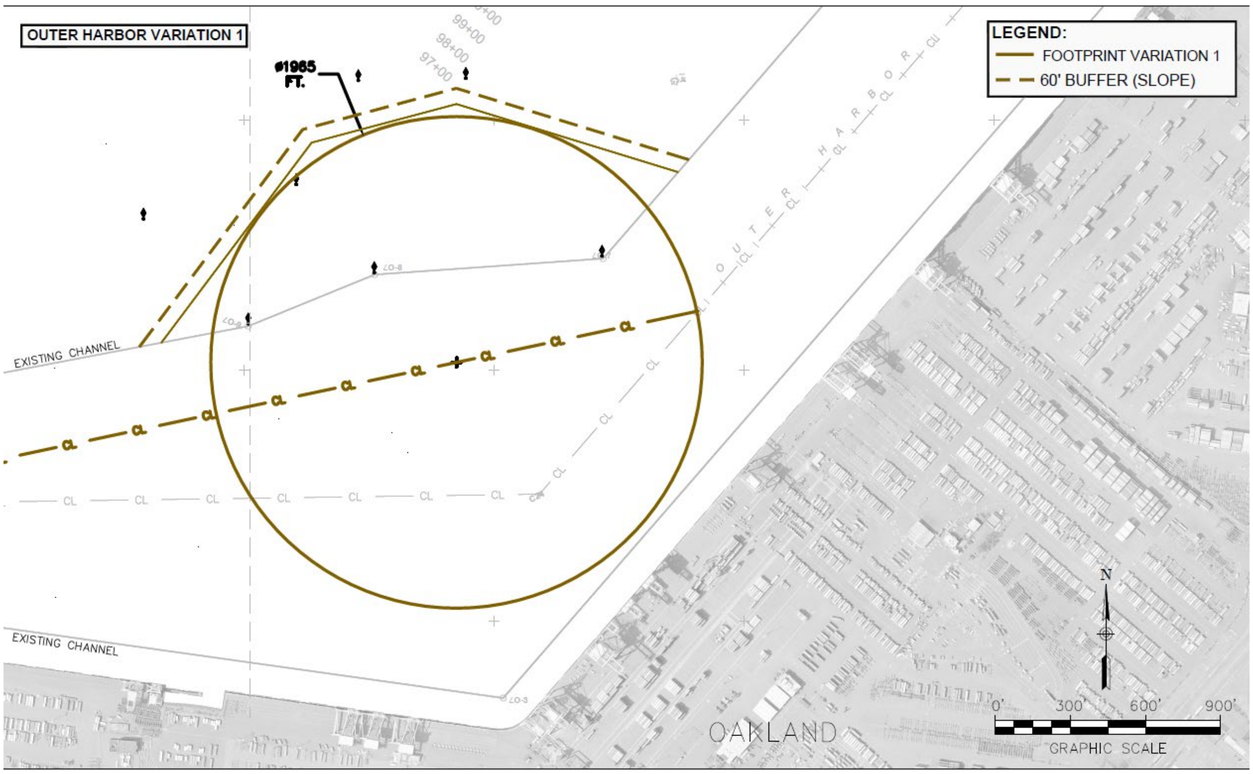


Figure 31: Outer Harbor Variation 7 - Shifted East

Outer Harbor Variation 7 would require a shift in the channel centerline to north of the existing centerline; this is not ideal for the pilots. This footprint would also impact a larger footprint than Outer Harbor Variation 8, resulting in additional environmental impacts. To minimize impacts and costs, this footprint was not kept for further consideration.

Outer Harbor Variation 8: Centered

Outer Harbor Variation 8 is a circular turning basin that is centered over the existing turning basins in the bend of the Outer Harbor (Figure 32). This variation uses a turning basin multiplier of 1.5 to account for currents. This variation would not impact fast land nor require bulkheading.

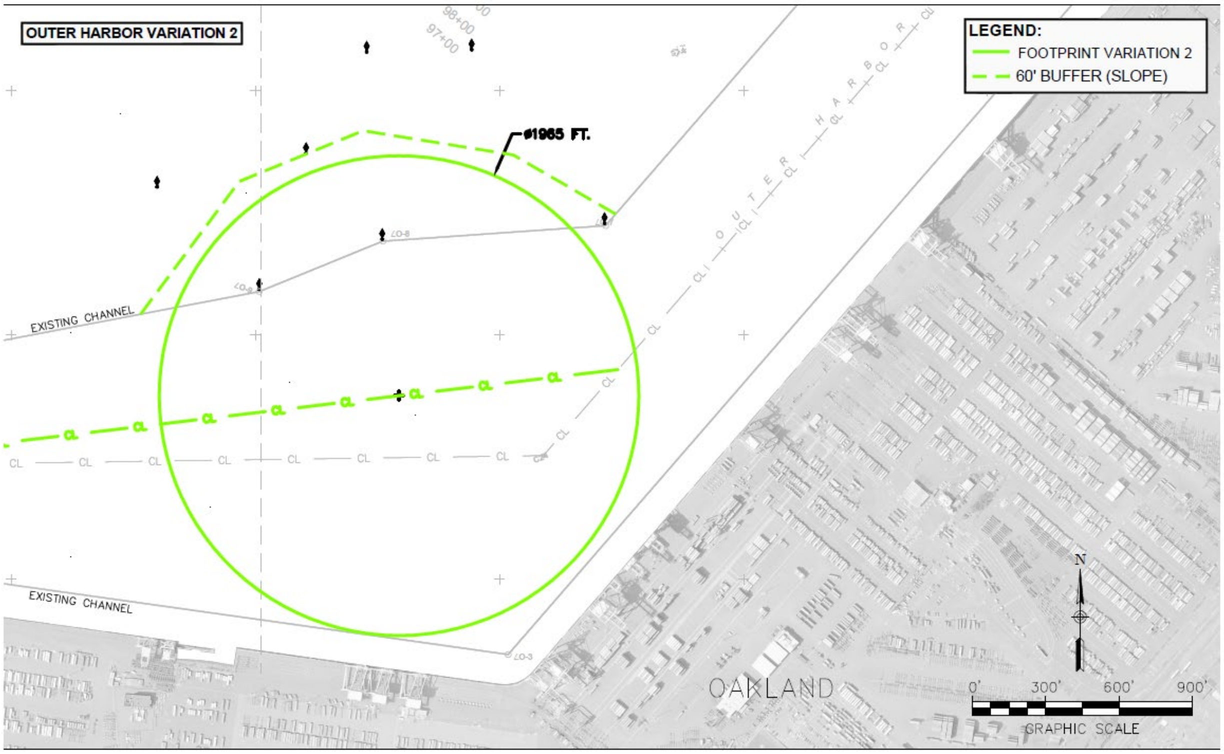


Figure 32: Outer Harbor Variation 8 - Centered

Outer Harbor Variation 8 keeps the proposed centerline of the channel close to the existing centerline given the required design standards; this is ideal for the San Francisco Bar Pilots. Also, compared to Outer Harbor Variation 7, it limits the amount of dredged material that would need to be removed. This footprint was therefore kept for further consideration.

Summary

After the preliminary screening of footprint variations, three Inner Harbor Variations and one Outer Harbor variation were kept for further consideration. Table 28 summarizes the results.

Table 28: Summary of Preliminary Screening of Footprint Variations

FOOTPRINT VARIATION	KEPT FOR FURTHER CONSIDERATION?
Inner Harbor Variation 1: Shifted East	✓ Yes.
Inner Harbor Variation 2: Shifted North	× No. Estimated to have detrimental impacts to Schnitzer Steel that may prevent Schnitzer Steel's operation at the location.
Inner Harbor Variation 3: Centered	✓ Yes.
Inner Harbor Variation 4: Non-Circular	✓ Yes.
Inner Harbor Variation 5: New Location West Of Existing	× No. Estimated to have greater costs and have less benefits than other Inner Harbor variations moving forward.
Inner Harbor Variation 6: New Location Outside Middle Harbor	× No.
Outer Harbor Variation 7: Centered	✓ Yes.
Outer Harbor Variation 8: Shifted Northeast	× No. Estimated to be more costly and have more environmental impacts than Outer Harbor Variation 7.

4.7.2 Development of Focused Array of Alternative Plans

For the three Inner Harbor footprint variations and the one Outer Harbor footprint variation moving forward for further consideration (Figure 33), preliminary quantities and costs were calculated for screening purposes. The preliminary costs used to screen these four footprints do not include real estate nor environmental mitigation. A preliminary analysis of the four footprints moving forward is presented in Table 29.

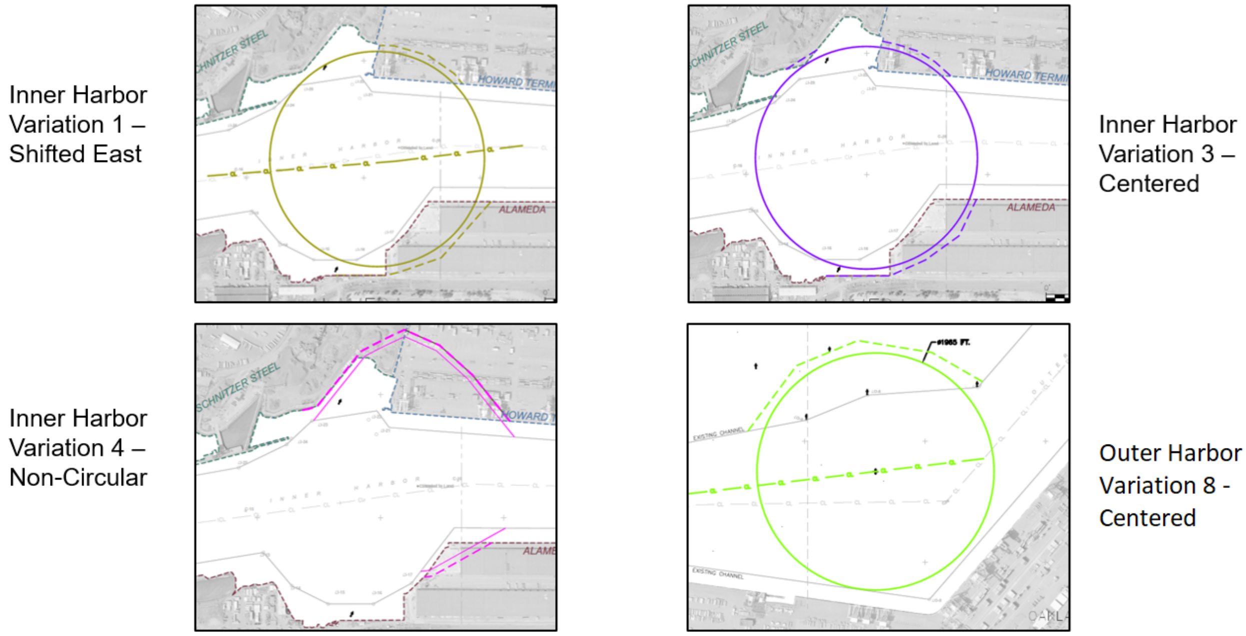


Figure 33: Footprints Moving Forward for Preliminary Cost Calculations

The footprints' costs, benefits, environmental impacts, and impacts to businesses were considered. No footprints are anticipated to have catastrophic environmental impacts because all avoid sensitive habitat.

Considering costs and benefits, Inner Harbor Variation 4 is estimated to have the highest cost as well as the least amount of benefits due to the extra time needed for ULCVs to maneuver within a non-circular turning basin as compared to a circular turning basin. This would not efficiently meet the objectives of the study. Therefore, Inner Harbor Variation 4 was not kept for further consideration. Inner Harbor Variation 1 is anticipated to cost $10 million more than Inner Harbor Variation 3 and is anticipated to have more substantial impacts to local business operations in Alameda. Additionally, while Inner Harbor Variation 1 and 3 are anticipated to produce similar benefits, Inner Harbor Variation 3 is more favorable and efficient because the channel centerline would stay the same while Inner Harbor Variation 1 would require the channel centerline to shift. With Inner Harbor Variation 1 estimated to cost less, produce more benefits, and impact less businesses in Alameda, Inner Harbor Variation 3 was removed from further consideration. Outer Harbor Variation 8 does not require acquiring land, does not negatively impact businesses, and is anticipated to be economically justified. Therefore, Outer Harbor Variation 8 was kept for further consideration.

Table 29: Preliminary Analysis of Four Footprints that Moved Forward

	FOOTPRINT			
	INNER HARBOR			**OUTER HARBOR**
	1 – Shifted East	**3 – Centered**	**4 - Non-Circulator**	**8 - Centered**
Preliminary First Cost	$160 million	$150 million	$170 million	$47 million
Benefits / NED	$$$ – ideal	$$$ – ideal	$$ – not ideal	$$$ – ideal
Environmental impacts	No catastrophic impacts	No catastrophic impacts	No catastrophic impacts	No catastrophic impacts
Minimized impacts to any one business	No	Yes	Yes	Yes
Moves to alternatives?	No ×	Yes ✓	No ×	Yes ✓

The focused array of alternatives was developed with economically competitive components from the preliminary analysis summarized in Table 30. Various combinations of these components make up the focused array of alternatives. Additionally, a comprehensive benefits plan (Alternative D-2) was developed in accordance with the Assistant Secretary of the Army for Civil Works (ASA(CW)) policy directive dated 5 January 2021. All of the alternatives assume beneficial placement of dredged material in compliance with Section 204(d) of WRDA 1992 (see section 4.5 Material Placement for more information).

Table 30: Focused Array of Alternatives

ALTERNATIVES	
A	No Action
B	Inner Harbor Only (Inner Harbor Variation 3), with beneficial placement of eligible material
C	Outer Harbor Only (Outer Harbor Variation 8), with beneficial placement of eligible material
D-1	Inner and Outer Harbor (Inner Harbor Variation 3 and Outer Harbor Variation 8), with beneficial placement of eligible material
D-2	Inner and Outer Harbor (Inner Harbor Variation 3 and Outer Harbor Variation 8), with beneficial placement of eligible material and the electrification of dredges

4.8 Evaluation of the Focused Array of Alternatives

Per the 1983 Principles and Guidelines by the U. S. Water Resources Council, the federal objective of water and related land resources project planning is to "contribute to NED consistent with protecting the Nations' environment, pursuant to national environmental statutes, applicable EOs, and other Federal planning requirements" (U.S. Water Resources Council, 1983). The 1983 Principles and Guidelines Accounts and Criteria were used to evaluate and compare the array of alternative plans. For the evaluation of the Focused Array of Alternatives, the costs and benefits were refined. The results are presented in the following sections of the report.

4.8.1 Meeting Objectives and Avoiding Constraints

Alternatives were evaluated based on their ability to make significant contributions to the planning objectives and sufficiently avoid the planning constraints. The evaluation of the alternatives relative to each other is presented in Table 31.

Alternative A – No Action does not meet the study objectives. Alternatives B, C, D-1, and D-2 all contribute to meeting the objectives of improving the efficiency of operations of containerships within Oakland Harbor and allowing for more efficient use of containerships. However, Alternatives B and C only improve efficiency for vessels transiting to either the Inner Harbor or Outer Harbor; therefore, they are given a 'medium' rank. Alternatives D-1 and D-2 improves the efficiency of vessels transiting to both the Inner Harbor and Outer Harbor, therefore getting a 'high' rank. No alternatives contribute to an increase in shoreline erosion. Additionally, all alternatives stay within the land dedicated for turning basin expansion at Howard Terminal. All the alternatives were formulated to avoid these constraints.

Table 31: Alternatives' Ability to Meet Objectives and Avoid Constraints

	ALTERNATIVES				
	A – NO ACTION	B – INNER HARBOR ONLY W/ BENEFICIAL USE	C – OUTER HARBOR ONLY	D-1 – INNER AND OUTER HARBOR W/ BENEFICIAL USE	D-2 - INNER AND OUTER HARBOR W/ BENEFICIAL USE & ELECTRIC DREDGES
OBJECTIVES					
Improve the efficiency of operations of containerships within the Oakland Harbor	Low	Medium	Medium	High	High
Allow more efficient use of containerships	Low	Medium	Medium	High	High
CONSTRAINTS					
Cannot increase shoreline erosion	High	High	High	High	High
Stay within the dedicated land reserved at Howard Terminal for turning basin expansion	High	High	High	High	High

4.8.2 Principles and Guidelines Accounts

The alternatives were also evaluated on the 1983 Principles and Guidelines accounts.

National Economic Development (NED)

NED effects are changes in the economic value of the National output of goods and services.

This is calculated as the NED benefits of the project. NED benefits are shown in Table 32. For the evaluation of the Focused Array of Alternatives, costs and benefits were refined and estimates of real estate and environmental mitigation costs were incorporated. Of the alternatives, Alternative D-1 provides the most average annual equivalent net benefits with $34.0 million assuming beneficial placement of dredged material in compliance with Section 204(d) of WRDA 1992. Therefore, Alternative D-1 is the NED/BU Plan. Alternative D-2 provides the second most net benefits with $33.5 million and is the Comprehensive Benefits Plan.

Table 32: Summary Economics of Focused Array of Alternatives

	ALTERNATIVES				
	A – NO ACTION	B – INNER HARBOR ONLY W/ BENEFICIAL USE	C – OUTER HARBOR ONLY	D-1 – INNER AND OUTER HARBOR W/ BENEFICIAL USE (National Economic Development / Beneficial Use Plan)	D-2 - INNER AND OUTER HARBOR W/ BENEFICIAL USE & ELECTRIC DREDGES (Comprehensive Benefits Plan)
Economic Cost [1]	No Effect	$388,417,000	$79,422,000	$460,357,000	$475,643,000
AAEQ Cost [2]	No Effect	$13,610,000	$3,643,000	$16,172,000	$16,673,000
AAEQ Benefits	No Effect	$29,722,000	$21,343,000	$50,149,000	$50,149,000
AAEQ Net Benefits	No Effect	$16,112,000	$17,700,000	$33,977,000	$33,476,000
Benefit Cost Ratio	No Effect	2.2	5.9	3.1	3.0

Fiscal Year 2022 price level and discount rate of 2.25%
[1] Includes first cost, interest during construction, and associated costs
[2] Includes operation and maintenance

Regional Economic Development (RED)

Regional Economic Development (RED) effects are the impact of project spending, either directly or indirectly, on the local economy. For all actionable alternatives, there is an anticipated increase in regional economic development due to significant short-term increases in jobs and income during construction activities as workers are brought to the area. There may also be some negative impacts to regional economic development resulting from the implementation of the alternatives. Alternative C does not require the acquisition of any fast land nor properties and would not be expected to have any negative impact to regional economic development. Alternatives B, D-1, and D-2 would impact properties in Oakland and Alameda: Howard Terminal, Alameda, and Schnitzer Steel. At Alameda, 4.9 acres and three warehouse bays would be impacted. At Schnitzer Steel, 0.2 acres of fast land and a mooring pier would be impacted. At Howard Terminal, 2.3 acres of fast land would be impacted. Minimal negative impacts are anticipated to regional jobs and income associated with losses at Alameda and Oakland businesses from land acquisition. Impacts to businesses will be evaluated as more information becomes available.

Environmental Quality (EQ)

Environmental Quality (EQ) is the non-monetary beneficial effects on significant natural and cultural resources. Some of the main categories that make up environmental quality are considered for each alternative in Table 34. Detailed discussion can be found in Chapter 6. All of the alternatives assume beneficial placement of dredged material in compliance with Section 204(d) of WRDA 1992. Alternatives involving the Outer Harbor include the beneficial placement of 826,000 cubic yards of material as wetland foundation material. Alternatives involving the Inner Harbor include the beneficial placement of 621,000 cubic yards of material as wetland foundation material. Alternatives involving the Inner Harbor also include the beneficial placement of 193,000 cubic yards of material as wetland cover; this is beyond the Base Plan or least cost dredged material placement option (see section 4.5 Material Placement for more information). This has the potential to restore approximately 317 acres of wetlands assuming a 5-foot placement depth for both cover and non-cover material, which is a total 10-foot cross section. The incremental benefit of using Section 204(d) of WRDA 1992 is an additional 37.3 acres of wetland creation. The incremental benefit is shown in Figure 34. The methodology used to estimate the acres created is consistent with placement at a deeply subsided restoration site, such as the currently permitted Montezuma Restoration Site. If another less subsided site becomes available and is ready to accept material prior to construction, then the beneficial placement of material from Alternatives C, D-1, and D-2 could accomplish even more acres of wetland restoration at a shallower placement depth.

Figure 34: Incremental Benefit of Using Section 204(d) of WRDA 1992 to the Incremental Cost

Although Alternatives D-1 and D-2 are similar, Alternative D-2 would have more environmental benefits than Alternative D-1. Alternative D-2 would benefit air quality because electric dredges would reduce construction related emissions (relative to Alternative D-1) benefiting Alameda and the West Oakland community that is disproportionally impacted by air quality.

Additionally, due to the use of electric dredges, Alternative D-2 would have less noise from construction for nearby sensitive receptors in Alameda and West Oakland as compared to Alternative D-1. Using the definitions in Table 33, the categories that make up environmental quality are considered for each alternative in Table 34.

As described in Chapter 6, the alternatives in the focused array would affect the environment, but these effects would be less than significant with avoidance, minimization, and mitigation measures. Alternatives involving the Inner Harbor (Alternatives B, D-1, and D-2) would impact about 9.8 acres of subtidal aquatic habitat in the Inner Harbor. With subtidal mitigation, the impacts are anticipated to be less than significant. Pile driving that would be required for the installation of bulkheading in the Inner Harbor would cause terrestrial and aquatic vibration and noise that would be attenuated with best management practices such as vibratory hammers, bubble curtains, dampening blocks. It is also anticipated that aquatic material containing contaminants would be encountered in the Inner Harbor. Silt curtains would be deployed to minimize aquatic resuspension and aquatic work would be conducted within established work windows for the project location to avoid or minimize any potential effects to species during sensitive life stages. It is anticipated that fast lands may also have HTRW requiring placement at an appropriate class I landfill facility, as may be required.

Alternatives involving the Outer Harbor (Alternatives C, D-1, and D-2) would impact about 15.0 acres of subtidal habitat. The Outer Harbor is located in proximity to eelgrass which is considered a component of essential fish habitat. With the avoidance and minimization measures included in Appendix A7, the impacts would be less than significant.

Effects of the alternatives in the focused array and associated significance determinations are discussed in detail in Chapter 6.

Table 33: Defining Criteria for Scale of Impacts

IMPACT SCALE	CRITERIA
No Effect	The resource area would not be affected and there would be no impact.
Negligible	Changes would either be non-detectable or, if detected, would have effects that would be slight and local. Impacts would be well below regulatory standards, as applicable.
Minor	Changes to the resource would be measurable, but the changes would be small and localized. Impacts would be within or below regulatory standards, as applicable. Mitigation measures would reduce any potential adverse effects.
Moderate	Changes to the resource would be measurable and could have either localized or regional scale impacts. Impacts would be within or below regulatory standards, but historical conditions would be altered on a short-term basis. Mitigation measures could be necessary, and the measures would reduce any potential adverse effects.
Major	Changes to the resource would be readily measurable and would have substantial consequences on regional levels. Impacts would exceed regulatory standards. Mitigation measures to offset the adverse effects would be required to reduce impacts, though long-term changes to the resource would be expected.

Table 34: Scale of Final Array's Impacts to Environmental Quality/Resources

	ALTERNATIVES				
	A – NO ACTION	**B – INNER HARBOR ONLY W/ BENEFICIAL USE**	**C – OUTER HARBOR ONLY**	**D-1 – INNER AND OUTER HARBOR W/ BENEFICIAL USE (National Economic Development / Beneficial Use Plan)**	**D-2 - INNER AND OUTER HARBOR W/ BENEFICIAL USE & ELECTRIC DREDGES (Comprehensive Benefits Plan)**
Water resources & quality	No Effect	Moderate & Beneficial (wetland creation)	Minor & Beneficial (wetland creation)	Moderate & Beneficial (wetland creation)	Moderate & Beneficial (wetland creation)
Vegetation [1]	No Effect	Minor	Minor	Minor	Minor
Aquatic/Essential Fish Habitat	No Effect	Minor	Moderate	Moderate	Moderate
Species [1]	No Effect	Moderate	Moderate	Moderate	Moderate
Cultural resources	No Effect	No Effect	No Effect	No Effect	No Effect
Construction related air quality emissions	No Effect[2]	Moderate	Moderate	Moderate	Minor
Topography / Bathymetry	No Effect	Minor	Minor	Minor	Minor
HTRW	No Effect	Moderate	Minor	Moderate	Moderate

[1] The action alternatives (B through D2) would all have some indirect benefits to this resource due to wetlands creation from beneficial reuse of dredge material.

[2] The No Action alternative would have no construction related impacts to air quality, but would have negative operational air quality impacts throughout the period of analysis because it would not improve navigational efficiencies and therefore would not lessen ship idling nor transit/maneuvering times which results in operational emissions.

Other Social Effects

Other Social Effects (OSE) include the effects that are not covered in the NED, RED, and EQ. This account includes items such as community impacts, health and safety, and displacement. The same criteria presented in Table 33 were used to evaluate the Focused Array of Alternatives' other social effects. All the actionable alternatives would result in a decreased risk of a marine casualty because the widenings would result in an increased margin for error during vessel turning operations. The alternatives are not anticipated to have an impact on cultural identity nor recreation. Alternatives, including modifications to the Inner Harbor turning basin, are anticipated to have a minor impact to aesthetics as they would require modifying fast lands.

Alternative B and D-1 are anticipated to have a moderate impact on environmental justice communities because, while the footprints would only impact commercial properties, the dredging would be conducted with diesel-powered dredges that would produce air-pollutant emissions, particularly DPM – a toxic air contaminant – in the surrounding communities that are already disproportionately impacted by air pollution and associated health impacts from that pollution, as well as being environmental justice communities of concern. Alternative D-2 would have minor effects to environmental justice communities because dredging would be conducted with electric dredges, minimizing the air-pollutant emissions. This effect would be important to the West Oakland community which already has high cumulative air pollution exposure as well as many sensitive receptors and designated disadvantaged communities. West Oakland residents are exposed to air concentrations of diesel pollution that are almost three times higher than average in the Bay Area(CARB, 2008).

Table 35: Scale of Final Array's Impacts to Socioeconomic Resources

	ALTERNATIVES				
	A – NO ACTION	**B – INNER HARBOR ONLY W/ BENEFICIAL USE**	**C – OUTER HARBOR ONLY**	**D-1 – INNER AND OUTER HARBOR W/ BENEFICIAL USE (National Economic Development / Beneficial Use Plan)**	**D-2 - INNER AND OUTER HARBOR W/ BENEFICIAL USE & ELECTRIC DREDGES (Comprehensive Benefits Plan)**
Recreation	No Effect	Negligible	Negligible	Negligible	Negligible
Aesthetics	No Effect	Minor	Negligible	Minor	Minor
Environmental Justice	No Effect	Moderate	Minor	Moderate	Minor
Noise and Vibration	No Effect	Moderate	Minor	Moderate	Moderate (some reduced effects relative to D-1)

4.8.3 Principles and Guidelines Criteria

The 1983 Principles and Guidelines require that plans are formulated in consideration of four criteria: completeness, effectiveness, efficiency, and acceptability. The study team carefully analyzed and compared all of the alternatives for completeness, their effectiveness at alleviating navigation inefficiencies, their benefits and costs, and their legality (Table 36).

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. All the alternatives in the focused array were evaluated with consideration of necessary investments and other actions. The plans in the focused array were looked at for environmental, vessel traffic, and cultural resource impacts, as well as the costs associated with mitigating those impacts and acquiring the required real estate for implementation. Therefore, all actionable alternatives considered as part of the focused array are complete.

Effectiveness is the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities. All the actionable alternatives in the final array alleviate the problem of inefficiencies due to width limitations and achieve the study objectives to improve navigational efficiencies related to depth and width limitations in the existing federal navigation channel. Therefore, all actionable alternatives considered as part of the focused array are effective.

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. Efficiency was measured through a comparison of benefit cost ratios, improved navigation efficiencies, and benefits from the project. This preliminary analysis indicated that Alternatives B, C, D-1, and D-2 are efficient because they are estimated to produce more benefits than they cost to implement and maintain. However, Alternative D-1 is the most efficient because it produces the most economic net benefits.

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. The study team formulated the alternatives in accordance with applicable laws and regulations. All alternatives considered as part of the focused array are acceptable.

Table 36: Summary Principles and Guidelines Criteria on the Focused Array of Alternatives

	ALTERNATIVES				
	A – NO ACTION	B – INNER HARBOR ONLY W/ BENEFICIAL USE	C – OUTER HARBOR ONLY	D-1 – INNER AND OUTER HARBOR W/ BENEFICIAL USE (National Economic Development / Beneficial Use Plan)	D-2 - INNER AND OUTER HARBOR W/ BENEFICIAL USE & ELECTRIC DREDGES (Comprehensive Benefits Plan)
Complete	N	Y	Y	Y	Y
Effective	N	Y	Y	Y	Y
Efficient	N	Y	Y	Y	Y
Acceptable	Y	Y	Y	Y	Y

4.9 Comparison of Focused Array of Alternatives

The study team considered how well each alternative performed relative to others as related to planning objectives, planning constraints, the Principles and Guidelines accounts, and the Principles and Guidelines criteria. Table 37 summarizes each alternative's performance relative to these selection criteria on a subjective scale of Low-Medium-High.

Table 37: Comparison of Focused Array of Alternatives

	ALTERNATIVES				
	A – NO ACTION	**B – INNER HARBOR ONLY W/ BENEFICIAL USE**	**C – OUTER HARBOR ONLY**	**D-1 – INNER AND OUTER HARBOR W/ BENEFICIAL USE (National Economic Development / Beneficial Use Plan)**	**D-2 - INNER AND OUTER HARBOR W/ BENEFICIAL USE & ELECTRIC DREDGES (Comprehensive Benefits Plan)**
Objectives	Low	Medium	Medium	High	High
Constraints	High	High	High	High	High
Principles and Guidelines Criteria	Low	Medium	Medium	High	High
Principles and Guidelines Accounts	Low	Medium	Medium	High	High

Of the alternatives in the Final Array, Alternatives D-1 and D-2 meet the objectives of improving efficiency the most because they include improving both the Inner Harbor and the Outer Harbor. They both would result in the same navigation efficiency benefits and contribute to Principles and Guidelines Accounts fairly equally. Alternatives D-1 and D-2 provide the most benefits to NED and Regional Economic Development because they include improving both the Inner Harbor and the Outer Harbor. Alternative D-1 has slightly higher net benefits than Alternative D-2 because of the additional cost of including electric dredges in Alternative D-2 and therefore is the NED/BU plan. Alternative D-2 contributes the most to the environmental quality and other social effects accounts because the electric dredges reduce air-pollutant emissions during construction and subsequently reduce health-related impacts.

After careful consideration of the tradeoffs between the alternatives, USACE and the Port of Oakland selected Alternative D-2, Inner and Outer Harbor modifications using electric dredges during construction, as the Tentatively Selected Plan.

Chapter 5: Tentatively Selected Plan*

The study team and non-federal sponsor, the Port of Oakland, identified the Tentatively Selected Plan as Alternative D-2 – Inner and Outer Harbor Modifications with Beneficial Use and Electric Dredges (Figure 35). The Tentatively selected plan is the NEPA proposed action and would modify the Inner Harbor Turning Basin and Outer Harbor Turning Basin. These improvements will allow vessels to operate within the Oakland Harbor more efficiently and allow large vessels to call more frequently. The increase in cargo per vessel call yields economic benefits by allowing for more efficient use of containerships.

The Tentatively Selected Plan would require an estimated 2,500 linear feet of bulkhead and would impact approximately 4.9 acres of fast land at an Alameda site, 0.2 acres of fast land at Schnitzer Steel, and 2.3 acres of fast land at Howard Terminal. In Alameda, four of the warehouse bays on the property would be impacted.

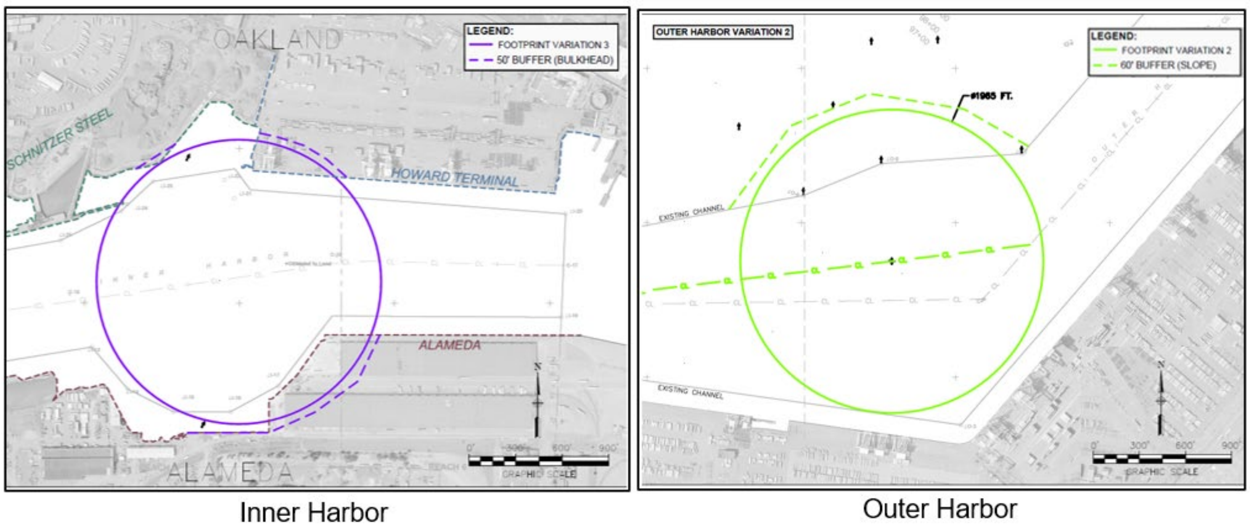


Figure 35: Tentatively Selected Plan

The Tentatively Selected Plan requires the removal and placement of approximately 1,983,000 cubic yards of aquatic dredged and terrestrial excavated material. Material is assumed to be placed at Keller Canyon landfill, Kettleman Hills landfill, and at a beneficial use site for the protection, restoration, or creation aquatic wetland habitats as either non-cover or cover (Table 38). The opportunity to use some of the dredged material for placement at a beneficial use site represents an increase in cost for the project. The beneficial use of dredged material beyond the Base Plan benefits the environment by keeping sediment in system, accelerating wetland accretion, and creating habitat for endangered species. The non-federal sponsor, The Port of Oakland, supports the beneficial placement of dredged material and is willing to share in the incremental cost above the Base Plan.

The beneficial placement of dredged material has the potential to restore approximately 317 acres of wetlands assuming a 5-foot placement depth for both cover and non-cover material. This would be consistent with placement at a deeply subsided restoration site, such as the currently permitted Montezuma Restoration Site. If another less subsided site was to become available and ready to accept material prior to construction, which is likely, then the beneficial placement of material from the Tentatively Selected Plan could accomplish even more acres of wetland restoration at a shallower placement depth. If other beneficial use sites become available and are permitted, they will be considered during Preconstruction Engineering and Design.

Table 38: Tentatively Selected Plan Excavated and Dredged Sediment Quantities and Placement Assumptions

MATERIAL	PRELIMINARY QUANTITY (cubic yards)	PLACEMENT LOCATION
Materials requiring Class I landfill placement -Potentially classified as hazardous -Terrestrial soils only, not aquatic dredge sediments	16,000	Kettleman Hills landfill
Materials requiring Class II landfill placement* - Non-hazardous but not suitable for beneficial use foundation or aquatic disposal	291,000	Keller Canyon landfill
Materials not suitable for aquatic placement at San Francisco Deep Ocean Disposal Site - Also unsuitable for cover material at upland beneficial use site	1,483,000	Upland beneficial use site, foundation
Materials suitable for unconfined aquatic disposal at San Francisco Deep Ocean Disposal Site or cover material at upland beneficial use site - Cleanest material	193,000	Upland beneficial use site, cover
TOTAL	**1,983,000**	

*Quantity includes 21,700 cubic yards of pilings

5.1 Costs

The project first cost is used as the basis for providing the cost of the project for which authorization is sought. The project first cost includes the preconstruction engineering and design costs; construction costs, including mitigation costs; lands, easements, rights-of-way and relocations; and contingencies. The economic cost is the monetary equivalent cost used in determining the benefit-cost ratio. The economic cost includes the project first cost and the opportunity costs of using the resource; it is expressed in average annual equivalent (AAEQ) terms. Project first costs for the NED/Base Plan (Base Plan and diesel dredges), and NED/BU Plan (beneficial use and diesel dredges), and the Tentatively Selected Plan / Comprehensive Benefits Plan (beneficial use and electric dredges) are shown in Table 39 for comparison purposes. AAEQ costs for the Tentatively Selected Plan / Comprehensive Benefits Plan presented in Table 40.

Table 39: First Cost of NED/Base Plan, NED/BU Plan, and Tentatively Selected Plan / Comprehensive Benefits Plan

ACCOUNT	NATIONAL ECONOMIC DEVELOPMENT PLAN / BASE PLAN (BASE PLAN + DIESEL DREDGES)	NATIONAL ECONOMIC DEVELOPMENT / BENEFICIAL USE PLAN (BENEFICIAL PLACEMENT + DIESEL DREDGES)	TENTATIVELY SELECTED PLAN / COMPREHENSIVE BENEFITS PLAN (BENEFICIAL PLACEMENT + ELECTRIC DREDGES)
01 Lands and Damages	$149,477,000	$149,477,000	$149,477,000
02 Relocations	$2,384,000	$2,384,000	$2,384,000
06 Fish and Wildlife Facilities	$4,406,000	$4,406,000	$4,406,000
12 Navigation Ports and Harbors	$226,101,000	$227,151,000	$238,811,000
18 Cultural Resource Preservation	$0	$0	$0
30 Planning, Engineering and Design	$45,202,000	$45,405,000	$47,672,000
31 Construction Management	$18,631,000	$18,715,000	$19,648,000
Total Project First Costs	**$446,201,000**	**$447,539,000**	**$462,399,000**
Economic Costs [1]	**$458,981,000**	**$460,357,000**	**$475,643,000**

Fiscal Year 2022 Price Level and discount rate of 2.25%

[1] Includes first cost, interest during construction, and associated costs

Table 40: Tentatively Selected Plan AAEQ Costs

	COST
Average Annual Equivalent Operation and Maintenance Cost	$1,105,000
Total Average Annual Equivalent Costs	$16,673,000

Fiscal Year 2022 Price Level and discount rate of 2.25%

5.2 Economic Benefits

The Tentatively Selected Plan of widening the Inner Harbor turning basin and the Outer Harbor turning basin would allow for more efficient operation of currently calling vessels and for the fleet to transition to larger vessels. This decreased transportation cost yields economic benefits. The Tentatively Selected Plan is estimated to produce $50.2 million in benefits and $34.0 million in net benefits with a benefit cost ratio of 3.0.

Table 41: AAEQ Benefits and Benefit-Cost Ratio

	COST OR BENEFIT
Total Average Annual Equivalent Costs	$16,673,000
Average Annual Equivalent Benefits	$50,149,000
Average Annual Equivalent Net Benefits	$33,476,000
Benefit Cost Ratio	3.0

Fiscal Year 2022 Price Level and discount rate of 2.25%

5.3 Regional Economic Development, Environmental Quality and Other Social Effects

As discussed in previous sections, the Tentatively Selected Plan (Alternative D-2) would provide significant environmental quality and other social effect benefits beyond those associated with the NED/BU Plan (Alternative D-1) by avoiding construction-related air-pollutant emissions and the health risks associated with such emissions. These benefits are particularly important in the context of the West Oakland communities that surround the Port of Oakland and the proposed project areas which are disadvantaged and already disproportionally impacted by poor air quality. Moreover, the Tentatively Selected Plan (Alternative D-2), like the NED/BU Plan (Alternative D-1), would result in hundreds of acres of wetland restoration and sea level rise resiliency benefits, avoided greenhouse gas emission reductions from operational efficiency gains at the Port, and short term increases in local job opportunities during construction. The Tentatively Selected Plan would deliver all this while providing average annual net benefits of approximately $33.5 million and nearly equivalent to those of the NED/BU Plan.

<u>Importance of Avoided Air Quality Emissions and their Associated Health Impacts</u>

The West Oakland community and its residents have endured poor air quality and poor health for decades. West Oakland has a significant number of sensitive receptors and a high cumulative air pollution exposure burden (see section 3.13.2).

In addition to high air pollution exposure, the areas surrounding the Port of Oakland experience high incidences of poverty and high minority populations, making these locations communities of concern for environmental justice. An analysis of racial and income indicators from the United States Census Bureau's 2015-2019 American Community Survey was conducted for this feasibility study and found 12 of 14 (or 85% of) census tracts intersecting a one-mile radius of the proposed project areas are considered minority or minority and low-income environmental justice communities of concern. These census tracts all have greater than 50% minority population and two-thirds (8 tracts) also have meaningfully greater (10% points or higher) low-income population than the percentage of Alameda County as a whole. Similarly, based on data from the California Communities Environmental Health Screening Tool (2021), the West Oakland community is 75% non-white, with approximately 74% of the population living two times below the federal poverty level; 50% of the population over age 25 having less than a high school education; and 61% percent of the population over the age of 16 that is eligible but unemployed. Given the disadvantage experienced by West Oakland, the benefits of avoided air pollutant emissions and associated health risks strongly align with the government wide "Justice40 Initiative" established by EO 14008, which aims to deliver 40% of the overall benefits of relevant federal investments to such disadvantaged communities.

Diesel emissions are of particular concern in West Oakland as health risks from ambient concentrations of DPM are much higher than the risks associated with any other TAC routinely measured in the West Oakland region.

The Port of Oakland has and continues to undertake efforts to reduce air pollution from its operations and improve air quality in the surrounding communities. Since 2009, the framework for the Port's Seaport-related air quality efforts has been the Maritime Air Quality Improvement

Plan which established a vision, goals, strategies, and targets to reduce emissions from Seaport-related equipment sources. The Port and the maritime industry undertook large-scale emissions reductions programs and projects in pursuit of this goal and as a result, DPM emissions at the Port have decreased 81% since 2005, according to the Port's 2017 Seaport Emissions Inventory (Port of Oakland, 2019). In 2019, the Port published its Seaport Air Quality 2020 and Beyond Plan. The purpose of the "2020 and Beyond Plan" is to provide a common framework of goals and strategies to address air quality, community health risk, and climate change while moving towards a zero-emissions Seaport. The 2020 and Beyond Plan notes that, at present, diesel equipment operating at the Seaport is one of the sources of DPM emissions affecting West Oakland and contributes to greenhouse gas emissions. A primary goal of the plan is to reduce the combustion of diesel fuel from Seaport operations to address a source of health risk for people living nearby. It is intended to complement concurrent plans by regulatory agencies and organizations including *The West Oakland Community Air Action Plan*.

Given the disproportionate pollution exposure burden currently borne by the West Oakland community, and the efforts of the Port to continue reducing air quality, community health, and climate change impacts, the value of the avoided construction-related emissions under the Tentatively Selected Plan cannot be overstated. The Tentatively Selected Plan's use of electric dredges as opposed to diesel powered dredges would result in significantly fewer emissions during construction of the project when compared to the NED/BU Plan, including an estimated reduction in emissions of:

- Fine particulate matter ($PM_{2.5}$) by 50% (from 4 to 2 total tons);
- Particulate matter (PM_{10}) by 50% (from 4 to 2 total tons);
- Nitrous oxides (NO_x) by 31% (from 111 to 77 total tons); and
- Reactive organic gasses (ROG) by 67%. (from to 12 to 4 tons)

These reductions are not inconsequential. In comparison, the tons of construction-related emissions avoided under the Tentatively Selected Plan equates to avoiding years of emissions from the 1.4 million annual truck trips made by Oakland Seaport trucks, including:

- Over 8 years of DPM emissions by Seaport trucks
- An entire year of PM_{10} emissions by Seaport trucks
- Over 2 years of $PM_{2.5}$ emissions by Seaport trucks
- Over a year of ROG emissions by Seaport trucks

Finally, these avoided emissions would also represent a very real benefit in terms of avoided health risk for surrounding communities and sensitive receptors. A Health Risk Assessment (HRA) conducted by the Port of Oakland for this study was used to evaluate the estimated incremental increase in lifetime health risks at the maximum impacted sensitive receptor from exposure to emissions of DPM associated with construction of the alternative plans under consideration. This assessment found that the Tentatively Selected Plan reduces the health risk to the sensitive receptors in the West Oakland community. These reductions in the incremental health risk have associated economic value as well, including but not limited to the value of avoided medical costs and income loss.

Importance of Beneficial Use

Both the NED/BU Plan and Tentatively Selected Plan include the placement of all suitable dredge material to restore hundreds of acres of wetlands around San Francisco Bay. These restoration benefits are of critical importance to the region in the context of resiliency to rising sea levels and consistent with the Administration's climate change priorities as described in EO 14008: Tackling the Climate Crisis at Home and Abroad and EO 13990: Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis (2021). Beneficially using dredged material keeps sediment in the system to feed mudflats and marshes that ring the Bay. San Francisco Bay's wetlands and mudflats are the first line of defense from sea level rise for many of the Bay's shoreline communities and for critical infrastructure. They are more resilient and adaptive than levees and seawalls, and they provide both cost-effective protection and many essential ecological and recreational benefits for the people of the Bay Area. The economic assets (like highways, sewage treatment plants and buildings) of the San Francisco Bay shoreline at risk from flooding due to climate change are valued at $100 billion dollars. There is broad scientific consensus that for much of the Bay's shoreline, wetlands provide the most effective and beneficial method to protect infrastructure from sea level rise and storm surge (Goals Project, 2015).

Bay wetlands and mudflats can grow vertically as sea level rises, which is what makes them so resilient. However, they need enough sediment (material carried by the tides) to do so. As sea level rises, the amount of sediment needed to maintain wetlands (current and restored) and mudflats at the right elevation will increase. New reports estimate that the Bay's wetlands and mudflats will need more than 450 million cubic yards of sediment between now and 2100 to maintain those we currently have, and areas purchased and slated for restoration. Even with an optimistic future of a wetter climate providing high sediment supply, under current watershed management approaches natural sediment supply will likely not come close to meeting the amount needed to maintain wetlands and mudflats until the end of the century. Much of the needed sediment for the wetlands could come from material dredged from the Bay's navigation channels (Dusterhoff et al., 2021). In a sediment starved system, beneficially reusing dredge material from federal channels for wetland restoration is mimicking a natural process that has been artificially impaired. This Engineering with Nature approach is a way to successfully execute the District's navigation missions while achieving multiple benefits for social and environmental outcomes.

While each of the alternatives assume beneficial placement of all suitable dredged material to protect, restore, or create aquatic wetland habitats in compliance with Section 204(d) of WRDA 1992, the NED/BU Plan and Tentatively Selected Plan, Alternatives D-1 and D-2 respectively, are estimated to provide the largest restoration benefit with the potential to restore approximately 317 acres of wetlands assuming a 5-foot placement depth for both cover and non-cover material. This would be consistent with placement at a deeply subsided restoration site, such as the currently permitted Montezuma Restoration Site. If another less subsided site was to become available and ready to accept material prior to construction, which is highly likely, then the beneficial placement of material from the NED/BU or Tentatively Selected Plan could accomplish even more acres of wetland restoration at a shallower placement depth.

5.4 Environmental Operating Procedures

The Environmental Operating Principles are an essential component of USACE's risk management approach in decision making, allowing the organization to offset uncertainty by building flexibility into the management and construction of infrastructure. 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 Tentatively Selected 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 pre-construction engineering and design (PED) phase. If out-of-kind mitigation (e.g. vegetated wetlands) is warranted, planting plans will utilize native vegetation that support pollinator species, have a lower susceptibility to disease or pests, and are more adaptable to climate change. 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. Where impacts to these resources are unavoidable, compensatory mitigation will be performed.

Continuous coordination with the Port of Oakland, the state of California, federal resource agencies, and the public occurred throughout the study to ensure an open and transparent process that respects views of individuals and groups. The project will be constructed in compliance with all applicable environmental laws and regulations.

Chapter 6: NEPA Environmental Effects Analysis*

This chapter presents the study's detailed environmental effects analysis, a primary component of the NEPA environmental assessment. The plan formulation process outlined in the preceding chapters of this document included the identification of a purpose and need for action (Chapter 1), the formulation, evaluation, and screening of a range of alternative measures and plans, and the identification of a focused array of alternatives to be carried forward for further study. The alternatives in the focused array are listed in Table 30 and include the no-action alternative (Altenative A); modification of the Inner Harbor Turning Basin (Alternative B); modification of the Outer Harbor Turning Basin (Alternative C); and modification of both turnining basins (Alternative D). Alternative D has two sub alternatives, D-1 involves the use of diesel dredges and D-2 involves the use of electric dredges. All action alternatives include the beneficial use of suitable dredge material for wetland restoration.

The analysis in this chapter includes evaluation of the potential effects to the environment associated with the Tentatively Selected Plan (Proposed Action; Alternative D-2) and the other action alternatives in the focused array, in comparison to the no Action alternative. The objective of the environmental effects analysis is to analyze whether the implementation of the action alternatives would significantly affect the quality of the environment. Analysis of the no action alternative is required under NEPA to provide a comparative baseline against which other alternatives can be evaluated. In this case, under the no-action alternative, there would be no modifications to any turning basin to address navigation inefficiencies. This would be expected to over time result in the future without-project transportation and economic conditions described in Chapter 2 of this Integrated Report. The existing conditions of the environmental resources in the study areas are described in Chapters 2 and 3 of this integrated report. Unless otherwise noted below, the existing conditions of the environmental resources in the study areas would be expected to persist under the no action alternative as future without-project conditions. This assessment uses the following categories to ascribe significance to the potential impacts of the action alternatives:

- No impact would result if there is no overlap between the resource and areas impacted by project activities;
- A beneficial impact would generally be regarded as an improvement over the no action alternative;
- A negligible impact would cause a slight adverse change in the environment, but one that generally would not be noticeable;
- A less-than-significant impact would cause an adverse change in the environment that would likely be noticeable but does not meet or exceed the defined significance criteria; or an impact that would be potentially significant, but avoidance and minimization measures or mitigation developed for the project would reduce such impacts to a less than significant level.

The scope of the effects analysis is limited in time and space by the reasonably foreseeable impacts of the alternatives. The primary action areas for this analysis include the existing Inner Harbor Turning Basin, Outer Harbor Turning Basin, and adjacent aquatic areas; fast lands in the vicinity of the Inner Harbor Turning Basin (including at Howard Terminal, Schnitzer Steel, and a portion of the Alameda waterside); and the proposed construction staging areas and access routes. For certain potential effects, such as those related to ambient noise and air quality conditions, the analysis extends to the surrounding communities of West Oakland and Alameda. Construction activities associated with the action alternatives are expected to take place over a maximum of three years. This analysis assumes that three-year period would range from 2027 to 2029.

The action alternatives would not change the projected overall volumes of freight that would come into the Port under future without-project conditions and maintenance dredging would remain wholly similar to current maintenance dredging for the federal channels at Oakland Harbor. Expansion of one or both of the turning basins would incrementally increase the area of the maintained navigation channel; however, increases to maintenance dredging volumes, if any, would be negligible and the nature of impacts from maintenance dredging would be the same as those occurring with existing maintenance dredging which have been separately evaluated under NEPA and associated environmental laws and regulations. Therefore, operational effects associated with freight volumes and maintenance dredging are not discussed further in this analysis.

6.1 Environmental Justice

Chapter 3 identified the environmental justice communities within a 0.5-mile and 1-mile radius of each of the turning basins. This environmental justice effect analysis evaluates whether the Proposed Action (Tentatively Selected Plan; Alternative D-2) or other action alternatives would result in a disproportionately high adverse effect on environmental justice communities of concern.

For the purposes of this study, the effects of a project alternative on environmental justice would be considered significant if the alternative would have:

- substantial adverse human health or environmental resource impacts that disproportionately harm low-income communities and/or minority communities.

Expansion of either turning basins would improve operational efficiency for vessels entering and exiting the Port, but there would be no increase in the Port's overall volume of freight from current projected volumes. Thus, there would be no long-term adverse health or resource impacts with any of the action alternatives relative to the No Action alternative. Given this, the environmental justice effect analysis herein focuses on the short-term effects from construction activities associated with the action alternatives.

The potential for construction activities to result in adverse environmental justice impacts depends on the geographic relationship of the construction impacts to the environmental justice communities of concern. To evaluate potential environmental justice impacts, this environmental justice analysis summarizes the findings of other impact analyses completed for the project and the potential for those impacts to be significant and disproportionately borne by environmental justice communities. These analyses are described in detail in subsequent sections of this Chapter. The primary environmental impacts analyzed with respect to their potential to effect environmental justice communities in the vicinity of the potential action areas (with the sections where they are discussed in full in parentheses) are those related to air quality (Section 6.13), noise/vibration (Section 6.14), and transportation (Section 6.10). When considering resource impacts such as those to air quality that may contribute to conditions over a wider area, the numerous census tracts within 1-mile of the turning basin sites that are environmental justice communities is relevant context. Environmental impacts to other resources would be localized to the immediate construction areas or otherwise would not pose a potential disproportionate impact to environmental justice communities (e.g., biological resources, sediments and soils, and water quality) and therefore they are not discussed further in this section. While recreation and cultural resources are relevant resources for the identified environmental justice communities, no potentially significant recreational or cultural impacts from the project were identified; consequently, no resulting environmental justice impacts for these resources would occur and they are also not analyzed further in this section.

6.1.1 Inner Harbor Turning Basin Expansion

As described in Section 3.1.2, two of the four census tracts within a 0.5-mile radius of the Inner Harbor Turning Basin were identified as environmental justice communities of concern. West Jack London Square (CT 9820) is a minority environmental justice community of concern and West Alameda (CT 4827) is considered both a low-income and minority environmental justice community of concern. Nine additional census tracts within 1 mile of the Inner Harbor Turning Basin are environmental justice communities.

Air Quality

This alternative would involve both dredging and upland construction to widen the Inner Harbor Turning Basin. As described in Section 6.12 even with dredge equipment assumed to be fueled by diesel, construction emissions under this alternative would not result in the emissions of ozone or $PM_{2.5}$ exceeding the corresponding federal *de minimis* levels for any calendar year during the duration of this alternative. Because the emissions do not exceed the *de minimis* levels, the air quality impacts of this alternative are less than significant with respect to the Clean Air Act. While the General Conformity criteria are used as the significance threshold under NEPA, the Port's air quality analysis for this alternative indicated that even with minimization measures for fugitive dust and use of Tier 4 engines, daily emissions of NO_x would exceed the BAAQMD's local threshold.

Air quality is an important environmental factor, with a potential for associated health effects on impacted communities and their residents. As discussed in Section 3.13.2, West Oakland has a high cumulative air pollution exposure burden, particularly to DPM. The Port conducted a HRA for this study to evaluate the potential increase in health risks to nearby sensitive receptors (described in Section 3.13.2) from exposure to project construction emissions under the various alternatives. The HRA analysis for the Inner Harbor Turning Basin expansion (Alternative B) found that the maximum impacted residential receptor would be located in Alameda and in a census tract (CT 4287) identified as an environmental justice community. However, with the proposed minimization measures for fugitive dust and use of Tier 4 engines for off-road construction equipment, the increase health risks, and $PM_{2.5}$ annual average concentration estimated at this receptor would be less than their respective BAAQMD local thresholds.

Given that the emissions for this alternative do not exceed the General Conformity *de minimis* levels and with the proposed minimization measures, environmental justice impacts related to air quality are considered less than significant for the Inner Harbor Tuning Basin Expansion Alternative.

Noise and Vibration

Noise-sensitive receptors are identified in Section 3.14.4 and occur between 500 and 2,000 feet from the proposed new perimeter of the Inner Harbor Turning Basin. Beyond 2,000 feet, construction-related or operational noise levels would generally decrease to ambient urban noise levels due to distance and intervening structures. Section 6.14.1 describes the noise effects of the Inner Harbor Tuning Basin Expansion Alternative and concludes that daytime construction noise levels at the nearest sensitive receptors would remain below the Federal Transit Administration's 90-dBA daytime criterion, and nighttime construction noise levels associated with 24-hour dredging experienced at the nearest sensitive receptors would remain under the 80-dBA nighttime criterion and therefore construction noise impacts would be less than significant. The noise and vibration analysis also determined that this alternative's construction vibration would be less than significant. Therefore, while project-related increases in noise and vibration may occur in the West Alameda and West Jack London Square environmental justice communities, the magnitude of these impacts would be less than significant as would the environmental justice effects.

Transportation

Construction during the 2.5-year construction duration of the Inner Harbor Turning Basin expansion alternative would result in temporary increases in traffic on local roads. The increase in average daily traffic would represent a minor portion of existing average daily traffic on local and regional roadways expected to be used for construction traffic and would not cause traffic levels to exceed existing capacity on any roadways. These traffic levels would not substantially affect overall circulation. There may be some localized effects along roadways closest to the construction sites, but USACE would include a minimization measure requiring a construction traffic management plan to minimize the effects of project-related construction traffic on traffic, transit, bicycle, and pedestrian circulation, as well as emergency access. As a result, this alternative would not result in any significant land-based transportation impacts. Consequently, no significant environmental justice impacts would result from traffic generated by construction activities.

6.1.2 Outer Harbor Turning Basin Expansion

One of the two census tracts within the 0.**5-**mile radius study area from the Outer Harbor Turning Basin, West Clawson (CT 4017), was identified as an environmental justice community of concern. No additional census tracts fell in the 1-mile radius (see Section 3.1.2).

Air Quality

The Outer Harbor Turning Basin expansion (Alternative C) would involve dredging to widen the existing turning basin; no land areas would be impacted. Based on the air quality analysis in Section 6.12 , construction emissions under this alternative would not result in ozone precursors or $PM_{2.5}$ that exceed the corresponding *de minimis* levels for any calendar year. Therefore, the air quality impacts of this alternative are less than significant with respect to the Clean Air Act. While the General Conformity criteria is used as the significance threshold under NEPA, the Port's air quality analysis for this alternative indicated that even with minimization measures for fugitive dust and use of Tier 4 engines, daily emissions of NO_x would exceed the BAAQMD's local threshold.

No sensitive receptors are within 1,000 feet of the Outer Harbor Turning Basin and the nearest sensitive receptors are recreational users at Middle Harbor Shoreline and Port View parks, which are approximately 1,800 feet from the Outer Harbor Turning Basin. Due to the distance separating the nearest receptors from Outer Harbor Turning Basin expansion emissions and the temporary nature of recreational exposure, the Outer Harbor Turning Basin expansion alternative would result in a negligible increase in lifetime health risks to these receptors. Similarly, the increased health risks would be negligible for the nearest residential receptors, which are approximately 1 mile east of the Outer Harbor Turning Basin. Given that the increased risks would be negligible at the nearest residential receptors, environmental justice impacts related to air quality under this alternative are less than significant.

Noise and Vibration

Construction activities for the Outer Harbor Turning Basin would only require dredging, and no pile driving activity is proposed. The nearest noise-sensitive land use to the Outer Harbor Turning Basin would be single-family residences on Pine Street, approximately 1 mile to the east where noise from dredging activity would not be perceptible. Thus, there would be no noise and vibration impacts from construction of this alternative and no environmental justice impacts from noise or vibration under this alternative.

Transportation

Overall land-based transportation impacts would be substantially less than those of the Inner Harbor Turning Basin expansion (Alternative B) because there is no landside construction activity. Worker commute trips may use local roads through residential areas during the 6-month construction period but these trips would be negligible in the context of area average daily traffic volumes. This alternative would include the same traffic management plan minimization measure as described for the Inner Harbor Tuning Basin expansion alternative. Thus, expansion of the Outer Harbor Turning Basin would not result in significant effects on land-based transportation nor environmental justice.

6.1.3 Inner Harbor and Outer Harbor Turning Basin Expansion

Air Quality

Sub-alternative D-1 involves expansion of both the Inner and Outer Harbor Turning Basins with dredge equipment powered by diesel fuel whereas Sub-alternative D-2 involves expansion of both turning basins with dredge equipment powered by electricity. All other elements of the Inner Harbor Turning Basin and Outer Harbor Turning Basin expansion would be the same. Because the difference in power source would cause a difference in emissions, air emissions were calculated for each sub-alternative.

Diesel Dredging Variation

Construction emissions under sub-alternative D-1 would not result in the emissions of ozone precursors or $PM_{2.5}$ that exceed the corresponding *de minimis* levels for any calendar year. However, similar to the Inner Harbor Turning Basin expansion only and Outer Harbor Turning Basin expansion only alternatives, while the General Conformity criteria is used as the significance threshold under NEPA, the Port's air quality analysis found that even with minimization measures, daily emissions of NO_x would exceed the BAAQMD's local threshold.

Dredging activities associated with the expansion of the Outer Harbor Turning Basin would result in a negligible increase in lifetime health risks to the nearest Outer Harbor sensitive receptors and would take place more than 2.2 miles from the sensitive receptors impacted by the Inner Harbor Turning Basin expansion and would not contribute to the health risks at these receptors. Therefore, the health risk impacts of Sub-alternative D-1 would be the same as those for the Inner Harbor Turning Basin expansion described above. Accordingly, air quality environmental justice impacts would also be less than significant under Sub-alternative D-1.

Electric Dredging Variation

The use of an electric-powered dredge under Sub-alternative D-2 would result in a decrease in criteria pollutant emissions from construction compared to those associated with Sub-alternative D-1 and would remain below the General Conformity *de minimis* levels. As with Sub-alternative D-1, even with minimization measures, the Port's air quality analysis found that daily emissions of NO_x would exceed the BAAQMD's local threshold.

As described in Section 5.3 , Sub-alternative D-2 (Tentatively Selected Plan; Proposed Action) would reduce construction related pollutant emissions and associated health effects in the environmental justice communities surrounding the Inner Harbor Turning Basin. With the use of electric dredges, the Port's HRA found that this alternative would result in a lesser increase in health risks and $PM_{2.5}$ annual average concentrations than Sub-alternative D-1. Use of an electric dredge was found by the Port's analysis to reduce DPM emissions from project construction by approximately 37.5 to 40% at these residential receptor locations. Therefore, use of an electric dredge would substantially reduce the health risk impacts from construction of this alternative on environmental justice communities in the study area. While health risk impacts for this alternative are less than significant for both the diesel and electric dredge scenarios, the reduced effects resulting from electric dredge use will confer important benefits in the context of the existing air pollution exposure burden borne by environmental justice communities in the area.

Noise and Vibration

As described above, expansion of the Outer Harbor Turning Basin would result in no construction-related or operational noise or vibration impacts on sensitive receptors. Therefore, the noise and vibration and associated environmental justice impacts of the Inner and Outer Harbor Turning Basin expansion sub-alternatives (D-1 and D-2) are the same as those identified for expansion of the Inner Harbor Turning Basin expansion (Alternative B) and are less than significant.

Transportation

The Inner and Outer Harbor Turning Basin expansion Sub-alternatives (D-1 and D-2) would result in the impacts described above for both the individual Inner Harbor Turning Basin and Outer Harbor Turning Basin expansion alternatives (Alternative B and Alternative C, respectively). The Outer Harbor Turning Basin expansion by itself would not include any land excavation and therefore minimal land-based transportation. Consequently, the land-based traffic effect of Sub-alternatives D-1 and D-2 would only be marginally higher than for the Inner Harbor Turning Basin expansion (Alternative B), due to concurrent construction activities for both turning basins during a 6-month period anticipated in 2028 and added worker commute trips for the Outer Harbor Turning Basin during this period. Impacts on transportation from either Sub-alternative would be less than significant as would the associated environmental justice impacts.

6.1.4 No Action Alternative

Because the No Action Alternative does not involve any changes from existing conditions, there would be no effects on the land uses, activities, or resources at the project sites or in the surrounding project area. As a result, no related or resulting environmental justice impacts would occur.

6.2 Socioeconomics

The socioeconomic study area extends to the city and county economies that serve or are dependent on Port operations and/or neighboring land uses including the cities of Oakland and Alameda as well as Alameda County.

An alternative would have a significant impact on socioeconomics if it resulted in:

- a measurable and prolonged decrease in local job supply or a decrease in revenue from leading industries; or
- a measurable and prolonged decrease in local housing supply or decrease in housing affordability.

The socioeconomic impacts are the same for all action alternatives in the focused array.

6.2.1 Socioeconomic Impacts for All Action Alternatives

Expansion of one or both turning basins would improve operational efficiency for vessels entering and exiting the Port, allowing larger and fewer freight ships to operate annually, but there would be no increase in the Port's overall volume of freight containers from projected volumes under the future without-project condition. Long-term impacts related to the construction of the action alternatives would be limited to relatively minor, if any, reductions in adjoining land uses, which will be mitigated by financial compensation for project-related loss or impairment to the affected properties and their use. Given the absence of any future operational and long-term project-related socioeconomic impacts, the subsequent socioeconomic analysis is primarily focused on the short-term impacts resulting from construction activities.

Employment

The potential socioeconomic effects of the action alternatives are associated with short-term job creation during construction. A small number of temporary jobs would be created during construction of any of the action alternatives. The duration of these temporary jobs would be no more than 2.5 years (the maximum duration of any alternative); jobs for the Outer Harbor Turning Basin expansion only alternative (Alternative C) would be shorter (i.e., approximately 6 months), given the lesser degree of construction activity compared to the other action alternatives. Such construction-related employment would have a beneficial impact on the local economy and workforce by providing new job opportunities. The labor force needed for the construction of any alternative is expected to be relatively small and would likely be obtained from local workers who are currently Alameda County and Bay Area residents.

Construction activities would not have any adverse impact on existing industry revenues because none of those activities are expected to alter their operations. Therefore, the action alternatives would not result in an adverse, prolonged decrease in the local job supply or a decrease in revenue from leading industries. As indicated above, all action alternatives would have a beneficial impact on employment.

Demand for Housing

As discussed above, the labor force needed for the construction of any action alternative is expected to be relatively small and would likely be obtained from local workers who are currently Alameda County and Bay Area residents. As a result, construction activities would not induce workers to relocate to the region and there would be no effect associated with the action alternatives on the supply of local housing available or local housing affordability.

6.2.2 Socioeconomic Impacts for the No Action Alternative

Because the No Action Alternative does not involve any changes from existing conditions, there would be no effects on the land uses, activities, or resources at the project sites or in the surrounding project area. As a result, no related or resulting socioeconomic impacts would occur.

6.3 Geology, Soils, and Seismicity

The proposed action alternatives would not introduce elements that would increase potential risks related to rupture of a known earthquake fault; seismic shaking; or seismic-related ground failure, including liquefaction; or landsides. Similarly, the action alternatives would not involve activities that would cause geologic units or soils to become unstable, and potentially result in onsite or offsite landslide, lateral spreading, subsidence, or collapse; this excludes minor erosion of the turning basins' sideslopes from sloughing that may occur after the areas are dredged. Any new bulkhead or sheetpile shoreline structures that would be installed as part of the action alternatives would comply with applicable seismic standards. Placement of dredged material at permitted beneficial reuse sites or landfills would not be expected to result in onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse because the placement of dredged material at these sites are managed and monitored to avoid such impacts. Thus, the action alternatives would have no effect on seismicity or geologic resources. Additionally, the action alternatives would not affect minerals. Effects associated with HTRW in terrestrial soils and contaminants in dredge material are discussed in section 6.11 and 6.12 respectively.

Because the No Action Alternative would result in no construction and no operational changes, there would be no effect on existing geologic, seismic, or soil conditions.

6.4 Water Resources and Water Quality

For the purposes of this analysis, an effect on water quality may be considered significant if an alternative would do any of the following:

- Substantially degrade water quality through long-term alteration of physical and chemical characteristics (i.e., temperature, salinity, pH, and dissolved oxygen);
- Substantially degrade water quality because of long-term increased turbidity;
- Violate any water quality standards; or
- or substantially degrade surface or groundwater water quality because of mobilization of contaminated sediments or release of hazardous materials.

6.4.1 Inner Harbor Turning Basin Expansion

Surface Water

Physical and Chemical Characteristics

The Inner Harbor Turning Basin Expansion (Alternative B) would involve both upland construction activities such as demolition, landside excavation, and pile installation as well as aquatic activities such as dredging. Eroded soils and construction-related wastes from upland construction have the potential to degrade water quality if they enter runoff and flow into waterways, potentially altering the dissolved oxygen content, temperature, and pH. Upland construction under this alternative would be managed to avoid adverse effects to waterbodies through implementation of the avoidance and minimization measures described in Appendix A7 These measures include adherence to the NPDES Construction General Permit through preparation and implementation of a stormwater pollution prevention plan (SWPPP) with best management practices (BMPs) to minimize discharges, limit erosion, and prevent releases of construction wastes and hazardous materials, as well as inspection, monitoring, and reporting requirements.

The proposed dredging also has the potential to alter physical and chemical characteristics in the Inner Harbor waters. The USACE (1976a) found that changes in temperature, salinity, or pH were localized to the immediate dredging area and short in duration during all types of dredging (hydraulic and mechanical); ambient concentrations of these parameters were usually regained within 10 minutes following material disturbance (USACE 1998). Dredging may change the pH of waters because excavated material is typically more acidic than the surrounding waters, however pH has remained relatively constant throughout the San Francisco Bay regardless of maintenance dredging projects that have occurred (USACE et al. 2009).

Dredging activities can resuspend in situ sediments and expose anoxic material to the water column, both of which can temporarily reduce dissolved oxygen concentrations in the immediate vicinity on the order of 1 to 2 parts per million (ppm). However, ambient conditions are shortly regained following settlement of the suspended sediment (USACE 1976a). In areas in the San Francisco Bay estuary that are more tidally influenced (such as the inner and outer harbors), nutrients that can reduce dissolved oxygen concentrations would be diluted and flushed out of the dredging area by tidal currents and freshwater flow (USACE et al. 2009). Hydroplan et al. (2015) also indicated that there is no risk to the ecosystem due to increased nutrient loading caused by dredging activities and that sediment disruption caused by dredging activities does not pose an environmental risk related to decreased dissolved oxygen concentrations.

Based on the temporary, localized, and minor effects on surface water physical and chemical characteristics as well as the avoidance and minimization measures described above, implementation of this alternative would have less than significant effects on surface water characteristics.

Suspended Sediments/Turbidity

Eroded soils from land-based construction activities associated with this alternative could degrade water quality if they enter waterways, increasing suspended sediment and turbidity levels. As described above adherence to the NPDES Construction General Permit and implementation of a SWPPP would be required as an avoidance measure for turbidity impacts under this alternative.

During dredging operations, the interaction of the dredge equipment with aquatic material would resuspend sediment into the water column via the impact and withdrawal of the clamshell bucket from the substrate, washing of material out of the bucket as it moves through the water column, and loss of water as the sediment is loaded onto the barge (Hayes et al. 1984; Nightingale and Simenstad 2001). Vibratory pile removal may temporarily disturb benthic sediments and increase turbidity and suspended sediment levels in the immediate vicinity of the piles. Increases in turbidity and suspended sediment levels from pile removal would be substantially less than similar effects from dredging, and therefore are not discussed further in this section. Movement of the dredge and other construction vessels would not be expected to increase turbidity above ambient ranges generated by natural hydrologic processes, weather, and existing vessel traffic.

Effects on turbidity and suspended sediment levels from new dredging to expand the Inner

Harbor Turning Basin are anticipated to be similar to those from existing annual maintenance dredging. The degree of sediment re-suspension depends on the physical composition of the material, with fine-grained material remaining suspended longer, and sandy material resettling much faster. Sediment in the Oakland Harbor is predominately fine-grained (USACE 2019), although coarser sand substrates may be present in areas 25 feet deep or shallower (City of Oakland 2021). Dredging fine silt or clay material typically results in suspended sediment levels of less than 700 mg/L at the surface, and less than 1,100 mg/L at the bottom adjacent to a dredge source (within approximately 300 feet) (LaSalle 1988). Much lower concentrations (50 to 150 mg/L at 150 feet) are expected at locations with coarser sediment. These concentrations would decrease rapidly with distance due to settling, mixing, and dispersion from tides, wind and waves.

USACE monitored turbidity plumes 500 feet downstream of dredging during clamshell maintenance dredging operations in Oakland Harbor in 2016 and 2017 (USACE 2019). Periodic exceedances of the applicable turbidity standard (50 Nephelometric Turbidity Units (NTU) or no greater than 10 percent of the baseline NTU if that is greater than 50) were observed. Turbidity plumes from Inner Harbor Turning Basin dredging would be similarly localized and affect a relatively small area in relation to surrounding San Francisco Bay waters. In the naturally turbid San Francisco Bay, turbidity plumes would be quickly diluted to near or within background particulate concentrations (USACE and SFRWQCB 2015).

In order to minimize effects from suspended sediments and turbidity from dredging operations, the avoidance and minimization measures detailed in Appendix A7 would be implemented. This includes, but is not limited to, use of silt curtains, avoiding spillage, and increasing cycle times as needed. In addition, any turbidity monitoring or other associated measures included as conditions of applicable regulatory permits that would be obtained for implementation of this alternative would be conducted as required for permit compliance.

In consideration of the localized and temporary effects of dredging-induced turbidity, ambient turbidity levels in the Inner Harbor, and the implementation of minimization measures to reduce turbidity effects, potential impacts to surface waters from increased turbidity and suspended sediments under this alternative would be less than significant.

Contaminants

Both land-based and aquatic construction activities associated with the Inner Harbor Turning Basin expansion (Alternative B) have the potential to result in accidental discharge of contaminants into San Francisco Bay. Various contaminants, such as fuel oils, grease, and other petroleum products used in construction activities, could be released into waters directly during dredging and nearshore construction. Shoreline construction, including demolition, excavation, and sheet pile installation, could also result in increased contaminant loading to San Francisco Bay waters via surface run-off. Implementation of a SWPPP and measures to prevent accidental spills of hazardous materials, would be required avoidance measures under this alternative to prevent contaminants and disturbed sediments from reaching storm drains or from being directly discharged into Bay waters.

There may be minor, permeant alterations to upland drainage patterns at Howard Terminal, Schnitzer Steel, and the Alameda landside area as a result of Inner Harbor Turning Basin expansion, but these would not result in adverse water quality impacts. Alterations may include removal, replacement, or redesign of drainage infrastructure such as curbs and gutters resulting from upland excavation and reconfiguration of the facility shorelines. Any such alterations would occur in compliance with NPDES post-construction runoff requirements for new development and redevelopment, including treatment measures and other appropriate source control and site design features to minimize the pollutant load in stormwater discharges and to manage runoff flows.

As described in Section 3.4 , the upland areas at Schnitzer Steel, Howard Terminal, and Alameda are known to contain contaminants of concern (COCs) such as dioxin, hydrocarbons, PCBs, and heavy metals in soils and/or groundwater. Upland excavation would remove COCs, and excavated material would be disposed of at offsite locations, potentially providing a long-term benefit to water quality. As discussed in further detail in section 6.11 , prior to dredging, upland areas in the proposed Inner Harbor Turning Basin expansion area footprint would be excavated to -5 feet MLLW (approximately -17 feet BGS). This would include excavation in fills from surface to below groundwater elevations. Additional landside excavation may be required at Schnitzer Steel to remove potentially contaminated soils below -17 feet BGS, if determined to be present. Removing contaminated materials would remove the potential for future pollutant inputs to the waterbody, such as through tidally influenced groundwater or other vectors.

Dredging may resuspend COCs in the water column if they are present in aquatic sediments. As detailed in section 3.12 , although sampling and analysis has not been conducted in the subtidal areas in the Inner Harbor Turning Basin expansion footprint specifically for this study, based on existing sampling and analysis from prior projects in the immediate vicinity, most of the aquatic material is not expected to contain elevated COCs that would preclude beneficial reuse at an upland wetland restoration site as non-cover or potentially cover material.

The exception is the basin between Howard Terminal and Schnitzer Steel, where sediment may be contaminated with heavy metals requiring landfill disposal, which would occur as needed under this alternative. Sediments that would be dredged as part of implementation of this alternative would be tested in the pre-construction phase that follows completion of the USACE's study phase, but occurs prior to any construction activities, including dredging. The results would be reviewed by the DMMO to identify appropriate placement site options based on the characteristics of the sediment and criteria for each placement location. If landfill disposal is required for some sediments, they would be removed and appropriately re-handled and dried out at the Port of Oakland's Berth 10 facility, which is an authorized material rehandling location, before being hauled to the landfill.

Potential effects resulting from release of COCs could occur if dredging where in situ sediments are found to have contaminants. However, most contaminants are tightly bound to sediments and are not easily released during short-term resuspension. Generally, plumes created during dredging and disposal activities are short-lived; and given the tight bounding of COC to sediments, the potential for release of COCs into the water column is expected to be minor (USACE et al. 2009). Water quality protection measures including use of silt curtains when dredging sediments found to contain COCs would be implemented as part of this alternative to further minimize any potential effects from contaminants. Additionally, any applicable conditions required by applicable regulatory permits that would be obtained for implementation of this alternative would be adhered to in order to minimize the potential for water quality degradation.

Given the analyses above, with implementation of proposed avoidance and minimization measures to protect water quality, the Inner Harbor Turning Basin expansion (Alternative B) would not be expected to substantially increase contaminant concentrations in the water column above baseline conditions or result in violation of a water quality standard. Impacts under this alternative would be less than significant.

Groundwater

Project construction and operation would not use groundwater, and shallow groundwater underlying the proposed project site is not used as a source of drinking water. The Inner Harbor Turning Basin expansion would not construct any new or expanded impermeable surface areas, and therefore would not impede groundwater infiltration. Although new dredging can increase saltwater intrusion into groundwater, these effects are anticipated to be minimal given the relatively small size of the Inner Harbor Turning Basin expansion area, and the project's location in the Central Bay, where impacts to freshwater flow regimes are typically minimal.

As described in Section 3.4.3, both the Howard Terminal and Schnitzer Steel portions of the proposed Inner Harbor Turning Basin expansion area are in active DTSC or SWRCB cleanup sites, and ground-disturbing activities in these areas have the potential to adversely affect groundwater if improperly managed. Both sites are subject to ongoing monitoring, investigations, and other remedial actions. The Howard Terminal Site is also subject to a Land Use Covenant that prohibits any use that disturbs or interferes with the existing cap and requires a DTSC approval for any cap disturbance.

All ground-disturbing activities at Howard Terminal and Schnitzer Steel would occur in coordination with DTSC or the SWRCB, as applicable, to ensure that adverse groundwater impacts associated with existing contamination would be avoided. Project plans would be developed to avoid impeding existing cleanup and abatement orders and effects on existing monitoring wells in or near the proposed footprint. It should be noted that the proposed Inner Harbor Turning Basin expansion would not affect the existing concrete quay wall and wood bulkhead at Howard Terminal, which has been shown to contain and prevent the movement of impacted groundwater into San Francisco Bay. Upland excavation throughout the proposed Inner Harbor Turning Basin expansion area would also have a long-term benefit to groundwater quality by removing contaminated sediments at all three upland sites (Howard Terminal, Schnitzer Steel, and Alameda) that could leach into the groundwater table.,

Under the proposed Inner Harbor Turning Basin expansion (Alternative B), removal of terrestrial soils would provide an indirect benefit groundwater quality by removing contaminated sediments that could leach into the groundwater table. Impacts associated with existing contaminated groundwater and currently ongoing remediation would be avoided through coordination with DTSC and the SWRCB as applicable. Therefore, impacts to groundwater from this alternative would be less than significant.

As described above, the Inner Harbor Turning Basin expansion (Alternative B) would not exceed any of the thresholds of significance identified for water quality and therefore the overall impacts of this alternative on water quality would be less than significant.

6.4.2 Outer Harbor Turning Basin Expansion

The proposed Outer Harbor Turning Basin expansion (Alternative C) would result in dredging-related effects to water quality that are similar to those described for Inner Harbor Turning Basin expansion (Alternative B). However, this alternative would not result in any effects related to upland excavation, alterations to existing upland facilities, or groundwater because there would be no removal of lands and no land-based construction activities associated with the Outer Harbor Tuning Basin expansion.

Surface Water

Physical and Chemical Characteristics

Dredging to construct the Outer Harbor Turning Basin expansion has the potential to alter physical and chemical characteristics in project area waters, including temperature, salinity, pH, and dissolved oxygen. These effects would be similar to those described in detail for the Inner Harbor Turning Basin expansion in the preceding section. As with the Inner Harbor Turning Basin expansion, potential impacts to surface water physical and chemical characteristics from expansion of the Outer Harbor Turning Basin would be less than significant.

Suspended Sediments/Turbidity

Dredging to construct the Outer Harbor Turning Basin expansion would resuspend sediment into the water column which would result in the same related effects to water quality as described in detail for the Inner Harbor Turning Basin expansion in the preceding section. These effects would be temporary and localized to the dredging area and would impact a relatively small area in relation to surrounding San Francisco waters. The sediment suspension and turbidity minimization measures described for the Inner Harbor Turning Basin expansion, including silt curtains and standard practices to minimize resuspension of sediments, would be employed during dredging for all action alternatives, and would minimize these potential effects. Furthermore, in the naturally turbid San Francisco Bay, turbidity plumes would be quickly diluted to near or within background particulate concentrations (USACE and SFRWQCB 2015).

In consideration of the localized and temporary effects of dredging-induced turbidity, background turbidity levels in the San Francisco Bay, existing activities in the Outer Harbor, and the implementation of the proposed minimization measures in section 4.1, potential impacts to surface waters from increased turbidity and suspended sediments would be less than significant for the Outer Harbor Turning Basin expansion (Alternative C).

Contaminants

As described in detail for the Inner Harbor Turning Basin expansion alternative, construction activities in the aquatic environment have the potential for the accidental discharge of contaminants into surface waters and dredging may resuspend COCs in the water column if they are present in aquatic sediments. The measures identified for the Inner Harbor Turning Basin expansion to avoid accidental discharges of contaminants from construction equipment to surface waters would be employed under all action alternatives. Although sampling and analysis has not been conducted in the subtidal areas in the Outer Harbor Turning Basin expansion footprint specifically for this study, based on existing sampling and analysis from prior projects and maintenance dredging in the immediate vicinity, the aquatic material is not expected to contain elevated COCs that would preclude beneficial reuse at an upland wetland restoration site. Sampling and testing of material to be dredged prior to construction as well as the contaminant minimization measures described above for the Inner Harbor Turning Basin expansion, would be implemented under all action alternatives to minimize the potential for water quality degradation.

Thus, the Outer Harbor Turning Basin expansion (Alternative C) would not be expected to substantially increase contaminant concentrations in the water column above baseline conditions, or result in violation of a water quality standard, and its associated effects would be less than significant.

As described above, the Outer Harbor Turning Basin expansion (Alternative C) would not exceed any of the thresholds of significance identified for water quality and therefore the overall impacts of this alternative on water quality would be less than significant.

6.4.3 Inner Harbor and Outer Harbor Turning Basin Expansion

Sub-alternatives D-1 and D-2 involve expansion of both the Inner and Outer Harbor Turning Basins. Sub-alternative D-1 involves the use of dredge equipment powered by diesel fuel whereas Sub-alternative D-2 is the Proposed Action (Tentatively Selected Plan) and involves the use of dredge equipment powered by electricity. All other elements of these sub-alternatives would be the same. From a water quality perspective, the effects of these two sub-alternatives involving expansion of both the Inner and Outer Harbor Turning Basins would be the same.

The potential water quality impacts of sub-alternatives D-1 and D-2 would be a combination of the impacts from the Inner Harbor Turning Basin expansion (Alternative B) and the Outer Harbor Turning Basin expansion (Alternative C). Potential water quality effects from impacts related to land removal or construction activities would be identical to those described for the Inner Harbor Turning Basin expansion because none would take place with the Outer Harbor Turning Basin expansion. Construction-related in-water work activities associated with the Outer Harbor Turning Basin expansion would be conducted at the same time as a portion of the in-water work for the Inner Harbor Turning Basin expansion during a period of approximately 6 months (expected to be June through November 2028). Compared to the single turning basin expansion alternative, the relatively larger dredging area under the sub-alternatives involving both turning basins would result in a proportional increase for potential impacts related to altered physical and chemical characteristics, accidental discharge, suspended sediment/turbidity, and resuspension of COCs in the water column. However, based on the localized nature of project impacts as described in the above sections and the distance and landforms between the Inner Harbor Turning Basin and Outer Harbor Turning Basin, the impacts on water quality from expanding both turning basins would not combine to create a more significant level of impact.

Given this, both sub-alternative D-1 and the Proposed Action (Tentatively Selected Plan; sub-alternative D-2) would not exceed any of the thresholds of significance identified for water quality and therefore the overall effects of either alternative on water quality would be less than significant.

6.4.4 No Action Alternative

Under the No Action Alternative, neither the Inner Harbor Turning Basin nor Outer Harbor Turning Basin would be expanded. The No Action Alternative would result in no new construction or operational impacts related to surface water or groundwater. Existing contaminated fills at upland sites in the Inner Harbor Turning Basin expansion area would not be removed and the potential risk of that contamination leeching into groundwater would remain.

6.5 Wildlife

Based on the biological resources present or potentially occurring in the project area, for the purposes of this analysis, an effect may be considered significant if the alternative would do any of the following:

- have a substantial adverse effect, either directly or through habitat modifications, on any terrestrial or pelagic species;
- interfere substantially with the movement of resident or migratory fish or wildlife species; or
- cause substantial adverse, long-term effects to the benthic community directly or through habitat loss.

6.5.1 Inner Harbor Turning Basin Expansion

Terrestrial Wildlife

As described in Section 3.5.2, terrestrial wildlife in the Inner Harbor Turning Basin expansion (Alternative B) action area is limited to common species that are adapted to inhabiting developed areas. All terrestrial areas that would be impacted by the expansion of the Inner Harbor Turning Basin are heavily developed, and any wildlife present would be able to relocate to other nearby areas of similar habitat in the vicinity. Therefore, impacts to terrestrial wildlife would be negligible.

Pelagic (open water) Resources

The Inner Harbor Turning Basin expansion (Alternative B) action area includes open waters that serve as habitat for aquatic wildlife such as fish, marine mammals, and birds. Effects to special status fish, marine mammals, and migratory birds are discussed in Section 6.6 . Therefore, this section focuses on common (non-special status) fish.

Dredging associated with this alternative would be conducted over approximately 14 months of in-water construction, but would be spread over three years, during the in-water work window for Oakland Harbor (June through November) to avoid the presence of special status fish species (see Section 6.6 below). Dredging activities have the potential to incidentally remove organisms from the aquatic environment along with the dredge material, a process referred to as entrainment. Entrained fish are likely to suffer mechanical injury or suffocation during dredging, potentially resulting in mortality. Although individual fish have the potential to be struck or entrained by a clamshell bucket as it falls through the water column to the channel bottom, the falling bucket would generate a pressure wave around it that would force small fish away from the bucket and result in a low risk of entraining fishes (Reine and Clarke 1998, USACE 2019). Mechanical dredging is also generally accepted to entrain far fewer fish than hydraulic dredging because less water is removed along with the sediment, and no suction is involved.

Underwater noise generated from dredging activities has the potential to affect fish and cause behavioral changes, neurological stress, and temporary shifts in hearing. The Inner Harbor Turning Basin is an active marine waterway and existing vessel activities produce underwater noise. Ambient underwater noise levels in the Inner Harbor Turning Basin were monitored for this study at half the depth of the water column during an active turning event for a large container vessel (*One Aquila*) with three assist tugboats and were found to generate a peak underwater sound pressure level of 174 to 175 decibels (dB). The most intense sound impacts are produced by clamshell dredging are during the bucket's impact with substrate. Reine et al. (2002) found peak sound pressure levels of 124 dB measured 150 meters from the bucket strike location. Thus, clamshell dredging would not be expected to exceed ambient levels experienced in the turning basins when vessels are turning. Similarly, the transport barges carrying dredge material are not expected to generate underwater noise that is different than existing vessel traffic.

Underwater noise generated from pile removal also has the potential to affect fish. Pile removal would occur via vibratory means. Vibratory techniques are often employed as a minimization measure to reduce the underwater sound pressure that transmits into the water. Therefore, underwater noise from vibratory pile removal would not be expected to have a substantial adverse effect on fish. Based on the current conceptual designs and construction phasing, all pile driving would be conducted on the landside and no in-water pile driving would occur under any of the action alternatives. Should it later be determined that in water pile driving is necessary, it would likely be a very small portion of the overall pile driving and be conducted by vibratory means. The USACE would re-evaluate the underwater noise and associated effects to species should in-water pile driving become necessary.

Sediment suspension from mechanical dredging and in-water pile removal would generate turbidity plumes as described in Section 6.4.1 and these could interfere with the ability of pelagic organisms to receive sunlight, respirate, and find food (Wilber and Clarke 2001). The potential turbidity would be localized and temporary, and adult and juvenile fish would be mobile enough to avoid turbidity plumes. Turbidity can be of particular concern to certain species' life stages, such as spawning Pacific Herring which are known to breed on in-water structures and use habitat along the Oakland-Alameda Estuary waterfront. However, as stated in Chapter 3, herring spawning has not been observed along this portion of the waterfront in recent years and they are less likely to be present during the proposed work windows that would be adhered to under this alternative. Waters in the action area are also naturally turbid due to resuspension of sediments from wind, waves, tides, and frequent vessel traffic. The movement of vessels for transport of dredged material associated with construction of this alternative would not be expected to increase turbidity above ranges generated by existing vessel traffic. As described in section 3.6.1, there is a low likelihood of Longfin Smelt occurring in the project area. Implementation of the dredge-related minimization measures described in Section 6.4.1 (and Appendix A7), such as the use of silt curtains, would reduce potential impacts to pelagic resources from increased turbidity during construction of this alternative.

As discussed in Section 6.4.1, suspending sediments can circulate contaminants if they are present in disturbed sediments. Such contaminants have the potential to become biologically available to organisms either in the water column or through food-chain processes. The subtidal areas in the Inner Harbor Turning Basin expansion footprint are generally not expected to contain contaminants at levels that would preclude beneficial reuse at an upland wetland restoration site as non-cover or potentially cover material except between Howard Terminal and Schnitzer Steel, where sediment may be contaminated with heavy metals. Studies suggest that there is no significant transfer of metal concentrations into the dissolved phase during dredging, even though release of total metals associated with the suspended matter may be large (Jabusch et al. 2008). Additionally, organic contaminants such as pesticides, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs) are generally not very soluble in water, and direct toxicity by exposure to dissolved concentrations in the water column is not very likely (Jabusch et al. 2008). Additionally, the minimization measures described in section 6.4.1 would be implemented under this alternative to further minimize the potential for suspension of sediments and contaminants that could impact aquatic organisms.

Fish and aquatic organisms can also be impacted by the introduction of nonnative species. Dredging vessels may come from outside of the Bay Area to conduct construction associated with this alternative and thus there is the potential that nonnative species could be introduced by these vessels. Larval forms of nonnative species can be carried in the ballast water of vessels, and if ballast water is released in San Francisco Bay, larvae can be introduced into the San Francisco Bay ecosystem. The United States Coast Guard has mandatory regulations in effect that require ships carrying ballast water to have a ballast water management and reporting program in place and to exchange ballast water with mid-ocean water or use an approved form of ballast water treatment prior to releasing any ballast water in a port in the United States. All water-based vessels associated with construction of this alternative would be required to comply with these regulations, as applicable, to avoid the spread of invasive nonnative species and any associated impacts.

Expansion of the Inner Harbor Turning Basin would not involve addition of solid structures, such as breakwaters, that would serve as a barrier to migratory fish. Construction-related effects such as noise and turbidity may cause fish and wildlife to avoid the immediate construction area temporarily, however, this would not substantially limit available habitat or movement of fish relative to available open water habitat in Oakland Harbor and the greater San Francisco Bay. These effects would be negligible. Moreover, the expansion of the turning basin would create more open water habitat for fish to move through in the long term.

Based on the above analysis, in-water construction activities associated with this alternative would not have a substantial adverse direct impact on pelagic species or pelagic aquatic habitat and the project would not permanently or substantially interfere with the movement of aquatic organisms. Therefore, the effects of this alternative on pelagic resources would be less than significant.

Benthic Fauna

Expansion of the Inner Harbor Turning Basin (Alternative B) would result in the dredging of previously un-dredged areas ranging in depth from MHHW down to the edge of the existing turning basin at -50 feet. Dredging would directly impact benthic communities through physical disruption and direct removal of benthic organisms, resulting in the potential loss of most, if not all, organisms in the aquatic portions of the expansion area. Organisms immediately adjacent to the turning basin expansion area also may be lost because of smothering or burial from sediments resuspended in the water column during dredging (USACE 2019). These effects may also occur due to pile removal, although to a much lesser degree.

Benthic habitat in the federal channel and turning basins, and their margins, is regularly disturbed under baseline conditions because of annual maintenance dredging and the propeller wash of ship traffic. Following sediment-disturbing activities such as dredging, disturbed areas are usually recolonized quickly by benthic organisms (Newell et al. 1998). Recovery in deep-water channels may be slower, but this potential is minimized in the proposed action area due to deep-draft vessel use of the navigation channel and turning basin. which results in benthos that are in a constant state of disruption. Studies have indicated that even relatively large areas disturbed by dredging activities are usually recolonized by benthic invertebrates within 1 month to 1 year, with original levels of biomass and abundance developing within a few months to between 1 and 3 years (Newell et al. 1998). Benthic disturbance associated with this alternative would be spread over three years, during the in-water work window for Oakland Harbor (June through November). Following dredging, disturbed areas are recolonized, beginning with mobile and opportunistic species (Oliver et al. 1977, Lenihan and Oliver 1995). However, colonizing species composition may be different than prior to dredging, and recolonizing species may include nonindigenous species common to the San Francisco Bay (USACE and SFRWQCB 2015).

Most dredging under this alternative would occur in places that are already heavily disturbed by operations and maintenance at the Port. The newly dredged areas would be subject to more frequent disturbance from operations and maintenance activity. The USFWS considers this aquatic habitat type to be Resource category 4 due to its regional abundance, regular disturbance and medium value. In their Draft Fish and Wildlife Coordination Act (FWCA) report for this study, USFWS determined that although restored tidal wetland is different than subtidal benthic habitat, the beneficial reuse of suitable sediments at a wetland restoration site, as proposed under this alternative, would meet the resource category 4 mitigation goals for subtidal benthic habitat (See appendix A2). Given the generally disturbed nature of the benthic habitat in the action area, along with implementation of the general and dredge-related minimization measures described in Appendix A7, and mitigation of effects associated with the beneficial reuse of available suitable material for wetland restoration, potential impacts to benthic fauna and subtidal benthic habitat would be less than significant with mitigation.

As described above, the Inner Harbor Turning Basin expansion (Alternative B) would not exceed any of the thresholds of significance identified for Wildlife and therefore the overall impacts of this alternative on wildlife would be less than significant.

6.5.2 Outer Harbor Turning Basin Expansion

Terrestrial Wildlife

No terrestrial areas would be modified by expansion of the Outer Harbor Turning Basin (Alternative C), so no effect to such resources would occur.

Pelagic (open water) Resources

Under this alternative, potential impacts to pelagic species and habitat would be similar to those described for the Inner Harbor Turning Basin expansion (Alternative B). However, the total duration over which this alternative would occur would be shorter, taking approximately 6 months during one in-water work window (June-November) and it would only involve dredging (not pile removal). The same applicable avoidance and minimization measures proposed under the Inner Harbor Turning Basin expansion would be used under this alternative. Given the similarity of effects to those of the Inner Harbor Turning Basin expansion, and the fact that this alternative would be shorter in duration, the effects of Outer Harbor Turning Basin expansion (Alternative C) to pelagic resources would be less than significant.

Benthic Fauna

The proposed project would permanently deepen subtidal waters within the Outer Harbor Turning Basin expansion (Alternative C) areas from existing depths as shallow as approximately -23 feet MLLW to a design depth of -50 feet MLLW. Overall, the magnitude and duration of the potential impacts to benthic fauna and habitat due to dredging the expanded Outer Harbor Turning Basin would be similar to the impacts described for the Inner Harbor Turning Basin expansion, but the duration of impact would be shorter, lasting approximately 6 months during one dredging window. The USFWS similarly determined that restoration of tidal wetland is through the beneficial reuse of suitable sediments at a wetland restoration site, as proposed under this alternative, would meet their recommended restoration recommendation for subtidal benthic habitat impacts associated with this alternative (See appendix A2). With implementation of the general and dredge-related measures described for the Inner Harbor Turning Basin expansion, and beneficial reuse of suitable material at a wetland restoration site, potential impacts to benthic fauna and habitat under the Outer Harbor Turning Basin expansion would be less than significant with mitigation.

Based on the above analysis, the Outer Harbor Turning Basin expansion (Alternative C) would not exceed any of the thresholds of significance identified for Wildlife and therefore the overall impacts of this alternative on wildlife would be less than significant.

6.5.3 Inner Harbor and Outer Harbor Turning Basin Expansion

Sub-alternatives D-1 and D-2 involve expansion of both the Inner and Outer Harbor Turning

Basins using dredge equipment powered by diesel fuel and electricity, respectively. All other elements of these sub-alternatives would be the same and the effects of these two sub-alternatives on wildlife would not differ. The potential impacts of these alternatives would be a combination of those impacts presented for the Inner and Outer Harbor Turning Basin individual expansion alternatives. Construction-related in-water work activities associated with the Outer Harbor Turning Basin expansion would be conducted at the same time as a portion of the in-water work for the Inner Harbor Turning Basin expansion during a period of approximately 6 months (expected June through November 2028). Based on the localized nature of project impacts and the distance and landforms between the Inner and Outer Harbor Turning Basins, , as well as the proposed minimization measures and mitigation, the impacts on wildlife from expanding both turning basins would not combine to create a more significant level of impact under sub-alternative D-1 or D-2. Thus, the effects of the Proposed Action (Tentatively Selected Plan; sub-alternative D-2) and of sub-alternative D-1 on wildlife would be less than significant.

6.5.4 No Action Alternative

Under this alternative, the two turning basins would each remain at their existing dimensions and associated limitations, and there would be no construction activities. Thus, there would be no effect to wildlife.

6.6 Special Status Species and Protected Habitats

Based on the special status species and habitats present or potentially occurring in the action area for an alternative, for the purposes of this analysis, an effect may be considered significant if the alternative would do any of the following:

- have a substantial adverse effect, either directly or through habitat modifications, on any species listed as threatened or endangered under, or otherwise protected by, the ESA;
- alter or diminish critical habitat, EFH, mudflats, or eelgrass beds;
- cause levels of harm to marine mammals that are greater than that considered incidental harassment under the marine mammal protection act (MMPA); or
- harm populations of migratory birds through direct impact or impacts to their migration.

6.6.1 Inner Harbor Turning Basin Expansion

Threatened and Endangered Fish

Federal ESA listed fish species and critical habitats with the potential to occur in the proposed action area are described in Section 3.6.2 and include multiple runs of steelhead and Chinook Salmon, and Green Sturgeon. Potential impacts to federally-listed fish species associated with the Inner Harbor Turning Basin expansion (Alternative B) would be from the same impact pathways described for non-listed pelagic fish resources in section 6.6.1 including entrainment, underwater noise, turbidity, and resuspended contaminated sediments.

As described in Section 6.5.1, the potential for clamshell dredging to entrain or physically injure or kill listed fish species is considered low and in-water construction would be limited to the

June 1 through November 30 work window established for maintenance dredging under the LTMS, when listed salmonids (steelhead and Chinook Salmon) are less likely to be present. Green Sturgeon may be present in the central portion of the Bay during the in-water construction period, but only in low densities (see section 3.6.1), and juveniles and adults would be mobile enough to avoid the clamshell bucket.

In-water construction would result in underwater noise primarily from mechanical dredging and removal of concrete piles. As noted in Section 6.5.1, the Inner Harbor Turning Basin is an active marine waterway and ambient underwater noise levels were found to have a peak underwater sound pressure level of 174 to 175 dB when large vessels are turning in the basin. In comparison, peak sound pressure levels from a clamshell bucket striking the substrate were found to be on the order of 124 dB at 150m from the bucket. These dredging sound pressure levels are well below established interim criteria for underwater noise impacts to fish from pile driving which suggest a peak sound pressure of 206 dB is injurious to fishes and sound pressure levels of 183-187 dB (depending on fish weight) can cause temporary shifts in hearing, resulting in temporarily decreased fitness (e.g., reduced foraging success and reduced ability to detect and avoid predators; Caltrans 2020). Moreover, the mechanical dredging sound pressure levels are below 150 dB, which is the threshold NMFS has used for triggering behavioral effects (e.g. avoidance) in fish.

As described in Section 6.5.1, pile removal would occur via vibrating out piles and based on current designs and construction phasing, all pile driving is expected to be conducted on the landside. Vibratory techniques are often employed as a minimization measure to reduce the underwater sound pressure that transmits into the water. There are no established cumulative noise injury criteria for fish for vibration pile removal as there is less concern that vibratory techniques will result in injury or other adverse effects on fish (Caltrans 2020). Any underwater noise associated with pile removal is not anticipated to substantially affect Chinook Salmon, steelhead, and Green Sturgeon due to their mobility and ambient sound levels associated with existing activity at the Oakland Harbor. Should it later be determined that in water pile driving is necessary, it would likely be a very small portion of the overall pile driving and be conducted by vibratory means. The USACE would re-evaluate the underwater noise and associated effects to species should in-water pile driving become necessary.

Section 6.5.1 describes how dredging, pile removal, and other in-water construction activities would result in increased turbidity from suspended sediments and the potential effects on fish species. While early life stage individuals tend to be more sensitive to turbidity than adults, steelhead and Green Sturgeon do not spawn in the action area so their eggs or larval life stages would not be present. Large adult and juvenile fish (including Chinook Salmon, steelhead, and Green Sturgeon) would be mobile enough to avoid areas of high-turbidity plumes caused by dredging. Suspending sediments can also suspend contaminants into the water column, if they are present in disturbed sediments, which could affect listed fish species. However, as discussed in Section 6.5.1, A study on the short-term water quality impacts of dredging and dredged material placement on sensitive fish species in San Francisco Bay concluded that direct short-term effects on sensitive fish by contaminants associated with dredging plumes are minor (Jabusch et al. 2008). Moreover, turbidity plumes would be local, quickly disperse, and would be minimized by measures proposed under this alternative, such as the use of silt curtains.

Benthic habitat can also provide important foraging areas for special-status fish species, especially for Green Sturgeon, which primarily forage in the benthos at depths up to 33 feet. Steelhead and Chinook Salmon are primarily drift feeders, but also occasionally forage in the benthos typically in waters less than 30 feet deep. The loss of benthic invertebrates during dredging or other bottom-disturbing activities may decrease the forage value of benthic habitat in the action area. This impact would be localized, negligible in the context of the forage habitat available in the Oakland-Alameda Estuary, and areas disturbed by dredging would be expected to recolonize within months to years.

Based on the above analysis, and with implementation of the water quality and dredging related measures described in the preceding sections (see Appendix A7), impacts to federally listed threatened and endangered fish species and their designated critical habitats from the Inner Harbor Turning Basin expansion (Alternative B) would be less than significant.

California Least Tern

As described above, dredging and shoreline construction activities could temporarily increase turbidity, which may affect California least tern foraging. Increased turbidity may decrease foraging success by decreasing prey abundance or by making it more difficult for least terns to detect prey. This bird species forages in the upper few feet of the water column. Turbidity impacts would be mostly confined to existing moderately deep waters or shoreline areas currently occupied by marine structures proposed for removal. Impacts to shallow-water habitat would be limited and would not occur in waters adjacent to known California least tern colonies at the former Alameda Naval Air Station or known foraging and roosting habitat within the Middle Harbor Enhancement Area. Mapped eelgrass areas in the Oakland Harbor are also greater than 250 meters (820 feet) from the proposed Inner Harbor Turning Basin expansion footprint. Suitable foraging habitat for this species is widely available outside of the proposed construction limits.

Similarly, noise from construction activities would not substantially disrupt foraging activities of California least tern. Birds currently residing in the vicinity are accustomed to ambient noise from existing truck and train traffic, ferry operations, heavy metal recycling at the Schnitzer Steel site, and shipping operations. Typically, birds will avoid disturbance areas and move to preferable environments and in this case would be able to forage in similar shoreline waters elsewhere in the Oakland-Alameda Estuary away from construction activities.

The LTMS program maintenance dredging work window for California least tern in the project vicinity is August 1 through March 15 each year. Because in-water construction is proposed to occur partially outside of this work window under all action alternatives, the USACE will initiate ESA consultation with USFWS and propose minimization measures (such as funding predator management activities) for USFWS concurrence to conduct work outside this window without adversely affecting the species. With this, implementation of the turbidity minimization measures described in the preceding sections, and the use of vibratory pile removal to limit noise, impacts to California least tern would be less than significant.

Marine Mammals

The marine mammals with potential to occur in the action area primarily include Pacific harbor seal, to a lesser extent California sea lion, and infrequently harbor porpoise.

The NMFS has established thresholds regarding the exposure of marine mammals to high-intensity noise that may be considered a take under the MMPA (NMFS 2018). Noise from dredging activities proposed under the Inner Harbor Turning Basin expansion is comparable to ambient noise from shipping vessels and not expected to cause harassment of marine mammals. As noted for fish above, based on current designs and construction phasing, all pile driving is expected to be conducted on the landside and therefore would not create substantial underwater noise. Vibratory pile extraction is considered continuous noise, which has the potential to cause harassment to marine mammals. The injury (Level A Harassment) threshold for such continuous noise is specific to the species hearing group (i.e., high-frequency cetaceans [harbor porpoise] and low-frequency phocids [Pacific harbor seal} and otariids [California sea lion]) and the behavioral harassment (Level B; non-injurious) threshold is 120 dB RMS for all marine mammals.

Based on underwater noise calculations conducted by USACE, the pile extraction associated with the expansion of the Inner Harbor Turning Basin would exceed the aforementioned Level B behavioral harassment threshold in an aquatic zone extending approximately 500m from the location the piles being removed via vibration, which is approximately the middle of the tuning basin. In order to avoid behavioral impacts to marine mammals during vibratory pile removal, USACE would require the construction contractor to station a marine mammal monitor to observe this 500m zone during pile removal activities and, should a marine mammal enter the zone, the monitor would direct the pile vibration work to immediately and safely shutdown. Only pile vibration work associated with this construction action would be shutdown, the shutdown would not affect any vessel traffic or other construction activities. Based on marine mammal usage and experience from similar vibratory pile removal work in the Oakland Inner Harbor for other projects, this would be expected to result in a maximum of one shutdown of pile removal activities per day. Once a shutdown of vibratory pile removal occurs, work would be allowed to resume when either 1) the monitor verifies the mammal has left the 500m shutdown zone, or 2) 15 minutes has passed without re-detection of the animal. Because this measure would avoid behavioral impacts to marine mammals associated with construction of this alternative, an incidental harassment authorization in accordance with the requirements of the MMPA, would not be required. Should it later be determined that in water pile driving is necessary, it would likely be a very small portion of the overall pile driving and be conducted by vibratory means. The USACE would re-evaluate the underwater noise and potential effects to marine mammals should in-water pile driving become necessary. Aquatic pile-driving noise minimization measures, monitoring, and shut-down measures would be developed so that injury or mortality of marine mammals would be avoided and, if applicable, an Incidental Harassment Authorization under the MMPA would be pursued and through coordination with NMFS.

Increased turbidity may temporarily reduce foraging opportunities for marine mammals in the project area. Marine mammals would not be substantially affected by the turbidity generated during the dredging operations, because they forage over large areas of San Francisco Bay and can avoid areas of temporarily increased turbidity and dredging disturbance. Additionally, the turbidity minimization measures identified in prior sections would lessen the effects of turbidity on marine mammals as well.

With implementation of measures to avoid effects from pile-removal activities and reduce construction related turbidity, impacts to marine mammals would be less than significant.

Species Protected under the Migratory Bird Treaty Act and EO 13186

Nesting areas for migratory birds are not expected be impacted by expansion of the Inner Harbor Turning Basin, because they are not present in the proposed action areas. Peregrine falcons have nested on the easternmost crane on the Howard Terminal waterfront since approximately 2015; these cranes are moved along the Howard Terminal waterfront and would not be present in the action areas at the time of construction. Dredging related turbidity and construction related noise would have similar effects on migratory birds that may forage in the project area as described above for the California least tern and those effects would be reduced by the same proposed minimization measures. The project would not cause mortality to migratory birds, or their eggs and chicks. Impacts to migratory birds would be negligible.

Essential Fish Habitat

Areas of the Bay below MHHW are designated as EFH under the Pacific Coast Groundfish, Coastal Pelagic Species, and Pacific Salmon FMPs. Because both open waters and substrates are included in the EFH designations, the potential impacts described in Section 6.5.1 for pelagic and benthic fauna are applicable to EFH as well. Such impacts include entrainment of fish and plankton and the removal of substrates and benthic invertebrates during dredging. Regular dredging of new areas in the expanded turning basin is expected to alter the benthic habitat community, favoring organisms that can quickly colonize disturbed areas.

The removal of piles and other man-made hard substrates would result in the alteration of EFH in the project footprint as well because hard-substrate habitat would be removed and replaced with soft-substrate area. Overall, expansion of the Inner Harbor Turning Basin would result in an increase of open waters and soft-substrate bottom, increasing the extent of EFH in the project area.

Implementation of the previously identified minimization measures for water quality and wildlife would reduce potential construction related impacts to EFH to less than significant and the long-term gain in aquatic area would be a beneficial effect to EFH

Vegetation, Wetlands, and Submerged Aquatic Vegetation

Expansion of the Inner Harbor Turning Basin (Alternative B) would require additional dredging on the perimeter of the existing basin, as well as modification of the existing adjacent uplands to accommodate the expansion. This alternative would result in the removal of existing fill such as concrete piles and sheet piles as well as conversion of terrestrial areas to Bay waters.

There are no wetlands or significant upland vegetation in the footprint or in the vicinity of the Inner Harbor Turning Basin, aside from some landscaped areas adjacent to buildings and roadways. The natural vegetation present is limited to ruderal growth along the shoreline fill adjacent to Schnitzer Steel. These areas do not provide significant habitat value to special-status species potentially occurring in the project area.

Eelgrass beds and mudflats are considered special aquatic sites and are subject to jurisdiction under Section 404 of the CWA and the CZMA. Eelgrass beds are also considered "habitat areas of particular concern" with regard to essential fish habitat designations. There are no eelgrass beds within 250 meters (820 feet) of the proposed Inner Harbor Turning Basin expansion area; the nearest patch occurs approximately 500 meters (1,640 feet) to the west (Merkel and Associates 2021). When dredging occurs more the 250 meters from eelgrass, potential impacts from dredge-induced turbidity would be minimal (USACE, EPA, and LTMS 2009). Implementation of the general and dredging-related minimization measures described in Section 6.4 and Appendix A7 including the use of silt curtains, would further reduce potential impacts to eelgrass so that they are to be negligible.

6.6.2 Outer Harbor Turning Basin Expansion

Threatened and Endangered Fish

Potential impacts to listed fish species under the Outer Harbor Turning Basin expansion (Alternative C) would be like those of the Inner Harbor Turning Basin expansion (Alternative B). However, there would be no pile removal (or associated underwater noise). Other potential impacts arising from construction activities, such as removal of benthic habitat and increased turbidity, would be similar, and the associated minimization measures proposed for the Inner Harbor Turning Basin expansion would be implemented for this alternative as well. Therefore, the impacts to federally listed threatened and endangered fish species from construction of the Outer Harbor Turning Basin expansion would be less than significant.

Federally Endangered California Least Tern

Potential impacts to the California Least Tern under the Outer Harbor Turning Basin expansion (Alternative C) would be the same as those described for the Inner Harbor Turning Basin expansion (Alternative B). The same minimization measures and consultation under ESA to work outside the Least Tern work window established for maintenance dredging as described for the Inner Harbor Turning Basin expansion, would be implemented as part of this alternative. Impacts to least tern would be similarly less than significant.

Marine Mammals

The Outer Harbor Turning Basin expansion (Alternative C) would involve dredging activities but would not involve any vibratory pile removal and therefore, impacts to marine mammals would be less than those described for the Inner Harbor Turning Basin expansion. Underwater noise generated by dredging would not cause harassment of marine mammals. Increased turbidity could temporarily reduce foraging opportunities for marine mammals in the action area, but turbidity minimization measures would reduce this effect and mammals could avoid areas of temporarily increased turbidity to forage in habitat of equal or greater value throughout the Bay. Therefore, impacts on marine mammals from expansion of the Outer Harbor Turning Basin would be less than significant.

Species Protected under the Migratory Bird Treaty Act and EO 13186

Nesting areas for migratory birds would not be impacted by expansion of the Outer Harbor Turning Basin, because none are not present in the action area. Dredging activity would have similar effects on migratory bird foraging in the action area as that described for the Inner Harbor Turning Basin expansion. Impacts to migratory birds under this alternative would be less than significant.

Essential Fish Habitat

Potential impacts to EFH would be similar to those described for the Inner Harbor Turning Basin expansion, although no shoreline modification would occur and there would be no changes to substrate type from removal of piles or other hard substrates. Expansion of the Outer Harbor Turning Basin would not result in any net gain or loss of EFH. Potential impacts to EFH would be minor and less than significant.

Vegetation, Wetlands, and Submerged Aquatic Vegetation

Expansion of the Outer Harbor Turning Basin (Alternative C) would not require any shoreline modification. Construction methods would be limited to dredging.

No terrestrial, emergent, or submerged aquatic vegetation would be directly impacted by construction or operations of the expanded Outer Harbor Turning Basin. One small patch of eelgrass is approximately 250 meters (820 feet) northeast from the proposed Outer Harbor Turning Basin expansion footprint (Merkel and Associates 2021). The areas proposed for expanded dredging are in waters that are too deep to support eelgrass, so the proposed project would not be limiting future expansion of the eelgrass beds present in the vicinity. Implementation of the general and dredging-related minimization measures described in Section 6.4 and Appendix A7, including the use of silt curtains, would further reduce potential impacts to eelgrass so that they are less than significant to negligible under this alternative.

6.6.3 Inner Harbor and Outer Harbor Turning Basin Expansion

Sub-alternatives D-1 and D-2 involve expansion of both the Inner and Outer Harbor Turning Basins using dredge equipment powered by diesel fuel and electricity, respectively. All other elements of these sub-alternatives would be the same and the effects of these two sub-alternatives on special status species and habitats would not differ. The potential impacts of these alternatives would be a combination of those impacts presented for the Inner and Outer Harbor Turning Basin individual expansion alternatives. Construction-related in-water work activities associated with the Outer Harbor Turning Basin expansion would be conducted at the same time as in-water work for the Inner Harbor Turning Basin expansion is ongoing for a period of approximately 6 months (expected June through November 2028). Based on the localized nature of the impacts, the between the Inner and Outer Harbor Turning Basins, and because expansion of the Outer Harbor Turning Basin does not require pile removal, the impacts on special status species and habitat from expanding both turning basins would not combine to create a more significant level of impact. Thus, the effects of the Proposed Action (Tentatively Selected Plan;

sub-alternative D-2) and of sub-alternative D-1) on special status species and habitats would be less than significant.

6.6.4 No Action Alternative

Under this alternative, the two turning basins would each remain at their existing dimensions and associated limitations, and there would be no impacts to special status species or habitat. There would also be no beneficial gain in aquatic EFH under the no Action alternative.

6.7 Cultural Resources

This assessment discusses the potential effects of the proposed alternatives on cultural resources (i.e., archaeological and historic architecture/built-environment resources) and address obligations under Section 106 of the National Historic Preservation Act (NHPA).

For the purposes of this analysis, an alternative may have a significant effect on cultural resources if it would:

- result in a substantial adverse change in the significance of a historical resource (National Register of Historic Places listed or eligible).

The four evaluation criteria to determine a resource's eligibility to the (NRHP), in accordance with the regulations outlined in 36 C.F.R. Part 800, are identified at 36 C.F.R. § 60.4. These evaluation criteria, listed below, are used to assist in determining what properties should be considered for protection from destruction or impairment resulting from project-related activities (36 C.F.R. § 60.2).

The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

a. Resources that are associated with events that have made a significant contribution to the broad patterns of our history; or

b. Resources that are associated with the lives of persons significant in our past; or

c. Resources that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

d. Resources that have yielded, or may be likely to yield, information important in prehistory or history (36 C.F.R. § 60.4).

Potential effects to cultural resources are evaluated within an area of potential effects (APE) which is defined as the "geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist" (36 C.F.R. § 800.16(b)). The APE for the Oakland Harbor Study undertaking comprises all areas of the proposed project where project implementation could have direct impacts to cultural resources, should there be any present.

Horizontal Area of Potential Effect

The horizontal extent of the APE for the proposed undertaking includes the boundaries of the entire area that could experience physical disturbance as a result of project implementation. The APE addresses only direct effects within the limit of construction because the proposed undertaking would not introduce new features that could result in effects to the setting of neighboring historic resources known to occur in the vicinity of the Port. The APE for this undertaking thus comprises the proposed construction footprints for the inner and outer harbor turning basins. Construction staging would occur in developed areas adjacent to the proposed construction areas at Howard Terminal and the Alameda site, and at Berth 10. Because no ground disturbance is proposed at these staging areas, they are not considered to be part of the APE. Similarly, existing roads would be used to provide ingress and egress to the project area. Accordingly, the roads to be used are likewise not included in the APE defined for the project. Figure 36 is a United States Geological Survey (USGS)-based map depicting both the Inner and Outer Harbor turning basin, with yellow circles depicting the APE which includes the proposed limits of construction of the expanded turning basins (also refer to Figure 35, in Chapter 5, which depicts the construction limit footprints on aerial imagery).

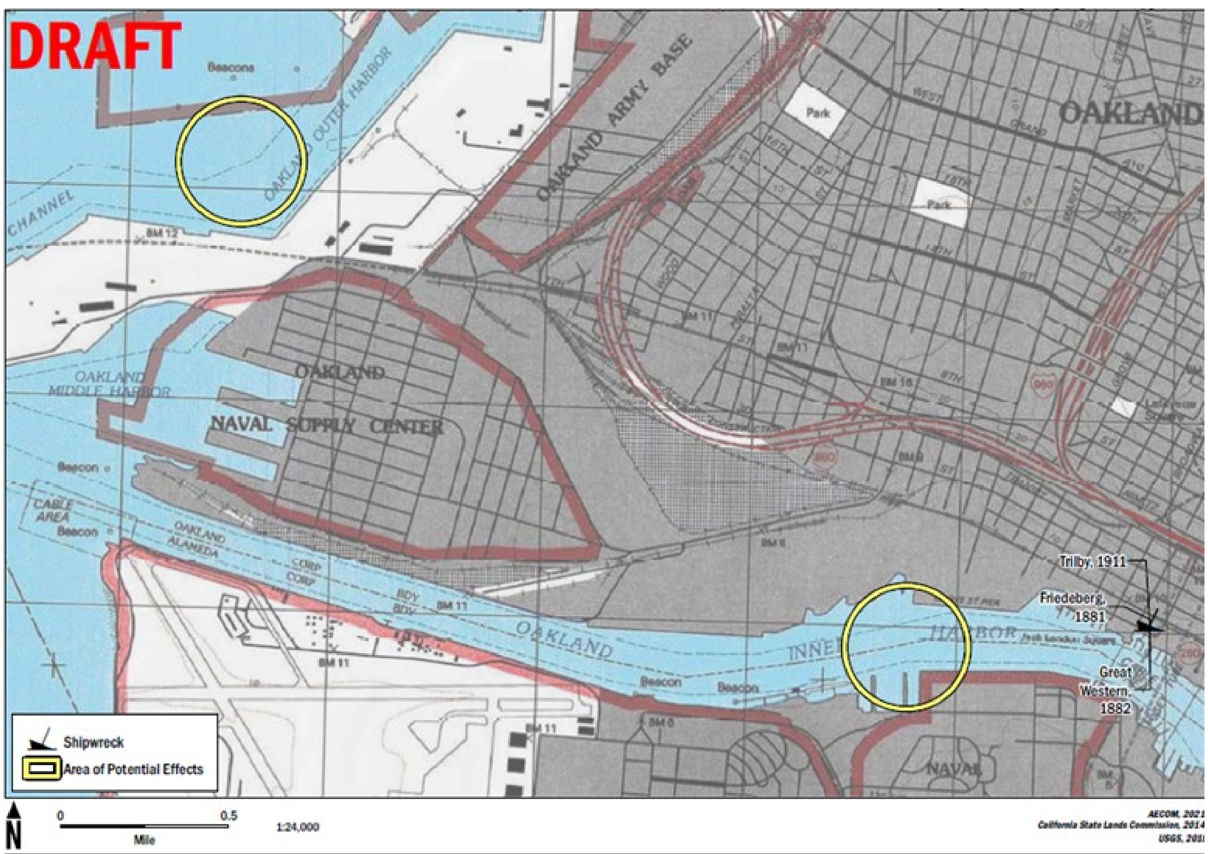


Figure 36: Areas of potential effect at the proposed expanded turning basin footprints (in yellow)

Vertical Area of Potential Effect

The APE for this undertaking includes all areas of potential aquatic sediment and upland ground-disturbing activity in association with the expansion of the turning basins, including buried/ submerged archaeological resources. The new bulkhead walls for the Inner Harbor Turning Basin would require installation of sheet piles to a depth of 65 feet below ground surface. The expansion of both the Inner Harbor Turning Basin and Outer Harbor Turning Basin include excavation and dredging to a maximum depth a depth of -50 feet MLLW, which equates to roughly 45 feet or less of actual sediment dredging in presently inundated areas. Thus, the maximum depth of the APE for the current undertaking is 65 feet below ground surface, which corresponds to the replacement of sheet piles for installation of the bulkhead walls for the Inner Harbor Turning Basin.

Cultural Resources Inventory

A cultural resources inventory report was prepared for the Oakland Harbor Turning Basins Widening Navigation Study (AECOM 2021) to identify cultural resources in the APE. The inventory was informed by:

- A records search at the Northwest Information Center (NWIC), Historical Resources Information System, Sonoma State University (File No. 202678), which is the official state repository of cultural resource records and studies for Alameda County.
- Review of the shipwreck database maintained by the California State Lands Commission (SLC) in concert with the results of previously conducted geophysical surveys.
- A Sacred Lands File (SLF) review as well as a list of Native American contacts for the study area from the California Native American Heritage Commission (NAHC).
- A mixed-strategy of cultural resources reconnaissance of the terrestrial project components.

The results of these efforts and the potential effects and/or impacts to both archaeological and historic architecture resources are presented below for each alternative.

Native American Consultation

USACE and the Port initiated consultation efforts with the local Native American community on September 16, 2020, with a letter requesting participation in public meetings to discuss the project (Appendix A6). These meetings, held virtually given pandemic, were held on October 2020; May 2021; and August 2021, all being attended by Cultural Representatives of Indian Canyon Mutsun Band of Costanoan Ohlone People.

In July 2021, a list of Native American contacts as well as results of a SLF review for the study area were obtained from the NAHC. The NAHC indicated that their review of the SLF was “positive” and identified the Amah Mutsun Tribal Band of Mission San Juan Bautista and the North Valley Yokuts as the parties to contact concerning this finding. In September 2021, a second letter was sent out by USACE and the Port to all of the groups identified in the July 2021 response from the NAHC, and requested any information these groups may have regarding properties, features, or materials in the project area and immediate vicinity that may be of concern to the local Native American community (Appendix A6). One response was received from cultural representatives of the Indian Canyon Band of Costanoan Ohlone People expressing interest in consulting regarding the study area. The USACE will seek to further consult on the study area and proposed action with the Indian Canyon Band of Costanoan Ohlone People after release of this Draft Integrated Report.

6.7.1 Inner Harbor Turning Basin Expansion

The records search associated with the cultural resource inventory revealed that the entirety of the terrestrial portions of the inner harbor APE, including Schnitzer Steel, Howard Terminal, and the FISC/Bay Ship & Yacht parcel in Alameda, have been previously inventoried for cultural resources. The two structures partially located on the Alameda side of the inner harbor APE were determined to be ineligible for listing on the NRHP (JRP 1996), and no historic properties were identified by Lerner (1988) on the Pier 2 parcel (i.e., Schnitzer Steel). Corbett and Hardy (1988) did identify the Todd-United Engineering Company Shipyard Historic District (P-01-003218; Historic Resource Inventory #4501-0325-9999) in the Alameda portion of the APE; it is the only historic property identified within the undertaking's entire APE. This resource was first recorded by Corbett and Hardy (1988), then later evaluated as a historic district by Basin Research (1998). The district was determined to be eligible for the NRHP pursuant to Criteria A and C because of its part in the transportation history of the San Francisco Bay Area from 1910 to 1963 (Basin Research 1998; Corbett and Hardy 1988). Subsequent to the original recordation, however, contributing elements of the district were demolished for the Port's -42-foot Channel Dredging Project and the -50-Foot Project (Corbett and Hardy 1988; Port 1998). No such contributing elements remain in the APE delineated for the current undertaking.

The SLC shipwreck database revealed that three vessels are reported to have gone down within 0.5 miles of the Inner Harbor APE, all plotted by SLC at same location to the east, near what is now Jack London Square. None of the reported locations are within or immediately adjacent to the APE (

Figure 36). Additionally, both the existing turning basins as well as the shipping channels are subject to annual maintenance dredging. Therefore, the likelihood that undiscovered and undisturbed (i.e., intact) cultural resources remain in the waters of the APE is low.

No new cultural resources, either archaeological or historic architecture, were identified in the inner harbor APE delineated for the undertaking during completion of a cursory survey/ windshield reconnaissance in July 2021 (AECOM, 2021).

Given that no known cultural resources existing in the Inner Harbor turning basin expansion APE, the Inner Harbor expansion alternative (Alternative B) would not result in effects and/or impacts to known Cultural Resources. implementation of this alternative would result in a USACE finding of no historic properties affected pursuant to Section 106 of the NHPA. While the potential for intact archeological resources to occur in the APE delineated for the Inner Harbor is extremely low, any alternative will include provisions for the accidental discovery of archeological resources, including human remains inadvertently exposed during construction activities. Should such an unanticipated discovery occur, all activities at the discovery site that may result in disturbance to the discovery would be required to cease until an archeologist has evaluated the finds and determined their significance. The archaeologist would evaluate the finds and determine the disposition in accordance with applicable laws and regulations. With this minimization measure, adverse effects/impacts to unidentified archeological resources would be less than significant.

6.7.2 Outer Harbor Turning Basin Expansion

Based on the cultural resources inventory, no historic properties occur in the Outer Harbor portion of the APE which is entirely situated offshore. The records search did reveal that the Carnation Mill and Elevator (P-01-011758) was recorded (Basin Research 1998; Corbett and Hardy 1988) onshore, just south of the outer harbor portion of the APE, but the resource has since been razed and replaced by modern container cranes. AECOM (2021) reviewed other environmental documents, cultural resources reports, and technical data that could provide insight regarding the potential for cultural resources to occur in the APE, including a recent geophysical survey conducted to identify lost shipping containers in the Outer Harbor. As seen in in Appendix A6 nearly the entire Outer Harbor portion of the APE was covered by this survey and the only anomalies identified were three of the lost containers (marked Objects # 1, # 2, and #3 in that figure). Additionally, both the existing turning basins as well as the shipping channels are subject to annual maintenance dredging. Therefore, the likelihood that undiscovered and undisturbed (i.e., intact) cultural resources remain in the waters of the APE is low.

No new cultural resources, either archaeological or historic architecture, were identified in the outer harbor APE delineated for the undertaking during completion of a cursory survey/ windshield reconnaissance in July 2021 (AECOM, 2021).

Given that no known cultural resources exist in the Outer Harbor turning basin expansion APE, the Outer Harbor expansion alternative (Alternative C) would not result in effects and/or impacts to known cultural resources. Implementation of this alternative would result in a USACE finding of no historic properties affected pursuant to Section 106 of the NHPA. While the potential for intact archeological resources to occur in the APE delineated for the Outer Harbor turning basin is extremely low, any alternative will include provisions for the accidental discovery of archeological resources (as described in the Inner Harbor Turning Basin Expansion Section above), With this minimization measure, adverse effects/impacts to cultural resources would be less than significant.

6.7.3 Inner Harbor and Outer Harbor Turning Basin Expansion

The NEPA Proposed Action is the Tentatively Selected Plan (Sub-alternative D-2) which, along with Sub-alternative D-1, would involve expansion of both the Inner and Outer Harbor turning basins. As with the individual Inner Harbor and Outer Harbor turning basin expansion alternatives, both of these sub-alternatives, would also result in no effects and/or impacts to known cultural resources, because none occur in the APEs delineated for the two turning basins. Implementation of either the proposed action (Sub-alternative D-2) or Sub-alternative D-1would result in a USACE finding of no historic properties affected pursuant to Section 106 of the NHPA. While the potential for intact archeological resources to occur in the APE delineated for either turning basin is extremely low, any alternative will include provisions for the accidental discovery of archeological resources (as described in the Inner Harbor Turning Basin Expansion Section above), with this minimization measure, adverse effects/impacts to cultural resources from either the proposed action (Tentatively Selected Plan; Sub-alternative D-2) or Sub-alternative D-1 would be less than significant.

6.7.4 No Action Alternative

Under the No Action Alternative, there would be no construction actions and no modification of either turning basin; therefore, no effects and/or impacts to Cultural Resources, known or unknown, would occur.

6.8 Aesthetics

This analysis of visual resources is based on qualitative evaluation of the extent and implications of changes to existing visual resources. Consideration was given to specific changes in the visual composition, character, and valued qualities of the affected environment.

For the purposes of this analysis, an effect on aesthetics or scenic resources may be considered significant if the alternative would do any of the following:

- substantially damage scenic resources associated with a designated or eligible scenic highway;
- permanently block or disrupt existing public scenic views or reduce public opportunities to view scenic resources;
- substantially reduce the existing scenic quality from public viewpoints;
- conflict with applicable zoning and other regulations governing scenic quality; or
- create a new source of substantial light or glare which would adversely affect nighttime views in the area.

6.8.1 Inner Harbor Turning Basin Expansion

Temporary visual impacts would occur during construction of the Inner Harbor Turning Basin expansion (Alternative B) due to the presence of construction equipment such as barges and scows used for dredging; cranes, bulldozers, and trucks used for demolition; and cranes, excavators, and drill rigs used for installation of bulkhead, anchor/tie-back, and pilings. On the Oakland side of the turning basin, construction equipment and materials would be stored at Howard Terminal and on the Alameda side of the turning basin they would be stored in a paved upland area at the construction site and on work barges.

There are no federally designated National Scenic Byways in the project region (FHWA 2021) and no state-designated or eligible scenic highways that afford views of the Inner Harbor Turning Basin. Therefore, there would be no effect to visual resources associated with a scenic highway.

Views of construction activities, materials, and equipment associated with implementation of this alternative would largely be visible to private recreational boaters and San Francisco Bay Ferry passengers in the Inner Harbor Channel; recreationists along the waterfront area and the adjacent Bay Trail; and users of open space fields and parks (e.g. Alameda's Estuary Park). Views of construction on the Oakland side of the turning basin from the Oakland Ferry Terminal, ship museums, and the ground floors of hotels and restaurants in the Jack London Square area, would be blocked by intervening facilities (including buildings, trucks, and cargo containers) at Howard Terminal directly to the west. However, construction work and staging on the Alameda side would be visible from these locations. From the Middle Harbor Park Complex, including the Chappel Hayes Observation Tower, views of construction in the Inner Harbor Turning Basin would be blocked by intervening Port facilities.

Although construction equipment would be visible throughout the duration of construction, the Port and other maritime facilities already sustain considerable industrial/maritime activity, which includes the use of tugboats, barges, large vessels, cranes, and trucks. In addition, maintenance dredging and sediment transport in the Inner Harbor Channel is also a routine occurrence. The dredging and construction equipment associated with the Inner Harbor Turning Basin expansion would therefore appear as an extension of existing surrounding industrial/maritime activities and would be considered visually compatible with existing uses. Their visual presence would not substantially degrade existing scenic views from public viewpoints and would not block or substantially disrupt scenic vistas of the Inner Harbor Channel, the City of Oakland skyline, or the San Leandro hills.

At the completion of construction, the expanded Inner Harbor Turning Basin would appear visually similar to existing conditions, except that portions of two existing white metal warehouse buildings on the Alameda side would be removed. Removal of these metal buildings would provide a visual benefit, because the existing viewshed would be improved from public vantage points, including Alameda's Estuary Park. New bulkhead sections, tiebacks, and pilings installed along the waterfront on both sides of the Inner Harbor Turning Basin would also be of a size, scale, mass, and color similar to the existing facilities. These changes would not reduce the existing scenic quality from public viewpoints.

Dredging associated with the Inner Harbor Turning Basin expansion would be conducted 24 hours per day on weekdays (Monday through Friday), and if necessary, on weekends. This would require the use of minor nighttime lighting on the barge. Minor nighttime lighting is already required on all boats in the Inner Harbor Channel. In addition, high-mast lighting is present along the northern side of the turning basin for nighttime loading and unloading activities in the Port, as well as at Alameda's Estuary Park for use during nighttime outdoor sporting events. The minor nighttime lighting associated with the dredge would be inconsequential in relation to the existing nighttime lighting sources and would be temporary in nature. Therefore, it would not create a new source of substantial light or glare which would adversely affect nighttime views.

Because construction materials and equipment would be localized, temporary, and visually consistent with existing heavy industrial/maritime uses, they would not conflict with applicable regulations governing scenic quality. Moreover, expansion of the turning basin would be consistent with policies in the Bay Plan and the Port's Seaport Plan related to the visual appearance of new bulkhead along the waterfront (which would appear visually similar to the existing bulkhead).

Given the above analysis, visual impacts associated with the Inner Harbor Turning Basin expansion (Alternative B) would be less than significant.

6.8.2 Outer Harbor Turning Basin Expansion Alternative

Construction of the Outer Harbor Turning Basin expansion (Alternative C) would not include any land-based activities, only water-based sediment removal from a barge-mounted dredge. Staging of materials and equipment would occur at Berth 10.

The Outer Harbor Turning Basin is visible from I-80, including the San Francisco-Oakland Bay Bridge, which is eligible for scenic highway designation. However, a barge-mounted excavator dredge would be barely visible from the bridge and the adjacent Bay Trail/Alexander Zuckerman Path, at approximately 0.5 mile away. The staging area at Berth 10 would also not be visible due to intervening buildings and international shipping container storage. Scows loaded with dredged sediments traveling underneath the bridge would be consistent with existing shipping activities that occur in the Channel. Therefore, construction of the Outer Harbor Turning Basin Alternative would have negligible impact on views from designated or eligible scenic roadways.

Views of construction activities, materials, and equipment associated with implementation of this alternative would largely be visible to recreational and commercial boaters in the Outer Harbor and users of Judge John Sutter Regional Shoreline Park (Gateway Park), including the observation pier and the Bridge Yard Building Event Center and observation deck. Construction equipment and materials at Berth 10 would be visible from the Bay Trail to the north, however, neither the proposed staging area at Berth 10 nor the Outer Harbor Turning Basin are visible from the Bay Trail along Maritime Street or the 7th Street Pedestrian/Bicycle Path, due to the presence of intervening industrial buildings and other equipment. Similarly, the proposed staging area at Berth 10 and the Outer Harbor Turning Basin are not visible from the Middle Harbor Park Complex or the Chappel Hayes Observation Tower which is not tall enough to afford views of the Outer Harbor Turning Basin.

Existing land uses on the southern side of the Outer Harbor Turning Basin are heavy industrial in nature and is dominated by large, mechanized cranes and cargo ships. Because dredging in the Outer Harbor Channel is a routine occurrence, the presence of a barge-mounted dredge, and occasional scow trips, would be visually consistent with existing shipping activities that occur. The area around the proposed staging area at Berth 10 is also heavy industrial in nature, consisting of cargo containers, dredged material stockpiles, industrial buildings and warehouses, metal fencing, paved roadways, construction equipment, and truck parking. Construction materials would be consistent in form, size, mass, and color with existing equipment and materials that are currently stored in the Berth 10 area. Thus, construction equipment and materials, although visible, would not block or substantially disrupt scenic vistas of the Outer Harbor Channel or the San Leandro Hills and their visual presence would not substantially degrade existing scenic views from public viewpoints.

Dredging in the Outer Harbor Turning Basin with a barge-mounted excavator would be conducted 24 hours per day on weekdays (Monday through Friday), and weekends if necessary.

This would require the use of minor nighttime lighting on the barge. Such nighttime lighting is required on all boats in the Outer Harbor Channel and nighttime lighting is present at all landside facilities along the channel and immediately adjacent to the Outer Harbor Turning Basin. The minor nighttime lighting associated with the dredge would be inconsequential in relation to the existing nighttime lighting, would be temporary in nature, and would not create a new source of substantial light or glare that would adversely affect nighttime views in the area.

Because construction materials and equipment would be localized, temporary, and visually consistent with existing heavy industrial/maritime uses, their visual presence would not substantially conflict with applicable regulations governing scenic quality. At the completion of construction, the expanded Outer Harbor Turning Basin would appear visually the same as existing conditions.

Based on the above factors, visual impacts associated with the Outer Harbor Turning Basin expansion (Alternative C) would be less than significant.

6.8.3 Inner Harbor and Outer Harbor Turning Basin Expansion

Sub-alternatives D-1 and D-2 involve expansion of both the Inner and Outer Harbor Turning Basins using dredge equipment powered by diesel fuel and electricity, respectively. All other elements of these sub-alternatives would be the same and the effects of these two sub-alternatives on aesthetics would be the same. The Inner Harbor Turning Basin and Outer Harbor Turning Basin are not visible together from any one location; therefore, visual impacts from each turning basin expansion would be separate and would not combine to create a more significant level of impact. The same effects related to aesthetics and scenic resources described above for the Inner Harbor Turning Basin expansion (Alternative B) and Outer Harbor Turning Basin expansion (Alternative C) would occur under sub-alternatives D-1 and D-2. Therefore, impacts related to aesthetics and scenic resources under the Proposed Action (Tentatively Selected Plan; Sub-alternative D-2) and under Sub-alternative D-1 would be less than significant.

6.8.4 No Action Alternative

Under the No Action Alternative, the two turning basins would each remain at their existing dimensions. There would be no adverse temporary, construction-related effects to scenic views or recreational resources. Because large portions of the white metal warehouses at the Alameda site would not be removed under this alternative, the visual benefit to the viewshed in the southwestern portion of the Inner Harbor Turning Basin would not occur.

6.9 Recreation

Effects to recreational facilities were evaluated by considering the potential for construction methods and equipment, and the nature of project operation, associated with each alternative to modify or alter the nearby recreational resources described in detail in section 3.9 . For the purposes of this analysis, an effect on recreational resources may be considered significant if it would:

- result in a permanent, substantial decrease or loss of public access to any waterway or public recreational land;

- create an additional demand for recreational facilities that is beyond their capacity; or
- increase the use of recreational facilities to such a degree that substantial physical deterioration would occur.

6.9.1 Inner Harbor Turning Basin Expansion

Construction activities associated with the Inner Harbor Turning Basin expansion (Alternative B) may result in temporary effects from visual setting degradation and increased noise and dust at the City of Alameda's Estuary Park, potentially temporarily displacing some users to other parks further from the construction area. However, the park would remain open during construction of this alternative. Furthermore, given that Estuary Park is surrounded by existing heavy industrial/ maritime uses on the northwestern, northern, and northeastern sides, and by traffic on Mosley Avenue to the south, the construction sounds and level of noise in the vicinity of the park would be consistent these ambient sources.

Similar temporary visual setting degradation and increased noise would occur for recreational boaters, and passengers aboard the San Francisco Bay Ferry boats, traveling through the Inner Harbor Turning Basin. The presence of water-based construction equipment in the turning basin may necessitate localized areas of the channel be closed off from public waterway access. However, the turning basin and Inner Harbor Channel are wide enough that recreational boaters and San Francisco Bay Ferry boats would have ample room to traverse through the turning basin, as dictated by construction activities. Any localized closure would be temporary and be expected for a maximum of approximately 6 months on each side of the turning basin and given construction phasing, would not be expected to occur simultaneously on both the Oakland and Alameda sides. The turning basins will remain open to all ship traffic, including the turning of vessels, during construction.

Given the distance from the project site, recreationists at the USS Potomac, Lightship Relief, and Alameda Landing Waterfront Park are unlikely to be affected. Similarly, the Alameda Ferry Terminal and the Bay Ship & Yacht Company property are between recreationists at the Main Street Dog Park/Bay Trail and the southern portion of the Inner Harbor Turning Basin; although the tops of cranes and the barge-mounted excavator would be visible in the middleground during construction, this would not affect recreational use. No other parks in the vicinity would be affected by project-related construction activities.

While temporary effects for recreationists at the City of Alameda's Estuary Park and boaters in the Inner Harbor Turning Basin would occur other nearby parks are available for landside recreation use, and boaters would be able to transit through the Inner Harbor. The potential minor, temporary displacements of recreationists from Estuary Park, and from portions of the Inner Harbor Turning Basin during construction, would not create an additional demand at other parks or boating areas that is beyond their capacity or increase the use of these other recreational facilities to such a degree that substantial physical deterioration would occur. After construction, the Inner Harbor Turning Basin would be fully available for recreational use, similar to existing conditions, but would provide a slightly expanded open-water area for use. Therefore, effects on recreation from the Inner Harbor Turning Basin Expansion (Alternative B) would be less than significant.

6.9.2 Outer Harbor Turning Basin Expansion

Construction activities associated with the Outer Harbor Turning Basin Expansion (Alternative C) may result in minor temporary effects from visual setting degradation for recreationists on the Bay Trail and in the Judge John Sutter Regional Shoreline Park (Gateway Park), from views of construction in the Outer Harbor Turning Basin approximately 0.5 mile to the south. Recreationists on the Bay Trail north of the proposed staging area at Berth 10 may experience increased noise during the 6-month construction period associated with this alternative. However, given that this portion of the Bay Trail is surrounded by existing heavy industrial/ maritime uses on all sides, including City of Oakland storage yards and tugboat berths along with traffic on Burma Road and I-80 to the north, the noise level in the vicinity of this portion of the Bay Trail is already high. The temporary noise increase associated with construction in the staging area would not be high enough to displace Bay Trail users.

Similar temporary effects from visual setting degradation and increased noise would occur for recreational boaters traveling through the Outer Harbor Turning Basin. The presence of water-based construction equipment in the Outer Harbor Turning Basin, could necessitate localized portions be closed off from public waterway access. However, the turning basin is sufficiently wide that boaters would have ample room to traverse through the turning basin, as dictated by construction activities. These effects to boaters would occur for a maximum of approximately 6 months, the duration of construction of this alternative.

While temporary effects for recreationists at Judge John Sutter Regional Shoreline Park (Gateway Park) and along a small portion of the Bay Trail as well as boaters in the Outer Harbor Turning Basin would occur, other nearby parks and areas of the Bay trail would remain available for use, ample room to traverse the turning basin would be provided during construction, and all of the waterways outside of the turning basin would continue to be available for recreational use. These temporary effects during construction would not create an additional excessive demand on other recreational facilities or increase the use of other recreational facilities to such a degree that substantial physical deterioration would occur. Therefore, effects on recreation from the Outer Harbor Turning Basin Expansion (Alternative C) would be less than significant.

6.9.3 Inner Harbor and Outer Harbor Turning Basin Expansion

The NEPA Proposed Action is the Tentatively Selected Plan (sub-alternative D-2) which, along with Sub-alternative D-1, would involve expansion of both the Inner and Outer Harbor turning basins. The effects of these two sub-alternatives on recreation would not differ from one another. The potential impacts of these alternatives would be a combination of those effects presented for the Inner and Outer Harbor Turning Basin individual expansion alternatives. Construction-related in-water work activities associated with the Outer Harbor Turning Basin expansion would be conducted at the same time as a portion of the in-water work for the Inner Harbor Turning Basin expansion for a period of approximately 6 months (expected in 2028). Construction equipment would be present in both turning basins during this period. Because more area would potentially be restricted at the same time from public boat transit during construction, these sub-alternatives would have a slightly greater level of impact during construction than would be experienced under either the Inner Harbor Turning Basin expansion (Alternative B) or the Outer Harbor Turning Basin expansion (Alternative C) alone. However, as previously discussed, there would be ample room for boaters to pass through both turning basins, as dictated by construction activities.

Therefore, for the same reasons described above, impacts related to recreation under either of the sub-alternatives involving the expansion of both the Inner Harbor and Outer Harbor Turning Basins (Sub-alternatives D-1 and D2), would be less than significant.

6.9.4 No Action Alternative

Under the No Action Alternative, the two turning basins would each remain at their existing dimensions, and no construction would take place. There would be no effect to recreational resources.

6.10 Navigation and Transportation

Turning basin expansion would improve operational efficiency for vessels entering and exiting the Port, but there would be no increase in the Port's overall volume of freight from current projected volumes. However, there would be land-based traffic associated with construction activities under the action alternatives, such as dump trucks hauling excavated soil and other materials to landfills. This section estimates the land-based traffic associated with each of the action alternatives and evaluates the potential impacts. Additionally, potential navigational effects during construction are discussed and evaluated.

For the purposes of this analysis, an effect on land-based transportation or navigation may be considered significant if the alternative would do any of the following:

- substantially impact vehicular traffic circulation by increasing ADT such that it exceeds roadway capacity or increases typical daily traffic by 25% or more;
- substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment);
- result in inadequate emergency access;
- Eliminate or substantially inhibit public transit, bicycle, or pedestrian circulation; or
- change vessel traffic patterns in a manner resulting in regularly-occurring extended delays, adverse change in freedom of movement, increased safety risks, or introduction of safety hazards.

It should be noted that none of the proposed action alternatives involve physical changes to the land-based transportation and circulation system. As a result, none of the alternatives include any geometric design features or introduce incompatible uses that could substantially increase hazards for land-based transportation. Similarly, all of the construction-related traffic would utilize existing roadways and would not eliminate or inhibit the existing or planned public transit, bicycle, or pedestrian circulation routes described in Section 3.12. As such, these two significance criteria are not discussed further in the alternative effect evaluations below.

Traffic Methodology and Assumptions

Traffic estimates were developed for each action alternative based on three primary trip types:

- Commute trips generated by laborers and equipment operators
- Deployment and withdrawal of equipment and machinery
- Dump truck trips to landfills

Traffic associated with each action alternative was calculated as a set of average daily traffic (ADT) values for equipment, labor, and truck hauling for each week of the construction schedule. These calculations assume land-based work associated with the action alternatives will take place 5 days a week, with one shift lasting 8 to 10 hours/day. In contrast, dredging activities would be conducted 24 hours primarily on weekdays and, if necessary, during weekends.

Specific assumptions for each trip type/purpose are described in more detail below.

Worker Commutes

Each laborer and equipment operator are assumed to make two trips per day: a morning commute trip to the site and an afternoon commute trip from the site. This includes equipment operators for water-based equipment such as barges, dredges, and tugboats, which are conservatively assumed to commute to the site and then access the water-based equipment from landside. Dump truck drivers were not included in the laborer and equipment operator trip tally, as they would not commute in a personal vehicle to and from the project sites. The trip estimation methodology conservatively assumes 100 percent of worker commute trips to the site are via personal vehicle with no public transit use, biking, or walking, and an average vehicle occupancy of one person, with no reductions for carpooling. While it is likely that at least some workers commuting to the site may carpool, use public transit, or walk/bike, the conservative assumptions made for this analysis are being used to bound the worst-case traffic impacts.

Equipment and Machinery Deployment and Withdrawals

To calculate the total number of equipment and machinery deployments and withdrawals, the analysis assumed two trips for each piece of equipment (one for deployment and one for withdrawal). Therefore, equipment deployment and withdrawal are absolute values (and not daily values) because the equipment is assumed to remain at the site for the duration of the given construction phase. Water-based equipment (i.e., barge ships, dredging vessels, and tugboats) were excluded from this analysis because they are not deployed from land.

Dump Trucks and Hauling

Each dump truck was estimated to make two roundtrips per day during construction phases involving hauling of excavated soils. Dump trucks are planned to be loaded at a rate of one truck approximately every 7 to 8 minutes at two stockpile locations. This results in an effective loading rate of one truck every 3 to 4 minutes. Each dump truck is assumed to hold 10 cubic yards of material. Once loaded, the dump trucks will haul material either to Keller Canyon Landfill (a Class II landfill) in Pittsburg, California, or to Kettleman Hills Landfill (a Class I landfill) in Kettleman City, California.

Traffic Estimates by Alternative

This section summarizes the maximum by trip type and peak total construction ADT estimates by project alternative. The reported maximum ADT values below for each alternative represent the maximum ADT estimated for worker commutes, equipment deployment, equipment withdrawal, or haul truck trips in any given week over the *entire* construction duration of the project. These maximum values for each trip type (purpose) are independent maximums and do not necessarily occur in the same week during the construction schedule. When an alternative involves multiple construction areas that trips would be made to/from, maximum ADT values by trip purpose are reported for each construction area separately (to facilitate comparison to traffic levels on these different routes expected under the no action alternative). Additionally, the peak ADT values experienced at each construction area are reported. These peak ADT values represent the highest total ADT expected for a site (sum total across all trip purposes) in any single week across all weeks in the entire construction schedule. The peak total ADT values should generally be considered conservative because the primary contributor to construction traffic is dump trucks, which will only be active during certain phases. Therefore, the ADT to each site on most days (e.g., days or phases without hauling activity) would be much lower than the peak ADT values reported below.

Inner Harbor Turning Basin Expansion

Construction traffic estimates for expansion of the Inner Harbor Turning Basin (Alternative B) are summarized in Table 42. The highest peak construction ADT across all Inner Harbor construction sites is 438 trips and is associated with the Alameda construction site. Given the phasing of construction, the 438 peak ADT is also the maximum peak ADT for the entire construction duration. The values in Table 42 a) demonstrate that the largest contributing trip type for construction traffic to all sites except the Inner Harbor Turning Basin sediments site is dump trucks. Dump truck trips would generally be spread over the course of the workday. A dump truck ADT of 300, for example, corresponds to 75 trucks making two roundtrips (or four one-way trips, two to the landfill and to back to the site) daily; spreading these 300 trips across an 8-hour workday, the actual peak-hour volume of haul trucks would be on the order of 38 trucks per hour.

Table 42: Construction Average Daily Traffic Estimates – Inner Harbor Turning Basin Expansion

a.)

Construction Area/Site	Maximum ADT by Trip Type[1]			
	Worker Commutes	Equipment Deployment	Equipment Withdrawal	Dump Trucks
Howard Terminal	52	12	12	308
Schnitzer Steel	52	10	10	308
Alameda	80	14	14	346
Inner Harbor Sediments – Inner Harbor Turning Basin Trips	52	2	2	—
Inner Harbor Sediments – Berth 10 Trips	56	6	6	152

[1] Maximum weekly ADT value for a trip type over the *entire* construction duration. Values for each trip type and site are independent maximums, they do not necessarily occur in the same week of the construction schedule.

b.)

Construction Area/Site	Peak ADT [2]
Howard Terminal	**344**
Schnitzer Steel	**352**
Alameda	**438**
Inner Harbor Sediments – Inner Harbor Turning Basin Trips	**54**
Inner Harbor Sediments – Berth 10 Trips	**214**

[2] Peak ADT values represent the highest total ADT expected for a site (sum across all trip purposes) in any single week across all weeks in the entire construction schedule.

Outer Harbor Turning Basin Expansion

Construction traffic estimates for expansion of the Outer Harbor Turning Basin (Alternative C) are summarized in Table 43. Because there would not be any landside construction, excavation, or hauling of material required for this alternative, there would be no equipment deployment or dump truck component. The only trip type associated with this alternative would be for workers to commute to the Outer Harbor site which are conservatively assumed to occur for those work to access water-based equipment from landside. Given this, the individual maximum ADT for worker commutes is also the peak ADT for the Outer Harbor site (see Table 43b below). This peak ADT is substantially lower than that of the Inner Harbor Turning Basin Alternative.

Table 43: Construction Average Daily Traffic Estimates – Outer Harbor Turning Basin Expansion

Construction Area/Site	Maximum Construction ADT by Trip Type			
	Worker Commutes	Equipment Deployment	Equipment Withdrawal	Dump Trucks
Outer Harbor Sediments – Outer Harbor Turning Basin Trips	52	—	—	—

Inner and Outer Harbor Turning Basins Expansion

Construction traffic estimates for expansion of both the Inner Harbor Turning Basin and Outer Harbor Turning Basin, as would occur under the proposed action (Tentatively Selected Plan; Alternative D-2) or Alternative D-1, are summarized in Table 44 (a) and (b). Because the construction traffic associated with the Outer Harbor Turning Basin Expansion Only Alternative would be much smaller than that of the Inner Harbor Only Alternative, the maximum peak ADT for the entire construction duration would be the same as for expanding the Inner Harbor Turning Basin only (438 ADT).

Table 44: Construction Traffic Estimates – Inner Harbor and Outer Harbor Turning Basin Expansion

a.)

Construction Area/Site	Maximum ADT by Trip Type[1]			
	Worker Commutes	Equipment Deployment	Equipment Withdrawal	Dump Trucks
Howard Terminal	52	12	12	308
Schnitzer Steel	52	10	10	308
Alameda	80	14	14	346
Inner Harbor Sediments – Inner Harbor Turning Basin Trips	52	2	2	—
Inner Harbor Sediments – Berth 10 Trips	56	6	6	152
Outer Harbor Sediments – Outer Harbor Turning Basin Trips	52	—	—	—

[1] Maximum weekly ADT value for a trip type over the *entire* construction duration. Values for each trip type and site are independent maximums, they do not necessarily occur in the same week of the construction schedule.

b.)

Construction Area/Site	Peak ADT [2]
Howard Terminal	**344**
Schnitzer Steel	**352**
Alameda	**438**
Inner Harbor Sediments – Inner Harbor Turning Basin Trips	**54**
Inner Harbor Sediments – Berth 10 Trips	**214**
Outer Harbor Sediments – Outer Harbor Turning Basin Trips	**52**

[2] Peak ADT values represent the highest total ADT expected for a site (sum across all trip purposes) in any single week across all weeks in the entire construction schedule.

6.10.1 Inner Harbor Turning Basin Expansion

Land-Based Transportation

As described above in Section 6.15.1, there would be a temporary increase in vehicle traffic (ADT) on roadways serving the construction sites during the construction period associated with the Inner Harbor turning basin expansion alternative (Alternative B). In general, construction-related traffic on a given roadway would dissipate with distance from the construction sites as traffic is distributed across multiple local street networks. Construction workers, for example, would be distributed throughout the region and can be expected to arrive at and depart from the sites using multiple possible local street routes. Construction trucks (those delivering/withdrawing equipment or hauling material) would be less dispersed and would be expected to approximately follow the truck routes described in Section 3.10.2 and depicted in the Figures below to access the proposed Howard Terminal and Schnitzer Steel (Figure 37); Berth 10 (Figure 38); and Alameda (Figure 39) action areas. These routes are designed to quickly and efficiently connect with designated citywide local truck routes, which are typically wider, higher-capacity arterial roadways and/or are in industrial areas where the effects of additional truck traffic would be substantially lower than for narrower, lower-capacity streets.

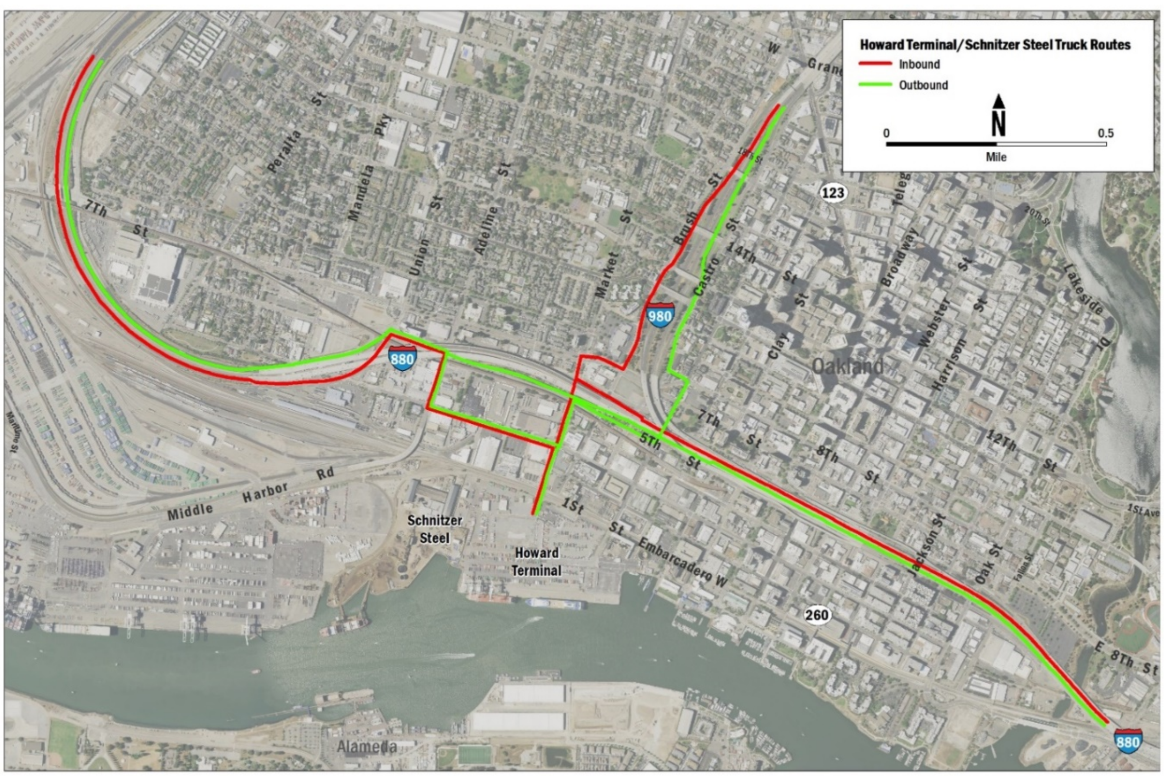


Figure 37: Truck routes to Howard Terminal and Schnitzer Steel action areas

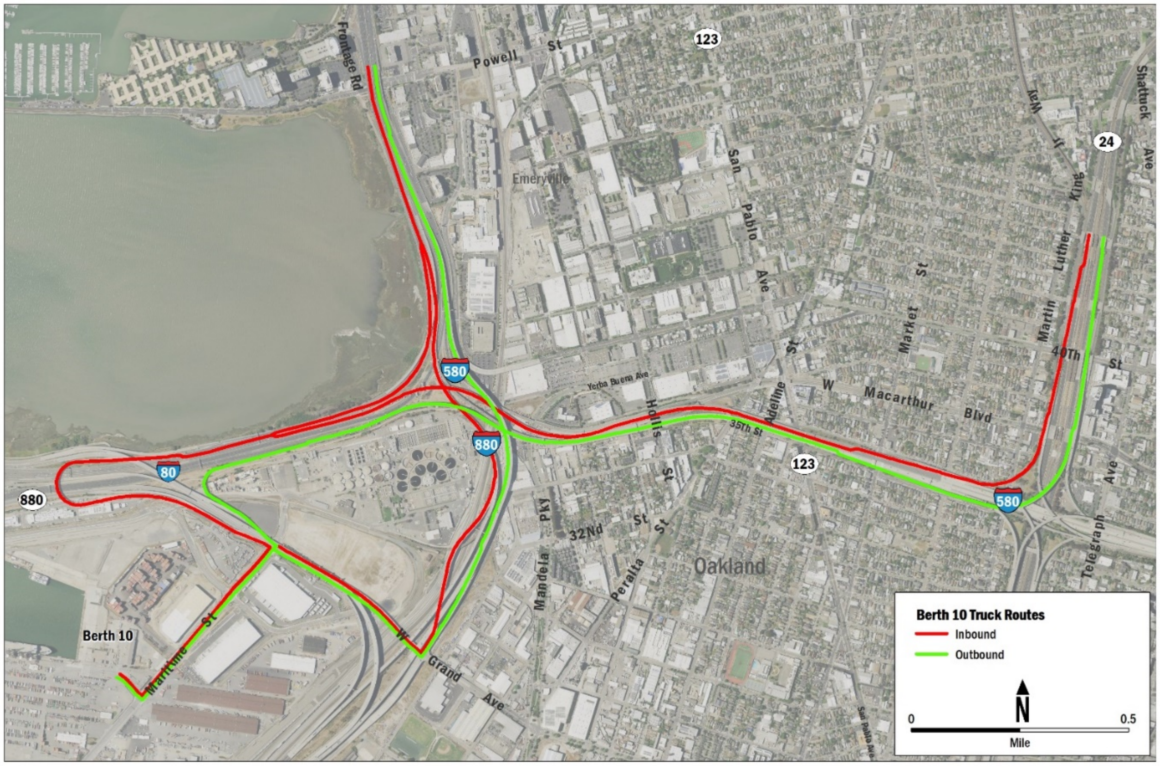


Figure 38: Estimated Truck routes to Berth 10 action area

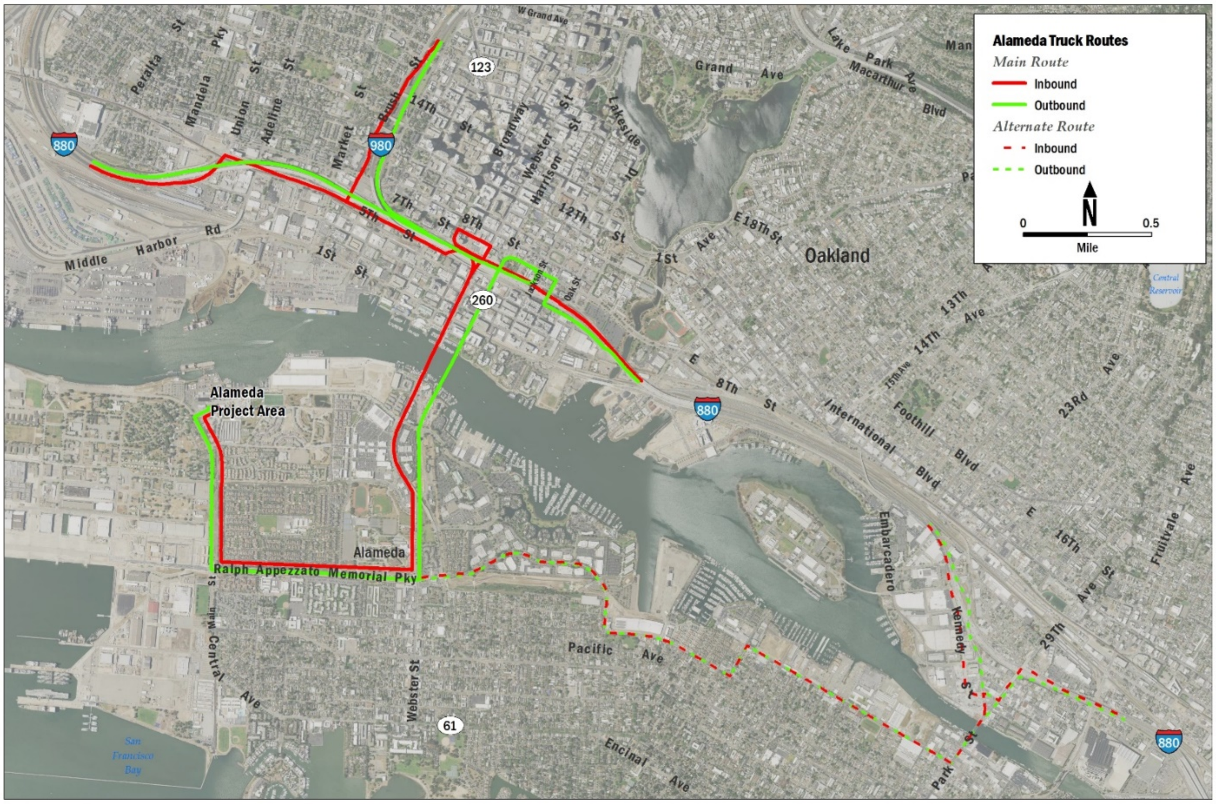


Figure 39: Estimated truck routes to the Alameda action area

Table 45 summarizes the typical daily capacity and existing ADT for key segments of local streets along the expected truck routes to/from each site, focusing on those locations closest to the project sites, where project-related construction traffic and associated effects would be most concentrated. The typical daily capacity is estimated as an hourly capacity of 900 vehicles per lane times the number of lanes on a roadway and multiplied by a typical traffic peaking factor of 10 times the hour capacity (Transportation Research Board 2016). As indicated in Table 45, the existing ADT in all cases is also below the existing capacity of the roadway.

Table 45: Capacity and Existing ADT along Expected Truck Routes

Construction Site	Roadway Segment	Lanes	Typical Daily Capacity[1]	Existing ADT	Percent Increase in ADT with Peak Site ADT[2]
Howard Terminal/ Schnitzer Steel	Market St. south of 3rd St.	4	36,000	3,400	10%
	Market St. north of 3rd St.*	4	36,000	3,100	11%
	3rd St. west of Market St.*	2	18,000	10,300	3%
	Adeline St. south of 5th St.*	4	36,000	8,900	4%
Alameda	Main St. north of Willie Stargell Ave.	2	18,000	6,000	7%
	Main St. south of Willie Stargell Ave.	2	18,000	4,500	10%
	Ralph Appezzato Mem'l Pkwy. west of Webster St.*	4	36,000	13,600	3%
	<u>*Preferred route via Webster/Posey Tubes*</u>				
	Webster St. north of Atlantic Ave.*	4	36,000	20,700	2%
	<u>*Alternative route via Park St. Bridge*</u>				
	Atlantic Ave. east of Constitution Way*	2	18,000	8,300	5%
	Sherman St. north of Buena Vista Ave.*	2	18,000	13,900	3%
	Buena Vista Ave. east of Sherman St.*	2	18,000	12,900	3%
	Buena Vista Ave. west of Grand St.*	2	18,000	11,100	4%
	Grand St. north of Buena Vista Ave.*	2	18,000	4,900	9%
	Clement Ave. east of Grand St.*	2	18,000	5,500	8%
	Clement Ave. west of Park St.*	2	18,000	5,300	8%
	Park St. north of Blanding Ave.*	4	36,000	29,700	1%
Berth 10	Maritime St. south of Burma St.	4	36,000	4,600	5%
	West Grand Ave. east of Maritime St.*	4	36,000	14,700	1%

[1] Typical daily capacity is calculated as 900 vehicles/lane multiplied by the number of lanes and by a factor of 10.
[2] Calculated as peak ADT by site [from table 47 (b)] divided by existing ADT. Peak ADT for Howard Terminal and Schnitzer Steel route was taken as 352, as this was the higher of the two peak ADTs.
*ADT values are order-of-magnitude estimates derived from weekday peak-hour turning movement counts.
Source: Alameda County Transportation Commission, 2018; City of Alameda, 2017; City of Oakland, 2021

Conservatively assuming that the peak construction ADT values associated with the Howard Terminal / Schnitzer Steel, Berth 10, and Alameda construction sites (as shown in Table 44 (b)) are assigned, respectively, to each roadway segment in Table 45 above, the traffic increase would only represent approximately 1 percent to 11 percent of the existing ADT on these segments. This would add a maximum of approximately 50 to 85 vehicles per hour during the peak hour. In no case would the addition of the construction ADT on a segment, cause that segment to exceed its existing capacity. In the case of major regional roadways such as freeways, construction traffic would represent an even smaller fraction of the overall existing ADT. For example, I-880 has an existing ADT on the order of 123,700 vehicles of which the peak construction ADT across all sites (438) would represent 0.3 percent. Furthermore, because the peak construction ADT associated with a site is a conservative value taken over the alternative's entire construction timeline, the actual contribution of project construction traffic to the existing traffic levels on these roadways would be much lower on most days. Thus, even with the addition of this alternative's peak construction ADT values to regional roadways, those roadways would still be expected to operate well below their capacities and their traffic circulation would not be substantially impacted by increased construction-related daily traffic. Added ADT associated with the alternative would drop to zero upon completion of construction (the overall construction duration is estimated at less than 2.5 years).

As described in section 3.15 of this report, neither the proposed Oakland nor the proposed Alameda action areas are in the immediate vicinity of any emergency service providers. As described above, construction-related ADT would not cause a substantial increase in existing ADT along roadways or cause an exceedance of roadway capacity, and thus would not materially affect emergency access to, from, or through the study area (such as by increasing response times).

With any increase in traffic, some localized effects along roadways closest to the construction sites may be expected. In order to minimize these effects, USACE would require the project construction contractor to develop a comprehensive construction traffic management plan (TMP) that includes measures to minimize the effects of project-related construction traffic on overall circulation, including traffic, transit, bicycle, and pedestrian routes, safety, and emergency access.

Measures in the construction TMP would include, but would not necessarily be limited to:

- signage/striping and temporary traffic control devices to minimize conflicts, encourage use of detour or alternative routes, and ensure safety for all roadway users, particularly during periods of heavy hauling activity;
- identification and enforcement of designated truck haul routes;
- advance notification of neighboring residents, businesses, and other property owners, as well as affected jurisdictions and key stakeholders of any substantial increases in construction traffic (e.g., ramping up of hauling activity);
- maintenance of adequate emergency access at the project sites and general access for neighboring properties, at all times; and
- construction worker parking and transportation demand management (e.g., carpool/ vanpool programs, and leased parking in remote/offsite parking facilities).

Based on the preceding analysis, with implementation of a TMP for construction, expansion of the Inner Harbor Turning Basin (Alternative B) would have less than significant effects on land-based transportation.

Waterway Navigation

As described in Chapter 4, expansion of the Inner Harbor Turning Basin would provide beneficial effects by improving operational efficiency and allow larger vessels to serve the Port (by providing an appropriately sized turning basin) but would not increase overall vessel traffic. The Inner Harbor Turning Basin is generally wide enough to accommodate operation and maintenance dredging and other marine-based construction equipment and allow passage of other vessel traffic. For construction of the proposed Inner Harbor turning basin expansion (Alternative B) stationary in-water equipment would be on the perimeter of the turning basin and not in the middle of the channel which would minimize interference with vessel traffic. Nevertheless, the in-water construction activities may occasionally delay some vessels. In-water construction activities would comply with applicable vessel traffic and safety requirements; notices to mariners, and navigational warning markers, would be used as needed to prevent navigational hazards. Dredging would add to vessel movement in the vicinity, particularly during transport of material to placement sites; however, this vessel traffic would be similar to that which has occurred during past annual maintenance dredging operations. Therefore, expansion of the Inner Harbor Turning Basin to allow for turning of larger vessels would not result in regularly occurring delays, adversely affect freedom of movement, increase safety risks, or introduce safety hazards.

Impacts to waterway navigation under the Inner Harbor turning basin expansion alternative (Alternative B) would be beneficial in the long-term and less than significant during construction.

6.10.2 Outer Harbor Turning Basin Expansion

Land-Based Transportation

Effects from expansion of the Outer Harbor Turning Basin (Alternative C) to land-based transportation would be substantially less than those of the Inner Harbor Tuning Basin (Alternative B) because there is no land excavation or other landside construction activity for the Outer Harbor Turning Basin expansion. The only trip type associated with this alternative would be worker commutes to the Outer Harbor site which would have a peak construction-related ADT value of 52 trips per day. Existing and expected future without-project ADT near West Grand Avenue is on the order of 36,000 vehicles daily (Caltrans 2021) so the maximum construction ADT would represent approximately 0.1 percent of the total ADT on this segment. Because workers are assumed to make a morning commute trip to the site and an afternoon commute trip from the site, construction traffic associated with this alternative would add a maximum of approximately 26 vehicles per hour during those two daily commutes. Additionally, construction-related traffic associated with the Outer Harbor Turning Basin Expansion would occur over approximately 26 weeks, which is a shorter duration than that of the Inner Harbor (2.5 years).

As with the Inner Harbor Alternative, the landside action area for the Outer Harbor Alternative is not in the immediate vicinity of any emergency service providers and construction-related ADT from this alternative would not cause a substantial increase in existing ADT along roadways or materially affect emergency access to, from, or through the study area (such as by increasing response times). Similarly, the USACE would require as part of construction of this alternative a construction TMP that includes the measures described under the Inner Harbor Tuning Basin Expansion Alternative (above) to minimize the effects of project-related construction traffic on overall circulation, including traffic, transit, bicycle, and pedestrian routes, safety, and emergency access. With implementation of a TMP for construction, expansion of the Outer

Harbor Turning Basin (Alternative C) would have less than significant effects on land-based transportation.

Waterway Navigation

Much of the analysis and discussion provided above for the Inner Harbor Turning Basin Alternative related to waterway navigation also applies to the Outer Harbor Turning Basin expansion. Similar to the Inner Harbor Turning Basin, the Outer Harbor Turning Basin is an existing turning basin currently in use at the Port and is in waters used by a variety of vessel sizes and configurations. Expansion of the turning basin would provide beneficial effects by improving operational efficiency and allow larger vessels to serve the Port (by providing an appropriately sized turning basin) but would not increase overall vessel traffic. During construction, dredging and sediment transport activities for the Outer Harbor Turning Basin expansion would take place at the outer edges of the existing basin and would comply with applicable vessel traffic and safety requirements. Notices to mariners and navigational warning markers would be used as needed to prevent navigational hazards. Expansion of the Outer Harbor Turning Basin would also not change existing waterway navigation so substantially that it could result in regularly occurring delays, adversely affect freedom of movement, increase safety risks, or introduce safety hazards. Thus, impacts to waterway navigation under the Outer Harbor Turning Basin expansion alternative (Alternative C) would be less than significant during construction and beneficial in the long-term.

6.10.3 Inner Harbor and Outer Harbor Turning Basin Expansion

Both Sub-alternative D-1 and Sub-alternative D-2 (the Tentatively Selected Plan / Proposed Action) would involve the expansion of both turning basins. Since the individual Inner and Outer Harbor Turning Basin expansion alternatives would involve construction activities taking place at distinct sites (Schnitzer Steel, Howard Terminal, Berth 10, and Alameda for the former and the Outer Harbor for the latter), effects under the alternatives that involve expansion of both turning basins would generally be the sum of the effects of the two component alternatives. The land-based traffic effects of the alternatives involving both turning basins (Alternatives D-1 and D-2) would only be marginally higher than those of the Inner Harbor Turning Basin Expansion Alternative (Alternative B), due to concurrent construction activities for both turning basins during a 6-month period (anticipated in 2028) and associated added worker commute trips for the Outer Harbor Turning Basin during this period.

Due to the distance between the turning basins, the impact on waterway navigation during construction would be the same as described for each individual turning basin alternative. However, the long-term beneficial impacts to navigation of expanding both turning basins would be greater than that of either of the individual alternatives because both turning basins would be appropriately sized to accommodate larger vessels to serve the Port.

Therefore, with implementation of a TMP for construction, expansion of both the Inner Harbor Turning Basin and Outer Harbor Turning Basin would result in less than significant effects on land-based transportation and waterway navigation during construction and beneficial effects in the long term.

6.10.4 No Action Alternative

Because the No Action Alternative does not involve any changes from existing conditions, there would be no effect on land-based transportation. However, the No Action Alternative would also perpetuate the navigational inefficiencies described in Chapter 2 that result from the existing turning basin widths and would not confer any benefits to waterway navigation associated with expanding the turning basins to accommodate larger vessels at the Port.

6.11 Hazardous, Toxic, and Radioactive Wastes

An alternative's potential effects related to HTRW would be considered significant if the alternative would:

- Create a significant hazard to the public or the environment through the transport, use, or disposal of substantial amounts of hazardous materials or wastes.
- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment; and

Dredge material associated with the action alternatives may contain contaminants at levels that make it unsuitable for beneficial reuse, but no regulated HTRW (i.e. requiring class I landfill disposal) is expected to occur in the aquatic sediments. Contaminants in dredge or fill material are discussed in the subsequent section and are not further discussed here.

6.11.1 Inner Harbor Turning Basin Expansion

As discussed in Section 3.11 , terrestrial soils on land adjacent to the Inner Harbor Turning Basin, as well as associated groundwater, have previously been found to contain HTRW. As part of this alternative, upland areas in the proposed expansion footprint would be excavated to approximately -17 feet BGS including fills from surface to below groundwater elevations. Additional landside excavation may also be required at Schnitzer Steel to remove potentially contaminated soils below -17 feet BGS.

Effects on water quality associated with potentially HTRW contaminated groundwater are discussed in Section 6.4.1. As noted in that section, all ground-disturbing activities at Howard Terminal and Schnitzer Steel would occur in coordination with DTSC or the SWRCB, as applicable, to ensure that adverse impacts associated with existing contamination would be avoided. Project plans would be developed to avoid impeding existing cleanup and abatement orders in or near the proposed footprint. Upland excavation throughout the proposed Inner Harbor Turning Basin expansion area would have a long-term benefit by removing contaminated sediments at all three upland sites (Howard Terminal, Schnitzer Steel, and Alameda). Excavated material and groundwater would be tested to identify an appropriate disposal site (e.g. class I or II landfill) and all federal, state, and local regulations regarding the storage, handling, transport, and disposal of any excavated HTRW materials would be adhered to during construction. Hauling of excavated material for transport to an authorized landfill would include appropriate containment procedures, such as covering transport trucks when appliable, and spill countermeasures to avoid release of any contaminated materials back to the environment.

In addition, hazardous materials such as fuel oils, grease, and other petroleum products would be used in construction activities associated with this alternative. To avoid accidental releases of hazardous wastes generated during construction, the construction contractor would be required to develop an environmental protection plan including spill pollution control and countermeasure procedures, and appropriate HTRW storage, handling, and disposal processes. The contractor would also be required to keep onsite appropriate spill control equipment commensurate with the quantity and type of materials being generated by construction in case an accidental spill occurs. These measures would avoid or minimize hazards to the public and environment associated with accidental release of hazardous materials into the environment. help protect health and safety impacts would be avoided through adherence to these procedures, conditions, and regulations.

Given the proposed measures to safely excavate, store, handle, and dispose of HTRW contaminated material excavated from the upland areas around the Inner Harbor Turning Basin, as well as those to avoid or minimize the effects of accidental releases of HTRW generated by construction onsite, effects associated with HTRW from the Inner Harbor Turning Basin expansion (Alternative B) would be less than significant. Moreover, this alternative would result in a beneficial permanent effect due to the removal of contaminated soil and groundwater in the Inner Harbor Turning Basin areas.

6.11.2 Outer Harbor Turning Basin Expansion

There is no landside work proposed as part of the Outer Harbor Turning Basin expansion (Alternative C) and therefore no HTRW is expected to be encountered in soils or groundwater. The same mitigation measures described above for preventing accidental releases of HTRW generated during construction would be applied under this alternative. Therefore, effects associated with HTRW from the Outer Harbor Turning Basin expansion (Alternative B) would be negligible.

6.11.3 Inner Harbor and Outer Harbor Turning Basin Expansion

Sub-alternatives D-1 and D-2 (Propose Action; Tentatively Selected Plan) involve expansion of both the Inner and Outer Harbor Turning Basins using dredge equipment powered by diesel fuel and electricity, respectively. All other elements of these sub-alternatives would be the same. Because the expansion of the Outer Harbor Turning Basin (Alternative C) would have negligible HTRW effects, the effects of both sub-alternatives D-1 and D-2 would essentially be the same as those of the Inner Harbor Turning Basin (Alternative B). The same avoidance and minimization measures would be employed and the effects associated with HTRW from both sub-alternative D-1 and the Proposed Action (D-2) would be less than significant.

6.11.4 No Action Alternative

The No Action Alternative would not involve any changes to or construction at the Inner or Outer Harbor Turning Basins. There would be potential for accidental releases of HTRW, however there would also be no beneficial removal of existing contaminated soil and groundwater.

6.12 Contaminants in Dredge or Fill Material

Dredge Material

As detailed in section 3.12 , sampling and analysis has not been conducted in the subtidal areas in the Inner and Outer Harbor Turning Basin expansion footprints specifically for this study, but based on existing sampling and analysis from prior projects in the immediate vicinity, most of the aquatic material is not expected to contain elevated COCs that would preclude beneficial reuse at an upland wetland restoration site as non-cover or potentially cover material. The exception is the basin between Howard Terminal and Schnitzer Steel, where sediment may be contaminated with heavy metals. Sediments that would be dredged as part of implementation of any action alternative would be sampled and tested in the pre-construction phase that follows completion of the USACE's study phase, but occurs prior to any construction activities, including dredging. The results would be reviewed by the DMMO to identify appropriate placement site options based on the characteristics of the sediment and criteria for each placement location. All handling and disposal of dredged sediments would occur in accordance with applicable permit conditions. If dredged sediments do not meet the criteria for placement at as non-cover at a permitted beneficial re-use site, they would be removed and appropriately re-handled at the Port of Oakland's Berth 10 facility, which is an authorized material rehandling location, before being hauled to a facility permitted for the receipt of such material (e.g., a landfill).

The effects of potential contaminants in dredge material associated with the various alternatives are described in the previous sections on "Water Quality" (6.4), "Wildlife" (6.5) , and "Special Status Species and Protected Habitat" (6.6). As concluded in these sections, effects of contaminants in dredge material, if they are present, are expected to be less than significant with the proposed minimization measures on these resources.

Fill Material

Because under all action alternatives, all dredge material would be placed at existing, separately permitted beneficial reuse sites for wetland restoration or, if necessary, an appropriate upland landfill facility, no dredge fill would be placed in waters of the U.S. Additionally, based on current conceptual designs and construction phasing, all pile driving would be conducted on the landside and no in-water pile driving would occur under any of the action alternatives. Any new sheet piles or bulkhead to be installed for expansion of the Inner Harbor Turning Basin are expected to be completed in the dry and tied into the remaining shoreline before existing sheetpiles and shoreline infrastructure are removed to expand the turning basin in the proposed Inner Harbor expansion areas. Therefore, there would be no fill in waters of the U.S associated with any of the action alternatives. In fact, under any alternatives involving Inner Harbor Turning Basin expansion (including Alternatives B, D-1, and D-2 which is the Proposed Action), the removal of approximately 760 existing concrete piles averaging 18-inches in diameter and some sheet piles in the aquatic environmental would result in net removal of fill and an expansion of open waters of the U.S.

Because there is no anticipated fill in waters of the U.S. associated with the action alternatives, a 404(b)(1) analysis in accordance with the Clean Water Act is not required. Should it be determined in later stages of design that aquatic pile driving or other aquatic fill is necessary, this fill would be expected to be minimal, and the USACE would complete any additional necessary environmental compliance at that time.

6.13 Air Quality

For the purposes of this analysis, an effect on air quality may be considered significant if the alternative would:

- Substantially contribute to air quality degradation or conflict with a State Implementation Plan to achieve National Ambient Air Quality Standards; or
- Generate substantial amounts of uncontrolled fugitive dust.

As described in Section 3.13 , the Bay Area is classified as nonattainment with respect to the federal standards for ozone (marginal) and $PM_{2.5}$ (moderate). The General Conformity Rule is designed to ensure that air emissions associated with federal actions do not contribute to air quality degradation or prevent achievement of state and federal air quality goals. Federal agencies conduct an applicability analysis comparing project-specific estimated annual emissions to established *de minimis* levels in order to determine if the project has a potential to air quality degradation or inhibit air quality goals and therefore requires a full conformity analysis. The *de minimis* levels for both ozone precursors (NO_X and volatile organic compounds [VOC]) and $PM_{2.5}$ in this case is 100 tons per year. The following sections summarize the estimated emissions from the action alternatives and evaluate their effects.

While the General Conformity criteria is used as the significance threshold under NEPA, the Port's air quality analysis performed for this study did find that for all action alternatives, average daily emissions of NO_x over the duration of construction for the Alternative, would exceed BAAQMD's local threshold of 54 pounds of NO_x per day. In order to minimize exceedance of this local threshold, all action alternatives would require construction contractors to equip all heavy-duty off-road construction equipment that require greater than 25 horsepower, with engines that meet the Tier 4 Final (Tier 4F) standards as certified by CARB and EPA.

In addition to air pollutant emissions, emissions of fugitive dust would also be generated by construction activities associated with grading and earth disturbance, stockpiling, travel on paved and unpaved roads, and other activities. Studies have shown that the application of BMPs at construction sites substantially controls fugitive dust (WRAP 2006), and individual measures have been shown to reduce fugitive dust by anywhere from 30% to 90% (BAAQMD 2009). For all projects, the BAAQMD recommends the implementation of its *Basic Control Mitigation Measures* (BAAQMD 2017c). The BAAQMD considers implementation of these dust control avoidance and minimization measures adequate to control impacts from construction fugitive dust. These measures would be implemented as part of any of the action alternatives and are listed in Appendix A7 They include watering exposed surfaces twice daily or more, covering trucks hauling loose materials, wet power vacuuming visible dirt on public roads daily, limiting speeds on unpaved roads, limiting idling time to 5 min, properly maintaining construction equipment, and posting signage with contact information for dust complaints, among others.

With implementation of these measures, the would be no significant impacts to air quality from fugitive dust under any of the action alternatives.

Finally, it should be noted that this effect analysis focuses on construction emissions from the action alternatives. In terms of operations, while the action alternatives would not change cargo throughput, they would increase the efficiency of operations at the Port and reduce delays. As a result of reducing delays, the action alternatives would reduce vessel idling and therefore would reduce emissions associated with that idling during operation. This would be a beneficial effect under any of the action alternatives.

Air Emissions Calculations

The air emissions calculations are estimated based on construction schedule and phasing, proposed construction equipment lists, activity levels, and worker and construction truck trips by phase. Construction equipment data have been aggregated to characterize the hours of activity by equipment and by-year. The construction schedule for Inner Harbor Turning Basin work assumes that most of the Howard Terminal activity would occur in year 1 of construction (projected to be 2027), all the Schnitzer Steel activity would occur in year 2 (projected to be 2028), and the Alameda-based activity would be split between year 2 (projected to be 2028) and year 3 (projected to be 2029). The construction schedule assumes dredging activity for the Outer Harbor Turning Basin would occur exclusively in year 2 (projected to be 2028) and that for the Inner Harbor Turning Basin would take place in year 3 (projected to be 2029). For the purposes of the emissions analysis, dredging activity was assumed to occur 24 hours a day on weekdays (but as noted above, dredging may occur on weekends if necessary). Land-based construction would be limited to 10 hours a day during the daytime on weekdays. The emissions calculations, equipment characterization and activity, and emission calculation methodology are located in the Air Quality General Conformity Memo in Appendix A4 and are summarized below.

Emissions Summary

The emissions, with dredge equipment assumed to be fueled by diesel, were calculated per calendar year for use in comparing to the *de minimis* levels to analyze the potential effects of the alternatives B, C, and D-1. As part of this calculation, it was conservatively assumed that the federal agency can exert control on all potential emission sources associated with the action alternatives. the Proposed Action (Tentatively Selected Plan; Sub-Alternative D-2) includes the use of electric dredge equipment, which would reduce emissions. Emission estimates, and comparisons to *de minimis* levels for this Sub-Alternative (D-2) are shown in Table 47. Additionally, because haul truck travel through the San Joaquin Valley Air Basin (SJVAB) when taking material to landfills, the resulting estimated emissions within that air basin are separately calculated in Table 48.

The resulting estimated emissions presented in the following tables do not result in ozone precursors or $PM_{2.5}$ exceeding the corresponding *de minimis* levels for any calendar year in either the San Francisco Bay Area or San Joaquin Valley air basins. These results indicate that a conformity analysis is not required, and no general conformity determination will be produced.

Table 46: Diesel dredge emissions estimates by calendar year, with comparison to de minimis rates

Alternative	Construction Year	Tons per year				Fraction of *de minimis*		
		VOC	NOx	PM_{10}	$PM_{2.5}$	VOC	NOx	$PM_{2.5}$
Alt B - Inner Harbor	2027	0.1	1.4	0.1	0.1	0.1%	1.4%	0.1%
	2028	1.1	18.0	0.8	0.6	1.2%	18.0%	0.6%
	2029	3.5	45.3	2.4	1.9	4.0%	45.3%	1.9%
	Alt B Total	4.67	64.80	3.24	2.55	--	--	--
Alt C - Outer Harbor	2028	6.33	52.33	1.92	1.90	7.3%	52.3%	1.9%
	Alt C Total	6.33	52.33	1.92	1.90	--	--	--
Alt D-1 - Inner & Outer Harbor (with Diesel Dredging)	2027	0.1	1.4	0.1	0.1	0.1%	1.4%	0.1%
	2028	7.4	70.4	4.6	4.4	8.5%	70.4%	4.4%
	2029	3.5	45.3	2.4	1.9	4.0%	45.3%	1.9%
	Alt D-1 Total	11.00	117.13	7.08	6.37	--	--	--

NOTE: Alameda and San Francisco Counties are both considered marginal ozone nonattainment areas and moderate $PM_{2.5}$ nonattainment areas. These designations correspond to de minimis rates of 100 tons per calendar year for each pollutant (VOC, NOx, and $PM_{2.5}$).
PM_{10} and $PM_{2.5}$ values in table include both emissions from exhaust and fugitive sources.
SOURCE: Table compiled by Environmental Science Associates in 2021.

Table 47: Electric dredge emissions estimates by calendar year, with comparison to de minimis rates

Alternative	Construction Year	Tons per year				Fraction of *de minimis*		
		VOC	NO_x	PM_{10}	$PM_{2.5}$	VOC	NO_x	$PM_{2.5}$
Alt D-2 - Inner & Outer Harbor (with Electric Dredging)	2027	0.1	1.4	0.1	0.1	0.1%	1.4%	0.1%
	2028	2.0	48.4	1.5	1.3	2.3%	48.4%	1.3%
	2029	1.5	33.6	1.8	1.4	1.7%	33.6%	0.9%
	Alt D-2 Total	3.63	83.45	3.44	2.73	--	--	--

Table 48: SJVAB hauling emissions estimates by calendar year, with comparison to de minimis rates

Alternative	Construction Year	Tons per year				Fraction of *de minimis*		
		VOC	NOx	PM_{10}	$PM_{2.5}$	VOC	NOx	$PM_{2.5}$
Alt B - Inner Harbor	2027	0.0001	0.0142	0.0012	0.0005	0.001%	0.142%	0.001%
	2028	0.0061	0.7741	0.0651	0.0285	0.061%	7.741%	0.041%
	2029	0.0018	0.2339	0.0203	0.0089	0.018%	2.339%	0.013%
	Alt B Total	0.0080	1.0222	0.0866	0.0379	--	--	--
Alt C - Outer Harbor	2028	0.0	0.0	0.0	0.0	0%	0%	0%
	Alt C Total	0.0	0.0	0.0	0.0	--	--	--
Alt D-1 & D-2 - Inner & Outer Harbor	2027	0.0001	0.0142	0.0012	0.0005	0.001%	0.142%	0.001%
	2028	0.0061	0.7741	0.0651	0.0285	0.061%	7.741%	0.041%
	2029	0.0018	0.2339	0.0203	0.0089	0.018%	2.339%	0.013%
	Alt D-1 & D-2 Total	0.0080	1.0222	0.0866	0.0379	--	--	--

NOTE: San Joaquin, Stanislaus, Merced, Fresno, and Kings Counties are considered extreme ozone nonattainment areas and serious $PM_{2.5}$ nonattainment areas. These designations correspond to de minimis rates of 10 tons per calendar year for VOC and NOx, and 70 tons per calendar year for $PM_{2.5}$.
SOURCE: Table compiled by Environmental Science Associates in 2021.

6.13.1 Inner Harbor Turning Basin Expansion

Annual emissions from the Inner Harbor Turning Basin expansion (Alternative B), broken down by location of work (Howard Terminal, Schnitzer Steel, Alameda, Inner Harbor) and emission source (off-road, on-road, and marine), are presented in Table 49 and would not generate emissions exceeding the applicable *de minimis* thresholds. Therefore, since any increase in pollutants would be temporary, and would not exceed CAA conformity *de minimis* thresholds, the Inner Harbor turning basin expansion alternative would have a less than significant effect on air quality.

Table 49: Annual Construction Emissions from the Expansion of the Inner Harbor Turning Basin

SOURCE	CONSTRUCTION YEAR	ANNUAL EMISSIONS[1] (TONS PER YEAR)			
		ROG	NO_X	PM_{10}	$PM_{2.5}$
Howard Terminal					
Off-Road	2027	0.09	0.88	0.04	0.04
On-Road	2027	<0.01	0.05	<0.01	<0.01
Marine	2027	0.03	0.50	0.01	0.01
Off-Road	2028	0.08	0.63	0.03	0.03
On-Road	2028	0.01	0.86	0.01	0.01
Marine	2028	0.80	11.17	0.31	0.30
Schnitzer Steel					
Off-Road	2027	<0.01	0.012	<0.01	<0.01
On-Road	2027	<0.01	<0.01	<0.01	<0.01
Off-Road	2028	0.05	0.42	0.02	0.02
On-Road	2028	<0.01	0.17	<0.01	<0.01
Marine	2028	0.08	1.70	0.04	0.04
Alameda					
Off-Road	2028	0.21	1.83	0.08	0.08
On-Road	2028	0.01	1.27	0.02	0.02
Off-Road	2029	0.16	1.38	0.06	0.06
On-Road	2029	0.01	0.43	0.01	0.01
Marine	2029	2.05	23.05	0.69	0.68
Inner Harbor					
Off-Road	2029	0.18	1.72	0.08	0.07
On-Road	2029	<0.01	0.23	<0.01	<0.01
Marine	2029	1.61	18.5	0.55	0.54
Inner Harbor Turning Basin Alternative Total		5.4	64.8	2.0	1.9

Notes:
Per BAAQMD methodology, PM_{10} and $PM_{2.5}$ emissions presented include only exhaust emissions and not tire-wear, brake-wear and fugitive emissions.
NOx = nitrogen oxides
$PM_{2.5}$ = particulate matter less than 2.5 microns in diameter
PM_{10} = particulate matter less than 10 microns in diameter
ROG = reactive organic gases
Source: Table compiled by ESA in 2021.

While the emissions from this alternative would be less than significant, air pollutants have the potential for associated health effects on communities and their residents. As discussed in Section 3.13.2, West Oakland has a high cumulative air pollution exposure burden, particularly to DPM. The Port conducted a HRA for this study to evaluate the potential increase in health risks to nearby sensitive receptors from exposure to project construction emissions under the various action alternatives. The HRA evaluates the estimated incremental increase in health risks from exposure to emissions of DPM and $PM_{2.5}$ associated with combustion and fugitive sources.

6.13.2 Outer Harbor Turning Basin Expansion

Expansion of the Outer Harbor Turning Basin (Alternative C) would involve dredging activities in the Outer Harbor; no land areas would be impacted. Annual emissions from this alternative, broken down by emission source (off-road, on-road, and marine), are presented in Table 50 And would not generate emissions exceeding the applicable *de minimis* thresholds. Therefore, since any increase in pollutants would be temporary, and would not exceed CAA conformity *de minimis* thresholds, the Outer Harbor turning basin expansion alternative would have a less than significant effect on air quality.

The Port's HRA for this study for this alternative found that the nearest sensitive receptors to the Outer Harbor Turning Basin would be recreational receptors at Middle Harbor Shoreline Park and Portview Park, which are approximately 2,000 feet away. Due to the distance separating the nearest receptors from the dredging activities associated with the Outer Harbor Tuning Basin expansion (Alternative C), emissions from this alternative would create a negligible increase in health risks to these receptors.

Table 50: Annual Construction Emissions from the Expansion of the Outer Harbor Turning Basin

SOURCE	CONSTRUCTION YEAR	ANNUAL EMISSIONS[1] (TONS PER YEAR)			
		ROG	NO_X	PM_{10}	$PM_{2.5}$
Off-Road	2027	0.06	0.59	0.02	0.02
On-Road	2027	<0.01	<0.01	<0.01	<0.01
Marine	2027	7.21	51.7	1.90	1.87
Outer Harbor Turning Basin Alternative Total		7.3	52.3	1.9	1.9

Notes:
Per BAAQMD methodology, PM_{10} and $PM_{2.5}$ emissions include only exhaust not tire-wear, brake-wear and fugitive emissions.
NOx = nitrogen oxides
$PM_{2.5}$ = particulate matter less than 2.5 microns in diameter
PM_{10} = particulate matter less than 10 microns in diameter
ROG = reactive organic gases
Source: Table compiled by ESA in 2021.

6.13.3 Inner Harbor and Outer Harbor Turning Basin Expansion

Sub-alternatives D-1 and D-2 involve expansion of both the Inner and Outer Harbor Turning Basins using dredge equipment powered by diesel fuel and electricity, respectively. All other elements of these sub-alternatives would be the same, however because of the differing fuel sources for dredging equipment, their air quality effects would differ.

Sub-alternative D-1 (Diesel Dredging)

Expansion of both the Inner and Outer Harbor Turning Basins with dredging activities fueled by diesel would result in combined emissions and impacts from the Inner Harbor Turning Basin expansion (Alternative B) and Outer Harbor Turning Basin expansion (Alternative C) individually. Annual emissions for this sub-alternative by location, year of construction, and emission source are presented in Table 51. This sub-alternative would not generate emissions exceeding the CAA conformity *de minimis* thresholds and any increase in emissions would be temporary, ending with construction. Therefore, the proposed action would not have a significant effect on air quality.

Table 51: Annual Construction Emissions from the Expansion of the Inner Harbor Turning Basin and Outer Harbor Turning Basin with Diesel Dredging

Source	Construction Year	Annual Emissions[1] (tons per year)			
		ROG	NO_X	PM_{10}	$PM_{2.5}$
Howard Terminal					
Off-Road	2027	0.09	0.88	0.04	0.04
On-Road	2027	<0.01	0.05	<0.01	<0.01
Marine	2027	0.03	0.50	0.01	0.01
Off-Road	2028	0.08	0.63	0.03	0.03
On-Road	2028	0.01	0.86	0.01	0.01
Marine	2028	0.80	11.17	0.31	0.30
Schnitzer Steel					
Off-Road	2027	<0.01	0.012	<0.01	<0.01
On-Road	2027	<0.01	<0.01	<0.01	<0.01
Off-Road	2028	0.05	0.42	0.02	0.02
On-Road	2028	<0.01	0.17	<0.01	<0.01
Marine	2028	0.08	1.70	0.04	0.04
Alameda					
Off-Road	2028	0.21	1.83	0.08	0.08
On-Road	2028	0.01	1.27	0.02	0.02
Off-Road	2029	0.16	1.38	0.06	0.06
On-Road	2029	0.01	0.43	0.01	0.01
Marine	2029	2.05	23.05	0.69	0.68
Inner Harbor					
Off-Road	2029	0.18	1.72	0.08	0.07
On-Road	2029	<0.01	0.23	<0.01	<0.01
Marine	2029	1.61	18.5	0.55	0.54
Outer Harbor					
Off-Road	2028	0.06	0.59	0.023	0.02
On-Road	2028	<0.01	<0.01	<0.01	<0.01
Marine	2028	7.21	51.7	1.90	1.87
Sub-Alternative D-1 Total		12.6	117.1	3.9	3.8

Per BAAQMD methodology, PM_{10} and $PM_{2.5}$ emissions presented include only exhaust emissions and not tire-wear, brake-wear and fugitive emissions.
NOx = nitrogen oxides
$PM_{2.5}$ = particulate matter less than 2.5 microns in diameter
PM_{10} = particulate matter less than 10 microns in diameter
ROG = reactive organic gases
Source: Table compiled by ESA in 2021.

Moreover, the health risks associated with this alternative would be the same as that for the Inner Harbor Turning Basin expansion because the distance between the outer harbor turning basin and any sensitive receptors makes its contribution negligible.

Sub-Alternative D-2 (Electric Dredging)

Sub-Alternative D-2 is the Tentatively Selected Plan and NEPA Proposed Action. It would involve the use of an electric-powered barge-mounted mechanical dredge instead of a diesel-powered mechanical dredge. Annual emissions for this sub-alternative, by location, year of construction, and emission source, are presented in Table 52. Emissions from this sub-alternative are substantially lower than those from the diesel dredging variation (Sub-alternative D-1). For example, in comparison to the diesel dredging variation, this sub-alternative would avoid approximately 8 tons of ROG, 33 tons of NO_x, 2 tons of PM_{10}, and 2 tons of $PM_{2.5}$. This sub-alternative would not generate emissions exceeding the CAA conformity *de minimis* thresholds and therefore the Proposed Action would not have a significant effect on air quality.

Furthermore, this Sub-alternative (Tentatively Selected Plan, Proposed Action) would reduce the estimated emission- related lifetime health risks posed to nearby sensitive receptors. The Port of Oakland's HRA analysis for this Sub-alternative found that the maximum impacted residential receptor would be located on the Alameda side and, with the proposed minimization measures for fugitive dust and use of Tier 4 engines, would have less health risks than those associated with the diesel dredging variation (sub-alternative D-1).

Table 52: Annual Construction Emissions from the Expansion of the Inner Harbor Turning Basin and Outer Harbor Turning Basin with Electrified Dredging

Source	Construction Year	Annual Emissions[1] (tons per year)			
		ROG	NO_X	PM_{10}	$PM_{2.5}$
Howard Terminal					
Off-Road	2027	0.09	0.88	0.04	0.04
On-Road	2027	<0.01	0.05	<0.01	<0.01
Marine	2027	0.03	0.50	0.01	0.01
Off-Road	2028	0.08	0.63	0.03	0.03
On-Road	2028	0.01	0.86	0.01	0.01
Marine	2028	0.38	8.20	0.20	0.19
Schnitzer Steel					
Off-Road	2027	<0.01	0.02	<0.01	<0.01
On-Road	2027	<0.01	<0.01	<0.01	<0.01
Off-Road	2028	0.05	0.42	0.02	0.02
On-Road	2028	0.002	0.17	<0.01	<0.01
Marine	2028	0.06	1.47	0.03	0.03
Alameda					
Off-Road	2028	0.21	1.83	0.08	0.08
On-Road	2028	0.01	1.27	0.02	0.02
Off-Road	2029	0.16	1.38	0.06	0.06
On-Road	2029	0.01	0.43	0.01	0.01
Marine	2029	0.78	16.9	0.41	0.40
Inner Harbor					
Off-Road	2029	0.18	1.72	0.08	0.07
On-Road	2029	<0.01	0.23	<0.01	<0.01
Marine	2029	0.58	13.0	0.31	0.30
Outer Harbor					
Off-Road	2028	0.06	0.59	0.03	0.02
On-Road	2028	<0.01	<0.01	<0.01	<0.01
Marine	2028	1.49	32.9	0.80	0.76
Alternative D-2 Total		4.2	83.5	2.2	2.1

Per BAAQMD methodology, PM_{10} and $PM_{2.5}$ emissions presented include only exhaust emissions and not tire-wear, brake-wear and fugitive emissions.
NOx = nitrogen oxides
$PM_{2.5}$ = particulate matter less than 2.5 microns in diameter
PM_{10} = particulate matter less than 10 microns in diameter
ROG = reactive organic gases
Source: Table compiled by ESA in 2021.

6.13.4 No Action Alternative

Under the No Action Alternative, there would be no construction activities within the Inner or Outer Harbor Turning Basins. Therefore, there would be no air quality or health risk impacts associated with the No Action Alternative.

6.14 Noise and Vibration

For the purposes of this analysis, an effect on noise or vibration may be considered significant if an alternative would:

- exceed FTA construction noise guidelines criteria of 90 dBA during daytime hours or 80 dBA during nighttime hours at residential receptors, or 100 dBA during any hour at other receptors;
- result in a readily perceivable difference in traffic noise by causing an increase in existing traffic noise levels of 5 dB or more; or
- result in vibration levels that exceed FTA's groundborne vibration impact criteria for damage to structures of 0.5 PPV for non-historic structures or 0.12 PPV for historic structures.

While underwater noise would be generated from construction activities associated with the action alternatives including dredging and vibratory pile removal, these sound levels are characterized and their effects evaluated in the "Wildlife" and "Special Status Species and Protected Habitats" Sections (6.5 6.5.1, and 6.6) above, and therefore underwater noise is not further discussed in this section.

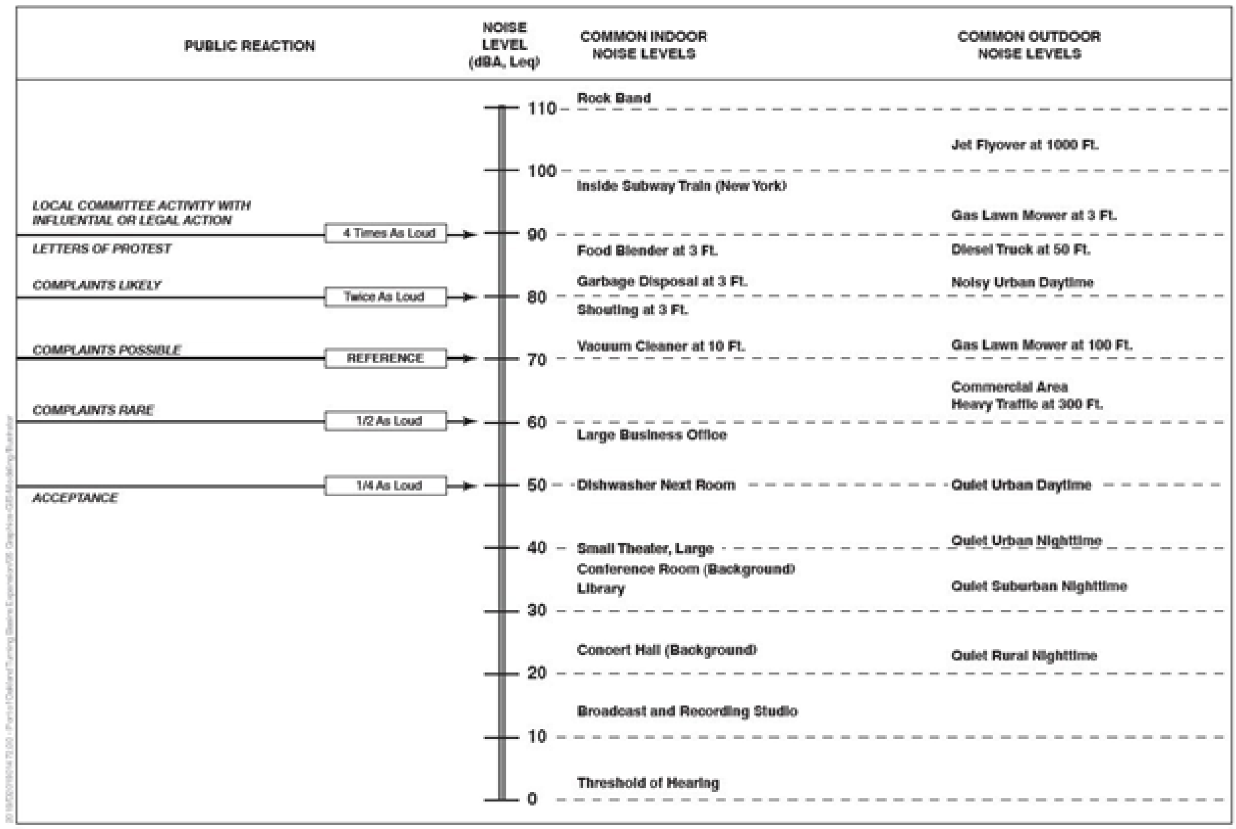
Additionally, while the action alternatives would not change the projected overall volumes of freight that would come into the Port under future without-project conditions, they could result in minor increases in operational noise experienced at noise receptors due to the expansion and shifting of the location of the turning basins reducing distance of operations to those noise-sensitive receptors. Larger container vessels calling on the port after implementation of the action alternatives would not be expected to require assistance from additional tugboats to complete their turns; therefore, the noise produced by the turning activity would reasonably be expected to remain very similar to noise generated by existing ships turning. The expansion of the turning basins would allow operations in the Inner Harbor Turning Basin to occur approximately 225 feet closer to noise sensitive receptors on either side. Given higher existing day and nighttime noise levels at noise sensitive receptors on the Oakland side of the Turning Basin, and the distance between these receptors and the expanded turning basin (approximately 1300 feet), there would not be perceptible change in noise levels from closer turning basin operations. Similarly, on the Alameda side, noise modeling conducted by the Port found the closer operations would only potentially increase the day-night average noise level from 58 to 59 L_{dn} at the nearest receptors (approximately 500 feet from the expanded basin). According to Caltrans (2020a) a 3 dB change in noise levels is considered a barely perceivable difference so this level of increase would be nearly unnoticeable. The closest noise-sensitive receptors to the expanded Outer Harbor Turning Basin would be approximately 5,000 feet away and given this distance, intervening structures, and the I-880 freeway, the change in noise from the slightly closer shift in operations would not be perceptible. Thus, noise effects from operations under any of the action alternatives would be negligible and are not discussed further in this section.

Noise and Vibration Effect Methodology

For this study, construction equipment noise levels were estimated following FTA's general assessment approach, which recommends assessing the two noisiest pieces of construction equipment operating concurrently at the center of the project site (U.S. DOT and FTA 2018). However, for the purpose of conducting a conservative analysis, and given the expansive work areas associated with the proposed alternatives, equipment noise was assumed to occur in areas closest to a sensitive receptor instead of at the center of the site. Increased noise levels due to construction were estimated for the nearest sensitive receptors to each of the proposed turning basin expansion areas.

As described in Section 6.10 , construction activities associated with the action alternatives would also generate traffic from worker commutes, equipment delivery/removal, and material hauling. Traffic noise modeling was completed using the Federal Highway Administration (FHWA) Traffic Noise Model (FHWA 2006) algorithms to estimate the noise generated by haul trucks. The potential increases in roadside noise levels generated by these transport trips were analyzed for local roadways where noise-sensitive receptors exist.

Construction related noise levels were compared to existing noise levels and the above thresholds to assess their potential effect. Human responses to typical environmental noise exposure are generally subjective (e.g., dissatisfaction, annoyance) or involve interference with activities such as normal conversations, watching television, and sleep (awakening or arousal to a lesser state of sleep). Typical noise levels and potential reactions are shown in Figure 40. It should be noted that the responses of individuals to similar noise events are diverse and are influenced the type of noise, perceived importance of the noise, appropriateness of the noise to the setting, noise duration, time of day, and individual noise sensitivity. In general, the more a new noise level exceeds the previously existing ambient noise level, the less acceptable the new noise level will be judged by those hearing it.



SOURCE: Caltrans Transportation Laboratory Noise Manual, 1982; and modification by ESA

Port of Oakland Turning Basin Project

Figure 40: Effects of Noise on People

Some construction activities that would occur on the Inner Harbor Turning Basin action area would also have the potential to generate groundborne vibration. For example, land-side pile driving, drilling, and compaction. In residential areas, the background vibration velocity level is usually around 50 VdB (approximately 0.0013 in/sec PPV). This level is well below the vibration velocity level threshold of perception for humans, which is approximately 65 VdB. A vibration velocity level of 75 VdB is considered to be the approximate dividing line between barely perceptible and distinctly perceptible levels for many people (U.S. DOT and FTA 2018). Potential groundborne vibration levels associated with construction equipment use under the action alternatives were modeled and compared to the above thresholds for structural damage to analyze their effect.

6.14.1 Inner Harbor Turning Basin Expansion

As described in Section 3.14.4, there are noise-sensitive receptors 500 feet and 1,800 feet from the proposed new extent of the Inner Harbor Turning Basin. Beyond 2,000 feet, construction-related noise would generally be attenuated by distance and intervening structures to noise levels commensurate with existing ambient noise levels of the surrounding urbanized areas. Therefore, an area extending 2,000 feet from the perimeter of the proposed expanded Inner Harbor Turning Basin was used as the geographical study area for this analysis.

Construction Noise

Equipment

Construction of the Inner Harbor Tuning Basin expansion (Alternative B) would require the use of heavy equipment during demolition, pile installation, and dredging activities. Construction activities would also involve the use of smaller power tools, generators, and other sources of noise. Throughout all stages of construction, there would be a changing mix of equipment. As a result, construction activity noise levels at and near the Inner Harbor Turning Basin project sites would fluctuate depending on the particular type, number, and duration of use of the various pieces of construction equipment.

Table 5-1 shows the hourly maximum instantaneous noise levels (L_{max}) produced by the various types of the noisiest equipment measured at a distance of 50 feet. It should be noted that L_{max} noise levels associated with the construction equipment would only be generated when equipment is operated at full power. Typically, the operating cycle for a piece of construction equipment would involve 1 or 2 minutes of full power operation, followed by operation at lower power settings. The L_{max} noise levels shown in Table 53 would, therefore, be expected to only occur briefly throughout the construction day.

Table 53: Maximum Noise Levels from Construction Equipment

Construction Equipment	Noise Level at 50 Feet (dBA, L_{max})
Air Compressor	77
Backhoe	78
Compactor	83
Crane	81
Excavator	81
Haul Truck	77
Front-End Loader	80
Dozer	82
Concrete Saw	90
Tugboat	82
Dredge (Diesel-powered)	81
Dredge (Electrically powered)	72
Impact and Vibratory Pile Drivers	101

Notes:
dBA = A-weighted decibel
L_{max} = maximum instantaneous noise level
Sources: U.S. DOT and FHWA 2017; U.S. DOT and FTA 2018; Epsilon Associates 2006; USFWS and SDRPJPA 2000

Following the FTA methodology described above, the two noisiest pieces of equipment during both the daytime and nighttime were identified in order to calculate construction related noise effects at nearby sensitive receptors in Oakland and Alameda. For this alternative, the noisiest daytime activity would be land-based pile driving (for land-side shoring) and the two noisiest pieces of equipment associated with such pile driving would be a pile driver and crane. The only construction activity planned to occur at night would be dredging which would occur 24 hours a day on weekdays and, if necessary, weekends. The two noisiest pieces of equipment associated with dredging would be a diesel-powered dredge and a support tugboat. The input equipment noise values, nearest sensitive-receptor distances, adjusted noise levels at each sensitive receptor, and comparison to the FTA criteria for daytime or nighttime construction are presented in Table 54.

Table 54: Noise Levels from Construction

Receptor	Existing Daytime/ Nighttime Noise Level (dBA, L_{eq})	Loudest Two Noise Sources	Reference Noise Level (dBA)[a]	Distance to Receptor (feet)[b]	Usage Factor	Adjusted L_{eq} Level (dBA)[c]	Exceed FTA Standards – 90 dBA Daytime/80 dBA Nighttime?
Noise Levels at Receptors in Oakland							
Phoenix Lofts Residential	68/65[d]	Pile driver/ crane	101/81	1,300	20/16 %	66	No
4th Avenue Residences	69/64[d]	Pile driver/ crane	101/81	1,800	20/16 %	63	No
Phoenix Lofts Residential	68/65[d]	Dredge/tug	81/82	1,300	50/25%	52	No
4th Avenue Residences	69/64[d]	Dredge/tug	81/82	1,800	50/25%	49	No
Noise Levels at Receptors in Alameda							
Mitchell Avenue Residential	58/52	Pile driver/ crane	101/81	1,000	20/16 %	68	No
Mosley Avenue Residential	55/50	Pile driver/ crane	101/81	500	20/16 %	74	No
Barbers Point Residential	63/60	Pile driver/ crane	101/81	1,100	20/16 %	68	No
Mitchell Avenue Residential	58/52	Dredge/tug	81/82	1,350	50/25%	51	No
Mosley Avenue Residential	55/50	Dredge/tug	81/82	600	50/25%	59	No
Barbers Point Residential	63/60	Dredge/tug	81/82	1,200	50/25%	53	No

Notes:
a L_{max} at 50 feet.
b Distance between approximate location of equipment and property line of sensitive receptor.
c The L_{eq} level is adjusted for distance and percentage of usage.
d Existing noise level as reported in the Draft Environmental Impact Report for the Waterfront Ballpark District at Howard Terminal.
dBA = A-weighted decibel
FTA = Federal Transit Administration
L_{eq} = equivalent-continuous sound level
L_{max} = maximum instantaneous noise level

As shown in Table 54, daytime noise from construction would be below the 90 dBA daytime criterion for the nearest residential sensitive receptors on both the Oakland and Alameda side of the Inner Harbor Turning Basin. Similarly, as shown in Table 54, nighttime construction noise levels from dredging operations would be below the 80 dBA nighttime criterion of the FTA for the nearest residential sensitive receptors in both Oakland and Alameda. Because noise generated by construction equipment associated with the Inner Harbor Turning Basin expansion (Alternative B) would not exceed the FTA significance thresholds for residential receptors, there would be a less than significant effect from construction equipment noise under this alternative.

While the FTA criteria are used as the significance threshold under NEPA, construction noise was also assessed relative to the standards of the local noise ordinances in Oakland and Alameda. For daytime noise Oakland's standard is 65 dBA for construction activity occurring over 10 days or more. To prevent exceeding this standard at the Phoenix Lofts receptor when land-side impact pile driving occurs, nylon or wood cushion blocks would be used during pile-driving activities and would be expected to reduce noise by 5 dBA and 11 dBA, respectively. The City of Alameda exempts construction noise from noise standards if occurring between 7:00 a.m. and 7:00 p.m. on Monday through Friday and 8:00 a.m. to 5:00 p.m. on Saturdays. Since daytime construction activities would take place during these hours, daytime noise would be consistent with the Alameda ordinance.

Dredging would be the one construction activity that would occur at night (during the hours of 7:00 p.m. to 7:00 a.m. on weekdays and 8:00 p.m. to 9:00 a.m. on weekends and federal holidays). Oakland's ordinance limits nighttime construction noise levels at residential receptors to 45 dBA (L_{33}) or the ambient noise level if it is greater. Existing noise levels surrounding the Inner Harbor Turning Basin exceed the applicable 45 dBA so the existing nighttime ambient level at each respective receptor (shown in Table 54) would be the applicable nighttime construction standard. Construction noise levels from dredging operations would be below existing ambient nighttime noise levels at all receptors in Oakland. Alameda's ordinance limits nighttime noise at residential uses to 50 dBA (L_{50}) which could be exceeded by up to 9 dBA at the residential use on Mosley Avenue when dredging is at the closest distance of approximately 600 feet away.[1] A temporary noise barrier would be used as an additional minimization measure approximately 200 feet from the Oakland Harbor along the southern edge during dredging activities to lower the nighttime noise levels by 5 dBA and minimize exceedance of this local ordinance. Such barriers are generally constructed with two layers of ½-inch thick plywood and would be 10-12 feet high.

Traffic

In addition to construction-related noise from equipment, traffic noise modeling using algorithms the FHWA Traffic Noise Model algorithms was conducted for baseline (2019) conditions and baseline plus the peak haul truck traffic amounts determined by the transportation analysis (see Section 6.10). Most of the routes used by haul trucks to access freeways pass through industrial areas where no noise-sensitive receptors are present. Several route options exist for construction traffic; for purposes of this analysis, a route along Martin Luther King Jr. Way was as indicative of potential effects. The 4th Street residences are sensitive noise receptors along Martin Luther

[1] This should be considered a highly conservative estimate given that it is based on noise generating equipment being located closest to a noise-sensitive receptor, not in the center of the construction zone, as is the standard methodology for evaluating such noise.

King Jr. Way between Embarcadero and 5th Street. Results of the traffic noise analysis for this route are summarized in Table 55. As shown, the addition of peak haul truck volumes on Martin Luther King Jr. Way would generate a temporary roadside noise-level increase of approximately 2.2 dBA during construction. This increase would be less than significant.

Table 55: Traffic Noise Increases along Roads in the Project Vicinity

Roadway Segment	Existing	Applicable Increase Threshold (dB)	Existing plus Project	dBA Difference	Substantial Increase?
Martin Luther King Jr. Way between Embarcadero and 5th Street	63.7	5 dBA	65.9	2.2	No

Notes:

a Existing noise levels are modeled on traffic contributions from the specific roadway only and do not reflect localized contributions of industrial uses or I-880.

dB = decibel

dBA = A-weighted decibel

I-880 = Interstate 880

Sources: Traffic data compiled by Fehr & Peers and AECOM in 2019 and 2021, respectively, and modeling performed by Environmental Science Associates in 2021.

Construction Vibration

Construction activities associated with the Inner Harbor Turning Basin expansion (Alternative B) that have the potential to generate groundborne vibration would include land-side impact pile driving and movement of loaded haul trucks. The estimated PPV levels for these types of construction equipment are identified in Table 56, as are the resultant vibration levels for the closest structures. As shown in Table 56 vibration from construction equipment would be below the applicable 0.5 PPV threshold for standard buildings, which the nearby buildings are. Thus, construction-related vibration associated with this alternative would be less than significant.

Table 56: Vibration Levels from Construction Equipment

Nearest Building/Receptor	Vibration-Inducing Equipment	Reference Vibration Level (PPV)[a]	Distance to Nearest Receptor (feet)[b]	Adjusted Vibration at Building (PPV)[c]	Exceed 0.5 PPV Standard or 0.25 PPV for Historic Building?
2900 Main Street Building 140D, Alameda	Impact Pile Driver	0.65	100	0.08	No
	Loaded Trucks	0.076	100	0.01	No
Schnitzer Steel, Oakland	Impact Pile Driver	0.65	700	0.004	No
	Loaded Trucks	0.076	700	0.0005	No

Notes:

a PPV at 25 feet.

b Distance between approximate location of equipment and structure. Propagation estimates assume a site-specific vibration attenuation rate ("n") of 1.5, based on FTA guidance.

c The PPV level is adjusted for distance.

FTA = Federal Transit Administration

PPV = peak particle velocity

Source: U.S. DOT and FTA 2018; Caltrans 2020b

As described above, the Inner Harbor Turning Basin expansion (Alternative B) would not exceed any of the thresholds of significance identified for noise and vibration, and therefore the overall noise and vibration impacts of this alternative would be less than significant.

6.14.2 Outer Harbor Turning Basin Expansion

The nearest noise-sensitive land use to the Outer Harbor Turning Basin would be single-family residences on Pine Street, approximately 5,000 feet to the east. The Middle Harbor Shoreline Park is approximately 1,800 feet from the Outer Harbor Turning Basin but recreational users at the park are not considered sensitive noise receptors.

Construction Noise

Equipment

Construction activities for the Outer Harbor Turning Basin expansion (Alternative C) would only require dredging. No land-side construction activities, other than staging, are proposed as part of this alternative. Noise from dredging activity would be attenuated to approximately 40 dBA at the nearest sensitive noise receptors and would be further attenuated by intervening structures and the I-880 freeway. Consequently, noise from dredging equipment would not be perceptible at these closest residences during daytime or nighttime hours. Noise from dredging activity at the Middle Harbor Shoreline Park would be approximately 49 dBA, which is less than existing monitored daytime noise levels at this park that were recorded to be 59 dBA. Thus, noise would not impact park users even if they were a noise-sensitive use. Because noise generated by construction equipment associated with the Outer Harbor Turning Basin expansion (Alternative B) would not exceed the FTA significance thresholds and would be negligible under this alternative.

Traffic

Construction related traffic associated with the Outer Harbor Turning Basin expansion (Alternative C) would only be associated with worker commutes, not haul trucks. Routes under this alternative would also use roadways that do not pass noise-sensitive receptors. Therefore, construction noise impacts of the Outer Harbor Turning Basin only alternative would be negligible.

Construction Vibration

The nearest structure to the Outer Harbor Turning Basin is the Cool Port Oakland refrigerated warehouse, approximately 1,800 feet to the southeast of the basin. There are no landside activities proposed as a part of this alternative that have the potential to generate high vibration levels. No construction-related vibration effects would occur under the Outer Harbor Turning Basin Expansion (Alternative C).

6.14.3 Inner Harbor and Outer Harbor Turning Basin Expansion

Sub-alternatives D-1 and D-2 (Proposed Action; Tentatively Selected Plan) involve expansion of both the Inner and Outer Harbor Turning Basins using dredge equipment powered by diesel fuel and electricity, respectively. All other elements of these sub-alternatives would be the same. As described in section 6.14.2, expansion of the Outer Harbor Turning Basin (Alternative C) would result in negligible construction-related noise effects and no construction-related vibration impacts. Therefore, the impacts associated with the expansion of the Inner Harbor Turning Basin and Outer Harbor Turning Basin under Sub-Alternatives D-1 and D-2 would be essentially the same as those identified in section 6.14.1 for the expansion of Inner Harbor Turning Basin (Alternative B).

While both Sub-alternative D-1 and D-2 would have less than significant effects from noise and vibration based on the NEPA thresholds of significance established herein, noise levels from electric dredges have been found to generate less noise than diesel powered dredges. For example, the electric dredge used to dredge the navigation channels in the Port of Los Angeles generates 72 dBA L_{eq} at 50 feet (USFWS and SDRPJPA 2000), which is approximately 9 dBA less than a diesel-powered dredge (see Table 53). Because dredging would be the one construction activity that would occur 24 hours a day and, therefore, have the potential to impact receptors during the more sensitive nighttime hours, the reduced noise generated by an electric dredge would result in lower noise-effects from construction than the use of a diesel-powered dredge under alternatives B and D-1. However, under Alternative D-2, construction noise levels from dredging operations at the very edge of the Inner Harbor Expansion could still potentially exceed Alameda's nighttime noise ordinance by up to approximately 4 dBA at the residential receptors on Mosley Avenue when dredging is occurring at the closest distance of approximately 600 feet away.[1] As described for the Inner Harbor Turning Basin expansion (Alternative B) above, A temporary noise barrier would be used as a minimization measure to lower the nighttime noise levels by 5 dBA which would avoid conflicting with the local ordinance.

6.14.4 No Action Alternative

Under the No Action Alternative, there would be no construction activities or changes to existing vessel operations in the Inner Harbor Turning Basin or the Outer Harbor Turning Basin. Therefore, there would be no noise or vibration impacts associated with the No Action Alternative.

[1] This should be considered a highly conservative estimate given that it is based on noise generating equipment being located closest to a noise-sensitive receptor, not in the center of the construction zone, as is the standard methodology for evaluating such noise.

Chapter 7: Coordination and Compliance with Environmental Requirements*

Applicability of and compliance with relevant environmental laws and EOs is described for the Proposed Action (Tentatively Selected Plan; Alternative D-2) in Table 57. Note that this does not encompass every law or regulation potentially applicable to the Proposed Action.

7.1 Environmental Compliance, EOs, and Permitting Requirements

Table 57: Environmental Compliance, EOs, and Permitting Requirements

STATUTE	STATUS OF COMPLIANCE
National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. § 4321 *et seq*) Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of the NEPA (40 C.F.R. §§ 1500-1508) dated July 1986	This EA has been prepared in compliance with NEPA and CEQ regulations. All agency and public comments will be considered and evaluated. If appropriate, a Finding of No Significant Impact (FONSI) will be signed with a conclusion of no significant impacts from this proposed action. A Draft FONSI is provided in Appendix A10.
Clean Air Act, as amended (42 U.S.C. § 7401 *et seq*)	An applicability analysis has been completed and the emissions were found to be below the applicable *de minimis* thresholds. Thus, a general conformity analysis and determination is not necessary.
Clean Water Act, as amended (33 U.S.C. § 1251 *et seq*)	No fill in waters of the U.S. is anticipated under the action alternatives as currently designed. All dredge material will be placed at a permitted upland beneficial reuse site or landfill and no other aquatic fill is expected. Alternatives involving the Inner Harbor Turning Basin expansion would remove existing fill and result in net expansion of open waters of the U.S. Therefore a 404(b)(1) analysis has not been included with this study. If applicable, a water quality certification for the project will be obtained after the feasibility phase, in the pre-construction design phase.
Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 403)	Original construction of the federal navigation channels was authorized under the Rivers and Harbors Act and these proposed modifications remain consistent with the act. Therefore, this project is appropriately exempt from Section 10. See 33 C.F.R. § 322.3
EO 11990, Protection of Wetlands, (42 Fed. Reg. 26961, May 24 1977)	No wetlands occur within the proposed project area.
National Oceanic and Atmospheric Administration Federal Consistency Regulation (15 C.F.R. Part 930)	See CZMA
Coastal Zone Management Act of 1972 (16	A draft Negative Determination has been prepared and

STATUTE	STATUS OF COMPLIANCE
U.S.C. § 1451 *et seq*)	is included in the environmental appendix A5. Concurrence from BCDC will be requested after concurrent review of the Draft Integrated Report and during feasibility level design. A consistency notice is expected to be obtain prior to the Final Integrated Report.
The McAteer-Petris Act (Cal Gov't. Code § 66600 *et seq*.)	See CZMA
Endangered Species Act as amended (16 U.S.C. § 1531 *et seq*)	A draft Biological Assessment (BA) has been prepared and is included in this document in the environmental appendix A1. Consultation will be initiated after concurrent review of the Draft Integrated Report and during feasibility level design. A Biological Opinion will be obtained prior to the Final Integrated Report.
Fish and Wildlife Coordination Act (16 U.S.C. §§ 661-666c)	USACE is coordinating with the USFWS per the FWCA. A draft CAR is included in Appendix A2. A final CAR will be obtained prior to the Final Integrated Report.
Magnuson-Stevens Fishery Conservation and Management Act - Fishery Conservation Amendments of 1996, (16 U.S.C. § 1801 *et seq*) – Essential Fish Habitat (EFH)	A draft EFH assessment has been prepared and can be found in Appendix A1. EFH consultation will be initiated after concurrent review of the Draft Integrated Report and during feasibility level design. EFH conservation recommendations will be obtained prior to the Final Integrated Report.
Migratory Bird Treaty Act (16 U.S.C. §§ 703-711)	No significant impacts to migratory birds are expected from the action alternatives.
Marine Mammal Protection Act (16 U.S.C. § 1361 *et seq)*	The proposed plan includes measures to avoid noise impacts to marine mammals from aquatic pile removal. No aquatic pile driving is expected.
National Marine Sanctuaries Act (16 U.S.C. § 1431 *et seq*)	The proposed action would not take place in or near a national marine sanctuary.
Marine Protection Research and Sanctuaries Act of 1972 (33 U.S.C. § 1401 *et seq*)	The proposed plan will not involve aquatic or ocean disposal.
National Historic Preservation Act (16 U.S.C. § 470 and 36 C.F.R. Part 800): Protection of Historic Properties	The proposed action would not affect any historical and cultural resources as none occur within the proposed action area.
EO 11593: Protection and Enhancement of the Cultural Environment (36 Fed. Reg. 8921, May 13, 1971)	See Above
Archaeological and Historic Preservation Act of 1974, (16 U.S.C. § 469 *et seq*)	See Above

STATUTE	STATUS OF COMPLIANCE
Abandoned Shipwreck Act of 1987 (43 U.S.C. § 2101 *et seq*)	None occur in the proposed action areas.
Submerged Lands Act (Pub. L. 82-3167; 43 U.S.C. § 1301 *et seq*)	Because the proposed action would expand the turning basins which are part of the federal navigation channel, the proposed action is being exercised in accordance with federal navigational servitude and a lese from the State Lands Commission is not required.

7.2 List of Preparers

The study team for the study was extensive. The team members listed below provided substantial text to the Integrated Feasibility Report and Environmental Assessment.

Table 58: List of Report Preparers

NAME	CONTRIBUTION	AFFILIATION
Karen Baumert	Plan formulation / study manager	USACE
Andrew Bazzle	Economics	USACE
Spencer Harper	Water Resources, hydrologic and hydraulic engineering	USACE
Eric Jolliffe	Environmental	USACE
Jennifer Purcell	Economics	USACE
LeAnne Jett	Real Estate	USACE
Kathleen Ungvarsky	Cultural Resources	USACE
Mike Vo	Cost Engineering	USACE
Barney Wair	Geotechnical Engineering	USACE
Jin Yang	Civil Engineering / Technical Manager	USACE
Kelly Bayer	Environmental	AECOM, Port of Oakland consultant
Krystal McBride	Environmental	AECOM, Port of Oakland consultant

Chapter 8: Plan Implementation

8.1 Institutional Requirements

The implementation of the Tentatively Selected Plan is subject to cost sharing and other applicable requirements of federal laws, regulations, and policies. Federal implementation of the project for commercial navigation includes, but is not limited to, the following items of local cooperation to be undertaken by the non-Federal sponsor in accordance with applicable federal laws, regulations, and policies:

a. Provide the non-Federal share of construction costs, as further specified below:

1) Provide, during design, 50% of the costs of design for the general navigation features of the project in accordance with the terms of the design agreement for the project;

2) Provide, during construction, 50% of the costs of the general navigation facilities allocated to that portion of the project with a channel depth in excess of 50 feet;

b. Provide all real property interests, including those required for relocations and dredged material placement facilities, acquire or compel the removal of obstructions, and perform or ensure the performance of all relocations, including utility relocations, as determined by the Federal government to be necessary for the construction, operation, and maintenance of the general navigation features;

c. For each relocation of a utility, or portion thereof, located in or under navigable waters of the United States that is required to accommodate a channel depth over 45 feet, pay to the owner of the utility at least one half of the owner's relocation costs, unless the owner voluntarily agrees to waive all or a portion of the non-Federal sponsor's contribution;

d. Pay, with interest over a period not to exceed 30 years following completion of construction of the general navigation features, an additional amount equal to 10 percent of the construction costs of the general navigation features less the amount of credit afforded by the Federal government for the value of the real property interests and relocations, including utility relocations, provided by the non-Federal sponsor for the general navigation features, except for the value of the real property interests and relocations provided for mitigation, which is included in the construction costs of the general navigation features;

e. For general navigation features in excess of 50 feet (MLLW), pay 50 percent of the excess cost of operation and maintenance of the project, which includes operation and maintenance of dredged material placement facilities, over that cost which the Federal government would have incurred for operation and maintenance of the project if the channel had a depth of 50 feet;

f. Ensure that the local service facilities are constructed, operated, and maintained at no cost to the Federal government, and that all applicable licenses and permits necessary for construction, operation, and maintenance of such work are obtained;

g. Give the Federal government a right to enter, at reasonable times and in a reasonable manner, upon the real property interests that the non-Federal sponsor owns or controls for the purpose of operating and maintaining the project;

h. Hold and save the Federal government free from all damages arising from design, construction, operation and maintenance of the project, except for damages due to the fault or negligence of the Federal government or its contractors;

i. Perform, or ensure performance of, any investigations for hazardous, toxic, and radioactive wastes (HTRW) that are determined necessary to identify the existence and extent of any HTRW regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. §§ 9601-9675, and any other applicable law, that may exist in, on, or under real property interests that the Federal government determines to be necessary for construction, operation and maintenance of the general navigation features;

j. Agree, as between the Federal government and the non-Federal sponsor, to be solely responsible for the performance and costs of cleanup and response of any HTRW regulated under applicable law that are located in, on, or under real property interests required for construction, operation, and maintenance of the project, including the costs of any studies and investigations necessary to determine an appropriate response to the contamination, without reimbursement or credit by the Federal government;

k. Perform the non-Federal sponsor's responsibilities in a manner that will not cause HTRW liability to arise under applicable law to the maximum extent practicable; and

l. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended, (42 U.S.C. §§ 4630 and 4655) and the Uniform Regulations contained in 49 C.F.R Part 24, in acquiring real property interests necessary for construction, operation, and maintenance of the project including those necessary for relocations, and placement area improvements; and inform all affected persons of applicable benefits, policies, and procedures in connection with said act.

8.2 Real Estate Requirements

U.S. Army Corps of Engineers projects require that the non-federal sponsor provide the lands, easements, rights-of-way and relocations necessary for a project[1]. The Tentatively Selected Plan has lands, easements, rights-of-way cost of $149,480,000 and relocation costs of $2,384,000.00, for a total of $151,860,000. These costs will be borne by the Port of Oakland who will serve as

[1] 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.

the non-federal sponsor for construction of this project.

There may be modifications to the plan that occur during Pre-construction, Engineering and Design (PED) phase, thus changing the final acquisition area (s) and/or administrative and land costs.

The project is located at the Port of Oakland, on the eastern side of the San Francisco Bay in the counties of Alameda and San Francisco, California. It includes the Entrance Channel – Oakland Bar, the Outer Harbor Channel and its Outer Harbor Turning Basin, the Inner Harbor Channel, and its Inner Harbor Turning Basin.

A Feasibility Cost Sharing Agreement was executed on July 1, 2020 with the Port of Oakland as the non-federal sponsor. The Oakland Harbor Study is cost shared 50% federal and 50% non-federal. The non-Federal sponsors will acquire the minimum interests in real estate to support the construction and subsequent operation and maintenance of the future USACE project.

Navigation Servitude per Article I, Section 8 (Commerce Clause) will be applied in this project for the dredging of the Federal channel in the Inner and Outer Harbors where the City of Alameda owns submerged lands. It will further apply in the turning basin where private parties own some of the submerged lands.

The non-Federal sponsors must comply with the Uniform Relocation Assistance and Real Properties Acquisition Policies Act of 1970, as amended, 42 U.S.C. § 4601 *et seq.* (Pub. L. 91-646, "the Uniform Act") and provide relocation assistance to qualifying residences and businesses within the project area that are displaced, as defined in the Uniform Act, because of USACE project implementation. Possible displacements will be required for the Tentatively Selected Plan.

8.3 Implementation Schedule

For Preconstruction Engineering and Design and construction to be initiated, the USACE must sign a Design Agreement with a non-federal sponsor. After Preconstruction Engineering and Design is complete, the USACE must sign a Project Partnership Agreement with a non-federal sponsor for construction to being.

This project would require congressional authorization for Preconstruction Engineering and Design and construction. The Preconstruction Engineering and Design and construction phases are cost shared 50% federal and 50% non-federal[1]. Implementation would then occur, provided that sufficient funds are appropriated to design and construct the project.

The below schedule was estimated for study analysis purposes and is dependent on congressional authorization, federal and non-federal budgeted funding, and agreement executions (Table 59).

[1] Memorandum, Modification of non-federal contribution in Design Agreement (2013) https://planning.erdc.dren.mil/toolbox/library/MemosandLetters/2013May-DA.pdf

Table 59: Draft Tentatively Selected Plan Implementation Schedule

TASK	DATE
Chief of Engineering Report Approval	July 2023
Design Agreement	October 2023
Pre-Construction Engineering & Design	October 2023 – October 2025
Project Partnership Agreement Execution	December 2025
Real Estate Acquisition	December 2025 – May 2027
Construction	June 2027 – December 2029

8.4 Cost Sharing and Non-Federal Partner Responsibilities

Cost sharing for the Tentatively Selected Plan will be done in accordance with Section 111 of the Water Resources Development Act of 2016, as amended, and cost shared as a general navigation feature. The cost share is based on the recommended improvements being at 50 feet MLLW. Channel depths of 0 to -20 are cost-shared at 10% non-federal and 90% federal; depths of -20 to -50 feet are cost shared 25% non-federal and 75% federal. The Port of Oakland will provide all lands, easements, rights-of-way, and relocations. Disposal necessary for the project is cost-shared as a general navigation feature. Local service facilities and aids to navigation are not anticipated at this time. An additional 10% 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 lands, easements, rights-of-way, and relocations[1], are credited against the additional cash contribution. The cost share for the incremental cost of the NED/BU Plan above the NED/Base Plan (least cost disposal option) is shared 65% federal and 35% non-federal (WRDA 1986, as amended, Section 103). The operation and maintenance of the Tentatively Selected Plan will be 100% federally funded. Consistent with current Port of Oakland practice, the turning basins are anticipated to be maintained by dredging every year. The cost to place the 193,000 cubic yards of material at an upland beneficial use site, beyond the cost of the least cost placement option of San Francisco Deep Ocean Disposal Site, would be cost shared in compliance with Section 204(d) of WRDA 1992 at 35% non-federal and 65% federal.

Since the team is recommending the Comprehensive Benefits Plan (not the NED/BU Plan), how the electrification of the dredges, beyond the cost of the National Economic Development Plan, would be cost shared is uncertain at this time. If the Exception to National Economic Development (NED) Plan Policy Documentation Package is approved by ASA(CW), the cost of electrifying the dredges beyond the cost of the NED/BU Plan would be cost shared between the federal government and the non-federal sponsor (Table 60). Please note these cost sharing scenarios are estimates.

[1] 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 60: Approximate Cost Sharing Scenario-Fully Cost Shared

DESCRIPTION	TOTAL	FEDERAL	NON-FEDERAL
General Navigation Features (-50FT MLLW)			
0 – 20 feet MLLW (10% non-federal)	$124,216,000	$111,794,000	$12,422,000
20 – 50 feet MLLW (25% non-federal)	$186,324,000	$139,743,000	$46,581,000
Subtotal GNF	***$310,540,000***	$251,537,000	$59,003,000
Lands, Easements, Rights of Ways, Relocations (LERR) (100% non-federal)	***$151,860,000***	*$0*	*$151,860,000*
Project Cost Apportionment	***$462,400,000***	***$251,537,000***	***$210,863,000***
Aids to Navigation	**$0**	$0	$0
Local Service Facilities	**$0**	$0	$0
10% over time adjustment (less LERR)*		$0	$0
Final Allocation of Costs	***$462,400,000***	***$251,537,000***	***$210,863,000***

*10% over time adjustment ($310,540,000 General Navigation Features x 10% = $31,054,000 - $151,860,000 LERR = $0)

8.5 Views of the Non-Federal Sponsor and Other Agencies*

The USACE has and will continue to coordinate with the Port of Oakland, as a part of the study team, continuously throughout the study. The study team has coordinated with pilots that use the Oakland Harbor and will continue to do so throughout the formulation process. The pilots' input has been considered and incorporated into the measures and alternatives developed during the plan formulation process. The feedback received from the pilots so far is positive.

The study team has been holding interagency coordination team and resource agency and tribal working group meetings approximately quarterly during the study phase, or as new relevant information becomes available, to gain valuable input and feedback on the study process. The study team also held a community stakeholder engagement meeting on August 23, 2021. The primary concerns expressed were regarding traffic and air quality impacts. Another meeting will be scheduled during the NEPA public comment period in January 2022. Table 61 (below) lists agencies and entities that have been contacted for input on the study through the working group meetings and/or that registered for the August 2021 community engagement meeting. These agencies and entities will be provided with notice of availability of the Draft Integrated Report for further input on the study.

The non-federal sponsor is supportive of the Tentatively Selected Plan and the release of this Draft Integrated Report for concurrent agency and public review.

Table 61: Agencies and Entities Contacted During the Study Phase

AB Trucking	Oakland A's Athletics
Alameda Chamber of Commerce	Oakland Black Cowboy Association
Alameda County	Oakland Latino Chamber of Commerce
Alba Wheels Up	OCA Easy Bay – Asian Pacific American Advocates
Amah Mutsun Tribal Band	Ohlone Indian Tribe
Associated Right of Way Services, Inc.	ONE
Bay Area Air Quality Management District	Pacific Merchant Shipping Association
Bay Planning Coalition	Pacific Trailer Repair Services
Bay Ship & Yacht Co.	Port Transfer Inc.
BergDavis Public Affairs	Prescott Neighborhood Council
Berkeley Architectural Heritage Association	Quick Pick Express, Inc.
Board of Port Commissioners	Ramboll
California Department of Fish and Wildlife	San Francisco Bay Conservation and Development
California Department of Toxic Substance Control	San Francisco Bay Regional Water Quality Control Board
California Engineering Contractors	Schnitzer Steel
CalTrans Bay Area	Sierra Club
Central Valley Agricultural Grinding	SSA Terminals
City of Oakland	State Historic and Preservation Office
Envirocom	State Lands Commission
Esselen Tribe of Monterey County	Swire Property Group
FlexiVan Leasing, LLC	Tower Lofts Homeowners Association
Harbor Trucking Association	Trina Marie Ruano Family
Holy Names University	U.S. Coast Guard
Indian Canyon Mutsun Band of Costanoan	U.S. Environmental Protection Agency
International Longshore and Warehouse Union	U.S. Fish and Wildlife Service
International Maritime Center	Upline Solutions LLC
Kealy Connections	Wan Hai Lines Ltd.
Marine Exchange of San Francisco Bay Region	West Oakland Commerce Association
Mott MacDonald Engineers	West Oakland Environmental Indicators Project
Muwekma Ohlone Indian Tribe of San Francisco Bay Area	Wyse Logistics
National Marine Fisheries Service	

Chapter 9: Draft Recommendation

In making the following recommendations, I have given consideration to all significant aspects in the overall public interest, including environmental, social and economic effects, engineering feasibility and compatibility of the project with the policies, desires and capabilities of the Port of Oakland, the State of California, and other non-federal interests.

I recommend that the selected plan for navigation improvements in the Oakland Harbor be authorized for construction as a Federal project, subject to such modifications as may be prescribed by the Chief of Engineers. The recommended plan is fully detailed in this Final Integrated Feasibility Report and Environmental Assessment. The recommended plan consists of widening the Outer Harbor and Inner Harbor turning basins to be able to accommodate the larger containership vessels. It also involves electric dredges during construction, which will decrease air-pollutant emissions released into communities already disproportionately affected by air pollutant emissions, and the beneficial use of eligible dredged material. It is estimated the project would cost $462.4 million and provide $33.5 million in annual net benefits. The non-federal sponsor would be responsible for fully funding all lands, easements, rights-of-way, and relocation costs totaling $151.9 million.

The recommendations contained herein reflect the information available at this time and current departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of highest review levels within the Executive Branch. Consequently, the recommendations may be modified (by the Chief of Engineers) before they are transmitted to the Congress as proposals for authorization and implementing funding. However, prior to transmittal to Congress, the partner, the State, interested federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

KEVIN P. ARNETT, P.E.
LTC, EN
Commanding

Chapter 10: References*

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