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FINAL MITIGATED NEGATIVE DECLARATION

Date of Issuance of PMND:	May 2, 2018; amended on June 18, 2018 (amendments to the PMND are shown in deletions as ~~strikethrough~~; additions in double underline)
Case No.:	**2017-008824ENV**
Project Title:	**Mission Bay Ferry Landing and Water Taxi Landing**
Zoning:	P (Public) 40-X Height and Bulk District
Planning Area:	South Beach/China Basin Waterfront Subarea, Port of San Francisco Waterfront Land Use Plan
Block/Lot:	9900/064 and 9900/064H
Lot Size:	153,257 square feet
Project Sponsor:	Port of San Francisco Jonathan Roman (415) 274-0619
Lead Agency:	San Francisco Planning Department
Staff Contact:	Josh Pollak (415) 575-8766 josh.pollak@sfgov.org

Project Description

The proposed Mission Bay Ferry Landing and Water Taxi Landing project would be located on San Francisco Bay, within the Port of San Francisco's Southern Waterfront in the Mission Bay/Central Waterfront area. The proposed Ferry Landing site would be located within the Mission Bay neighborhood near the intersection of Terry A. Francois Boulevard and 16th Street, adjacent to Agua Vista Park and near the planned Bayfront Park. The proposed Water Taxi Landing site would be located approximately 400 feet south of the proposed Ferry Landing and approximately 100 feet south of the existing Agua Vista Park fishing pier. Both sites are located on Port of San Francisco property.

The proposed project would involve the construction of a single-float, two-berth Ferry Landing to provide regional ferry service, and a separate single-float, two-berth Water Taxi Landing to provide local water taxi access to the Mission Bay area and surrounding neighborhoods. Commute service would be provided to/from Alameda-Oakland, Vallejo, and potentially Larkspur. Special event service for the nearby Chase Center is also proposed for all Golden State Warriors' games and approximately 20 additional events per year. The Ferry Landing would serve the two ferry operators on San Francisco Bay. These are: 1) the Water Emergency Transit Authority (WETA), operating as San Francisco Bay Ferry, and 2) Golden Gate Bridge, Highway and Transportation District (GGBHTD), operating as Golden Gate Ferry. There would also potentially be limited private excursions. The Ferry Landing would include a pier and connecting ramp, gangway, and float, and would be covered with a canopy. The Water Taxi Landing would include a platform, gangway, and float, and would be uncovered. The proposed project would include landside improvements such as seating and landscaping, passenger loading/unloading zones, and a transit/shuttle stop with a bus pullout space.

In order to provide safe navigational approaches and maneuvering to the Ferry and Water Taxi Landing sites, the project would require dredging. The project would remove remnant piles and debris present in the proposed dredge area and may also include additional fill removal near the project site pursuant to resource agency review (including Port/City and County of San Francisco, San Francisco Bay Regional Water Quality Control Board, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, National Marine Fisheries Service, California Department of Fish and Wildlife, San Francisco Bay Conservation and Development Commission, and Dredge Material Management Office) and approval. Construction is proposed to commence in the summer of 2019 and continue for approximately 15 months.

Finding

This project would not have a significant effect on the environment. This finding is based upon the criteria of the Guidelines of the State Secretary for Resources, Sections 15064 (Determining Significant Effect), 15065 (Mandatory Findings of Significance), and 15070 (Decision to prepare a Negative Declaration), and the following reasons as documented in the Initial Evaluation (Initial Study) for the project, which is attached. Mitigation measures are included in this project to avoid potentially significant effects. See Section F, page 212.

<u>In the independent judgement of the Planning Department, there is no substantial evidence that the project could have a significant effect on the environment.</u>

Lisa Gibson

Lisa Gibson
Environmental Review Officer
for
John Rahaim
Director of Planning

DATE: 6/18/18

cc: Jonathan Roman, Port of San Francisco
Ming Yeung, Port of San Francisco

INITIAL STUDY

(2017-008824ENV: The Embarcadero #0064/ Mission Bay Ferry Landing and Water Taxi Landing)

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INITIAL STUDY

The Embarcadero #0064/Mission Bay Ferry Landing and Water Taxi Landing
Planning Department Case No. 2017-008824ENV

A. PROJECT DESCRIPTION

Project Location

The proposed Mission Bay Ferry Landing and Water Taxi Landing would be located on San Francisco Bay, within the Port's Southern Waterfront in the Mission Bay/Central Waterfront area (see **Figure 1**, Location Map). The proposed Ferry Landing would be located near the intersection of Terry A. Francois Boulevard and 16th Street, adjacent to Agua Vista Park and nearby planned Bayfront Park. The proposed Water Taxi Landing would be located approximately 400 feet south of the proposed Ferry Landing location, adjacent to Agua Vista Park and approximately 100 feet south of the existing Agua Vista Park fishing pier. Both sites are located completely on Port of San Francisco (Port) property (see **Figure 2**, Project Site and Vicinity Map).

Project Characteristics and Design Considerations

The Port is proposing to construct a single-float, two-berth Ferry Landing to provide regional ferry service, and a separate single float, two-berth Water Taxi Landing to provide local water taxi access to the Mission Bay area and surrounding neighborhoods (see **Figure 3**, Ferry Landing and Water Taxi Landing Layout Plan). The Water Emergency Transportation Authority (WETA) prepared the Expansion of Ferry Transit Service in the San Francisco Bay Area Program Environmental Impact Report (EIR) in 2003 that addressed the potential environmental impacts resulting from expansion of water transit service defined in WETA's Implementation and Operations Plan (IOP). The IOP presented a focused set of routes, terminals, and service improvements for expanded ferry service in the San Francisco Bay area and included Mission Bay as a potential ferry landing site. The Program EIR assumed that project-level environmental review would be necessary for development of expanded or new ferry facilities, such as the proposed project, to adequately address site-specific environmental issues. The purpose of the proposed project is to provide new Ferry and Water Taxi Landing facilities to enable regional water-based public transportation (including commute service from Alameda, Oakland, Vallejo and Larkspur, and special event service from the Chase Center) and emergency response in the Mission Bay and Central Waterfront areas of the City of San Francisco; to support current and future transit demand; to reduce vehicular trips in the Mission Bay area; and to alleviate trans-bay commute traffic. The design of the Ferry and Water Taxi Landings would conform to the current Americans with Disabilities Act (ADA) Standards for Accessible Design.

The Final Design is being developed in consultation with WETA and other City agencies. The design is also being coordinated with other agencies with jurisdiction over and expertise in areas along the waterfront, including the San Francisco Bay Conservation and Development Commission (BCDC), the San Francisco Bay Regional Water Quality Control Board (RWQCB), the U.S. Army Corps of Engineers (USACE), and the U.S. Fish and Wildlife Service (USFWS). In order to provide safe navigational approaches and maneuvering to the Ferry and Water Taxi Landing sites, the project would require dredging of the Bay floor. All material proposed to be dredged has been characterized and would be disposed at permitted disposal sites, pursuant to applicable regulations and the Dredged Material Management Office (DMMO) determination of suitability for dredge material disposal for the project. The project would be designed to address sea-level

SOURCE: ESA, 2017

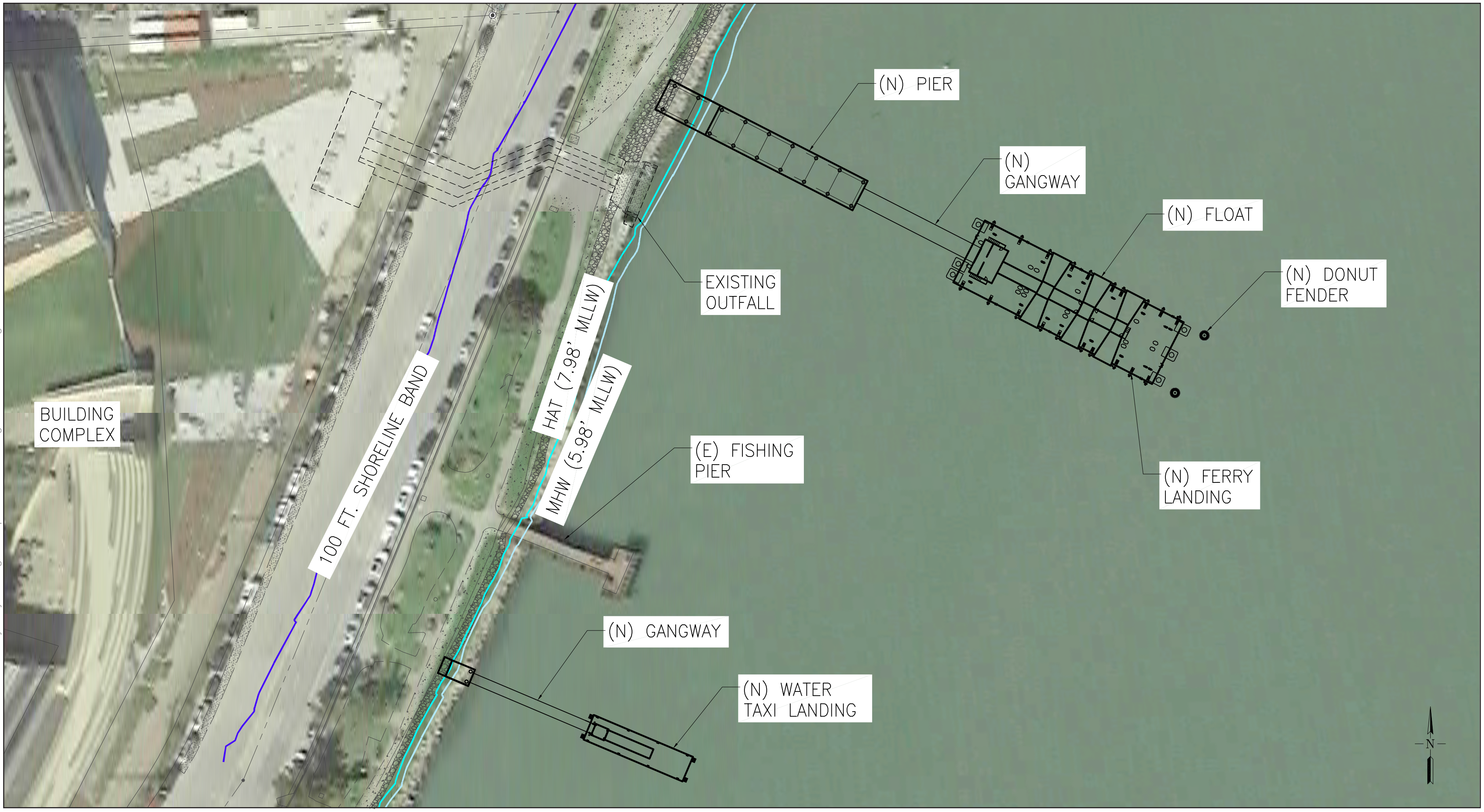
Mission Bay Ferry Landing and Water Taxi Landing Project

Figure 1
Location Map

SOURCE: ESA, 2017

Mission Bay Ferry Landing and Water Taxi Landing Project

Figure 2
Project Site and Vicinity Map



SOURCE: COWI OLMM

Mission Bay Ferry Landing and Water Taxi Landing Project

Figure 3
Ferry Landing and Water Taxi Landing Layout Plan

rise based on a design life-span of approximately 50 years for the Ferry Landing (2070) and 30 years for the Water Taxi Landing (2050) based on the "Likely Range" projections for the year 2070 of approximately 23 inches.[1]

The landside portion of the project site has an approximate elevation of 11.58 feet above mean lower low water (MLLW[2]). Features of the project would be constructed at approximately 13 feet above MLLW. The project's design includes elevated elements, such as canopies, as well as transitions (e.g., sloped walkways) between the new elevated elements and the existing grades of surrounding areas (e.g., Bayfront Park, Agua Vista Park and the Bay Trail).

Ferry Landing

The Ferry Landing would consist of three primary structured components described in detail below: pier, gangway, and float (see **Figure 4**, Ferry Landing Plan; **Figure 5**, Ferry Landing Sections; and **Figure 6** Ferry Landing Canopy Plan). Other features of the project include shoreside improvements and utilities connections. A summary of the Ferry Landing elements is shown below in **Table 1**.

TABLE 1
SUMMARY OF KEY FERRY LANDING ELEMENTS

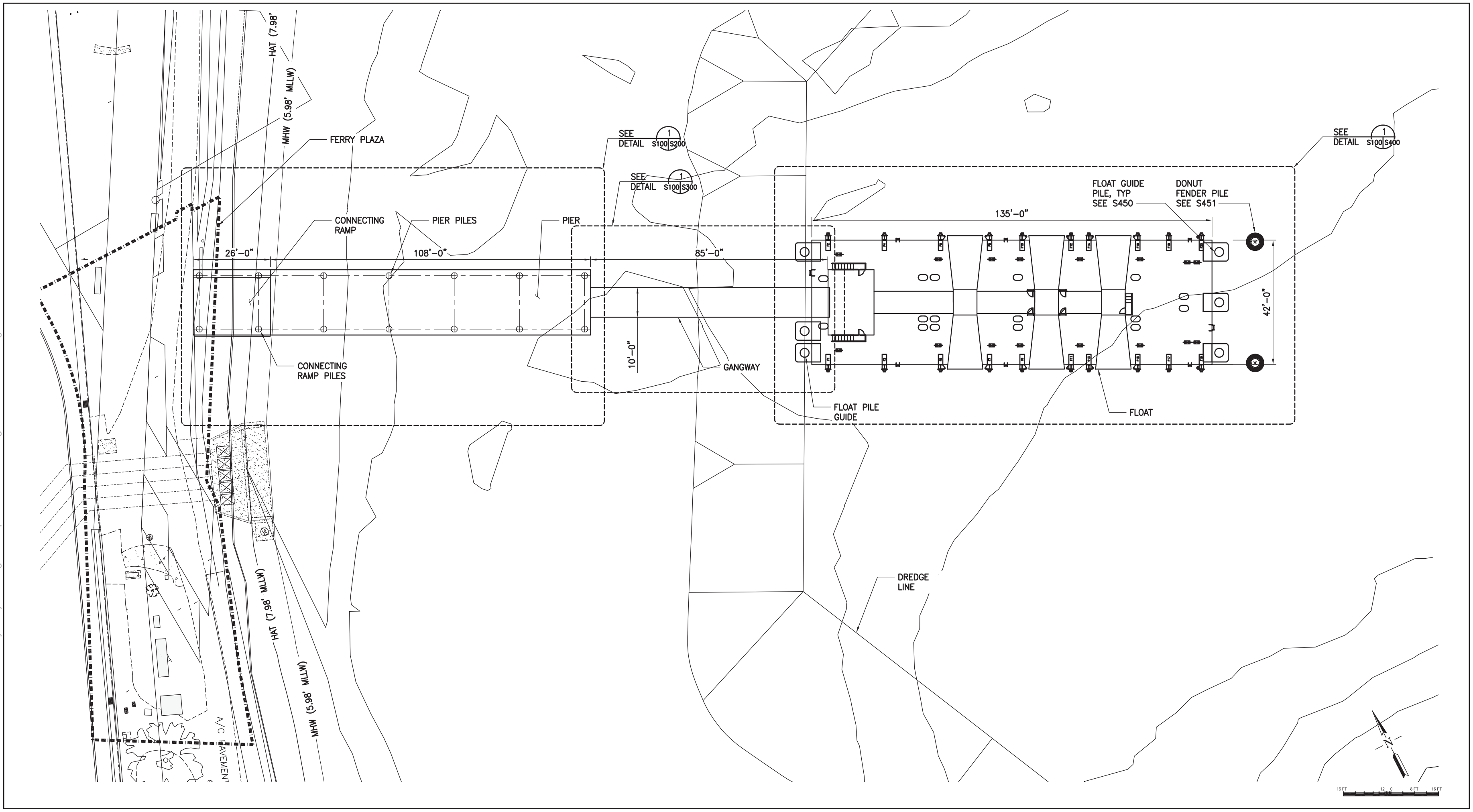
Structure	Size	Area (square feet [sf])	Type	Piles – No.	Piles – Size
Pier Connecting Ramp	108 feet x 22 feet 26 feet x 22 feet	2,376 sf 572 sf	concrete	10 4	24-inch octagonal concrete
Gangway	85 feet x 10 feet	850 sf	aluminum or coated steel	--	--
Float	135 feet x 42 feet	5,670 sf	steel	6 + 2 donut fender piles	36-inch diameter; steel

Pier and Connecting Ramp

A pier would extend over the Bay, perpendicular to the shoreline, in a south-easterly direction. Access to the pier would occur via an approximately 26-foot by 22-foot concrete connecting ramp. The connecting ramp would include steel railings and be supported by four 24-inch octagonal concrete piles. The four connecting ramp piles would be enclosed in a 48-inch permanent caisson sleeve.

The pier, measuring approximately 108 feet by 22 feet, would be constructed with a 20-inch-thick concrete deck with steel railings, and would be supported by ten 24-inch octagonal, concrete piles. The pier deck would be located approximately 13 feet above MLLW. The design of the pier and connecting ramp would account for a 50-year sea-level rise. The fixed pier elevation would be set based on projected sea-level rise over the service life of the structure. The connecting ramp, which transitions between the existing onshore grade to the higher pier deck elevation, would be designed for ease of replacement if the shoreline requires raising due to further sea-level rise in the future. A public access gate would be located at the entrance to the

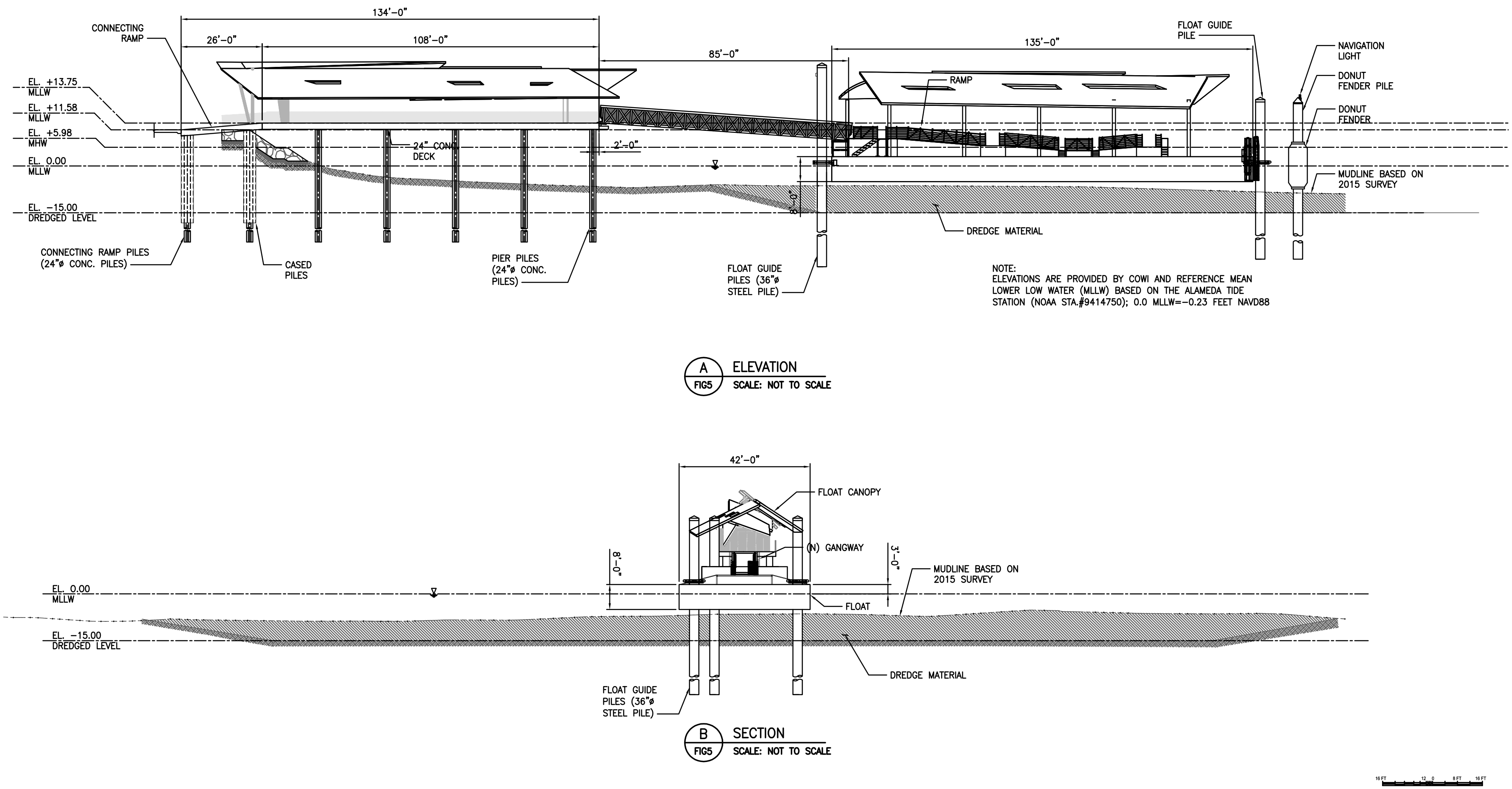
1 California Natural Resources Agency, 2017. *Draft State of California Sea-Level Rise Guidance: 2018 Update*. 2017.
2 The National Oceanic and Atmospheric Administration uses mean lower low water (MLLW), which is the average height of the lowest tide recorded at a tide station each day during a 19-year recording period, known as the National Tidal Datum Epoch.



SOURCE: COWI OLMM

Mission Bay Ferry Landing and Water Taxi Landing Project

Figure 4
Ferry Landing Plan View

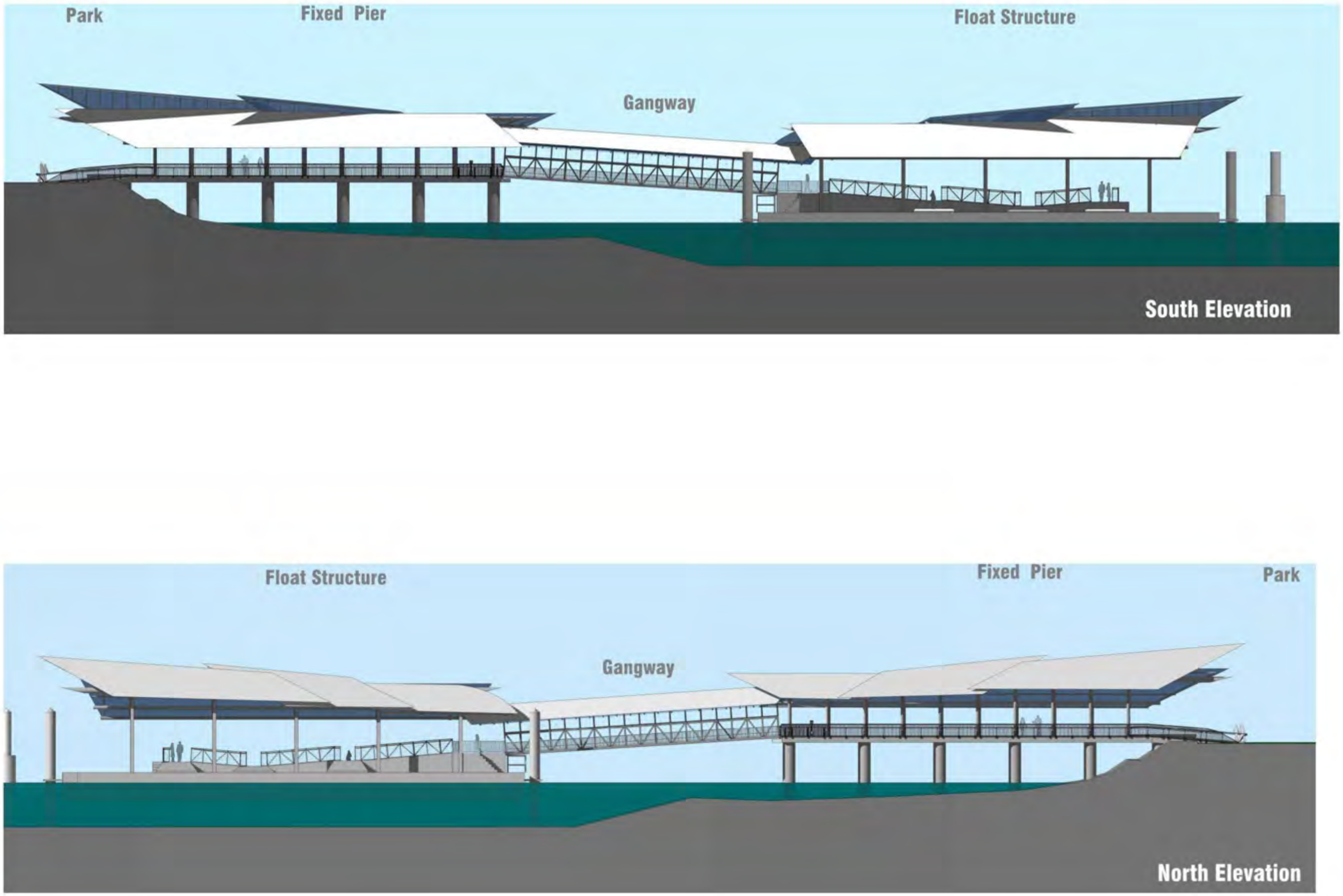


Note: elevations are provided by COWI and reference Mean Lower Low Water (MLLW) based on the Alameda Tide Station (NOAA Sta.#9414750); 0.0 MLLW = -0.23 feet NAVD88

SOURCE: COWI OLMM

Mission Bay Ferry Landing and Water Taxi Landing Project

Figure 5
Ferry Landing Cross-Sections



SOURCE: COWI/OLMM, 2017; Robin Chiang & Company, 2017

Figure 6
Ferry Landing Canopy Plan

pier. This gate would be approximately 8 feet tall and would be locked during overnight hours. A secure gate would be located where the pier connects to the gangway. The secure gate would prevent access to the gangway when closed and would be approximately 12 feet tall.

The pier would be covered with a canopy consisting of steel tubes supporting a translucent, polycarbonate material over the pier. Up-lighting may be included to illuminate the canopy. Lighting for pedestrian circulation would be included on the connecting ramp and pier.

Gangway

To meet ADA requirements, an approximately 85-foot by 10-foot aluminum or coated steel gangway with railings would extend from the pier and descend at no greater than a 1:12 slope to a float. The gangway would be covered with a canopy of similar materials as the pier canopy. Lighting for pedestrian circulation would also be included on the gangway. The gangway would be designed for future tide ranges to account for sea-level rise.

Float

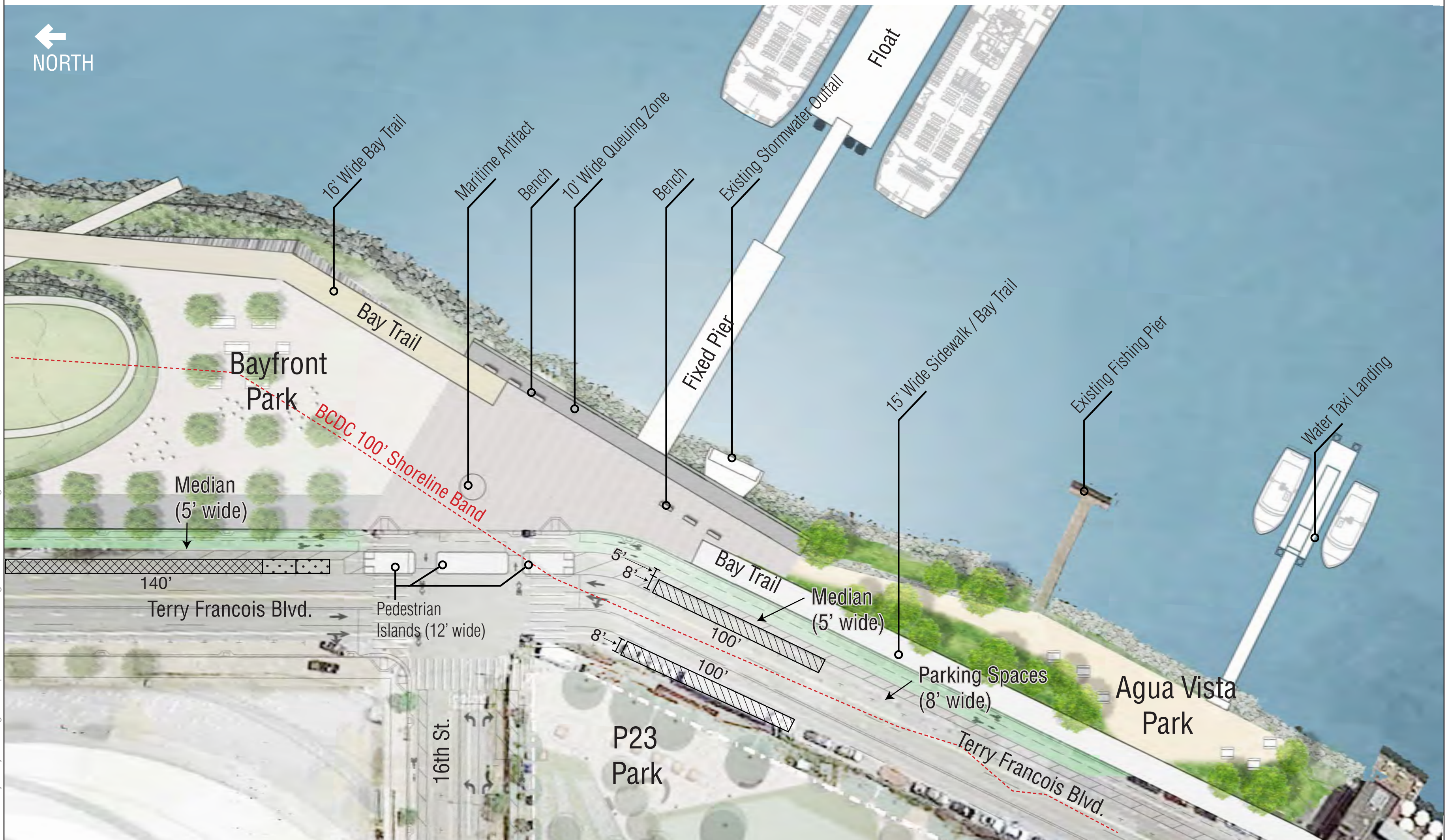
The gangway would connect to a steel barge float measuring approximately 135 feet by 42 feet (nominally 8-foot-thick). Six 36-inch diameter steel guide piles would be required to secure the float in place. The top elevation of the float guide piles would account for the projected 50-year sea-level rise. The deck of the float would be approximately 3 feet above the water surface. A lift structure to support the gangway when the float is removed for periodic maintenance would be attached to the end of the float where the gangway descends. Railings and lighting would be provided on the float.

The float would include rubber arch fenders supported by steel beams. Navigation lights would be provided on top of the fender brackets. Vessel mooring hardware would consist of cast steel cleats mounted on the side of the barge deck. Pile collars would be steel with ultra-high-molecular-weight polyethylene (UHMW) sliding pads.

Two 36-inch diameter steel guide piles with 6-foot diameter floating donut fenders would be used to protect the corners of the float from vessel impacts. The piles would be located approximately 12 feet beyond the end of the float and separated by approximately 39 feet. They would be topped with fiberglass pile cones and navigation lights.

Landside and Utility Improvements

Landside improvements, such as seating would be installed, and landscaping treatments, as well as other treatments, would be installed to organize passenger queuing. These facilities would be integrated into the adjacent Bayfront Park and Agua Vista Park projects (see **Figure 7**, Landside Improvement Areas). Lighting would be provided at the entrance and in the queuing areas. Additional improvements to Agua Vista Park by the Port are planned to occur following completion of the Ferry Landing and Water Taxi Landing.



Note: Exact locations subject to change based on regulatory review. This figure shows the proposed realignment of Terry A. Francois Boulevard and Chase Center transportation network improvements Final landside improvement design details subject to further review and regulatory approvals.

SOURCE: Surfacedesign Inc., 2017; COWI, 2017; Port of San Francisco, 2017; ESA, 2017

Mission Bay Ferry Landing and Water Taxi Landing Project

Figure 7
Landside Improvement Areas

Utilities for the Ferry Landing would include electric service for lighting and telecommunications; fire alarm and security systems; public address system; data and voice systems; boarding ramp lift system; and potable water for pressure washing. All utilities would extend from the ferry structure onshore and would be buried to connection points with existing systems. Approximately 380 cubic yards of soil would be excavated for installation of utilities and landside improvements.

Electricity would be provided by an above ground transformer and adjacent switchrack to be constructed in Agua Vista Park. The transformer would be sized to accommodate both operational requirements (e.g., lighting, moveable access ramps, gates, and layberthing). Layberthing is the temporary berthing of a vessel while awaiting redeployment on its next scheduled service route. Operators may choose to layberth vessels at the Ferry Landing dock between the a.m. and p.m. commuter service and between the start and end of special events. Layberthing eliminates "deadhead" (i.e., empty vessel) trips when vessels have to travel across the Bay to other terminals in order to access shoreside power connections. Electrical service to the transformer would be provided from an underground San Francisco Public Utilities Commission (SFPUC) vault located in 16th Street near its intersection with Terry A. Francois Boulevard.

Potable water service would be provided to the float for periodic wash down; currently, a hose bib is proposed for this purpose. Existing water service runs along the east side of Terry A. Francois Boulevard. A buried pipe would be constructed to connect to the Ferry Landing. A domestic water back flow preventer would be constructed above ground within 25 feet of the point of connection to the water main in Agua Vista Park. A dry stand pipe would be located near the front of the Ferry Landing. The proposed project would not include restrooms or other facilities that would produce wastewater.

Onshore irrigation for the project would be provided as part of the Agua Vista Park and Bayfront Park projects. Irrigation systems near the Ferry Landing would be modified as needed to serve the project.

Storm water drainage facilities may be required on the landside hardscape and would be integrated with the proposed Agua Vista Park Improvements Project. For the in-water Ferry Landing structural elements, all deck surfaces (pier, gangway, float) would be gently graded or sloped to direct runoff towards the edges of structures and into the Bay; no specific storm water drainage or treatment facilities are required for these structures. Vessel fueling or maintenance would not occur at the Ferry Landing.

Proposed landside improvements would include construction of approximately 5,765 square feet of impervious surfaces. As the landside improvements for the project as a whole encompass an area larger than 5,000 square feet, a Stormwater Control Plan would be required in order to comply with the San Francisco Stormwater Management Requirements and Design Guidelines, updated in May 2016, in order to meet state mandates. In accordance with Port requirements for construction-related stormwater runoff, the project must submit an Erosion and Sediment Control Plan, including pollution prevention measures to be implemented during construction and post-construction. The Port would review and approve the Stormwater Control Plan and identify the stormwater controls included in the project in monitoring reports submitted to the San Francisco Bay Regional Water Quality Control Board (RWQCB). In areas served by separate stormwater systems[3], such as the project site, the City's Stormwater Management

[3] The landside portion of the project site is in an area served by a separate stormwater drainage system under the jurisdiction of the Port.

Requirements and Design Guidelines require that projects that create and/or replace 5,000 square feet or more of impervious surface implement source controls and best management practices to meet performance requirements and also manage runoff from the 85th percentile, 24-hour storm.

Other improvements may include a maritime artifact/art piece within the Ferry Landing plaza area and an informational pylon sign located either on the shoreside hardscape or on the pier near the public gate. The sign may include an LED monitor with ferry arrival/departure information, maps, ferry schedules, and the U.S. Coast Guard's Maritime Security (MARSEC) notification information. A Clipper card reader would be located near the entrance to the gangway inside the security gate.

Landside Transportation Changes

The proposed project includes changes to the planned reconfiguration of Terry A. Francois Boulevard to accommodate access for passengers arriving at or departing from the Mission Bay Ferry Landing by transit and vehicles. In order to accommodate vehicular passenger loading and unloading, the project would include two passenger loading/unloading zones for taxis, transportation network companies (e.g., Uber, Lyft), and private vehicles, subject to regulatory approvals (see Figure 7). The zones would be located on both sides of the reconfigured Terry A. Francois Boulevard, south of its intersection with 16th Street. Each zone would be approximately 100 feet long and 8 feet wide and demarcated with white curbside paint. The passenger zone on the east side of the street would replace about five on-street parking spaces planned (as part of the Chase Center transportation network improvements) to be located adjacent to the proposed separated bicycle lanes (also referred to as a "cycle track"). A 5-foot-wide walkable median between the drop-off lane and the cycle track would be provided for passenger waiting, loading, and unloading. The median would provide separation and protection for waiting and arriving passengers from vehicular and bicycle traffic. The passenger loading/unloading zone on the west side of the street would replace about five curbside on-street parking spaces.

A transit/shuttle stop with a bus pullout space would also be provided on Terry A. Francois Boulevard north of 16th Street, subject to regulatory approvals (see Figure 7). The stop would be approximately 140 feet long and would include a 5-foot-wide walkable median between the bus pullout space and the cycle track identical to the proposed median on Terry A. Francois Boulevard south of 16th Street. The transit stop could accommodate UCSF, Kaiser Permanente, and Mission Bay TMA (Transportation Management Association) shuttle buses already operating in Mission Bay and that could be rerouted to serve the Ferry Landing once ferry service is implemented. The transit stop could also serve the potential extension of Muni's 55 16th Street route east of Third Street along 16th Street to Terry A. Francois Boulevard once construction of 16th Street between Illinois Street and Terry A. Francois Boulevard is completed.

Emergency Response Fire Systems

Fire Suction Standpipe. A fire suction standpipe would be constructed near the Ferry Landing pier entrance with a pipe extending down the pier to the water line for the intake point. Bollards would be constructed to protect the fire suction standpipe.

Dry Standpipe (Fire Hydrant). A dry standpipe would be constructed near the pier entrance.

Auxiliary Water Supply System. The Port is currently working with the SFPUC to design a connection to a proposed Auxiliary Water Supply System (AWSS) manifold[4] that would be constructed above-ground in Bayfront Park. The AWSS connection would allow San Francisco Fire Department fire boats to pump bay water to the AWSS as an auxiliary emergency water source. The manifold valves and check valves would be buried. The manifold would be approximately 15 feet by 4 feet and 3 feet above ground surface. The AWSS would not be constructed as part of this project; rather, it is a separate project proposed by the SFPUC. Paved areas onshore near the Ferry Landing would allow for fire trucks to access the dry stand pipe (fire hydrant) and suction stand pipes.

Water Taxi Landing

A separate proposed Water Taxi Landing would be located approximately 400 feet south of the proposed Ferry Landing and would consist of three primary components described in detail below: platform, gangway, and float (see **Figure 8**, Water Taxi Landing Plan; and **Figure 9**, Water Taxi Landing Sections). The design of the Water Taxi Landing would conform to the current ADA Standards for Accessible Design. A summary of the Water Taxi Landing elements is shown below in **Table 2**.

TABLE 2
SUMMARY OF KEY WATER TAXI LANDING ELEMENTS

Structure	Size	Area (square feet [sf])	Type	Piles – No.	Piles – Size
Platform	20 feet x 10.5 feet	210 sf	Steel	2	16-inch circular; steel
Gangway	80 feet x 6.2 feet	496 sf	Aluminum	--	--
Float	65 feet x 16 feet	1,040 sf	Concrete	4	20-inch square; concrete

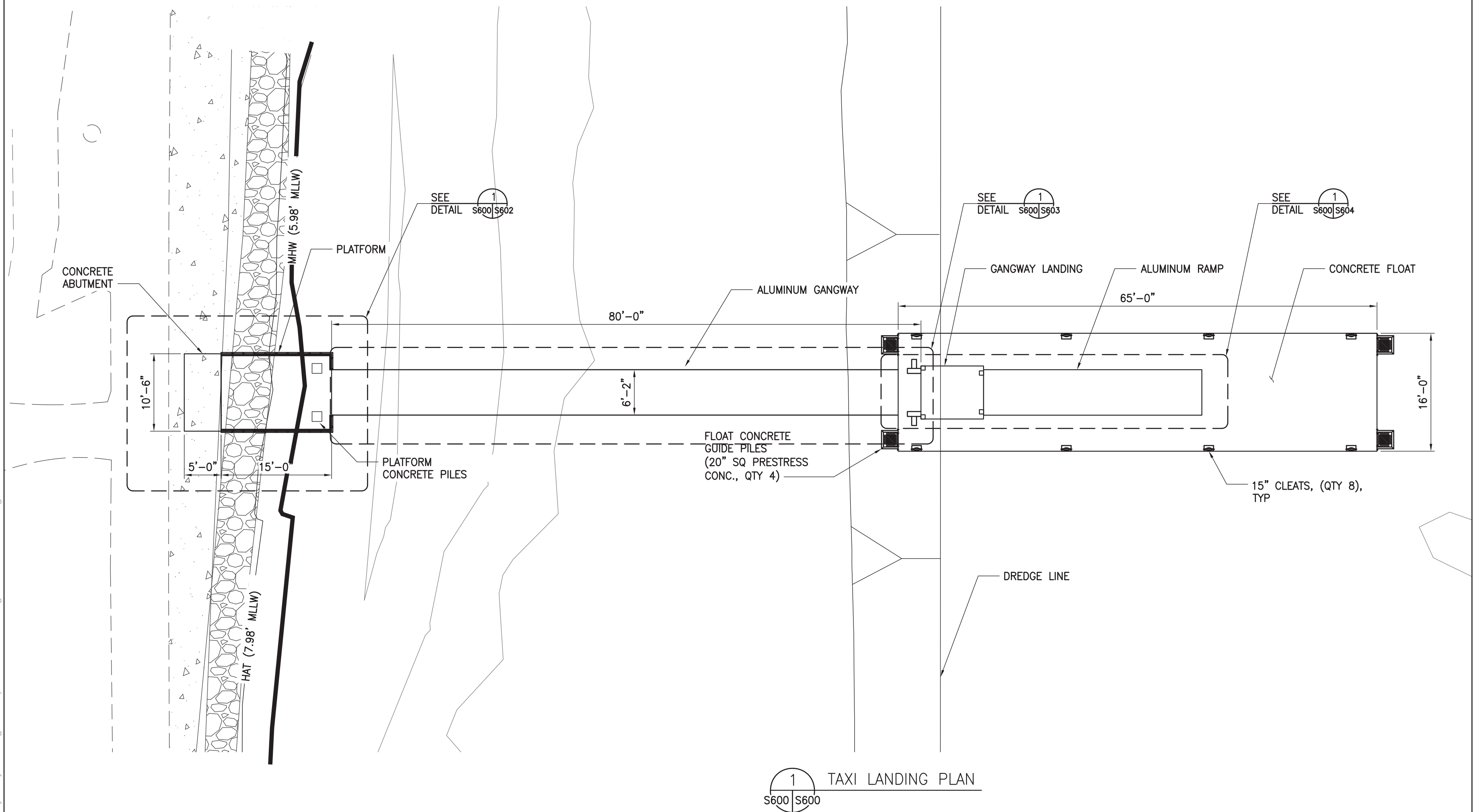
Platform

A small landside steel platform with railings would be constructed perpendicular to the shore, in a south-easterly direction. The platform, measuring approximately 20 feet by 10.5 feet, would be constructed of steel, and would be supported by two steel piles (16-inch circular). A security gate would be constructed either onshore or on the platform where it connects to the gangway.

Gangway

To meet ADA requirements, an aluminum gangway with railings, measuring approximately 80 feet by 6.2 feet, would extend from the landside platform out over the Bay and connect to an approximately 8.5-foot by 7.3-foot aluminum ramp and an approximately 30-foot by 6-foot uncovered aluminum ramp located on the float. Lighting for pedestrian circulation would be included on the gangway.

4 A manifold is the hub of a water system that distributes supply water to distribution lines.



Note: elevations are provided by COWI and reference Mean Lower Low Water (MLLW) based on the Alameda Tide Station (NOAA Sta.#9414750); 0.0 MLLW = -0.23 feet NAVD88

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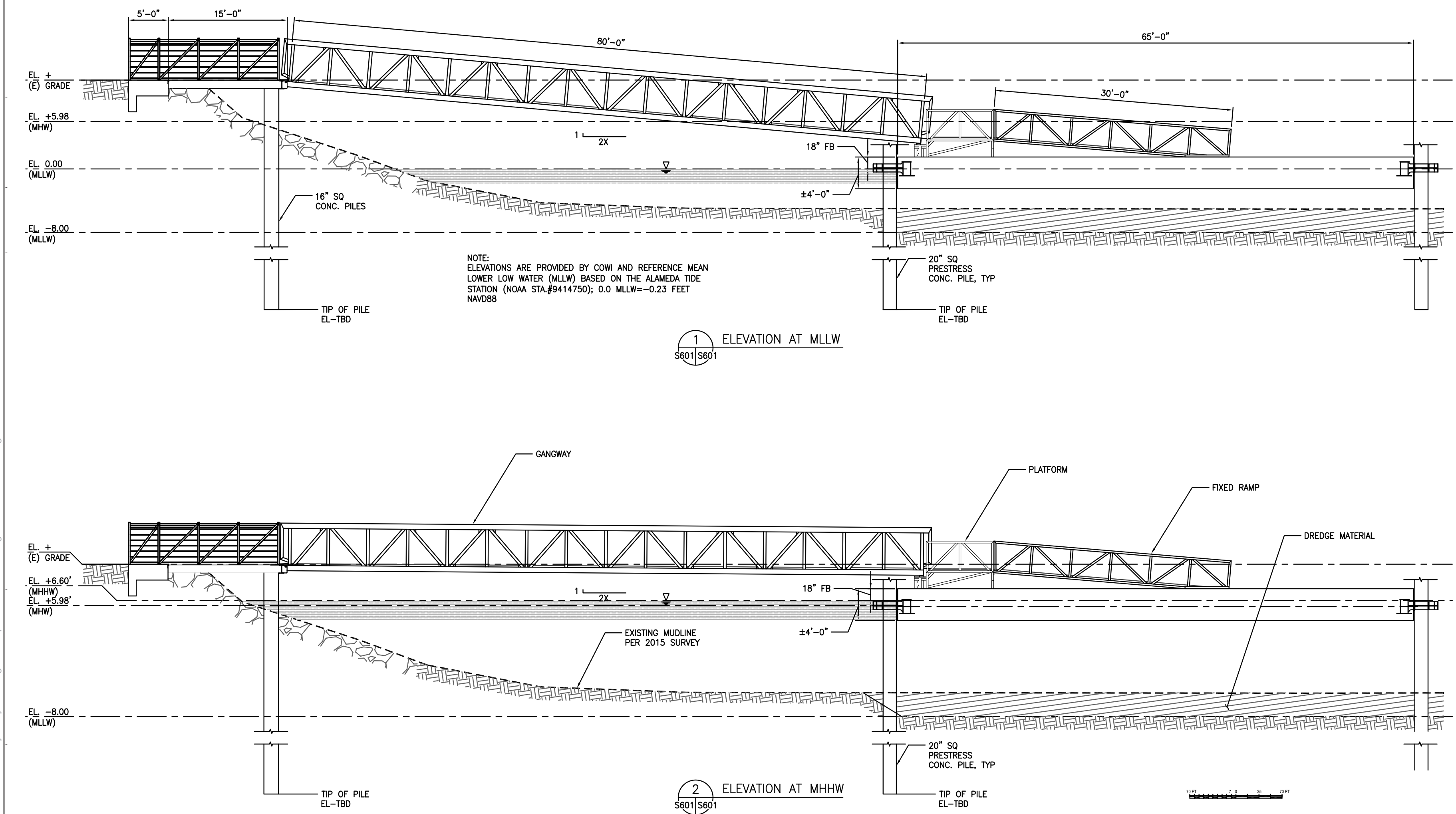
SOURCE: COWI OLMM

Mission Bay Ferry Landing and Water Taxi Landing Project

Figure 8
Water Taxi Landing Plan View



Note: elevations are provided by COWI and reference Mean Lower Low Water (MLLW) based on the Alameda Tide Station (NOAA Sta.#9414750); 0.0 MLLW = -0.23 feet NAVD88

SOURCE: COWI OLMM

Figure 9
Water Taxi Landing Cross-Sections

Float

A pre-cast concrete float, measuring approximately 65 feet by 16 feet, would be moored with four 20-inch square concrete guide piles designed with a top elevation to account for a projected 30-year sea-level rise. The float would accommodate boarding on each side. Lighting and railings would be included on the float.

Landside and Utility Improvements

Lighting would be constructed at the entrance to the Water Taxi Landing. A dry standpipe would be constructed near the pier entrance. Similar to the Ferry Landing, all utilities would be located atop or mounted to the Water Taxi Landing structure (outside of waters) and would extend from the structure onshore, and be buried to landside connection points with existing systems.

Project Operations

Ferry Landing

Commute Service

The Ferry Landing would be designed to serve the two ferry operators on the San Francisco Bay. These are: 1) WETA, operating as San Francisco Bay Ferry, and 2) GGBHTD, operating as Golden Gate Ferry. Ferry service would likely be from Alameda-Oakland and Vallejo in the East Bay, and potentially Larkspur in the North Bay. See **Figure 10**, Proposed Mission Bay Ferry Routes, for illustration of proposed ferry routes as well as current routes operated by WETA, GGBHTD, and other operators. GGBHTD would initially provide ferry service only for Golden State Warriors' games and other special events at the nearby Chase Center. GGBHTD is analyzing potential commuter service options to the Ferry Landing. It is expected that existing fleets of both ferry operators are large enough to accommodate the anticipated commute service.

The initial service concept assumes the proposed Ferry Landing would be in operation during the a.m. and p.m. peak periods, with inbound and outbound trips linked via downtown San Francisco's Ferry Building terminal. Under a maximum general service operating scenario, up to 11 vessel trips would occur during the a.m. peak period (six to/from Alameda-Oakland, three to/from Larkspur, and two to/from Vallejo), arriving at the Ferry Landing between approximately 6:45 a.m. and 9:45 a.m.; and up to 12 vessel trips would occur during the p.m. peak period (seven to/from Alameda-Oakland, three to/from Larkspur, and two to/from Vallejo), departing the Ferry Landing between approximately 5:00 p.m. and 7:25 p.m. WETA's ferries would be approximately 100 feet to 145 feet long and carry a maximum of approximately 400 passengers. WETA's ferry fleet currently includes a variety of vessels with engines ranging in manufacturer year from 1997 to 2017, the latter of which reflect Tier 4 engines, and use Bio Diesel B5 and Ultra Low Sulfur Diesel.[5] Vessels operated by Golden Gate Ferry are between 135 feet and 170 feet long, and can carry up to 750 passengers, and use No. 2 Diesel.[6] No vessel fueling or maintenance operations are proposed at the landing.

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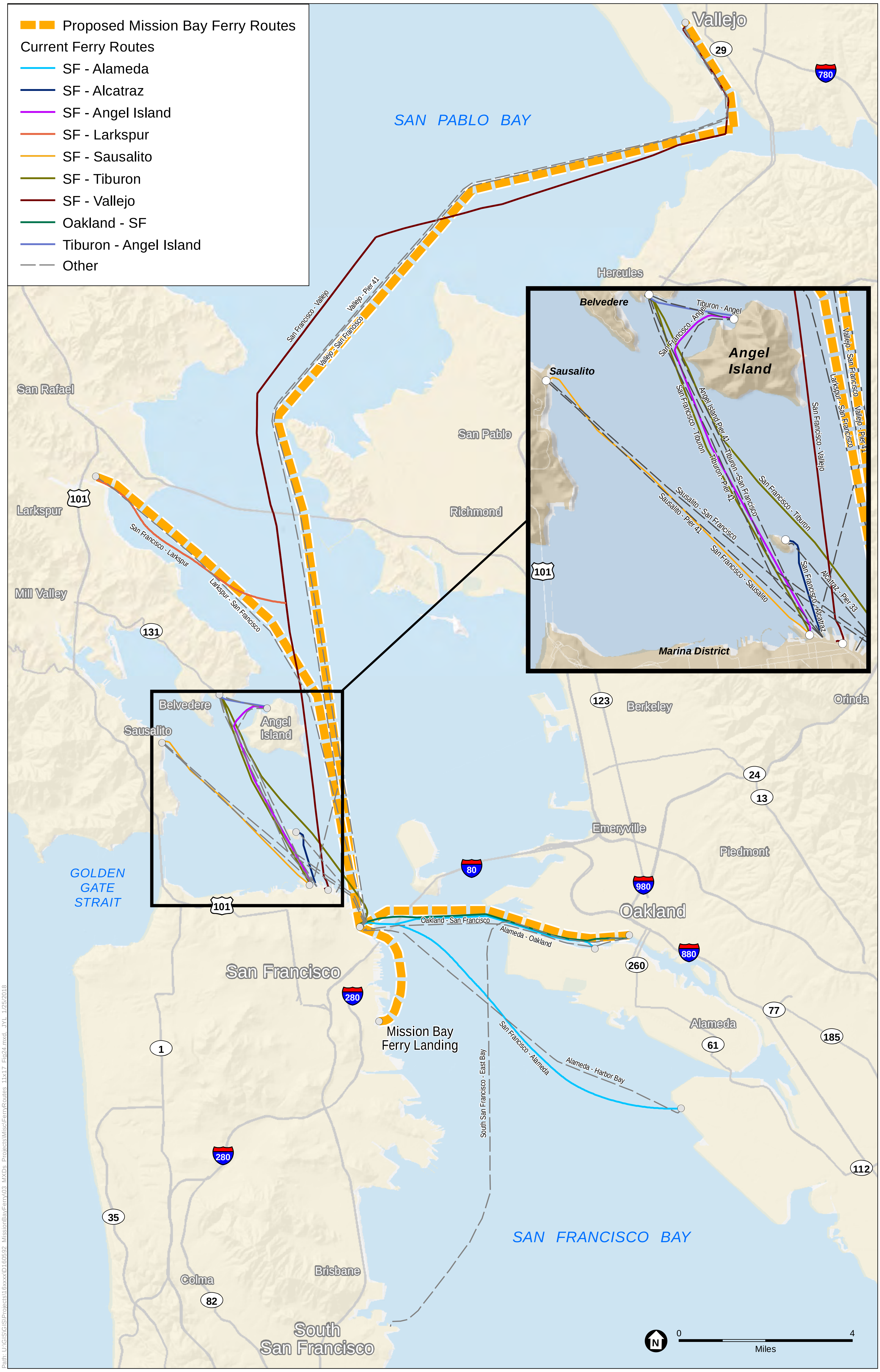
5 Water Emergency Transportation Authority, San Francisco Bay Ferry, About the Fleet, sanfranciscobayferry.com/node/419.

6 Golden Gate Bridge Highway and Transportation District, Golden Gate Ferry's Routes and Fleet, goldengateferry.org/researchlibrary/fleet.php.



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SOURCE: MTC, ESRI, ESA, 2017

Mission Bay Ferry Landing and Water Taxi Landing Project

Figure 10
Proposed Mission Bay Ferry Routes

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Special Event Service

Direct Chase Center special event service is proposed from Larkspur, Vallejo, and Oakland/Alameda to the Ferry Building, then to the Ferry Landing. Pre-game arrival would be part of the normal commuter service for events that occur Monday through Friday. Up to 4 vessel trips would occur for special event end times, departing the Ferry Landing between approximately 9:30 p.m. and 10:00 p.m., or upon the conclusion of games or events at the Chase Center. Return service may connect first with the Ferry Building terminal before departing for Larkspur, Vallejo, and Oakland/Alameda. Special event service would be provided for all Golden State Warriors' games (41 regular season games), including pre-season (3 games) and post-season (up to 16 playoff games). Service also would be provided for approximately 20 additional events (e.g., concerts, family shows, other sporting events, conventions, corporate events) per year at the Chase Center. Overall, ferry service would be provided for 80 special events per year. Special event service would be provided for approximately 12 Warriors' games that occur on the weekend or holidays. These games typically begin at either 12:00 p.m. or 5:30 p.m. Weekend service may also be provided for concerts and other events at the Chase Center. Concerts would occur in the evening, typically 7:30 p.m. to 10:30 p.m. Other weekend events may occur at variable times but WETA and GGBHTD have indicated that service for such events would not be provided unless attendance was anticipated to exceed 5,000. It is expected that existing fleets of both ferry operators are large enough to accommodate the anticipated special event service.

Emergency Operation

The Ferry Landing would be designed to remain in operation after a major earthquake[7] and could be used as a transit link allowing passengers to enter and leave the Mission Bay area. Immediately after an earthquake or other disaster, the Ferry Landing could be available 24-hours per day for transporting emergency service personnel and passengers to terminals in the East Bay and North Bay. The Ferry Landing would be available for continuous operation in a long-term recovery period if BART and/or the Bay Bridge are unavailable for several months.

As described above, the San Francisco Fire Department would have access to the AWSS manifold located across from the Ferry Landing entrance. The AWSS connection would allow Fire Department fire boats to pump bay water to the AWSS as an auxiliary emergency water source. Hoses from a fire boat would be placed directly on top of the float, gangway, and pier and connect with the AWSS.

Water Taxi Landing

Use of the Water Taxi Landing would be limited to licensed operators. Water taxi providers operate under landing agreements with the Port Commission. There are four potential water taxi operators that have expressed interest in possibly providing service to the Water Taxi Landing. Water taxis would be approximately 29 feet to 54 feet long and carry a maximum of 45 passengers. Vessel trips would occur from

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[7] The project would be designed in accordance with the Seismic Design of Piers and Wharves, American Society of Civil Engineers and the 2016 California Building Code. The Ferry Landing would be designed as an essential facility for use as a staging area for first responders and evacuation by ferry in the event of a catastrophe (Risk Category IV). The seismic hazard and performance requirements would be more stringent than the "high" design classification. The Water Taxi Landing would be designed as a Risk Category II structure with seismic hazard and performance requirements in accordance with the "high" design classification.

various locations around the Bay, including from Pier 1.5, Pier 39, Fisherman's Wharf, Sausalito, Berkeley, and Richmond. It is anticipated that 10-15 trips would occur per day with more on days with Golden State Warriors' games or other events at the Chase Center. No vessel fueling or maintenance operations are proposed at the landing.

Project Construction

Ferry Landing

Construction of the Ferry Landing would occur both landside and in-water. Landside staging would include construction parking, access, and staging of construction equipment and material, all of which would occur within the onshore project footprint between Terry A. Francois Boulevard and the top of the rip rap[8] slope and portions of Agua Vista Park. Planned staging and access areas would occupy a total of approximately 0.16 acre.

In-water construction activities (i.e., removal of remnant piles and debris, dredging and pile installation) may require two in-water seasonal work windows (June 1 to November 30) and is currently planned for 2019 and 2020. In-water staging of construction equipment and material would occur on temporarily-moored barges adjacent to the proposed landing structures. A crane would be onsite to facilitate unloading of any large and/or heavy equipment or materials.

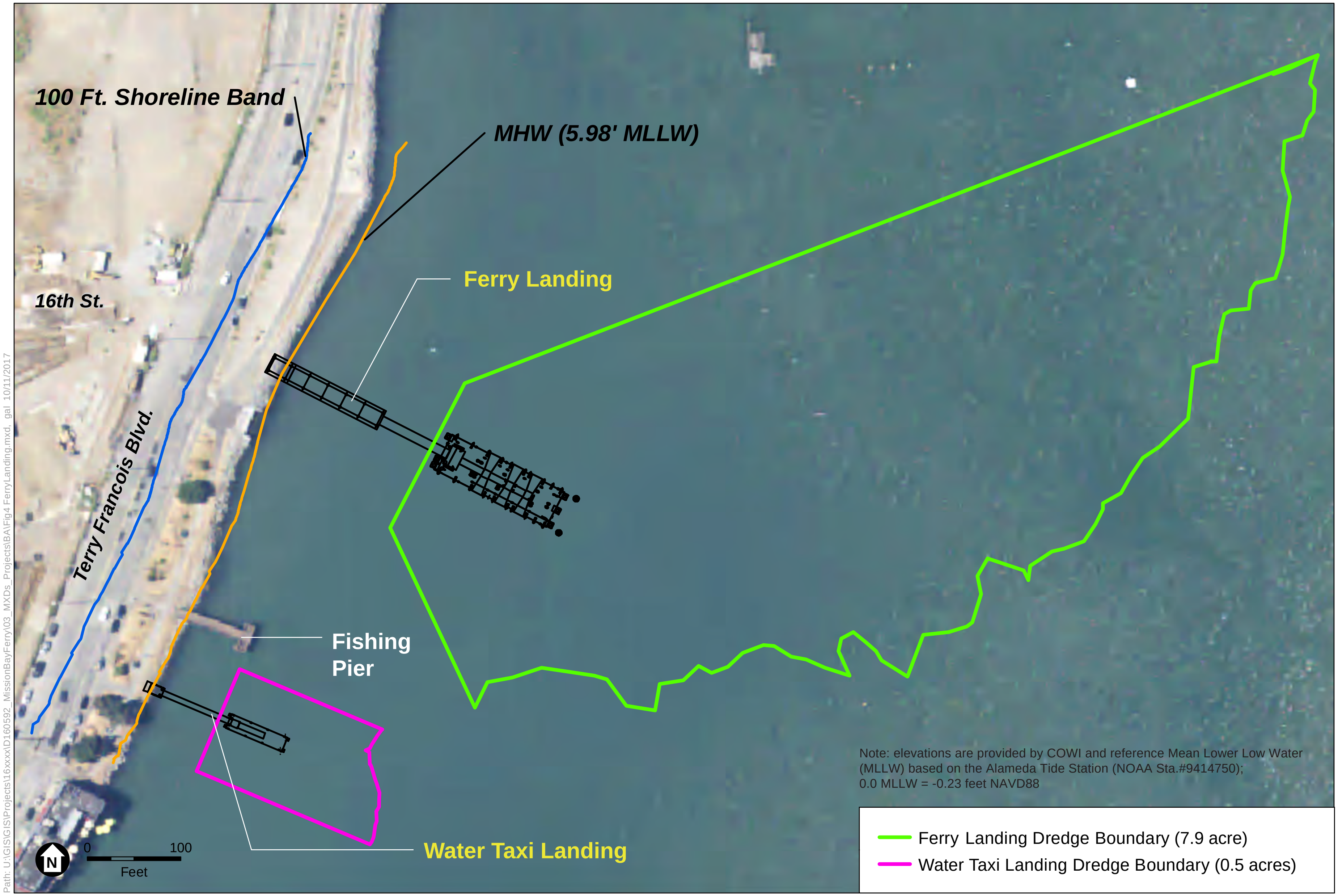
Equipment necessary during construction would likely include a derrick crane barge, support barges, small support vessels for crew transportation, impact hammer, vibratory hammer, concrete truck, concrete pump truck, generators, forklift, small land-based mobile crane, and pickup trucks. The Clean Construction Ordinance requires all work performed under a public works contract to use off-road equipment and off-road engines fueled by biodiesel fuel grade B20. As described further in Section 7, Air Quality, the Port intends to comply with the alternative fuel component of the Clean Construction Ordinance through use of renewable diesel.

Figure 11 presents the proposed dredging plans for the Ferry Landing and Water Taxi Landings. **Table 3** provides an estimated construction schedule. The expected construction approach is described in detail below.

TABLE 3
PROPOSED FERRY LANDING CONSTRUCTION SCHEDULE

Task	Start Date	Finish Date	Duration
Demolition/Site Preparation	June 2019	July 2019	1 month
Dredging	June 2019	August 2019	2.5 months
Pier Pile Installation	September 2019	October 2019	2 months
Pier Deck Construction	November 2019	June 2020	8 months
Float, Guide Piles and Fender Piles Installation	June 2020	July 2020	1 month
Float Outfitting and Gangway Installation	July 2020	August 2020	2 months
Landside Construction	June 2020	February 2021	8 months

[8] Loose stone use to form a foundation for a breakwater.



SOURCE: COWI 2017

Mission Bay Ferry Landing and Water Taxi Landing Project

Figure 11
Ferry Landing and Water Taxi Landing Layout Plans and Dredge Areas

1) ***Demolition*** **–** A multi-beam bathymetric survey[9], Port diver assessment, and historic information, indicate that buried remnants of concrete and wood debris from the former Pier 64-66 southern apron may be encountered within the Ferry Landing dredge boundary. All debris encountered during dredging operations would be removed, sorted, and disposed of at an appropriate upland recycling or disposal facility.

   The project also proposes to remove additional marine debris during demolition including full protruding timber piles, remnant timber piles, and decommissioned pipelines located within the project footprint. Existing remnant piles would be pulled with a cable choker or removed with a vibratory hammer if necessary and every effort would be made to remove the entire pile length. Piles would then be placed on a flat barge, transported to an appropriate facility and disposed of at a permitted facility. Additional debris and material adjacent to the project site may also be removed per required regulatory permits and resource agency authorizations.

2) ***Dredging*** **–** Dredging would be required in order to provide safe navigational approaches and maneuvering to the Ferry Landing location. The project designs provide for a dredge depth of 15 feet MLLW plus a 2-foot over-depth[10] within the proposed Ferry Landing dredge boundary (approximately 7.9 acres of bottom surface area).

   Based on the project designs and dredge boundary, an estimated 96,398 cubic yards (cy) would be dredged to achieve project depths plus 29,389 cy of allowable over-depth, for a total of approximately 125,787 cy. Proposed dredge depths and dredge volumes include side slope, over-depth, and 15% contingency for sedimentation estimated through 2019. Based on sediment characterization results, the Port is proposing to perform additional dredging within the project dredge boundary to remove an estimated additional 7,500 cy of contaminated sediment and to place a cap in the area of contaminated sediment removal. The volume associated with “contaminated” sediment accounts for approximately 20 percent of the total volume. The Port proposes to remove this material and place it at Pier 94/96 to re-handle and dry before ultimate disposal at a permitted landfill. Additional analysis documents as well as conceptual and final design plans for the proposed cap area would be submitted to the regulatory agencies for review and approval.

   Best Management Practices (BMPs) would be implemented and detailed in a Dredge Operations Plan (DOP) submitted to the permitting agencies for approval before dredging begins. All proposed dredged material has been characterized for disposal at appropriate and permitted disposal sites, pursuant to applicable regulations.[11] Approximately 80 percent of the dredged material (including sediment dredged for the Water Taxi Landing described below) has been approved for disposal by the DMMO agencies at the San Francisco Deep Ocean Disposal Site or for beneficial reuse at the Montezuma Wetlands Restoration Project in Solano County. The remaining approximately 20 percent requires disposal by haul truck at an upland landfill, such as the Altamont Landfill, Redwood Landfill, Vasco Road Landfill, or Ox Mountain Landfill. Sediment destined for landfill disposal would be temporarily transferred to a rehandling facility, such as Pier 94/96, in order to de-water the sediment.

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9 Bathymetric surveys are used to measure the depth of a water body and map the underwater features of a water body.

10 The 2-foot allowable over-depth is an excess amount of dredge material that takes into consideration the physical conditions, equipment, and material to be excavated and to ensure that the project depth is obtained even after resettling and sloughing of side slopes that typically occurs during the dredging process.

11 San Francisco District, U.S. Army Corps of Engineers. 2017. Port of San Francisco, Mission Bay Ferry and Water Taxi Dredging, Episode 1; Test Results; DMMO Serial Number: 17-102. December 18, 2017.

Dredging would be performed from water side barges using a clamshell bucket. Dredge material would be placed into scows for transfer to the approved disposal sites. Scows would have a grid to screen out debris. Debris would be removed from the grid and placed in a debris barge for transfer to an upland disposal site.

3) ***Pier Pile Installation*** – Working primarily from the water, the pier concrete piles would be installed. In-water piles would be stored on a barge and lifted by a derrick crane barge for installation. The first two piles at the top of the existing shoreline embankment would likely be driven onshore using a land-based crane. Concrete piles would be installed into pre-drilled holes. The construction sequence for drilling includes installing a temporary steel pipe caisson to act as a sleeve, which would likely be vibrated into position. Spoils would be collected for disposal and piles would be placed into the drilled hole. The piles would be grouted into the hole and the caisson then removed.

4) ***Pier Deck*** – The pier deck would be constructed over water working from both the land and water-based vessel. Formwork would be constructed, rebar placed, and concrete poured. Equipment would consist of generators and a small land-based crane for placement of formwork and rebar. Concrete trucks and a concrete pump truck would work from land during placement of concrete.

5) ***Pier Canopy*** – Steel frame and railings would be fabricated off-site. The canopy would be assembled and installed on-site.

6) ***Float and Gangway*** – Both the float and gangway would be constructed off-site at the fabrication yard. The float would be towed to the project site for installation. The gangway with canopy would be loaded on either a truck or barge and delivered to the project site. A derrick crane would lift and install the gangway.

7) ***Float Guide Piles and Donut Fender Piles*** – The float guide piles would be installed through the pile collars on the float. The donut fender piles would be installed at the specified locations and the 6-foot diameter floating fender would be placed over the piles. Piles would be installed with an impact hammer; however, the contractor once selected, may utilize a vibratory hammer for the initial drive and then switch to impact when harder substrate of bedrock is encountered.

8) ***Utilities*** – Trenches between points of connection onshore to the Ferry Landing would be cut, the conduit/piping installed, and the trenches backfilled. Trenches would be cut and filled using a backhoe. A compactor would be used after fill is placed. Electrical service would be run through conduit cast into the pier deck. Mechanical lines would be hung below the pier deck. Flexible connections would be installed between the pier and gangway, and between the gangway and float. Electrical and mechanical lines would be hung below the gangway and float walkway system.

Water Taxi Landing

Construction of the Water Taxi Landing would be conducted from both landside and in-water. Dredging for the Water Taxi Landing would occur immediately following dredging for the Ferry Landing in August 2019. Similarly, platform pile installation for the Water Taxi Landing would immediately follow pier pile installation at the Ferry Landing. The remaining construction at the Water Taxi Landing would occur concurrent with the Ferry Landing with an estimated completion in August 2020 for both facilities. Equipment needed during construction would be similar to that required for the Ferry Landing. In-water construction activities (i.e., dredging and pile installation) also would occur during the in-water work windows (June 1 to November 30 in 2019 and 2020). **Table 4** provides an estimated construction schedule. The expected construction approach is described in detail below.

TABLE 4
PROPOSED WATER TAXI LANDING CONSTRUCTION SCHEDULE

Task	Start Date	Finish Date	Duration
Dredging	August 2019	August 2019	2 weeks
Platform Pile Installation	October 2019	November 2019	1 week
Platform Construction	November 2019	December 2019	1 month
Float and Guide Piles Installation	June 2020	June 2020	1 week
Gangway Installation	July 2020	July 2020	1 week
Landside Construction	August 2020	August 2020	1 month

1) ***Dredging*** – Project designs provide for a dredge depth of -8 feet MLLW plus a 1-foot over-depth within the proposed Water Taxi Landing dredge boundary (approximately 0.5-acre of surface area). Based on the project designs and dredge boundary, an estimated 2,688 cy would be dredged to achieve proposed water taxi design depth plus 898 cy for over-depth, for a total of approximately 3,586 cy. Proposed dredge depths and dredge volumes include side slope, over-depth, and 15% contingency for sedimentation through 2019.

   As with the Ferry Landing dredging described above, all dredged material has been characterized for disposal at an appropriate and permitted disposal site, pursuant to applicable regulations.

2) ***Platform*** **–** The platform would be constructed of steel. Piles would be installed with an impact hammer; however, the contractor once selected, may utilize a vibratory hammer for the initial drive and then switch to impact when harder substrate of bedrock is encountered.

3) ***Float and Gangway*** **–** Both the float and gangway would be constructed off-site at the fabrication yard. The float would be towed to the project site for installation. The gangway would be loaded on either a truck or barge and delivered to the project site. A derrick crane would lift and install the gangway.

4) ***Float Guide Piles*** **–** The float guide piles would be installed through the pile collars on the float. Piles would be stored on a barge and lifted by the derrick crane barge for installation. Piles would be stored on a barge and lifted by the derrick crane barge for installation. An impact hammer would be used to install the concrete piles. The piles are required to be installed a minimum of 5 feet into the bedrock. A 5-foot long H-Pile stinger (with a driving shoe) attached to the tip of the concrete piles will be used to facilitate the pile embedment into bedrock.

5) ***Utilities*** **–** Trenches between points of connection onshore to the Water Taxi Landing would be cut, the conduit/piping installed, and the trenches backfilled. Trenches would be cut and filled using a backhoe. A compactor would be used after fill is placed. Electrical service would be run through conduit cast into the platform. Flexible connections would be installed between the platform and gangway, and gangway and float. Electrical lines would be hung below the gangway and float walkway.

Avoidance and Minimization Measures

The proposed project has been designed to avoid fill in the Bay and other impacts to waters of the State and U.S. to the extent practicable. Unavoidable fill and/or other impacts would be minimized. The permanent fill proposed for the project would be offset by removal of existing remnant piles within the proposed dredge area and possibly the removal of other debris and material adjacent to the project site. The Port proposes to remove additional remnant piles and pile stubs that are likely creosote-treated. Based on a high definition multi-beam survey, it is estimated that up to 25 14-inch timber piles ranging from 2 feet to 5 feet in length remain in the Bay and can be removed. This equates to approximately 26.7 square feet of surface area and 93.5 cubic feet of fill that would be removed. The removal of the pile stubs within the dredging footprint would also increase Bay water quality and ensure safe navigation.

General best management practices (BMPs) for pollution prevention and construction management would be employed during construction. In order to avoid and/or minimize potential impacts to jurisdictional waters, water quality, and biological resources the following standard construction BMPs would be implemented by the project. These measures would be subject to modification and additions based upon regulatory and resource agency review:

- In-water construction activities (i.e., dredging and pile installation) shall be restricted to the National Oceanic and Atmospheric Administration (NOAA) approved environmental work window (June 1 to November 30).
- No debris, rubbish, creosote-treated wood, soil, silt, sand, cement, concrete, or washings thereof, or other construction-related materials or wastes, oil, or petroleum products shall be allowed to enter into or placed where it would be subject to erosion by rain, wind, or waves and enter into jurisdictional waters.
- No fresh concrete or concrete washings shall enter the water.
- Protective measures shall be utilized to prevent accidental discharges to waters during fueling, cleaning, and maintenance.
- Floating booms shall be used to contain debris discharged into waters and any debris shall be removed as soon as possible, and no later than the end of each workday.
- Machinery or construction materials not essential for project improvements shall not be allowed at any time in the intertidal zone. The construction contracts shall be responsible for checking daily tide and current reports.
- The Port shall have a spill contingency plan for hazardous waste spills into the San Francisco Bay. The plan shall include floating booms and absorbent materials to recover hazardous wastes. Non-buoyant debris discharged into waters shall be recovered (by divers) as soon as possible after discharge.
- To reduce potential impacts from noise due to pile-driving, the project shall implement one or more of the following as needed:
- Use vibratory methods for installation of steel piles to the extent practicable
- Use cushion blocks between hammer and piles
- Implement a “soft start” technique
- Operate only a single impact hammer at a time and during impact duration for 36-inch steel or 20-inch concrete a sound attenuation method shall be implemented.
- Utilize biological monitors and monitoring efforts as per conditions through the formal consultation process with the National Marine Fisheries Service (NMFS) and the California Department of Fish and Wildlife (CDFW).

Project Maintenance

Ferry Landing

Ferry Landing maintenance, including future maintenance dredging, would be the responsibility of the primary operator, currently proposed to be WETA. During future operations, maintenance dredging would be conducted as needed at the Ferry Landing to ensure continued vessel access. All maintenance dredging operations would take place during the approved work windows set forth by the appropriate regulatory agencies. Based on calculated average sedimentation rates, maintenance dredging at the Ferry Landing is expected to be required approximately every 7 to 14 years in order to maintain a safe navigational depth. An estimated 56,929 cy of dredging would be required to maintain project depths and an additional 25,555 cy of allowable over-depth would also be required, for a total of approximately 82,484 cy (or roughly two-thirds of the initial project construction dredging volume). This maintenance dredging estimate is based upon a minimum allowable water depth of -10 feet MLLW (or a maximum tolerance of approximately 5 feet of sedimentation with a periodic return to -15 feet MLLW).

The float would be dry-docked on a 10-year cycle for regular maintenance. The canopy and gangway would be rehabilitated on the same cycle. Maintenance may also include repairs and/or replacement of a number of piles, as needed. Maintenance activities such as dredging and structural repairs and/or replacements would follow the same methods as utilized for initial construction, including applying the same construction BMPs and avoidance and minimization measures described above, and would utilize the same equipment as utilized for initial construction.

Water Taxi Landing

Water Taxi Landing maintenance, including maintenance dredging, would be the responsibility of the Port. During future operations, maintenance dredging would be conducted as needed at the Water Taxi Landing to ensure continued vessel access. All maintenance dredging operations would take place during the approved work windows set forth by the appropriate regulatory agencies. Based on calculated average sedimentation rates, maintenance dredging at the Water Taxi Landing is expected to be required approximately every 7 to 10 years. An estimated 1,535 cy of dredging would be required to maintain project depths and an additional 781 cy of allowable over-depth would also be required, for a total of approximately 2,316 cy (roughly two-thirds of the initial project construction dredging volume). This maintenance dredging estimate is based upon a minimum allowable water depth of -6 feet MLLW (or a maximum tolerance of approximately 2 feet of sedimentation with a periodic return to -8 feet MLLW).

The float would be maintained (with no dry docking needed) on a 10-year cycle. Typical repairs would consist of replacing bumper, UHMW sliding pads, and minor concrete spalls/cracks. The gangway and piles would be inspected and rehabilitated on the same cycle. Maintenance activities such as dredging and structural repairs and/or replacements would follow the same methods as utilized for initial construction, including applying the same construction BMPs and avoidance and minimization measures (below), and would utilize the same equipment as utilized for initial construction.

Project Approvals

The Port anticipates the proposed activities would be authorized through the regulatory permits and resource agency authorizations, as outlined below.

Port/City and County of San Francisco

- Construction permits, including but not limited to Building Permit, Encroachment Permit, Boring Permit, and Grading Permit.
- Approval of WETA's long-term lease for operation and maintenance of new Ferry Landing facilities.
- Potential approval of Muni transit stop.

San Francisco Bay Regional Water Quality Control Board (RWQCB)

- Clean Water Act Section 401 water quality certification for placement of fill into waters of the United States, for approval of dredging and sediment capping.

U.S. Army Corps of Engineers (USACE)

- The USACE is the federal lead agency. NEPA documentation for the project, and appropriate supporting documents, would be submitted and/or prepared for the USACE.
- Clean Water Act Section 404 and Rivers and Harbors Act Section 10 Individual Permit for placement of fill into waters of the United States, for structures and work in navigable waters, for approval of dredging and sediment capping.
- 404(b)(1) Alternatives Analysis, in support of USACE requirements for the project's proposed discharge fill in the form of dredged sediments, and piles, per RWQCB policy.

U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and California Department of Fish and Wildlife (CDFW)

- An Endangered Species and Essential Fish Habitat Biological Assessment and an Incidental Harassment Authorization permit application have been submitted for consultation with NMFS (under the Marine Mammal Protection Act, Endangered Species Act Section 7 and Essential Fish Habitat), USFWS and CDFW (California Endangered Species Act, Incidental Take Permit).

San Francisco Bay Conservation and Development Commission (BCDC)

- Major Permit and Federal Consistency Certification, including BCDC Design Review Board review.

Dredge Material Management Office (DMMO)

- Dredge materials disposal suitability determination and authorization of Dredge Operation Plan

B. PROJECT SETTING

The project site is located within the Mission Bay neighborhood, in the southeastern region of the City. The project would be positioned on San Francisco Bay within the Port's Southern Waterfront in the Mission Bay/ Central Waterfront area. The site is bounded by Terry A. Francois Boulevard to the west, the Central Basin of San Francisco Bay to the east, the Mission Rock Resort restaurant to the south, and the future Bayfront Park to the north. The proposed project site overlaps with the existing Agua Vista Park, an approximately 500-foot linear park along the shoreline. The landside portion of the project site is relatively flat and slopes gently towards the shoreline. It is characterized by a combination of paved areas (including the temporary Bay Trail), ruderal/disturbed vegetation, and rip-rap protected shoreline (completed as part of the Mission Bay Shoreline Protection Project in 2011). Adjacent land uses include a mix of parkland and commercial uses. In general, the architecture of the area is characterized by a mix of modern and industrial styles of buildings. The project site is not within an area plan of the San Francisco General Plan. The project site is located within the South Beach/China Basin Waterfront Subarea of the Port of San Francisco's Waterfront Land Use Plan.

The project site is adjacent to the Mission Bay South Redevelopment Plan Area. Until 1998, land use in the Mission Bay area included primarily low-intensity industrial development and vacant land. Since the adoption of the Mission Bay North and South Plans in 1998, Mission Bay has undergone redevelopment, featuring a mixture of residential, commercial (light industrial, research and development, labs and offices), retail, and educational/institutional uses and open space. In recent years, Mission Bay has become one of the fastest growing neighborhoods in San Francisco. Approximately 5,296 housing units have been constructed in Mission Bay, and around 493 additional units are planned for construction. These residential areas of Mission Bay are within walking distance of the project site.

The proposed Ferry and Water Taxi Landings would be within a short walking distance to the future Chase Center, the UCSF Mission Bay Campus and Medical Center, and the surrounding neighborhood. The Chase Center mixed use space is northwest of the project site, across Terry A. Francois Boulevard. Directly west of the project site is a six-story office building located at 409/499 Illinois Street which houses biotech/high tech companies. One block further south of this building is another recently constructed six-story office building with both biotech and UCSF clinical uses. One block north of the Chase Center is a vacant lot planned for the development of office space. A six –story parking garage and six-story office building that is home to the Old Navy corporate headquarters is located approximately a block and a half north of the project site. The UCSF campus which includes student housing, parking structures, the Helen Diller Family Cancer Research Building, Betty Irene Moore Women's Hospital, Bakar Cancer Hospital, Ron Conway Gateway Medical Building and Benioff Children's Hospital is generally located to the west and southwest of the project site, across Third Street.

The Mission Bay neighborhood includes a multitude of open spaces many of which are in proximity to the project site. Constructed in the 1970's, Agua Vista Park includes minimal amenities such as a fishing pier, concrete picnic tables, outdoor lighting, bike racks and a shoreline trail. Bayfront Park, which is undergoing final design, is located immediately to the north of the proposed site of the Ferry Landing. Once Bayfront Park is completed, the park would include a large public plaza and space for active and passive recreation near the bay as well as the continuation of the Bay Trail and access to the Port's Pier 52 boat launch. Other parks in the project vicinity include the future Crane Cove Park, approximately 0.2 mile southwest of the project site; Mariposa Park, approximately 0.3 mile southwest of the project site; Mission Bay Commons Park, approximately 0.4 mile northwest of the project site; and the Mission Creek Parks, approximately 0.7 mile northwest of the project site.

Interstate 280 is located approximately 0.4 mile west of the project site. The landings would be one block from Muni's T-Third light rail line. Additionally, multiple Muni routes such as 22, 48, and 55 are within a short walking distance to the project site. While the proposed site does not lie within a historic or special use district, the Pier 70 Special Use District is located approximately 0.4 mile southeast of the proposed landings. The Port is currently in the process of re-activating the Pier 70 shipyard and dry-dock operations. The facility consists of two floating dry docks and two piers. Further south of the project site is the planned Pier 70 mixed use development project.

Cumulative Setting

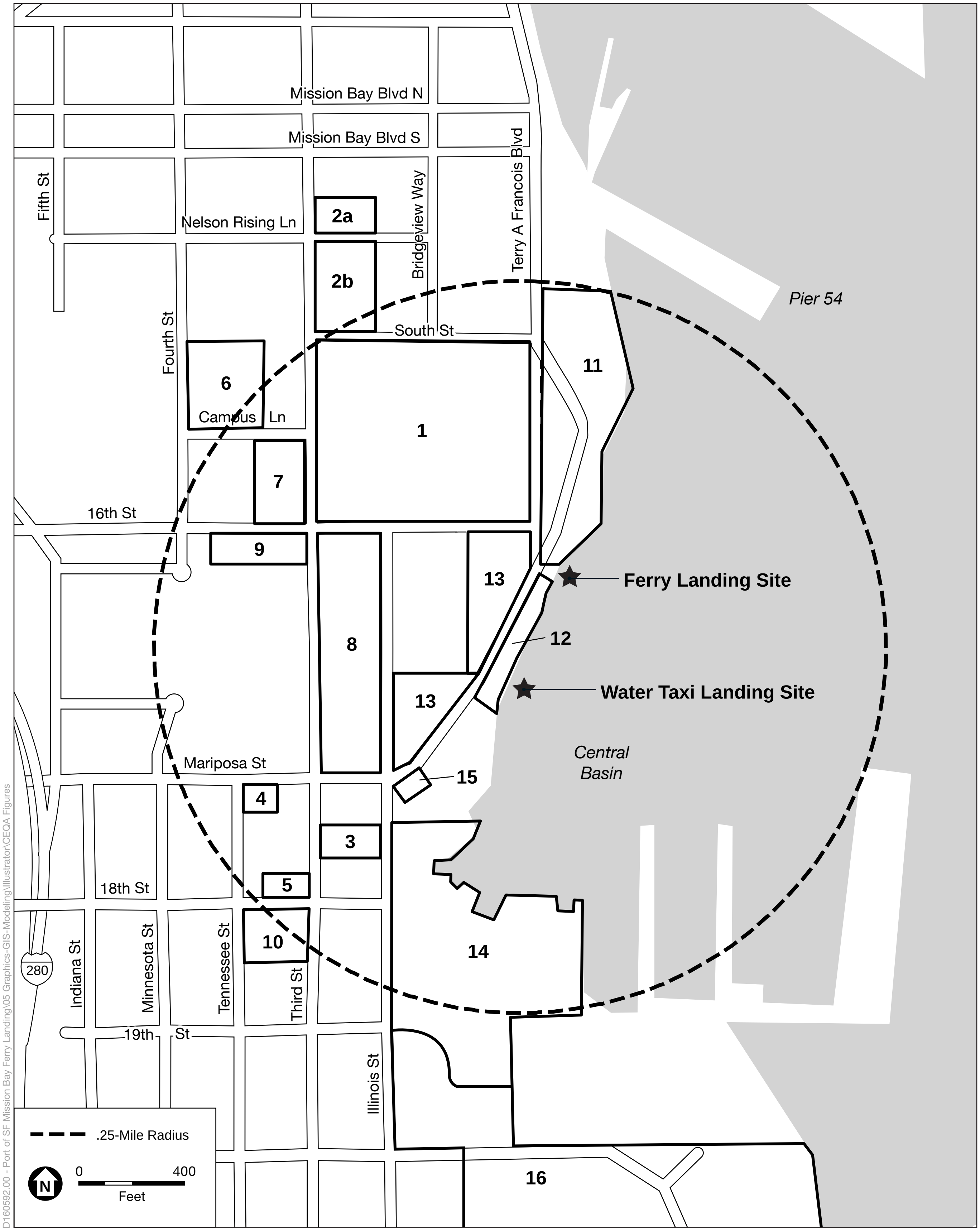
Past, present and reasonably foreseeable cumulative development projects within a ¼-mile radius of the project site are listed below in **Table 5: Cumulative Projects Within a ¼-Mile Radius of the Project Site** and mapped on **Figure 12**. These cumulative projects are either under construction or the subject of an Environmental Evaluation Application currently on file with the Planning Department.

TABLE 5
CUMULATIVE PROJECTS WITHIN A ¼-MILE RADIUS OF THE PROJECT SITE

	Address	Case File No.	Dwelling Units	Office / Mixed Use (gsf)	Academic / Hospital (gsf)	Park / Recreation (acres)
1	Golden State Warriors Event Center and Mixed-Use Development at Mission Bay Blocks 29-32 (Chase Center)	2014.1441E		1,955,000		
2	Mission Bay Blocks 26 & 27	2008.0850OFA-02		431,975		
3	650 Illinois, 2051 Third Street & 2065 Third Street	2010-0726E	97			
4	595 Mariposa Street	2014.1579E	20			
5	600 18th Street	2014.0168E	19	3,065		
6	UCSF Block 23A (Weill Institute for Neurosciences)				274,000	
7	UCSF Block 25B (research bldg.)				323,000	
8	UCSF Blocks 33 & 34 (office/research/clinical bldg. & parking)				500,000	
9	UCSF Block 36 (Precision Cancer Medicine)				179,650	
10	UCSF Child, Teen, and Family Center & Department of Psychiatry Building (2130 Third Street)				170,000	
11	Bayfront Park					5.5
12	Agua Vista Park					0.46
13	Mission Bay Parks, Blocks P23 & P24					1.89
14	Crane Cove Park	2015-001314ENV				11
15	Mariposa Pump Station and Force Main Improvements	2017-000818ENV				
16	1) Pier 70 Mixed-Use District Project 2) Illinois and 20th Streets/Pier 70 ("20th Street Historic Core")	2014-001272ENV 2016-000346ENV	3,025 --	2,749,300 340,000		9 --
Totals			33,161	55,479,340	1,466,650	2727.85

NOTE: No. 16) Pier 70 Mixed-Use District Project presents "Maximum Residential Scenario" for dwelling units and "Maximum Commercial Scenario" for office/mixed use gsf.

SOURCE: San Francisco Planning Department Property Information Database and Active Permits in My Neighborhood Map. Available online at http://propertymap.sfplanning.org/, accessed November 13, 2017; Port of San Francisco, sfport.com; UCSF, campusplanning.ucsf.edu.



SOURCE: San Francisco GIS and UCSF; ESA, 2017

Mission Bay Ferry Landing and Water Taxi Landing Project

Figure 12
Cumulative Projects

ESA

As shown in Table 5, there may be up to 136 dwelling units, 2,390,040 gross square feet (gsf) of office/mixed-use space, and 1,466,650 gsf of academic/hospital space developed within a ¼-mile radius of the project site.

In addition to the cumulative development and infrastructure projects identified in Table 5, the following transportation projects are also considered part of the cumulative setting:

- **Realignment of Terry A. Francois Boulevard.** The realignment of Terry A. Francois Boulevard between South Street and 16th Street is estimated to be completed in 2018. This realignment will create a regular block shape for Blocks 30 and 32 in order to maximize the size of Bayfront Park. Proposed improvements include installation of a two-way, protected bicycle lane ("cycle track") on the east side of the street.

- **Relocation of Muni UCSF/ Mission Bay Platform (Chase Center).** The UCSF/Mission Bay platform located on Third Street will be relocated one block south of its existing location. The size of the platform will be increased in order to accommodate event crowds and pedestrians.

- **Chase Center Transportation Network Improvements.** The Chase Center project will include a variety of transportation network and circulation improvements. These changes include the reconfiguration of South Street, 16th Street, and Terry A. Francois Boulevard; conversion of many all-way stop-controlled intersections to signaled intersections; and bicycle and pedestrian network improvements. South Street would be converted to one lane each way with the addition of on-street, permitted parking on both sides of the street. 16th Street will be rebuilt and extended to the realigned Terry A. Francois Boulevard. The turning lane designations along 16th Street will be reconfigured to accommodate a turn-only lane into the Chase Center garage. Sidewalks will be constructed and widened and five new crosswalks will be installed in order to improve pedestrian networks in the project vicinity. Additionally, the Mission Bay Shuttle Program will be expanded and the San Francisco Municipal Transportation Agency (SFMTA) will develop a special event service plan for the Chase Center.

- **16th Street Improvement Project.** SFMTA is planning transit priority and pedestrian safety improvements for the 22 Fillmore route along 16th Street between Church and Third streets (formerly known as the 22 Fillmore Transit Priority Project). This project will include transit-only lanes, transit bulbs and islands, new traffic signals and a number of pedestrian safety upgrades such as sidewalk widening. The project will also integrate infrastructure updates along 16th Street including repaving, utility work, and an extension of the Overhead Contact System from Kansas Street to Third Street to allow for zero-emission transit service into Mission Bay. In the segment between Third and Seventh streets, side-running transit-only lanes will be implemented on 16th Street by converting a mixed-flow lane to a transit-only lane. West of Seventh Street, the transit-only lane will be side-running in the westbound direction, and center-running in the eastbound direction. Initial transit enhancements on 16th Street between Potrero Avenue and Fourth Street were implemented in fall 2017. The first phase of construction (replace underground utilities, upgrade traffic signals, repave the street, improve pedestrian safety, and plant trees) is scheduled to start in the spring 2018. Construction of the project is expected to be completed by January 2020.

- **Mission Bay Loop.** Located within the Central Waterfront area on the blocks of 18th, Illinois, and 19th streets, the project is a component of the T Third Street line and Central Subway projects. This project would allow trains to turn around for special events and to accommodate additional service between Mission Bay and the Market Street Muni Metro during peak periods.

- **Central Subway Project.** This project is the second phase of the Third Street light rail line (i.e., T Third), which opened in 2007. Construction is currently underway, and the Central Subway will extend the T Third light rail line northward from its current terminus at Fourth and King streets to a surface station south of Bryant Street and go underground at a portal under U.S. 101. From there it will continue north to stations at Moscone Center, Union Square—where it will provide passenger connections to other Muni light rail lines and BART at the Powell station — and in Chinatown, where the line will terminate at Stockton and Clay streets. Revenue service on the Central Subway is scheduled for 2019. With initiation of service on the Central Subway, the number of light rail vehicles per train on the T Third will increase from one to two.

- **Muni Forward.** The Muni Forward program includes a series of improvements to the Muni network in order to increase the frequency of services, simplify the network, and make network navigation easier for customers. These improvements include frequency increases for impacted routes, vehicle changes, extended hours for high demand commute routes, improved bus shelters, and changes to route names and numbers. Improvements that have been implemented in the project area include increasing the frequency of the K/T Muni Metro service and adding a new bus route (55 16th Street) between Mission Bay and the 16th Street BART station. Future changes include shifting the 22 Fillmore and 10 Townsend routes to Mission Bay.
- **WETA Downtown San Francisco Ferry Terminal Expansion Project.** The goal of this project is to increase capacity for current and future passengers and improve amenities surrounding the current downtown ferry terminal. Improvements and construction will take place in the Ferry Building's south basin and will include the construction of two new ferry gates and the reconstruction of existing Gate E. The project will also include beautification and construction of weather canopies, a new plaza area, and extended promenades. This project is expected to be completed in 2019.
- **WETA Richmond Ferry Terminal Project.** This project is located at the southern point of Ford Peninsula, adjacent to the Ford Building. This project would replace an existing ferry terminal and would include a gangway, ramping system, and passenger float. Plans for the ferry terminal include minor reconfigurations and improvements of the existing parking lot and nearby waterfront trails as well as improvements to existing facilities in Sheridan Point Park.
- **WETA Central Bay Operations & Maintenance Facility.** Located near Pier 3 of the Naval Air Station Base Realignment and Closure Area known as Alameda Point, this project would include the development of 1 acre of landside property and 1/3 acre within San Francisco Bay. This facility will serve as the future home of the WETA Central San Francisco Bay ferry fleet. Additionally, the facility will include an Operations Control Center for service dispatch and an Emergency Operations Center which will serve as a primary location for the coordination of emergency transportation service in the event of a regional disaster or transportation disruption.

C. COMPATIBILITY WITH EXISTING ZONING AND PLANS

	Applicable	*Not Applicable*
Discuss any variances, special authorizations, or changes proposed to the Planning Code or Zoning Map, if applicable.	☒	☐
Discuss any conflicts with any adopted plans and goals of the City or Region, if applicable.	☒	☐
Discuss any approvals and/or permits from City departments other than the Planning Department or the Department of Building Inspection, or from Regional, State, or Federal Agencies.	☒	☐

San Francisco Planning Code

The Planning Code, which incorporates by reference the City's Zoning Maps, governs permitted uses, densities, and the configuration of buildings in San Francisco. Permits to construct new buildings (or to alter or demolish existing ones) may not be issued unless either the proposed action conforms to the Planning Code, or an exception is granted pursuant to provisions of the Planning Code.

Plans and Policies

San Francisco General Plan

In addition to the Planning Code, the project site is subject to the San Francisco General Plan. The general plan provides general policies and objectives to guide land use decisions. The general plan contains 10 elements (Commerce and Industry, Recreation and Open Space, Housing, Community Facilities, Urban Design, Environmental Protection, Transportation, Air Quality, Community Safety, and Arts) that set forth goals, policies, and objectives for the physical development of the city. In addition, the general plan includes area plans that outline goals and objectives for specific geographic planning areas. The project site is not within the boundaries of any of these area plans.

A conflict between a proposed project and a general plan policy does not, in itself, indicate a significant effect on the environment within the context of the California Environmental Quality Act (CEQA). Any physical environmental impacts that could result from such conflicts are analyzed in this Initial Study. In general, potential conflicts with the general plan are considered by the decisions-makers (normally the Planning Commission) independently of the environmental review process. Thus, in addition to considering inconsistencies that affect environmental issues, the Planning Commission considers other potential inconsistencies with the general plan, independently of the environmental review process, as part of the decision to approve or disapprove a proposed project. Any potential conflict not identified in this environmental document would be considered in that context and would not alter the physical environmental effects of the proposed project that are analyzed in this Initial Study.

The general plan elements that relate to the unique characteristics and considerations of the proposed project are discussed below.

Commerce and Industry Element. According to the general plan, "the Commerce and Industry Element sets forth objectives and policies that address the broad range of economic activities, facilities, and support systems that constitute San Francisco's employment and service base."[12] The element calls for managing economic growth to ensure enhancement of the total city environment, maintaining a diverse economic base, and providing employment opportunities for city residents. Relevant objectives and policies include:

Objective 5 – Realize San Francisco's full maritime potential.

Policy 4.7 – Improve public and private transportation to and from industrial areas.

Policy 5.8 – Encourage maritime activity which complements visitor activity and resident recreation.

12 San Francisco Planning, General Plan, published 1996, (Accessed 10/16/17) http://generalplan.sfplanning.org/I2_Commerce_and_Industry.htm

The proposed project would not obviously or substantially conflict with the Commerce and Industry Element.

Transportation Element. The Transportation Element comprises sections relating to General Transportation, Regional Transportation, Congestion Management, Vehicle Circulation, Transit, Pedestrians, Bicycles, Citywide Parking and Goods Movement. Each section consists of objectives and policies regarding a particular segment of the master transportation system and related maps which describe key physical aspects. The element specifically calls for the City to provide for a balanced, multi-modal transportation system that is consistent with planned land use. In Policy 22.5, it states that the City shall "facilitate and continue ferries and other forms of water-based transportation as an alternative mode of transit between San Francisco and other communities along the Bay, and between points along the waterfront within San Francisco." The proposed project would not obviously or substantially conflict with the Transportation Element.

Recreation and Open Space Element. The Recreation and Open Space Element (ROSE) indicates that the area surrounding the project site and vicinity has a "lesser need" for open space acquisition and renovation. This is due to the inclusion of proposed open spaces in the Mission Bay area, as well as the relatively low residential population compared to other areas of the City. The element specifically delineates Bayfront Park, east of the project site, as a "proposed open space," and it designates Terry A. François Boulevard as a "green connection." The proposed project would not obviously or substantially conflict with the ROSE.

Urban Design Element. As described in the general plan, the Urban Design Element relates to the physical character and order of the city, and the relationship between people and their environment. The element is organized into principles to guide urban design in private and public realms. Relevant principles include:

- Low buildings along the waterfront contribute to the gradual tapering of height from hilltops to water that is characteristic of San Francisco and allows views of the Ocean and the Bay.
- Waterfront development that maximizes the interface between land and water increases the opportunities for public access to the water's edge.

Waterfront Land Use Plan

The Waterfront Land Use Plan is a land use policy document governing property under the jurisdiction of the Port of San Francisco, generally from Fisherman's Wharf to India Basin. This plan is the product of an intensive, six-year public planning process conducted primarily by the Waterfront Plan Advisory Board. The project falls under the South Beach/China Basin Waterfront Subarea, and is called Pier 64½ in the plan documents. The plan sets forth objectives, acceptable land uses, and development standards for the area in which the project is located. Acceptable land uses[13] in the project document identified include: Recreational Boating and Water Use, Open Space, Public Access, and Retail. The project would comply

13 Port of San Francisco, 1998. Waterfront Land Use Plan. http://sfport.com/sites/default/files/FileCenter/Documents/4651-j1%20-%20sb%20cb%20land%20use%20table.pdf.

with these land uses as it is a Water Use site with Open Space and Public Access elements. As of November 2017, the plan was being updated through a public process directed by the Waterfront Plan Working Group. Relevant policies and recommendations from the existing plan and the update process are listed below.

Water Transportation. Continue existing, and promote new and expanded, ferry, excursion boat and water-taxi operations, including new berths and landing facilities, if necessary.

Update to Water Transportation[14] Increase ferry and water taxi ridership.

Update to Emergency Preparation Planning, Training and Mitigation. Improve the Port's ability to facilitate evacuations by strengthening the structures and improving the capacity and flexibility of existing ferry, water-taxi, and other vessel landing facilities and protecting access to them.

Regional Plans and Policies

The principal regional planning documents and the agencies that guide planning in the nine-county Bay Area are: Plan Bay Area, the region's first Sustainable Communities Strategy, developed in accordance with Senate Bill 375 and adopted jointly by the Association of Bay Area Governments (ABAG) and the Metropolitan Transportation Commission (MTC); the Bay Area Air Quality Management District (BAAQMD)'s 2017 Clean Air Plan: "Spare the Air, Cool the Climate"; the San Francisco Regional Water Quality Control Board's San Francisco Basin Plan; and the San Francisco Bay Plan, adopted by the San Francisco Bay Conservation and Development Commission (BCDC). Due to the relatively small size and infill nature of the proposed project, there would be no anticipated conflicts with regional plans. Plans with specific applicability to the project are described in more detail below.

San Francisco Bay Area Water Emergency Transportation Authority (WETA) 2016 Strategic Plan[15]

WETA recently adopted its Strategic Plan in 2016. Several of its goals include expanding ferry service to meet San Francisco Bay Area transportation and emergency response needs and to reach out to all populations in developing and operating services in order to reduce barriers to ferry ridership and to serve the larger Bay Area community. The project would help further these goals by providing new regional service to the Southern Waterfront neighborhood.

San Francisco Bay Area Seaport Plan

The San Francisco Bay Area Seaport Plan (Seaport Plan) is a joint regional policy document of BCDC and the Metropolitan Transportation Commission (MTC). The Seaport Plan constitutes the maritime element of MTC's Regional Transportation Plan, and is incorporated into BCDC's Bay Plan, where it is the basis of the Bay Plan port policies. The overarching purpose of the plan is to enhance economic activity while protecting the environment, making efficient use of all resources, and coordinating development. The

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14 Port of San Francisco, 2017, Waterfront Land Use Plan Update, Part 2 Summary Report-Working Group Subcommittee Recommendations. http://sfport.com/sites/default/files/Planning/WLUP%20Documents/9.11.17%20Waterfront%20Update%20Part%202%20Summary%20Report.pdf.

15 San Francisco Bay Area WETA, *2016 Strategic Plan*, 2016.

plan designates several ports on San Francisco Bay as port priority use areas, reserved for regional maritime port use. The project site is not located in a priority use area for the Port.

San Francisco Waterfront Special Area Plan

The San Francisco Waterfront Special Area Plan is a joint policy document of BCDC and the Port of San Francisco. The Special Area Plan applies the requirements of BCDC's McAteer-Petris Act and the provisions of the San Francisco Bay Plan to the San Francisco waterfront in greater detail. The project site is located within the Central Basin area of the San Francisco waterfront designated in the plan and new or replacement fill for public recreation/open space/public access, marina, and maritime uses are permitted uses.

Public Access Design Guidelines for the San Francisco Bay

The Public Access Design Guidelines for the San Francisco Bay, developed by BCDC, provide voluntary design standards for site planning to create attractive and usable public access areas. The design principles presented in the guidelines are aimed at enhancing shoreline access while providing for the protection of Bay resources, regional livability, and local economic prosperity. These guidelines were developed to be used by the BCDC Design Review Board, development teams, the public, and other public agencies. The Public Access Design Guidelines are advisory; however, they have been adopted by BCDC and are based on the San Francisco Bay Plan policies.[16]

San Francisco Bay Trail Plan

The Bay Trail Plan was prepared by the Association of Bay Area Governments (ABAG) pursuant to Senate Bill 100, which mandated that the Bay Trail provide connection to existing parks and recreation facilities, create links to existing and proposed transportation facilities, and avoid adverse effects on environmentally sensitive areas. The Bay Trail Plan proposes a 400-mile recreational "ring around the Bay." The Bay Trail's purpose is to create connections between more than 130 parks and publicly accessible open space areas around San Francisco and San Pablo Bays. Furthermore, the Bay Trail would provide access to a wide array of commercial ferries and public boat launches. The San Francisco Bay Trail Design Guidelines and Toolkit was developed to create a set of design principles that would guide the development and management of the San Francisco Bay Trail. These guidelines are intended to be complementary to the Public Access Design Guidelines developed by BCDC and share similar goals of protecting Bay resources, regional livability and local economic prosperity.[17] Bay Trail policies and design guidelines are intended to complement the adopted regulations and guidelines of local managing agencies. Relevant trail alignment policies include connections of the Bay Trail to other local and regional trail and bikeway systems to provide alternatives to automobile access to the Bay Trail. Bay Trail policies encourage access to the trail by all forms of public transit.[18]

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16 BCDC, 2005. Shoreline Spaces, Public Access Design Guidelines for the San Francisco Bay. http://www.bcdc.ca.gov/planning/reports/ShorelineSpacesPublicAccessDesignGuidelinesForSFBay_Apr2005.pdf

17 San Francisco Bay Trail, 2016. San Francisco Bay Trail Design Guidelines and Toolkit. http://baytrail.org/pdfs/BayTrailDGTK_082616_Web.pdf

18 ABAG, 2015, http://baytrail.org/wp-content/uploads/2015/12/San-Francisco-Bay-Trail_-Bay-Trail-Plan-Summary.pdf

In summary, the project would not obviously or substantially conflict with any environmental plan or policy adopted for the purpose of avoiding an environmental effect.

D. SUMMARY OF ENVIRONMENTAL EFFECTS

The proposed project could potentially affect the environmental factor(s) checked below, for which mitigation measures would be required to reduce potentially significant impacts to less than significant. The following pages present a more detailed checklist and discussion of each environmental factor.

- ☐ Land Use
- ☐ Aesthetics
- ☐ Population and Housing
- ☒ Cultural Resources
- ☐ Transportation and Circulation
- ☐ Noise
- ☐ Air Quality
- ☐ Greenhouse Gas Emissions
- ☐ Wind and Shadow
- ☐ Recreation
- ☐ Utilities and Service Systems
- ☐ Public Services
- ☒ Biological Resources
- ☐ Geology and Soils
- ☐ Hydrology and Water Quality
- ☐ Hazards/Hazardous Materials
- ☐ Mineral/Energy Resources
- ☐ Agricultural/Forest Resources
- ☐ Mandatory Findings of Significance

E. EVALUATION OF ENVIRONMENTAL EFFECTS

All items on the Initial Study Checklist that have been checked "Less than Significant with Mitigation Incorporated," "Less than Significant Impact," "No Impact" or "Not Applicable" indicate that, upon evaluation, staff has determined that the proposed project could not have a significant adverse environmental effect relating to that topic. A discussion is included for those issues checked "Less than Significant with Mitigation Incorporated" and "Less than Significant Impact" and for most items checked with "No Impact" or "Not Applicable." For all of the items checked "Not Applicable" or "No Impact" without discussion, the conclusions regarding potential significant adverse environmental effects are based upon field observation, staff experience and expertise on similar projects, and/or standard reference material available within the Planning Department, such as the Department's Transportation Impact Analysis Guidelines for Environmental Review, or the California Natural Diversity Data Base and maps, published by the California Department of Fish and Wildlife. For each checklist item, the evaluation has considered the impacts of the proposed project both individually and cumulatively.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
1. LAND USE AND LAND USE PLANNING — Would the project:					
a) Physically divide an established community?	☐	☐	☐	☒	☐
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒	☐	☐
c) Have a substantial impact upon the existing character of the vicinity?	☐	☐	☒	☐	☐

The project site is located in the Mission Bay neighborhood, in the southeastern part of the City. The site is bounded by Terry A. Francois Boulevard to the west, the Central Basin of San Francisco Bay to the east, the Mission Rock Resort restaurant to the south, and the future Bayfront Park to the north. Agua Vista Park is immediately adjacent to the two main project elements and is an approximately 500-foot linear feature along the shoreline. The existing land uses include transportation, recreation, commercial, and residential.

Impact LU-1: The proposed project would not physically divide an established community. (No Impact)

The division of an established community would typically involve the construction of a physical barrier to neighborhood access, such as a new freeway, or the removal of a means of access, such as a bridge or a roadway. The proposed Ferry Landing would not physically divide an established community. The proposed project would entail construction of a 135-foot long single-float, two-berth Ferry Landing to provide regional ferry service, with an associated 108-foot pier, 26-foot connecting ramp, and 85-foot gangway and a separate 65-foot long single float, as well as a two-berth Water Taxi Landing including an associated 20-foot platform and 80-foot gangway. The project also includes waterfront public use improvements such as seating, landscaping treatment, and utilities connections including lighting, telecommunications, and potable water. The proposed project would be incorporated into the existing street configuration, and it would not alter the established street grid, permanently close any streets, or impede pedestrian or other travel through the neighborhood. Although portions of the sidewalks and Bay Trail adjacent to the project site would likely be closed or re-routed for periods of time during project construction, these closures would be temporary in nature and sidewalk access would be restored after project construction. The proposed project would not create a physical barrier to neighborhood access or remove an existing means of access, such as a bridge or roadway which would create an impediment to the passage of persons or vehicles. Accordingly, the proposed project would not disrupt or physically divide an established community. Therefore, the project would have no impact with respect to physically dividing an existing community.

Impact LU-2: The proposed project would not conflict with any applicable land use plans, policies or regulations of an agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating an environmental effect. (Less than Significant)

The proposed project is accounted for and is not in conflict with the San Francisco General Plan. The existing zoning is "Public" and is adjacent to areas zoned parkland and commercial.

The proposed project would not obviously or substantially conflict with applicable plans, policies, or regulations identified under Section C, Compatibility with Existing Zoning and Plans, such that an adverse physical change would result. In addition, the proposed project would not obviously or substantially conflict with any adopted regional environmental plan or policy that directly addresses environmental issues and/or contains targets or standards that must be met in order to preserve or improve characteristics of the city's physical environment. Therefore, the proposed project would have a less-than-significant impact in regard to conflicts with existing zoning and plans.

Impact LU-3: The proposed project would not have a substantial impact upon the existing character of the vicinity. (Less than Significant)

The proposed project would be constructed on an already developed site in an urban environment along a developed section of Bay shoreline. The proposed project's land uses would be compatible with the existing character of the buildings and land uses in the area.

Existing structures and land uses include nearby docks for transportation and recreation, low to mid-rise buildings for commercial and residential land uses, and a small linear park for public recreation and fishing (Agua Vista Park). The proposed project would not alter the general land use pattern of the immediate area and therefore would have no impact on the existing character of the vicinity.

Existing shoreline uses includes public recreation and fishing via Agua Vista Park and the Bay Trail adjacent to the site, a shoreline restaurant complex and a private boat repair facility south of the site. There is an existing fishing dock at Agua Vista Park and private boat docks in the project vicinity. The proposed project would add an additional shoreline use, the ferry landing. The proposed project would add a water-related shoreline use consistent with the existing character of other existing shoreline land uses in the vicinity. The height and massing of the proposed project also would be in keeping with the existing character of the urban fabric of the neighborhood and waterfront. Therefore, the proposed project would have a less-than-significant impact upon the existing character of the vicinity and no mitigation measures are necessary.

Impact C-LU-1: The proposed project would not make a considerable contribution to any cumulative significant land use impacts. (Less than Significant)

Cumulative development projects located within an approximate 0.25-mile radius of the project site are identified in Table 5 and mapped on Figure 12 (page 30). With the exception of the future Chase Center, Crane Cove Park, Pier 70 Mixed-Use District, and Bayfront Park, the cumulative development projects primarily include new medical buildings associated with the UCSF Mission Bay Campus and commercial buildings, including the Uber headquarters. These projects would result in the intensification of land uses in the project vicinity; however, they are infill projects that would not physically divide an established community by constructing a physical barrier to neighborhood access, such as a new freeway, or remove a means of access, such as a bridge or roadway. The transportation infrastructure projects in the project vicinity, such as the relocation of the K/T station and the Mission Bay Loop, would also not physically divide the community or remove a means of access to the neighborhood. In addition, the proposed project together with the other cumulative projects planned in the vicinity would not conflict with any applicable land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect. Although these development projects would introduce new infill residential, retail, office, sports, recreation, and medical uses in the project vicinity, these uses currently exist; therefore, the cumulative development projects would not introduce incompatible uses, such as manufacturing or industrial, that would adversely impact the existing character of the project vicinity. Thus, the proposed project, in combination with past, present, and reasonably foreseeable future projects, would not result in a considerable cumulative land use impact.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
2. AESTHETICS — Would the project:					
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☒	☐	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and other features of the built or natural environment which contribute to a scenic public setting?	☐	☐	☒	☐	☐
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☒	☐	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area or which would substantially impact other people or properties?	☐	☐	☒	☐	☐

The San Francisco waterfront defines the urban edge of the eastern and northern portions of the City of San Francisco. The project vicinity is characterized by smaller-scale commercial structures, mid-rise office buildings, and open spaces, such as Agua Vista Park. The overall character of the waterfront is generally characterized by bulkhead buildings and piers, with maritime and other uses, parking areas, and open spaces. The bulkhead buildings and piers are the primary visual elements along the waterfront. Their spacing is broken up by open spaces that invite public use and provide scenic views of San Francisco Bay. The buildings in the vicinity represent a mixture of modern and historic, industrial elements. Modern buildings and elements (e.g., 409/499 Illinois Street and Mission Rock Resort) contrast with historic industrial buildings and structures (e.g., Pier 70). The existing Agua Vista Park, and Bay Trail provide a recreational character element to the area, though the park-like features are not highly groomed and are adjacent to large undeveloped gravel areas. **Figure 13** shows two existing views (one to the southeast and one to the northeast) of the proposed Ferry Landing site, near an existing stormwater outfall with fencing. **Figure 14** shows two existing views, one of the proposed Ferry Landing site looking east towards the Pier 70 Shipyard Pier 2 Dry Dock, and one of the Water Taxi Landing site looking southeast along the shore.


View of Ferry Landing site, looking southeast


View of Ferry Landing site, looking northeast

SOURCE: ESA, 2017

Figure 13
Site Photos

View of Ferry Landing site, looking east

View of Water Taxi Landing site, looking southeast

SOURCE: ESA, 2017

Figure 14
Site Photos

ESA

Impact AE-1: The proposed project would not have a substantial adverse impact upon a scenic vista. (Less than Significant)

For the purpose of this analysis, a scenic vista is defined as a vantage point with a broad and expansive view of a significant landscape feature (e.g., a mountain range, lake, or coastline) or of a significant historic or architectural feature (e.g., views of a historic tower or building). A scenic vista is a location that offers a high quality, harmonious, and visually interesting view. Under this definition, scenic vistas in the vicinity of the project site include views of the San Francisco Bay from the Bay Trail and Agua Vista Park.

Scenic vistas of San Francisco Bay and its environs are visible from public vantage points in the vicinity of the project site, namely the Bay Trail and Agua Vista Park. Such views are also visible from the project site, as the Bay Trail crosses through the project site in a north-south direction.

As under existing conditions, the public would be able to enjoy the existing views from this area after construction of the proposed project. The proposed project would introduce a similar, but more prominent visual element in the project area which includes the following components: landings, gangways, passenger floats, ramps, and platforms for the new Ferry Landing and the Water Taxi Landing. The proposed project would be visible from the shoreline, though it would not adversely affect the existing views of the scenic vista and would adhere to BCDC Public Access Design Guidelines and ABAG Bay Trail Plan Design Guidelines, as discussed in Section C, Compatibility with Existing Zoning and Plans. **Figures 15 and 16** show visual simulations of the proposed Ferry Landing and part of the Bay Trail looking southeast and northeast, respectively. Views of the project site and vicinity are not considered scenic vistas as they are currently of a major road and office buildings.

The proposed Ferry Landing would be served by approximately 11 to 12 vessel trips during each a.m. and p.m. peak period, with approximately 4 vessel trips for special events. The vessels would be docked for an average of 5 to 7 minutes per landing. Approximately 10-15 water taxi trips would occur per day with more on days with special events. The remaining project features would be visible from the shoreline and would not significantly block views. Implementation of the proposed project would not result in the obstruction or degradation of existing scenic vistas. Thus, the proposed project would not result in substantial adverse effects on scenic vistas, and the impact would be less than significant.

Impact AE-2: The proposed project would not substantially damage scenic resources and other features of the built or natural environment which contribute to a scenic public setting. (Less than Significant)

No scenic resources would be damaged as a result of project construction or operation. The closest officially designated State Scenic Highways are Interstate 580, approximately 7.5 miles northeast, and State Route 280, approximately 8 miles southwest. As such, there are no scenic highways in the vicinity of the project site. In addition, due to distance and topography, no portion of the project site is visible from these highways. Therefore, no impacts related to scenic resources within a state scenic highway corridor would occur.

Other existing features which contribute to a scenic public setting in the vicinity include Agua Vista Park and the Bay Trail. Neither of these features would be altered nor would views of or access to them be permanently blocked by the project. Therefore, the project would have a less than significant impact regarding scenic resources or features that contribute to a scenic public setting.

View from Bay Trail, looking southeast

SOURCE: Surfacedesign Inc.; COWI

Mission Bay Ferry Landing and Water Taxi Landing Project

Figure 15
Visual Simulation of Ferry Landing

View from Future Ferry Landing Plaza, looking northeast

SOURCE: Surfacedesign Inc.; COWI

Mission Bay Ferry Landing and Water Taxi Landing Project

Figure 16
Visual Simulation of Ferry Landing

Impact AE-3: The proposed project would not substantially degrade the existing visual character or quality of the site. (Less than Significant)

For the purposes of this analysis, a substantial impact on existing visual character or quality would occur if the proposed project were to introduce a new visible element to the area that would be inconsistent with the overall quality, scale, and character of the surrounding development. The analysis considers the degree of contrast between existing and proposed features that represent that area's valued aesthetic image, in addition to the degree to which the proposed project would contribute to the area's aesthetic value. This analysis examines the changes in visual character and quality at the project site itself and how the proposed project would change existing visual character and quality as seen from surrounding areas.

Currently, the immediate area contains a mix of visual elements, including landscaped areas and non-landscaped gravel areas along the shoreline, two-story commercial buildings, and mid-rise commercial buildings, resulting in an incongruous visual character. Agua Vista Park, which sits between the two project elements, is a public park featuring a pathway adjacent to the Bay and a fishing pier. The park also has two pine trees and several four-to-ten-foot-tall shrubs, non-irrigated landscaping, benches, picnic tables, street lamps, and a partially-paved pathway. To the south of the park is the Mission Rock Resort restaurant featuring a deck with east-facing views over Central Basin, the portion of the Bay into which the project extends. To the west, on the opposite side of Terry A. Francois Boulevard, is an office complex with two multi-story buildings and a landscaped plaza with amphitheater steps facing the Bay.

The shoreline interface itself is low in visual character. Existing elements include a rock rip-rap-lined edge, the existing stormwater outfall structure, and the fishing pier extending into the Bay from the shoreline. This mix of industrial and recreational elements is not high in visual character.

The Central Basin has a historic maritime character, with historic industrial, new recreational, and modern maritime elements. In the immediate vicinity of the project, a wooden fishing pier extends into the Bay approximately 75 feet. To the south beyond the Mission Rock Resort is a private marina with seven boat docks, all between 90 to 120 feet long. To the southeast beyond the boat dock is the closed Pier 70 Shipyard, of which the most prominent visual feature is Pier 2, an approximately 70-foot-tall dry dock used to repair large ships. Also visible are other vertical industrial elements including cranes. To the north and east of the site are pieces of abandoned docks and Pier 64 in varying states of disrepair, spanning an area of approximately 600 feet. The most prominent pieces are about 150 feet long. Further north is Pier 54, a smaller industrial dock for small to mid-size boats, which houses the American Red Cross Annex, and Pier 50, a larger industrial dock which is used by large ships. All of these uses vary in scale and character, making the existing visual quality of the site feel industrial despite the adjacent presence of recreational elements.

The proposed project (including the Ferry Landing and Water Taxi Landing) would introduce new vertical (e.g., weather protection canopies) and horizontal elements (e.g., deck and pile structures) to the site. The proposed project would extend into San Francisco Bay as a linear visual element. The proposed project includes landings, gangways, and passenger floats, which would lay close to the water, thereby not obstructing existing views of San Francisco Bay and its environs. The ferry float would be visible from the shoreline, but because of the existing mix of shoreline character and low level of quality, it would not substantially degrade the existing visual character and quality of the area and would rather enhance it.

Vessels could be docked at the landing for certain periods of time (5 to 7 minutes during most arrivals/departures), temporarily blocking a minor portion of views immediately adjacent to the project site. However, the presence of a maritime vessel along the waterfront is consistent with the existing visual character and quality of the site. Numerous private boats are present in the docks to the south of the project site and large freight vessels frequently enter and leave the basin to the north and east of the project site. A ferry would be consistent with these existing uses and would not substantially alter the visual character of the area.

The Port would adhere to BCDC Public Access Design Guidelines and ABAG Bay Trail Plan Design Guidelines, as discussed in more detail in Section C, Compatibility with Existing Zoning and Plans. The purpose of the BCDC Public Access Design Guidelines is to provide the San Francisco Bay region with a design resource for development projects along the shoreline of San Francisco Bay. These guidelines provide suggestions for site planning, as well as recommendations for designing and developing attractive and usable public access areas. In addition, the Bay Trail Plan Design Guidelines include the minimum width, surface type, slope, and grading for proposed segments of the Bay Trail. The proposed project would comply with these guidelines in order to minimize visual impacts along the shoreline. This compliance with BCDC guidelines would reduce the degree of contrast between existing visual elements and the proposed project.

The project's new elements could contribute to improving the visual character of the site by adding an aesthetically appealing ferry facility. The ferry canopy has been designed with three principles in mind: welcoming, layering, and light, and draws inspiration from maritime and sailing cues and the Chase Center behind it. The project would not degrade the existing visual character of the site. Rather, the Ferry Landing could be thought of as an aesthetic "bridge" between the existing recreational and industrial elements in the project vicinity.

Though the project would add additional visual elements to the site, these new elements would be congruent with the existing mix of industrial and recreational qualities of the site. This would be ensured by adhering to the Public Access Design Guidelines in designing and constructing the site. The project would be reviewed by BCDC's Design Review Board for consistency with these guidelines and for adherence to its public access and visual policies. The construction and operation of the proposed project would be consistent with the existing character and quality of an active port and marina, resulting in a less-than-significant impact.

Impact AE-4: The proposed project would not create a new source of substantial light or glare which would adversely affect day or nighttime views. (Less than Significant)

Each facility would be designed with lighting fixtures that provide sufficient light for pedestrian safety and security. Up-lighting may be included to illuminate the canopy. Lighting for pedestrian circulation would be installed along the entrance and queuing areas, as well as the connecting ramp, pier, gangway, and float. The lighting would be similar in fixture size and light levels to what is currently in the Ferry

Building area. Outdoor lighting would be focused, directed, and shielded to avoid the production of glare, and minimize up-light and light spill. As feasible, fixtures would be located, aimed, or shielded to minimize stray light to or across property boundaries. Light design would incorporate down-cast, low glare, shields, or equivalent designs to minimize light and glare. Levels and types of light and glare would be consistent with the area, would not have an adverse impact on daytime or nighttime views in the area, and would not result in adverse effects to people or properties. The proposed project's potential to impact daytime or nighttime views in the area, or to substantially affect other people or properties as a result of light and glare, would be less than significant.

Impact C-AE-1: The proposed project, in combination with other past, present, and reasonably foreseeable projects, would not result in a significant cumulative impact related to aesthetics. (Less than Significant)

The geographic area of potential aesthetic and visual resource cumulative impacts is the area within the viewshed of the proposed project. The proposed project would introduce new visual elements that would affect the visual character of the project area and alter some scenic views of the Bay. The Port and BCDC's permitting and approval process would ensure the project's consistency with the Port and BCDC policies intended to protect aesthetics and public views along the waterfront. Most of the cumulative projects listed in Table 5 and shown on Figure 12 would not be in the same viewshed as the proposed project as they would be screened by the existing office and research buildings at 409/499 Illinois Street and the future Chase Center, which is scheduled for completion in late 2019. The Chase Center project includes a 135-foot tall arena and two 160-foot tall office/mixed use towers. The size, height, and character of the Chase Center could affect aesthetic and visual resources. The proposed project would not result in a cumulative impact to aesthetic and visual resources when evaluated along with the Chase Center; the proposed project would not significantly alter views of the area from nearby vantage points, such as from Potrero Hill or the waterfront, particularly when compared with the scale of change associated with the Chase Center. Additionally, though both projects would introduce new visual elements to the project area, the proposed project would not significantly affect the combined impact of the projects through new visual elements or change to the visual character of the project area. Proposed improvements to Agua Vista Park, Bayfront Park, Crane Cove Park, and Mission Bay Parks 23 and 24 would generally be low-profile and would not adversely affect views of or within the project area. These projects would remain consistent with the area use, and when combined with the proposed project, would not result in new or additional adverse effects on aesthetics or visual resources. The proposed project, in combination with other past, present, and reasonably foreseeable projects, would not contribute to a significant cumulative aesthetics impact.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
3. POPULATION AND HOUSING — Would the project:					
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☒	☐	☐
b) Displace substantial numbers of existing housing units or create demand for additional housing, necessitating the construction of replacement housing?	☐	☐	☐	☒	☐
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒	☐

Impact PH-1: The proposed project would not induce substantial population growth either directly or indirectly. (Less than Significant)

Construction and operation of the proposed Ferry Landing would bring water transit service to the project area that does not currently exist. However, implementation of the proposed project would not increase the number of employees to support maintenance and/or operational functions of the Ferry Landing or Water Taxi Landing.

The proposed project would not include housing at the project site. Passengers would pay for their fares with Clipper cards or on-board the vessels; therefore, staffed ticketing booths on land would not be included in the project. The proposed project would not result in new employees, and, therefore, would not result in population growth.

The proposed project would result in the increase of temporary construction employment (approximately 15 construction employees per day). Given the relatively common nature of the construction anticipated, the demand for construction employment would likely be met within the existing and future labor market in the Bay Area. If construction workers live outside of the Bay Area, then these workers would not be expected to be encouraged to relocate temporarily and would likely commute during the short construction period.

New job opportunities created by operation of the proposed project would likely be in the ferry industry including ferry operators, as well as on-board support for operation, passenger assistance, ticketing, and maintenance. However, existing ferry operators are not significant employers in the context of overall employment in the region and employees would not necessarily live in San Francisco. It is anticipated that a minimum crew of three would be needed to operate the vessel, similar to many other ferries in the Bay Area. However, these new employees would likely include people currently residing in the region and any job opportunities that are created as a result of the proposed project would be expected to occur incrementally.

Implementation of the proposed project and resulting new water transit services would not, in and of itself, require the expansion or construction of new infrastructure or public services that would result in indirect physical impacts. There could be an increase in population attributed to patrons of the water transit service but the potential new jobs on the vessel itself would be minimal. However, any population increases as a result of either of these would be insignificant compared to the number of people projected to move to the City and County of San Francisco, and the region in general. The population growth impacts of the project would be less than significant.

Impact PH-2: The proposed project would not displace a substantial number of existing housing units, people, or employees, or create demand for additional housing elsewhere. (No Impact)

No housing would be displaced as a result of implementation of the project. While housing may be constructed in the vicinity by other projects in response to market drivers and City policies, implementation of the proposed project would have no impact on the displacement of existing housing.

Impact PH-3: The proposed project would not displace substantial numbers of people, necessitating the construction of replacement housing elsewhere. (No Impact)

The proposed project would not require the relocation or displacement of substantial numbers of people from the adjacent businesses. As such, no replacement housing would be needed and no impact would occur.

Impact C-PH-1: The proposed project would not make a considerable contribution to any cumulative significant effects related to population or housing. (No Impact)

The proposed project would not contribute to cumulative growth-inducement impacts, because the project itself would not be growth-inducing. The project does not include any new home construction; therefore, it would not contribute to the expansion of existing housing resources, or the associated incremental increase in population. As the project would serve the needs of the existing regional population, rather than stimulate regional population growth, it would not contribute to cumulative growth-inducement effects.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
4. CULTURAL RESOURCES — Would the project:					
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5, including those resources listed in Article 10 or Article 11 of the San Francisco *Planning Code*?	☐	☐	☐	☒	☐
b) Cause a substantial adverse change in the significance of an archeological resource pursuant to §15064.5?	☐	☒	☐	☐	☐
c) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☒	☐	☐	☐
d) Cause a substantial adverse change in the significance of a tribal cultural resource as defined in Public Resources Code §21074?	☐	☒	☐	☐	☐

Impact CR-1: The proposed project would not result in a substantial adverse change in the significance of a historical resource as defined in §15064.5, including those resources listed in Article 10 or Article 11 of the San Francisco Planning Code. (No Impact)

CEQA Guidelines section 15064.5 requires the lead agency to consider the effects of a project on historical resources. A historical resource is defined as a building, structure, site, object, or district (including landscapes) listed in or determined to be eligible for listing in the California Register of Historical Resources (California Register), included in a local register or identified as significant in an historical resource survey, or determined by a lead agency to be significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, or cultural annals of California. The following discussion will focus on architectural resources. Archeological resources, including archeological resources that are potentially historical resources according to section 15064.5, are addressed below.

Background research was completed at the Northwest Information Center (NWIC) of the California Historical Resources Information System on September 12, 2017 (File No. 17-0805). The study area for the records search consisted of the project area and its surroundings within a 0.5-mile radius. Previous surveys, studies, and cultural resources records were reviewed. Records were also examined around the project area in the Historic Property Data File for the City and County of San Francisco, which contains information on locations of recognized historical significance, including those evaluated for listing in the National Register of Historic Places (National Register), the California Register, the California Inventory of Historic Resources, California Historic Landmarks, and California Points of Historical Interest. The purpose of the records search was to: 1) determine whether known cultural resources have been recorded within or adjacent to the project area; 2) assess the likelihood for unrecorded cultural resources to be present based on historical references and the distribution of nearby resources; and, 3) develop a context for the identification and evaluation of cultural resources.

The results of the background research indicate that the project area is adjacent to the Central Waterfront Historic District. The District encompasses approximately 500 acres bounded by Sixteenth Street to the north, Islais Creek to the south, U.S. Interstate 280 to the west, and the San Francisco Bay to the east. The area contains a concentration of mixed-use industrial properties, associated residential and commercial properties, and civic infrastructure oriented to water, railroad, and road transportation. The District was the epicenter of major industrial production beginning in the late 1850s, and continuing through the end of World War II. The District contains 26 contributory resources eligible for listing in the National Register under Criterion 1 (Events) for association with the industrial development of the City of San Francisco from 1872 to 1958.[19] There are no contributing buildings or structures within or adjacent to the project area and the proposed project would not have an impact on the significance of the District.

There are no architectural or structural resources in the project area that qualify as historical resources, as defined in CEQA Guidelines section 15064.5; therefore, the project would not impact historical resources and no mitigation is required.

[19] California Department of Parks and Recreation (DPR) District Record Form, *Central Waterfront*, prepared by Kelley & VerPlanck and Page & Turnbull, Inc., March, 2008.

Impact CR-2: The proposed project may result in a substantial adverse change in the significance of an archeological resource pursuant to §15064.5. (Less than Significant with Mitigation)

This section discusses archeological resources, both as historical resources according to section 15064.5, as well as unique archeological resources as defined in section 21083.2(g).

Based on the results of the background research complete at the NWIC (File No. 17-0805) there are no prehistoric or historical archeological resources in the project area or a 0.5-mile radius. The potential for encountering archeological resources is determined by several relevant factors including archeological sensitivity criteria and models, local geology, site history, and the extent of potential projects soils disturbance/modification, as well as any documented information on known archeological resources in the area. The San Francisco Planning Department completed a preliminary archeological review (PAR) for the proposed project.[20] The PAR determined that the proposed project has the potential to adversely affect legally-significant archeological resources. Recommendations included a review of the geotechnical cores (if preserved) and/or a geoarcheological coring program.

Geologic Analysis and the Potential for Prehistoric Resources

In October 2017, Geotechnical Consultants, Inc. (GTC) completed a Geotechnical Design Report for the proposed project.[21] As part of the study, GTC conducted a geotechnical field investigation consisting of two rotary wash borings using truck-mounted drilling equipment on land (B-1 and B-2), three rotary wash borings from a drilling barge in San Francisco Bay (B-3, B-4, and B-5), and marine geophysical surveys (SL-1a, SL-1b, SL-2a and SL-2b) through the collection of high resolution electrical resistivity data. Based on the results of the geotechnical borings, the near-surface geology local to the project area consists of Franciscan Complex bedrock overlain by Upper Layered Sediments, Young Bay Mud, and artificial fill. The Franciscan Complex bedrock consists of sandstone, shale, and serpentinite. The Upper Layered Sediments consists of 3 to 13 feet of dark gray and light brown silt with minor coarse angular gravels. Artificial fill ranging in thickness from 13 to 18.5 feet overlies a thin layer of Young Bay Mud that ranges from 0 to 5.5 feet thick.

On October 11, 2017, an ESA (environmental consultant) geoarcheologist examined curated geotechnical cores acquired during the geotechnical coring. The goal of the examination was to determine the presence or absence of cultural deposits and/or buried soil horizons within deposits identified by CCSF archeologists as potentially sensitive for containing cultural resources. These deposits included a "sand and shell lens" at the base of Young Bay Mud deposits in boring B-2 and "Upper Layered Sediments" identified below the Young Bay Mud in borings B-4 and B-5 that may have been terrestrial in origin.

Based on the examination of curated samples of Upper Layered Sediments from borings B-4 and B-5, the strata may represent a *subaerially-exposed*[22] terrestrial deposit prior to inundation by the sea level rise that

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20 San Francisco Planning Department, Environmental Planning, PAR Log 2017-008824ENV - Preliminary Archeological Review, Sally Morgan, September 27, 2107.

21 Geotechnical Consultants Inc., *Geotechnical Design Report Mission Bay Ferry Landing, San Francisco, California.* Prepared for COWI OLMM JV. October 2017.

22 A subaerial terrestrial deposit would have formed on the earth's surface, rather than underwater or underground.

created San Francisco Bay during the early-to-middle Holocene (ca. 11,800 to 4,500 B.P.). However, the unit does not represent an intact surface (*paleosol),* but rather the lower portions of a soil sequence (likely a B-horizon), the upper portion of which was eroded away, probably as the bay filled. These strata could not harbor cultural deposits because the upper strata where terrestrial deposits might have been exposed at the ground surface was not preserved in the sediments, but had eroded away. Additionally, subsurface topography indicates the presence of a steep rock slope underlying the deposit, that is unlikely to have been a settlement location for prehistoric inhabitants based on degree of slope.

Boring B-2 was located within the project area near the proposed onshore Ferry Landing pilings. The boring contained approximately 18.5 feet of modern artificial fill overlying 5.5 feet of Young Bay Mud resting on Franciscan Complex bedrock. The log for B-2 noted a sand and shell lens at the interface between Young Bay Mud and the underlying bedrock, which had been identified approximately 24 feet below ground surface (bgs) in cuttings brought up to the surface by the drill rig. While the sand and shell lens was not directly sampled, a sample taken from 20 to 23 feet bgs within the Young Bay Mud (1.5 feet above the lens) was examined for potential cultural materials. The sample contained numerous shells and shell fragments, as well as trace amounts of sand, in a thin, coarse-grained sediment deposit. The shells, likely the remains of the mollusk species *Macoma nasuta*, showed no signs of burning or other cultural modification. Given the abundance of unmodified mollusk shell identified in the Young Bay Mud deposits above the sand and shell lens noted in the core log, there is little evidence to suggest that the lens was cultural in origin. Further, a stratigraphic lens is generally less than a few inches thick, which suggests that the sand and shell lens was a naturally occurring deposit at the interface between Young Bay Mud and underlying bedrock, likely deposited in a nearshore environment as sea levels rose in San Francisco Bay. However, because a sample of the sand and shell lens was not preserved, the exact nature of the deposit sampled during geotechnical coring remained unclear. As shell may be the primary constituent of prehistoric archeological deposits in this shoreline environment, CCSF archeologists requested additional sampling and analysis of this sediment.

Due to the depth of the potentially sensitive stratum, geoarchaeological coring was the only practical extended survey method for making a presence/absence determination for potential buried cultural deposits. Coring was accomplished by extending four core samples (designated MBFL-1 to MBFL-4) with a truck-mounted Geoprobe 6600 hydraulic boring device. Two cores were placed at the locations of onshore pile driving and ground disturbance for the Ferry Landing and two for the Water Taxi Landing. Mechanical core sampling consisted of a drilling subcontractor advancing a 1.5-inch to 2-inch diameter core sample using a direct push coring device. The cores were transported to ESA’s laboratory and carefully examined for cultural materials and evidence of buried soil horizons, with samples from three cores additionally subjected to fine-mesh screening using a 1/16-inch screen.

General subsurface stratigraphy encountered during coring included an upper layer of historic fill consisting of gravel with sand, clay, concrete, and brick fragments to approximately 19–22 feet bgs. In core samples MBFL-1 and MBFL-2, Young Bay Mud deposits were observed below the fill to a depth of 22–24 feet bgs, where drilling encountered serpentinite bedrock. Trace sand and natural marine shell lenses were present throughout the Young Bay Mud stratum. In MBFL-3 Young Bay Mud was encountered from the base of the artificial fill to a depth of 24 feet bgs, where drilling encountered refusal owing to bedrock or a buried obstruction. In MBFL-4 Young Bay Mud was encountered below the fill to a depth of 39 feet bgs, where a layer of sandy clay with coarse sand and pebbles corresponding to the "Upper Layered Sediments" described by GTC (2017) was encountered to the depth of exploration at 44 feet bgs. Shell was not observed in the Young Bay Mud in these cores.

The screened portions of MBFL-1 and MBFL-2 contained Young Bay Mud with small, unmodified shell fragments and gravels above decomposed bedrock materials with no cultural materials or evidence of cultural modification. A creosote-laden wood fragment identified within the mud, sand and shell matrix in MBFL-1 suggests historic-era disturbance within the deposits. Poor recovery in MBFL-3 precluded screening, while the screened portion of MBFL-4 consisted of the upper 3 feet of the Upper Layered Sediments observed directly below the Young Bay Mud and did not contain shell deposits. These Upper Layer Sediment deposits consisted of weathered colluvium containing coarse sand and small pebbles with no evidence of soil development. No cultural materials were identified during screening.

Overall, no prehistoric cultural materials were observed during drilling or core examination. ESA archeologists did not observe any evidence of intact soil surfaces (paleosols) or prehistoric archeological materials in any of the recovered core samples.

Survey Analysis and the Potential for Submerged Historical Archeological Resources

Dredging such as is proposed for the project has the potential to impact submerged historical archeological resources, including shipwrecks. Project analyses included efforts to identify submerged historical archeological resources, which included background research, and review of multibeam bathymetric data collected to map the San Francisco Bay floor.

The earliest U.S. Coast Survey maps (1853, 1863, 1869, and 1883) show the project area as within the waters of the San Francisco Bay, just east of Point San Quentin/Point of Rocks at the southern end of Mission Bay. By 1899, landfilling of Mission Bay had increased. The western edge of the project area had been partially filled and piers had been constructed. Pier 64, where the project area is located, operated as a marine terminal for the transfer and storage of petroleum products. Four oil companies and their corporate predecessors, including Arco, Chevron, Texaco, and Unocal, operated above ground bulk fuel storage and related facilities from approximately 1884 to 1969.[23] In 2005, under orders from the San Francisco Bay Regional Water Quality Control Board, a cleanup action was completed that included the removal of 200,000 tons of affected soil from an 8-acre area.[24] The piers themselves slowly dilapidated until 2012 when they were removed, under the San Francisco Waterfront Special Area Plan, as part of the 34th America's Cup Events public benefits program.[25]

23 California Regional Water Quality Control Board, San Francisco Bay Region, 2005. Order No. R2-2005-0028, Adoption of Final Site Cleanup Requirements and Rescission of Order Nos. 98-028, 99-064, 01-137, and R2-2003-0018. June 15.

24 San Francisco Bay Regional Water Quality Control Board, Executive Orders Report, July 2014.

25 San Francisco Bay Conservation and Development Commission, San Francisco Waterfront Special Area Plan. April 1975 as amended through April 2012.

Background research to identify potential shipwrecks and other submerged historical archeological resources that might be present in the project site included reviewing the California State Lands Commission (CSLC) Shipwreck Database; San Francisco Planning Department, Environmental Planning Division Geographic Information System (GIS) maritime resources layer, and the National Oceanic and Atmospheric Administration (NOAA) Office of Coast Survey's Automated Wreck and Obstruction Information System (AWOIS). The CSLC Shipwreck Database is one source of information for identifying potential historical shipwrecks in San Francisco Bay. The CSLC database disclaimer notes,

> Information … was taken from books, old newspapers, and other contemporary accounts that do not contain precise locations. Except as verified by actual surveys, the database reflects information from many sources and is not based on actual fieldwork unless stated otherwise. Even though latitude and longitude coordinates are given for vessels in the database, these represent a guess, and must be considered along with other information. Not all shipwrecks are listed in the database and listed locations may be inaccurate. Ships were often salvaged or re-floated.

The CSLC Shipwreck Database lists a total of 58 ships inside San Francisco Bay (i.e., east of the Golden Gate Bridge), and one vessel, the *Fannie Adele,* is mapped within the 0.25 mile records search area around the project area. However, as noted above, there is a great deal of uncertainty about shipwreck locations in the CSLC database.

The San Francisco Planning Department, Environmental Planning Division GIS maritime resources layer provided additional information about the *Fannie Adele*. The vessel was a three-masted schooner built in 1883 that caught fire near Mission Bay in 1904 and sank. The *Fannie Adele* exploded while docked at the 16th Street Pier. After the explosion, the hawsers were cut and the burning vessel drifted north, burned to the waterline, and sank at an unknown location. This information suggests that the mapped location of the Fannie Adele within the 0.25-mile record search area is not necessarily accurate.

The NOAA Office of Coast Survey's AWOIS database was also consulted for information about potential shipwrecks located in the vicinity of the project area. The AWOIS database maintains a list of shipwrecks and other submerged objects that could pose a hazard to navigation. The AWOIS database does not include any entries within the 0.25 mile records search area.

Historical background research did not reveal any shipwrecks or other submerged historical archeological resources within the project area, although there is uncertainty about the location of the schooner *Fannie Adele*, which may have sunk in the vicinity.

In the absence of conclusive historical research about the presence or absence of potential submerged resources, results of a marine geophysical survey conducted in the project area was reviewed by an ESA maritime archeologist to determine if data suggested the presence of any shipwrecks or other resources. In 2015, eTrac Engineering (eTrac) conducted a *multibeam bathymetric survey* of the project area to map the seafloor. Multibeam bathymetry uses acoustical data to create an image of the sea floor, which records objects visible above the sea floor. Multibeam data analysis is one of the primary tools used by maritime archeologists to determine the presence of submerged archeological resources, primarily historical shipwrecks. The eTrac survey data recorded a large number of objects visible on the Bay floor in the project area, all pilings associated with recently demolished piers. The survey also recorded two submerged modern sailboats and a car, all located outside the project area. Review of the multibeam bathymetry by an ESA maritime archeologist concluded that no other targets of interest were recorded: that is, there appear to be no maritime features that are potential historical resources within the project area.

Conclusion

Based on the results of the records search and background research, as well as the surface and subsurface surveys, no archeological or submerged historical resources have been identified in the project area and the project area has a low potential to uncover buried or submerged archeological resources. As such, the proposed project is not anticipated to affect archeological historical resources pursuant to CEQA Guidelines section 15064.5.

While unlikely, if any previously unrecorded archeological or submerged historical resources are identified during project ground disturbing activities and were found to qualify as an historical resource per CEQA Guidelines section 15064.5 or a unique archeological resource, as defined in PRC section 21083.2(g), any impacts to the resource resulting from the project could be potentially significant. Any such potential significant impacts would be reduced to a less than significant level by implementing **Mitigation Measure M-CR-2: Accidental Discovery of Archaeological Resources.**

Mitigation Measure M-CR-2: Accidental Discovery of Archeological Resources

The following mitigation measure is required to avoid any potential adverse effect from the proposed project on accidentally discovered buried or submerged historical resources as defined in CEQA Guidelines section 15064.5(a)(c). The Port shall distribute the Planning Department archeological resource "ALERT" sheet to the project prime contractor; to any project subcontractor (including demolition, excavation, grading, foundation, pile driving, etc. firms); or utilities firm involved in soils disturbing activities within the project area. Prior to any soils disturbing activities being undertaken each contractor is responsible for ensuring that the "ALERT" sheet is circulated to all field personnel including, machine operators, field crew, pile drivers, supervisory personnel, etc. The Port shall provide the Environmental Review Officer (ERO) with a signed affidavit from the responsible parties (prime contractor, subcontractor(s), and utilities firm) to the ERO confirming that all field personnel have received copies of the Alert Sheet.

Should any indication of an archeological resource be encountered during any soils disturbing activity of the project, the project Head Foreman and/or Port shall immediately notify the ERO and shall immediately suspend any soils disturbing activities in the vicinity of the discovery until the ERO has determined what additional measures should be undertaken.

If the ERO determines that an archeological resource may be present within the project area, the Port shall retain the services of an archeological consultant from the pool of qualified archeological consultants maintained by the Planning Department archeologist. The archeological consultant shall advise the ERO as to whether the discovery is an archeological resource, retains sufficient integrity, and is of potential scientific/historical/cultural significance. If an archeological resource is present, the archeological consultant shall identify and evaluate the archeological resource. The archeological consultant shall make a recommendation as to what action, if any, is warranted. Based on this information, the ERO may require, if warranted, specific additional measures to be implemented by the Port.

Measures might include: preservation in situ of the archeological resource; an archeological monitoring program; or an archeological testing program. If an archeological monitoring program or archeological testing program is required, it shall be consistent with the Environmental Planning (EP) division guidelines for such programs. The ERO may also require that the Port immediately implement a site security program if the archeological resource is at risk from vandalism, looting, or other damaging actions.

The project archeological consultant shall submit a Final Archeological Resources Report (FARR) to the ERO that evaluates the historical significance of any discovered archeological resource and describing the archeological and historical research methods employed in the archeological monitoring/data recovery program(s) undertaken. Information that may put at risk any archeological resource shall be provided in a separate removable insert within the final report.

Copies of the Draft FARR shall be sent to the ERO for review and approval. Once approved by the ERO, copies of the FARR shall be distributed as follows: California Archaeological Site Survey Northwest Information Center (NWIC) shall receive one (1) copy and the ERO shall receive a copy of the transmittal of the FARR to the NWIC. The Environmental Planning division of the Planning Department shall receive one bound copy, one unbound copy and one unlocked, searchable PDF copy on CD three copies of the FARR along with copies of any formal site recordation forms (CA DPR 523 series) and/or documentation for nomination to the National Register of Historic Places/California Register of Historical Resources. In instances of high public interest or interpretive value, the ERO may require a different final report content, format, and distribution than that presented above.

Impact CR-3: The project may disturb human remains, including those interred outside of dedicated cemeteries. (Less than Significant with Mitigation)

There are no known human remains, including those interred outside of dedicated cemeteries, located in the immediate vicinity of the project area. In the event that construction activities disturb unknown human remains within the project area, any inadvertent damage to human remains would be considered a significant impact. With implementation of **Mitigation Measure M-CR-2**, as described above, the proposed project would have a less-than-significant impact on previously unknown human remains.

Impact CR-4: The project may result in a substantial adverse change in the significance of a tribal cultural resource as defined in Public Resources Code §21074. (Less than Significant with Mitigation)

CEQA section 21074.2 requires the lead agency to consider the effects of a project on tribal cultural resources. As defined in section 21074, tribal cultural resources are sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe that are listed, or determined to be eligible for listing, on the national, state, or local register of historical resources. In San Francisco, prehistoric archeological resources are presumed to be potential tribal cultural resources. A tribal cultural resource is adversely affected when a project causes a substantial adverse change in the resource's significance.

Pursuant to CEQA section 21080.3.1(d), within 14 days of a determination that an application for a project is complete or a decision by a public agency to undertake a project, the lead agency is required to contact the Native American tribes that are culturally or traditionally affiliated with the geographic area in which the project is located. Notified tribes have 30 days to request consultation with the lead agency to discuss potential impacts on tribal cultural resources and measures for addressing those impacts. On October 16, 2017 the Planning Department contacted Native American individuals and organizations for the San Francisco area, providing a description of the project and requesting comments on the identification, presence, and significance of tribal cultural resources in the project vicinity.

During the 30-day comment period, no Native American tribal representatives contacted the Planning Department to request consultation. As discussed under Impact CR-2, **Mitigation Measure M-CR-2, Accidental Discovery of Archeological Resources**, would be applicable to the proposed project. Unknown archeological resources may be encountered during construction that could be identified as tribal cultural resources at the time of discovery or at a later date. Therefore, the potential adverse effects of the proposed project on previously unidentified archeological resources, discussed under Impact CR-2, also represent a potentially significant impact on tribal cultural resources. Implementation of **Mitigation Measure M-CR-4, Tribal Cultural Resources Interpretive Program,** would reduce potential adverse effects on tribal cultural resources to a less-than-significant level. **Mitigation Measure M-CR-4** would require either preservation-in-place of the tribal cultural resources, if determined effective and feasible, or an interpretive program regarding the tribal cultural resources developed in consultation with affiliated Native American tribal representatives.

Mitigation Measure M-CR-4: Tribal Cultural Resources Interpretive Program

If the ERO determines that a significant archeological resource is present, and if in consultation with the affiliated Native American tribal representatives, the ERO determines that the resource constitutes a tribal cultural resource (TCR) and that the resource could be adversely affected by the proposed project, the proposed project shall be redesigned so as to avoid any adverse effect on the significant tribal cultural resource, if feasible.

If the Environmental Review Officer (ERO), in consultation with the affiliated Native American tribal representatives and the Port of San Francisco, determines that preservation-in-place of the tribal cultural resources is not a sufficient or feasible option, the Port of San Francisco shall implement an interpretive program of the tribal cultural resource in consultation with affiliated tribal representatives. An interpretive plan produced in consultation with the ERO and affiliated tribal representatives, at a minimum, and approved by the ERO would be required to guide the interpretive program. The plan shall identify, as appropriate, proposed locations for installations or displays, the proposed content and materials of those displays or installation, the producers or artists of the displays or installation, and a long-term maintenance program. The interpretive program may include artist installations, preferably by local Native American artists, oral histories with local Native Americans, artifacts displays and interpretation, and educational panels or other informational displays.

In the event that construction activities disturb unknown archeological sites that are considered tribal cultural resources, any inadvertent damage would be considered a significant impact. With implementation of **Mitigation Measures M-CR-2 and M-CR-4**, as described above, the proposed project would have a less-than-significant impact on previously unknown tribal cultural resources.

Impact C-CR-1: The proposed project in combination with past, present, and reasonably foreseeable future projects in the vicinity would not result in cumulative impacts to cultural resources. (Less than Significant)

The proposed project would not have an impact on historical (historic architectural) resources, and could not contribute to any significant cumulative effect on such resources.

Project-related impacts on archeological resources, tribal cultural resources, and human remains are site-specific and generally limited to a project's construction area. For these reasons, the proposed project in combination with other past, present, and reasonably foreseeable future projects would not have a significant cumulative impact on archeological resources, tribal cultural resources, or human remains.

Topics:		*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
5.	**TRANSPORTATION AND CIRCULATION — Would the project:**					
a)	Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☒	☐	☐
b)	Conflict with an applicable congestion management program, including but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	☒	☐	☐
c)	Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☐	☒
d)	Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses?	☐	☐	☒	☐	☐
e)	Result in inadequate emergency access?	☐	☐	☒	☐	☐
f)	Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☐	☐	☒	☐	☐

The proposed project would not result in a change in air traffic patterns, and would therefore not cause substantial air traffic safety risks. Therefore, Initial Study topic 5c is not applicable to the project.

Changes to CEQA contained in Public Resources Code section 21099(b)(1) require that the Governor's Office of Planning and Research (OPR) develop revisions to the CEQA Guidelines establishing criteria for determining the significance of transportation impacts of projects that "promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses." CEQA section 21099(b)(2) states that, upon certification of the revised guidelines for determining transportation impacts pursuant to section 21099(b)(1), automobile delay, as described solely by level of service (LOS) or similar measures of vehicular capacity or traffic congestion, shall not be considered a significant impact on the environment under CEQA.

In January 2016, OPR published for public review and comment a Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA[26] recommending that transportation impacts for projects be measured using a vehicle miles traveled (VMT) metric. On March 3, 2016, the San Francisco Planning Commission replaced automobile delay (vehicle LOS) with the VMT criteria (Resolution 19579). Accordingly, this analysis does not contain a discussion of automobile delay impacts. Instead, a VMT and induced automobile travel impact analysis is provided.

As part of implementing CEQA requirements within San Francisco, the City has established the following additional criteria, organized by transportation mode to facilitate the transportation analysis. The transportation significance thresholds are similar to those in Appendix G of the CEQA Guidelines as listed above, except for the criteria related to traffic hazards and VMT. The additional criteria are as follows:

- **Vehicle Miles Traveled**
- The project would have a significant effect on the environment if it would cause substantial additional VMT.
- The project would have a significant effect on the environment if it would substantially induce additional automobile travel by increasing physical roadway capacity in congested areas (i.e., by adding new mixed-flow travel lanes) or by adding new roadways to the network.
- **Traffic Hazards.** The project would have a significant effect on the environment if it would cause major traffic hazards.
- **Transit.** The project would have a significant effect on the environment if it would cause a substantial increase in transit demand that could not be accommodated by adjacent transit capacity, resulting in unacceptable levels of transit service; or cause a substantial increase in operating costs or delays such that significant adverse impacts in transit service levels could result. With the Muni and regional transit screenlines analyses, the project would have a significant effect on the environment if project-related transit trips would cause the capacity utilization standard of a transit provider to be exceeded during the peak hour, or contribute considerably (i.e., a contribution of 5 percent or more) to ridership at the screenline or corridor currently operating, or projected to operate under cumulative conditions, at greater than the transit provider's capacity utilization standard.

[26] Governor's Office of Planning and Research, Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA. Available: https://www.opr.ca.gov/docs/Revised_VMT_CEQA_Guidelines_Proposal_January_20_2016.pdf. Accessed March 8, 2017.

- **Pedestrians.** The project would have a significant effect on the environment if it would result in substantial overcrowding on public sidewalks, create potentially hazardous conditions for pedestrians, or otherwise interfere with pedestrian accessibility to the site and adjoining areas.
- **Bicycles.** The project would have a significant effect on the environment if it would create potentially hazardous conditions for bicyclists or otherwise substantially interfere with bicycle accessibility to the site and adjoining areas.
- **Loading.** The project would have a significant effect on the environment if it would result in a loading demand during the peak hour of loading activities that could not be accommodated within the proposed on-site off-street loading facilities or within convenient on-street loading zones, and if it would create potentially hazardous conditions affecting traffic, transit, bicycles, or pedestrians, or significant delays affecting transit.
- **Parking.** A project would have a significant effect on the environment if it would result in a substantial parking deficit that could create hazardous conditions affecting traffic, transit, bicycles or pedestrians, or significant delays affecting transit and where particular characteristics of the project or its site demonstrably render use of other modes infeasible.
- **Emergency Access**. A project would have a significant effect on the environment if it would result in inadequate emergency vehicle access.
- **Construction.** Construction of the project would have a significant effect on the environment if, in consideration of the project site location and other relevant project characteristics, the temporary construction activities' duration and magnitude would result in substantial interference with pedestrian, bicycle, or vehicle circulation and accessibility to adjoining areas thereby resulting in potentially hazardous conditions.

WETA's 2016 Strategic Plan calls for a new terminal in Mission Bay as well as other locations to ultimately create a 16-terminal regional network to meet the Bay Area's demand for a safe, sustainable and environmentally responsible transportation alternative. The impacts associated with WETA's planned expansion of water transit routes and services were analyzed in the Program Environmental Impact Report (EIR) for the Implementation and Operations Plan[27], and therefore are not re-assessed in this Initial Study. This Initial Study analyzes at a project level the site-specific impacts of constructing ferry and water taxi landings in Mission Bay, and impacts associated with the increase in vessels and additional passengers during operations including when vessels are docked at the landing. The Program EIR analyzed the impacts to navigation associated with the regional and cumulative increase in water transit vessels operations on San Francisco Bay. The Program EIR analysis concluded that increases in vessel traffic have the potential to increase conflicts with other commercial and recreational users of San Francisco Bay. These impacts would be reduced substantially through the implementation of a number of best management practices that should be considered in new terminal design and vessel operations.

[27] Water Transit Authority, *Final Program EIR for the Expansion of Ferry Transit Service in the San Francisco Bay Area*, 2003.

Approach to Analysis

Project Design

Due to the impending implementation of a number of transportation changes on the streets adjacent to and in the vicinity of the project site, the project includes discussion of these transportation changes, and the transportation impact assessment accounts for these planned and funded projects. Specifically, the Mission Bay Ferry Landing and Water Taxi Landing's on-street transportation elements (i.e., passenger loading/unloading zones, transit/shuttle stop) were designed to account for the realignment of Terry A. Francois Boulevard and the transportation network changes associated with the Chase Center, which is currently under construction. Descriptions of these projects are provided below.

The effects of these projects on the existing transportation network adjacent to the project site are described below in the Setting. In addition, the existing plus project analysis assumes implementation of these projects as it relates to conflicts with the proposed project operations. These same projects are also part of the cumulative analysis, which include the past, present, and future projects. The existing plus project conditions assess the near-term impact of the proposed project, while cumulative conditions assess the long-term impacts of the proposed project in combination with other reasonably foreseeable projects.

Realignment of Terry A. Francois Boulevard. As part of the Mission Bay Plan, Terry A. Francois Boulevard will be realigned to the west to be adjacent to the east side of the block containing the Chase Center, and a buffered two-way cycle track (Class IV)[28] will be provided on the east side of the street. The realignment of Terry A. Francois Boulevard is projected to be completed in 2018.

Chase Center Transportation Network Improvements. The Chase Center project will include a variety of transportation network and circulation improvements. These changes include the reconfiguration of South Street, 16th Street, and Terry A. Francois Boulevard with provision of new sidewalks adjacent to the site, and on-street parking, passenger loading/unloading, and commercial loading spaces. 16th Street will be rebuilt and extended east of Illinois Street to connect with the realigned Terry A. Francois Boulevard, and a Class II bicycle lane will be provided in each direction. The existing intersection of Terry A. Francois Boulevard/South Street and the new intersection of Terry A. Francois Boulevard/16th Street will be signalized, and will include pedestrian countdown signals, pedestrian crosswalks consistent with the continental design.[29] At the intersection of Terry A. Francois Boulevard/16th Street, bicycle signals would be provided, as well as a two-stage turn queue boxes[30] to facilitate turns between the planned bicycle lanes on 16th Street east of Illinois Street and the two-way cycle track on the east side of Terry A. Francois Boulevard. The Chase Center is scheduled to be completed in time for the 2019-2020 basketball season.

28 Class I bikeways are bike paths with exclusive right-of-way for use by bicyclists. Class II bikeways are bike lanes striped within the paved areas of roadways and established for the preferential use of bicycles. Class III bikeways are signed bike routes that allow bicycles to share the travel lane with vehicles. A Class IV bikeway is an exclusive bicycle facility that is separated from vehicular traffic and parked cars by a buffer zone (also referred to as a cycle track).

29 Crosswalks with a continental design have parallel markings that are the most visible to drivers.

30 Two-stage turn queue boxes offer bicyclists a safe way to make left turns at multi-lane signalized intersections from a right side cycle track or bicycle lane, or right turns from a left side cycle track or bicycle lane.

Setting

Regional and Local Roadways

Regional Access

Interstate 280 (I-280) provides the primary regional access to the Mission Bay area from southwestern San Francisco, the Peninsula and the South Bay. I-280 has an interchange with U.S. 101 south of the Mission Bay. Nearby northbound and southbound on- and off-ramps are located at Mariposa Street (northbound off-ramp and southbound on-ramp) and at 18th Street (southbound off-ramp and northbound on-ramp). The northern terminus of I-280 is on King Street at Fifth Street.

Interstate 80 (I-80) and **U.S. Highway 101 (U.S. 101)** provide regional access to the Mission Bay area. U.S. 101 serves San Francisco and the Peninsula/South Bay, and extends north via the Golden Gate Bridge to the North Bay. Van Ness Avenue serves as U.S. 101 between Market Street and Lombard Street. I-80 connects San Francisco to the East Bay and points east via the San Francisco-Oakland Bay Bridge. U.S. 101 and I-80 merge west of the project site. Northbound access is provided via an off-ramp at Mariposa Street (at Vermont Street), on-ramps at Cesar Chavez Street, and on-ramps and off-ramps at Bryant and Harrison streets.

Local Access

Terry A. Francois Boulevard is a two-way, north-south roadway to the east of Third Street, extending between Third Street and Mariposa Street (at Illinois Street). The roadway generally has two travel lanes each way, with on-street parking on both sides of the street. As described above, as part of the Mission Bay Plan, Terry A. Francois Boulevard will be realigned to the west to be adjacent to the east side of the block containing the Chase Center (currently under construction), and a buffered two-way cycle track (Class IV)[31] will be provided on the east side of the street. A bicycle lane (Class II facility) currently runs on each side of Terry A. Francois Boulevard between Illinois Street and Third Street.

Illinois Street is a two-way, north-south roadway to the east of Third Street that extends between 16th Street and Cargo Way. The roadway primarily has one lane each way with on-street parking on both sides of the street. There are Class II bicycle lanes in both directions of Illinois Street between Cesar Chavez and 16th streets.

Third Street is the principal north-south arterial in the southeast part of San Francisco, extending from its interchange with U.S. 101 and Bayshore Boulevard, to its intersection with Market Street. In the Mission Bay area, Third Street has two travel lanes each way. In the *San Francisco General Plan*, Third Street is designated as a Major Arterial in the Congestion Management Program (CMP) network, a Metropolitan Transportation System (MTS) Street, a Primary Transit Preferential Street (Transit Important Street between Market and Townsend streets, and between Mission Rock Street and Bayshore Boulevard), a

[31] Class I bikeways are bike paths with exclusive right-of-way for use by bicyclists. Class II bikeways are bike lanes striped within the paved areas of roadways and established for the preferential use of bicycles. Class III bikeways are signed bike routes that allow bicycles to share the travel lane with vehicles. A Class IV bikeway is an exclusive bicycle facility that is separated from vehicular traffic and parked cars by a buffer zone (also referred to as a cycle track).

Citywide Pedestrian Network Street and Trail (between 24th Street and Yosemite Avenue), and a Neighborhood Commercial Pedestrian Street. South of China Basin, the T Third light rail operates in a semi-exclusive center median right-of-way, with the exception of the segment between Kirkwood Avenue and Thomas Avenue, where the light rail runs within a mixed-flow lane.

South Street is an east-west roadway that runs for two blocks between Third Street and Terry A. Francois Boulevard. Two travel lanes are currently provided each way, and on-street parking is prohibited on both sides of the street. A sidewalk is not currently provided on the south side of the street, however, at completion of construction of the Chase Center, a 15-foot wide sidewalk will be provided between Terry A. Francois Boulevard and Third Street.

Sixteenth (16th) Street is an east-west arterial that runs between Illinois and Castro streets. In the Mission Bay area, 16th Street has two travel lanes each way, and on-street parking is prohibited on both sides of the street; dedicated left turn lanes are provided at all intersections. Sixteenth Street is classified as a Primary Transit Oriented Preferential Street between De Haro and Church streets and a Neighborhood Commercial Pedestrian Street between Bryant and Church streets. As described above, completion of construction of the Chase Center, 16th Street will be extended east of Illinois Street to connect with Terry A. Francois Boulevard. A Class II bicycle lane runs on both sides of 16th Street between Illinois and Seventh streets.

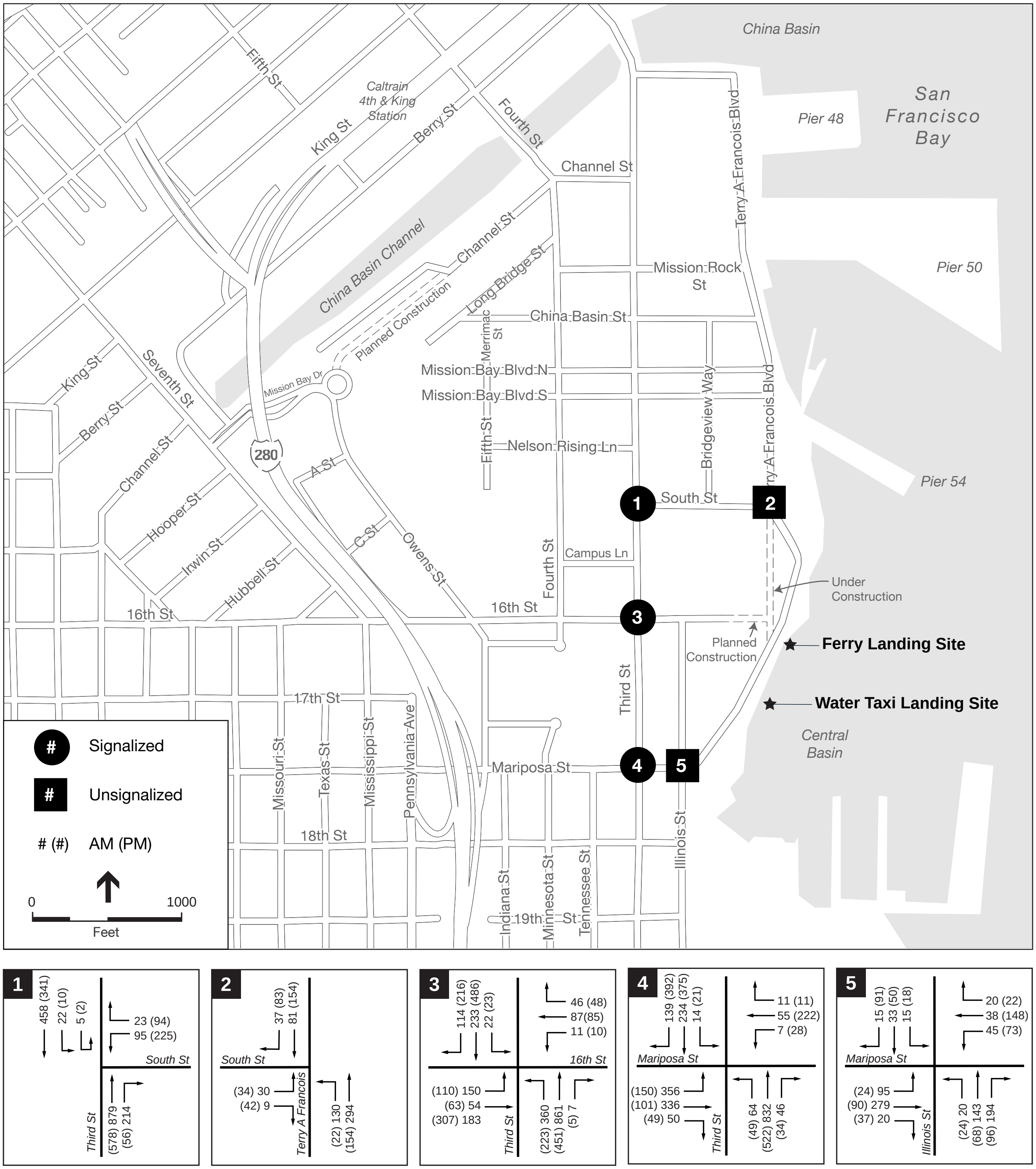
Mariposa Street is an east-west roadway that runs between Illinois and Harrison streets. The I-280 northbound off-ramp and southbound on-ramp are located immediately east of the intersection of Mariposa/Pennsylvania. In the Mission Bay area, Mariposa Street has two to three lanes each way (two-lanes each way with exclusive center left-turn lanes at major intersections). On-street parking is provided on Mariposa Street west of Tennessee Street. Bicycle sharrows (Class III bicycle facility) are provided both ways on Mariposa Street between Illinois and Mississippi streets.

Traffic Volumes

Intersection turning movement counts were collected at five study intersections on Wednesday, September 27, 2017 during the a.m. and p.m. peak periods. **Figure 17** presents the a.m. and p.m. peak hour traffic volumes at the study intersections. In general, on both Third Street and Terry A. Francois Boulevard, traffic volumes are higher during the p.m. peak hour than during the a.m. peak hour. Traffic volumes on Terry A. Francois Boulevard are substantially lower than on Third Street (roughly 65 to 70 percent lower), with peak hour volumes on Terry A. Francois Boulevard ranging between 400 and 500 vehicles per hour for both directions of travel. Between South and 16th streets, there are about 1,130 fewer vehicles on Terry A. Francois Boulevard than on Third Street during the a.m. peak hour, and about 830 fewer vehicles during the p.m. peak hour.

Transit Service

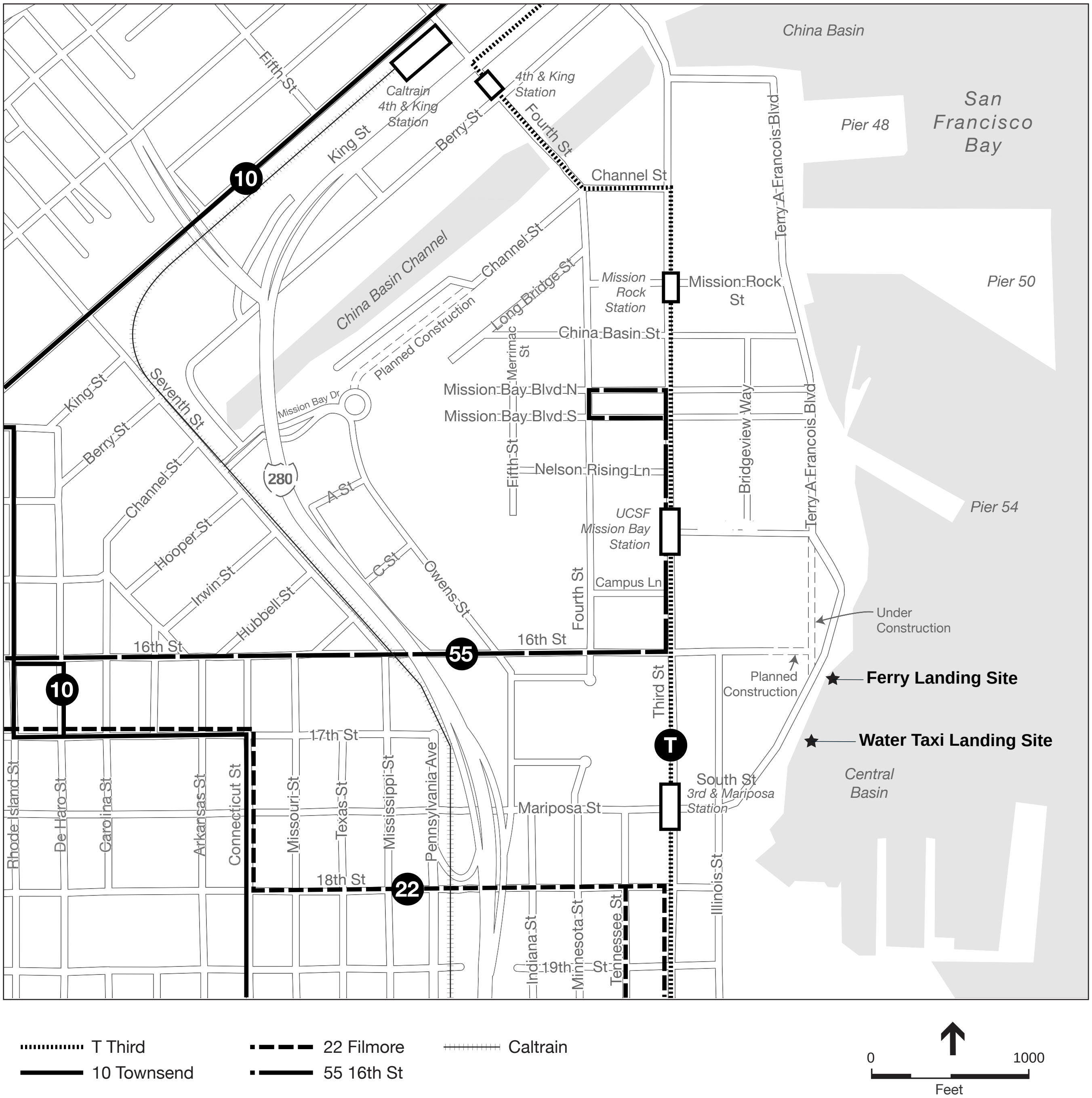
Local service in San Francisco is provided by the San Francisco Municipal Railway (Muni), the transit division of the San Francisco Municipal Transportation Agency (SFMTA). Muni bus, cable car and light rail lines can be used to access regional transit operators. **Figure 18** presents the existing transit route network in the project vicinity.



SOURCE: Adavant Consulting/LCW Consulting, 2017

Mission Bay Ferry Landing and Water Taxi Landing Project

Figure 17
Weekday AM and PM Traffic Volumes



SOURCE: SFMTA, 2017

Mission Bay Ferry Landing and Water Taxi Landing Project

Figure 18
Existing Transit Network

Local Muni Service

Muni service in the project vicinity bounded by Mariposa Street, Third Street, and South Street includes the T Third light rail line that runs along Third Street with the closest stop at South Street (i.e., the UCSF/Mission Bay stop), as well as the 55 16th Street bus route that runs east/west along 16th Street. The 55 16th Street route, initiated in 2015, is a temporary route, and will be replaced when the 22 Fillmore buses are extended into Mission Bay (see description of the 22 Fillmore Transit Priority Project in Section B, Project Setting, above). **Table 6** presents the existing service frequency for these three routes.

TABLE 6
EXISTING MUNI ROUTES IN PROJECT VICINITY

Line/Route	Frequencies (in minutes) A.M. (7 to 9 a.m.)	Frequencies (in minutes) P.M. (4 to 6 p.m.)	General Hours of Operation
T Third	8	8	4:00 a.m. to 1:00 a.m.
22 Fillmore	8	7	24 hours
55 16th Street	15	15	6:00 a.m. to midnight

SOURCE: SFMTA, Adavant Consulting/LCW Consulting, 2017.

Table 7 presents the ridership and capacity utilization at the maximum load point, which is the location of the greatest ridership demand, for the nearby routes during the weekday a.m. and p.m. peak hours. Capacity utilization relates the number of passengers per transit vehicle to the design capacity of the vehicle. The capacity per vehicle includes both seated and standing capacity, where standing capacity is between 30 to 80 percent of seated capacity (depending upon the specific transit vehicle configuration). For example, the capacity of a light rail vehicle is 119 passengers, the capacity of a historic streetcar is 70 passengers, and the capacity of a standard bus is 63 passengers. Muni's established capacity utilization standard for peak period operations is 85 percent. It should be noted that the 85 percent utilization is of seated and standing loads, so at 85 percent all seats are taken and there are many standees.

As indicated on Table 7, during the a.m. and p.m. peak hours, the capacity utilization for all routes is less than Muni's 85 percent capacity utilization standard for the nearby 22 Fillmore and the 55 16th Street bus routes. During the a.m. peak hour, the nearby T Third light rail line currently exceeds the 85 percent capacity utilization standard in the outbound direction of travel (i.e., towards the Bayview, at the maximum load point at the Van Ness Station). During the p.m. peak hour, the T Third exceeds the 85 percent capacity utilization standard in both the inbound (i.e., towards the Bayview) and outbound (i.e., from the Bayview) directions. During the p.m. peak hour, the maximum load point in both directions is located at The Embarcadero and Harrison Street (about 1.5 miles north of the project site). Capacity utilization on the T Third light rail line within Mission Bay is lower. As described in Section B, Project Setting, above, planned changes to transit service in the project vicinity include the Central Subway project (currently under construction), which would increase passenger capacity on the T Third light rail line.

TABLE 7
MUNI ROUTE RIDERSHIP AND CAPACITY UTILIZATION – EXISTING CONDITIONS – WEEKDAY A.M. AND P.M. PEAK HOURS

Routes	Inbound (towards downtown)			Outbound (away from downtown)		
	Ridership	Capacity	Capacity Utilization[1]	Ridership	Capacity	Capacity Utilization
A.M. Peak Hour						
T Third	519	793	65%	822	793	104%
22 Fillmore	313	504	62%	264	441	60%
55 16th Street[2]	26	252	10%	116	252	46%
P.M. Peak Hour						
T Third	945	793	**119%**	763	793	**96%**
22 Fillmore	301	567	53%	342	567	60%
55 16th Street	104	252	41%	48	252	19%

NOTES:
1 Routes where capacity utilization exceeds the 85 percent standard highlighted in **bold.**
2 The 55 16th Street route runs between the BART 16th Street station and Mission Bay/UCSF.

SOURCE: SFMTA Fall 2015 Baseline Service Data, 2017.

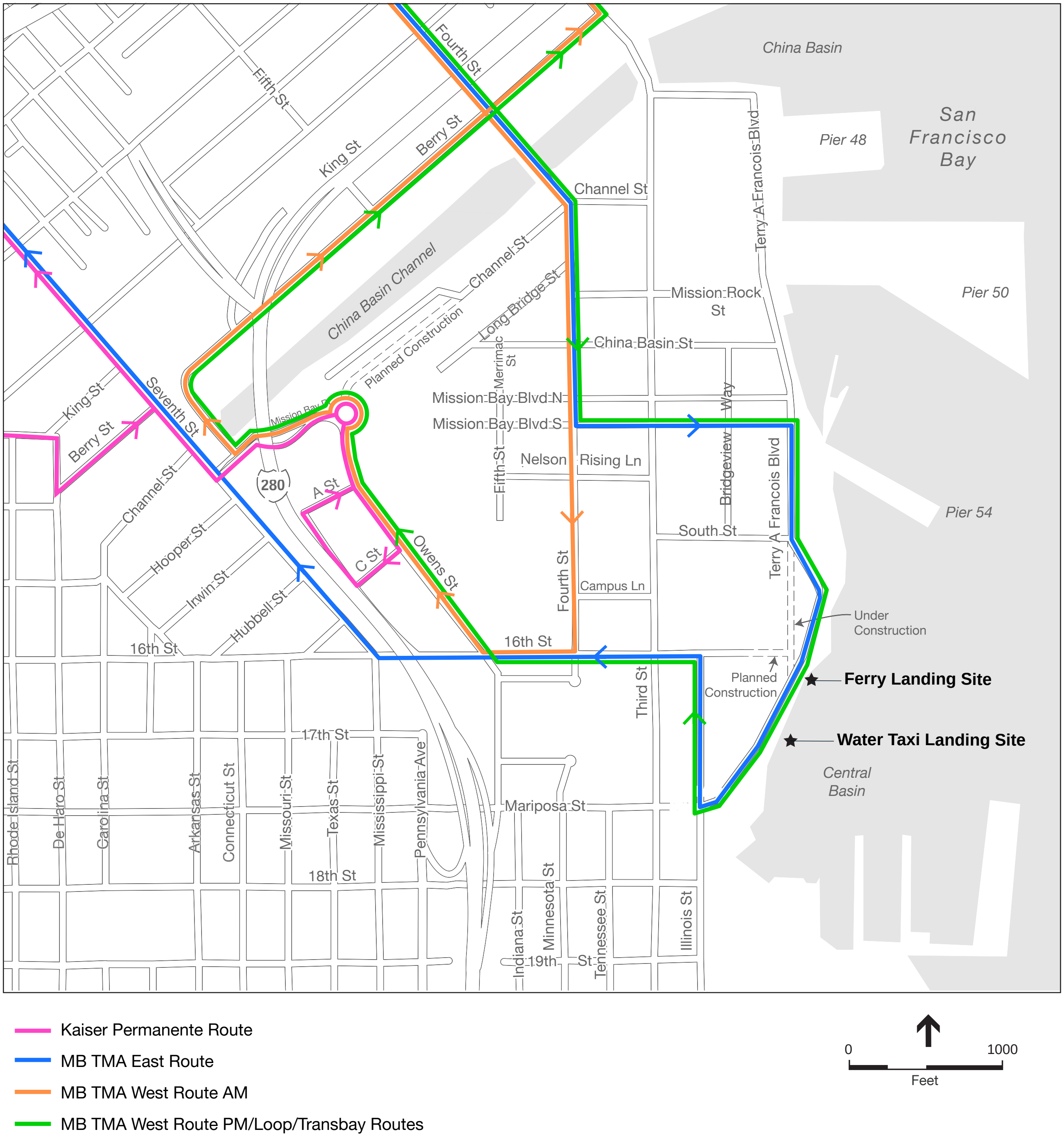
Regional Service Providers

Service to and from the East Bay is provided by Bay Area Rapid Transit District (BART), AC Transit, and WETA ferries; service to and from the North Bay is provided by Golden Gate Transit buses and ferries, as well as Blue & Gold, and WETA ferries; and service to and from the Peninsula and the South Bay is provided by Caltrain, SamTrans, BART, and WETA ferries.

The project site is located approximately 2.0 miles southeast of the Ferry Building and the Embarcadero Muni Metro and BART station, about 1.6 miles southeast of the temporary Transbay Terminal, about 0.8 miles south of the Caltrain terminal at Fourth/King and 0.9 miles northeast of the Caltrain station at 22nd Street, and adjacent to the T Third UCSF/Mission Bay stop at South Street. The project site is about 1.7 miles east of the 16th Street BART station, and about 1.7 miles southeast of the Powell BART/Muni Metro station.

UCSF, Kaiser Permanente, and Mission Bay TMA Shuttle Service

Three shuttle systems provide transit service to, from and within the Mission Bay South area. All are currently free of charge and open to employees, visitors, residents and patients, as appropriate, of their respective sites (see **Figures 19** and **20**). Each shuttle operator reserves the right to restrict use and requires appropriate identification in order to use the service. The various shuttle bus operators have been adapting their routes and stops overt the past ten years, in order to better serve their riders, as development and construction of new street infrastructure in the Mission Bay South Area has occurred.

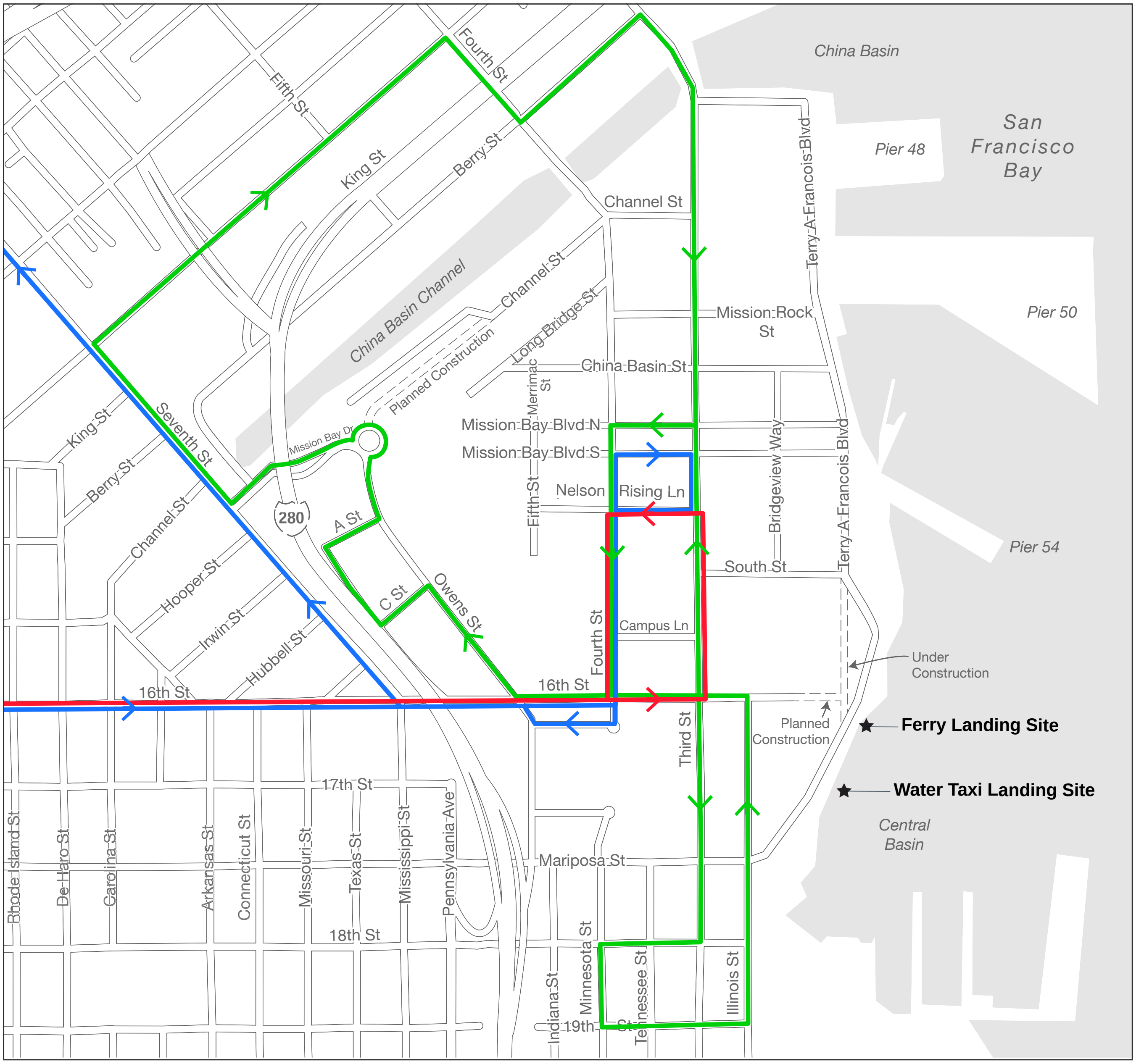


SOURCE: Adavant Consulting/LCW Consulting, 2017

Mission Bay Ferry Landing and Water Taxi Landing Project

Figure 19

Kaiser Permanente and Mission Bay TMA Shuttle Bus Service



UCSF Green Route
UCSF Red Route
UCSF Blue/Gold/Grey Route

0 1000
Feet

SOURCE: Adavant Consulting/LCW Consulting, 2017

Mission Bay Ferry Landing and Water Taxi Landing Project

Figure 20
UCSF Shuttle Bus Service

The Mission Bay Transportation Management Association (MBTMA), formed in conformance with mitigation measures identified in the Mission Bay Redevelopment Project's Supplemental Environmental Impact Report (SEIR[32]), currently operates four routes that run from the Powell Street BART Station and the Transbay Transit Terminal, via the Caltrain Depot, to Mission Bay destinations. In general, service is provided from 6 a.m.to 10:30 a.m., and from 3 p.m. to 8:30 p.m. on weekdays. The West route serves Fourth, Owens and Berry streets, the East, Loop and Transbay routes serve Fourth Street, Mission Bay Boulevard, Terry A. Francois Boulevard and Illinois Street. The East and West routes operate between BART and Mission Bay during the morning (7 a.m. to 10 a.m.) and afternoon (3 p.m. to 7 p.m.) periods at 10 to 15 minute headways, while the Transbay route connects Mission Bay with the Transbay Transit Terminal every 30 to 40 minutes during the same two periods. The Loop route combines the East and West routes from 6 a.m.to 7:30 a.m., from 10 a.m.to 10:30 a.m., and from 7 p.m. to 8:30 p.m.

UCSF provides shuttle bus services between primary campus sites (i.e., Parnassus Heights, Mission Bay, and Mount Zion) and some secondary campus locations (e.g., Zuckerberg SF General, San Francisco Veterans Administration Medical Center, UCSF Mission Center, 654 Minnesota Street). The shuttle system is primarily designed to facilitate work-related travel between UCSF locations and reduce single-occupancy inter-campus trips during the day, but it also offers linkages to major transit service providers such as BART and Caltrain. Service includes 13 fixed-routes and two on-demand evening services. Fixed-route shuttle headways are generally between 15 to 25 minutes, and most routes operate between 6 a.m. and 9 p.m., Monday through Friday. The UCSF's Red shuttle bus service connects the Mission Bay campus with the 16th Street BART Station, while the Blue, Gold and Grey lines connect the campus with Parnassus, Mt. Zion and ZSFG Hospital. The Green line operates along Townsend, Berry, Third, Minnesota, Illinois, and Owen Streets, connecting the Mission Bay campus, with UCSF's 654 Minnesota Street building, the Caltrain Depot, and the China Basin Landing building, approximately every 15 minutes. Riders can also request on-demand night service within a pre-defined border around the Mission Bay campus, by calling UCPD dispatch.

Kaiser Permanente provides hourly shuttle bus service from 8 a.m. to 5:30 p.m., between its Mission Bay Medical Office building at 1600 Owens Street and its main Geary Boulevard campus. Buses travel along Seventh Street, Mission Bay Drive, and Owens Street.

Pedestrian Conditions

The proposed Ferry and Water Taxi Landings are located within the existing Agua Vista Park. The Bay Trail currently runs along the Bay and is about 8 feet wide in the vicinity of the project site; however, there are no sidewalks on either side of Terry A. Francois Boulevard. Sidewalks (12.5 feet wide) are planned to be constructed on the west side of Terry A. Francois Boulevard as part of the realignment, the construction of the Chase Center, and completion of the park on the west side of Terry A. Francois Boulevard to the south of 16th Street. Pedestrian crosswalks are currently provided at the west and north legs of the unsignalized intersection of Terry A. Francois Boulevard/South Street. As described in the Approach to Analysis, the intersection of Terry A. Francois Boulevard/South Street will be signalized as

32 City and County of San Francisco and San Francisco Redevelopment Agency, 1998, Final Mission Bay Supplemental Environmental Impact Report. Planning Department File No. 96.771E, San Francisco Redevelopment Agency Case No. ER 919-97, State Clearinghouse No. 97092068. Certified September 17, 1998.

part of the Chase Center project with pedestrian signals and continental crosswalks between 12.5 and 14 feet wide on crossings.

Pedestrian counts at the crosswalks were conducted at the five study intersections on Wednesday, September 27, 2017 during the a.m. and p.m. peak periods. Along Terry A. Francois Boulevard and at crosswalks at the intersections of Terry A. Francois Boulevard/South Street and Illinois Street/Terry A. Francois Boulevard/Mariposa Street, existing pedestrian volumes are low throughout the day, with less than 50 pedestrians per hour during the a.m. and p.m. peak hours. Pedestrian volumes are greater along Third Street than on Terry A. Francois Boulevard, due to the T Third light rail stop at South Street and nearby medical and office developments.

Bicycle Network

The majority of the Mission Bay area is flat, with minimal changes in grades, facilitating bicycling within and through the area. A number of existing bicycle routes are located in the project vicinity. These include City routes that are part of the San Francisco Bicycle Network, routes developed as part of the Mission Bay Plan, and regional routes that are part of the San Francisco Bay Trail system. **Figure 21** presents the bicycle facilities within the study area. Bicycle facilities are typically classified as Class I, Class II, Class III, or Class IV facilities.[33] Class I bikeways are bike paths with exclusive right-of-way for use by bicyclists or pedestrians. Class II bikeways are bike lanes striped with the paved areas of roadways and established for the preferential use of bicycles, and include separate bicycle lanes. Separate bicycle lanes provide a striped, marked and signed bicycle lane buffered from vehicle traffic. These facilities are located on roadways and reserve four to five feet of space for exclusive bicycle traffic. Class III bikeways are signed bike routes that allow bicycles to share travel lanes with vehicles.

A Class IV bikeway is an exclusive bicycle facility that is separated from vehicular traffic and parked cars by a buffer zone (also referred to as a cycle track). Class II bicycle lanes currently run in both directions on Terry A. Francois Boulevard. With the upcoming realignment of Terry A. Francois Boulevard, a Class IV cycle track will be provided on the east side of the street. In addition, a Class II bicycle lane runs on both sides of 16th Street between Illinois and Seventh streets. As part of the Chase Center project, a Class II bicycle lane will be provided in each direction of 16th Street between Illinois Street and Terry A. Francois Boulevard.

Figure 21 also presents the San Francisco Bay Trail. The San Francisco Bay Trail is designed to create recreational pathway links to the various commercial, industrial and residential neighborhoods that surround the San Francisco Bay. In addition, the trail connects points of historic, natural and cultural interest; recreational areas such as beaches, marinas, fishing piers, boat launches, and numerous parks and wildlife preserves. At various locations, the Bay Trail consists of paved multi-use paths, dirt trails, bike lanes, sidewalks or city streets signed as bicycle routes. In the project vicinity, the Bay Trail is a paved path

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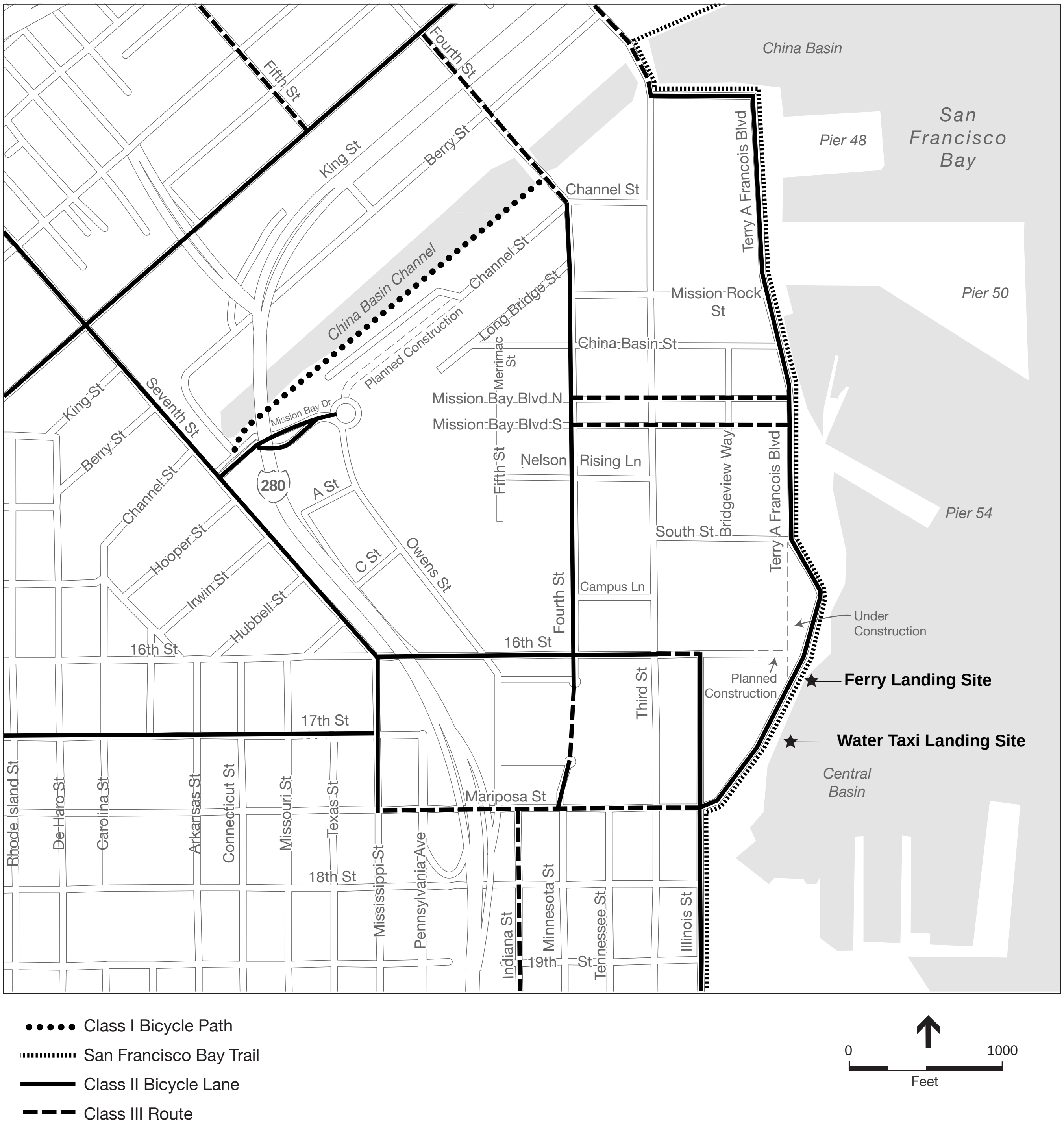
[33] Bicycle facilities are defined by the State of California in the California Streets and Highway Code Section, 890.4. Available online at http://ca.regstoday.com/law/shc/ca.regstoday.com/laws/shc/calaw-shc_DIVISION1_CHAPTER8.aspx. Accessed May 28, 2015.



SOURCE: Adavant Consulting/LCW Consulting, 2017

Figure 21
Existing Bicycle Network

that follows the shoreline of San Francisco Bay, east of Terry A. Francois Boulevard within the area that will be developed as part of the Mission Bay Plan as the Bayfront Park.

Bicycle volume counts were conducted during the weekday a.m. and p.m. peak periods in September 2017 at the five study intersections. In the vicinity of the proposed project, peak hour bicycle volumes on Terry A. Francois Boulevard and Third Street are similar during the a.m. and p.m. peak hour, and range between 25 and 40 bicycles per hour in both directions of travel. Overall, bicycle conditions were observed to be operating acceptably, with no conflicts between bicyclists, pedestrians and vehicles.

There are no on-street bicycle racks on Terry A. Francois Boulevard adjacent to the project site, however, there are bicycle racks on the sidewalk on the north side of South Street and on the east sidewalk of Terry A. Francois Boulevard north of South Street, and west of the project site within the UCSF Mission Bay Campus; additional bicycle racks are provided at the recently opened UCSF Medical Center. There is one Ford GoBike station on Fourth Street at Mission Bay Boulevard South. Additional stations are planned for Terry A. Francois Boulevard at Mission Bay Boulevard South, and other, still to be determined, locations in Mission Bay.

Loading and Parking Conditions

There are no on-street commercial loading spaces or passenger loading/unloading zones adjacent to, or in the vicinity of the project site. On-street time limited parking is permitted on Terry A. Francois Boulevard, and on-street parking is well utilized during daytime hours. At completion of the Chase Center, metered on-street parking will be provided on the west side of Terry A. Francois Boulevard between South and 16th streets, on the south side of South Street between Third Street and Terry A. Francois Boulevard, and on the north side of 16th Street between Third and Terry A. Francois Boulevard. On-street commercial loading spaces will be provided adjacent to the Chase Center on the west side of Terry A. Francois Boulevard.

Emergency Access

The project site is fronted by Terry A. Francois Boulevard, and is also accessible from the Bay. Emergency vehicle access to the project site is primarily from Terry A. Francois Boulevard and Third Street, which have two travel lanes each way. The nearest fire stations to the project site are Station 4 at Mission Rock Street between Third Street and Terry A. Francois Boulevard (about 0.5-mile north of the project site), Station 8 at 36 Bluxome Street between Fourth and Fifth streets (about one mile to the northwest of the project site), and Station 29 at 299 Vermont Street between 15th and 16th streets (about 0.85 mile west of the project site).

Background on Vehicle Miles Traveled in San Francisco and Bay Area

In January 2016, OPR published for public review and comment the Revised Proposal on Updates to CEQA Guidelines on Evaluating Transportation Impacts in CEQA[29] (proposed transportation impact guidelines) recommending that transportation impacts for projects be measured using a *vehicle miles traveled* (VMT) metric. VMT measures the amount and distance that a project might cause people to drive, accounting for the number of passengers within a vehicle. OPR's proposed transportation impact guidelines provides substantial evidence that VMT is an appropriate standard to use in analyzing transportation impacts to protect environmental quality and a better indicator of greenhouse gas, air quality, and energy impacts than automobile delay. Acknowledging this, the San Francisco Planning Commission Resolution 19579:

> Found that automobile delay, as described solely by *level of service*, or similar measures of vehicular capacity or traffic congestion, shall no longer be considered a significant impact on the environment pursuant to CEQA, because it does not measure environmental impacts and therefore it does not protect environmental quality.
>
> Directed the Environmental Review Officer to remove automobile delay as a factor in determining significant impacts pursuant to CEQA for all guidelines, criteria, and list of exemptions, and to update the Transportation Impact Analysis Guidelines for Environmental Review.
>
> Directed the Environmental Planning Division and Environmental Review Officer to replace automobile delay with VMT criteria which promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses; and consistent with proposed and forthcoming changes to CEQA Guidelines by OPR.

Planning Commission Resolution 19579 became effective immediately for all projects that have not received a CEQA determination and for all projects that have previously received CEQA determinations, but require additional environmental analysis.

Many factors affect travel behavior. These factors include density, diversity of land uses, design of the transportation network, access to regional destinations, distance to high-quality transit, development scale, demographics, and transportation demand management. Typically, low-density development at great distance from other land uses, located in areas with poor access to non-private vehicular modes of travel, generate more automobile travel compared to development located in urban areas, where a higher density, mix of land uses, and travel options other than private vehicles are available.

Given these travel behavior factors, San Francisco has a lower VMT ratio than the nine-county San Francisco Bay Area region. In addition, some areas of the city have lower VMT ratios than other areas of the city. These areas of the city can be expressed geographically through *transportation analysis zones* (TAZs). TAZs are used in transportation planning models for transportation analysis and other planning purposes. The zones vary in size from single city blocks in the downtown core, multiple blocks in outer neighborhoods, to even larger zones in historically industrial areas like the Hunters Point Shipyard.

The San Francisco County Transportation Authority (the transportation authority) uses the San Francisco Chained Activity Model Process (SF-CHAMP) to estimate VMT by private automobiles and taxis for different land use types. Travel behavior in SF-CHAMP is calibrated based on observed behavior from the California Household Travel Survey 2010-2012, Census data regarding automobile ownership rates and county-to-county worker flows, and observed vehicle counts and transit boardings. SF-CHAMP uses a synthetic population, which is a set of individual actors that represents the Bay Area's actual population, who make simulated travel decisions for a complete day. The transportation authority uses tour-based analysis for office and residential uses, which examines the entire chain of trips over the course of a day, not just trips to and from the project. For retail uses, the transportation authority uses trip-based analysis, which counts VMT from individual trips to and from the project (as opposed to an entire chain of trips). A trip-based approach, as opposed to a tour-based approach, is necessary for retail projects because a tour is likely to consist of trips stopping in multiple locations, and the summarizing of tour VMT to each location would over-estimate VMT.

Project Travel Demand

The proposed project would accommodate extension of the water transit system from the downtown Ferry Building approximately 2 miles away into Mission Bay, and therefore add person-trips arriving and departing the proposed Ferry and Water Taxi Landings. Ridership estimates for the ferry and water taxi service that would use the landings were developed as part of the Benefit Cost Analysis for the San Francisco Mission Bay Ferry Service.[34] **Table 8** presents the annual and weekday commute and special event ridership (an event taking place at the Chase Center at Mission Bay, currently under construction) was projected for existing (2020) and 2040 cumulative conditions were determined using the SF-CHAMP travel demand model. The ridership projections were based on assumption of a ferry and water taxi service operating plan provided by WETA, consistent with their Strategic Plan. As described in the Project Description, during the weekday commute periods, it is anticipated that ferry service would be provided via existing ferry routes linked via downtown San Francisco's Ferry Building terminal and Alameda/Oakland and Vallejo terminals, and potentially Larkspur ferry terminal.

TABLE 8
FERRY LANDING AND WATER TAXI LANDING ANNUAL AND AVERAGE DAILY RIDERSHIP – WEEKDAY COMMUTE AND EVENT DAY CONDITIONS

	Weekday Commute		Event at the Chase Center	
Analysis Year	Annual Weekday Ridership	Average Daily Ridership	Additional Annual Event Day Ridership	Additional Average Event Day Ridership
2020	366,000	1,460	124,900	1,570
2040	318,400	1,270	118,100	1,480

SOURCE: Benefit Cost Analysis for San Francisco Mission Bay Ferry Service, Appendix B – Tables B2 and B3.

As part of this Initial Study analysis, using the estimated number of ferries and water taxis anticipated to serve Mission Bay, the annual ridership estimates were converted to weekday daily and a.m. and p.m. peak hour ridership. On a typical day approximately 1,460 riders were assumed to arrive at or depart from the Mission Bay by ferry or water taxi service. On days when existing ferry routes would serve evening events at the Chase Center (estimated to be up to 80 evening events a year), up to an additional 1,570 riders are anticipated to use the ferry service. Detailed assumptions and calculations on ferry service and average passengers are presented in Appendix TR.

[34] Port of San Francisco, *Benefit Cost Analysis for the San Francisco Mission Bay Ferry Service*, September 2017.

As shown on Table 8, based on the SF-CHAMP model analysis for the proposed Ferry and Water Taxi Landings, ferry ridership to and from Mission Bay is projected to decline between 2020 and 2040. This decrease in ferry ridership would be due to transit improvements that increase the competitiveness of non-ferry transit options. For that reason, the project travel demand analysis is based on year 2020 ferry ridership as a conservative assumption.

Site specific estimates of trips by mode of travel during the peak hour were based on modal share data from the San Francisco Ferry Terminal at the Ferry Building, obtained from the Downtown San Francisco Ferry Terminal Expansion Project EIS/EIR.[35] These mode shares were then adjusted to reflect differences in site-specific transportation characteristics of the Mission Bay area compared to downtown, since it is anticipated that the Ferry and Water Taxi Landings would primarily serve Mission Bay and the surrounding neighborhoods. Thus, the daily person trips shown on Table 8 were allocated to various modes of travel to obtain project-related demand for auto, transit, pedestrian, and bicycle modes; the results are summarized in **Table 9**.

TABLE 9
FERRY LANDING AND WATER TAXI LANDING DAILY RIDERSHIP –
NON-EVENT AND EVENT DAY BY MODE OF ACCESS IN MISSION BAY

	Weekday Commute			Event Days	
Mode	**By Ferry**	**By Water Taxi**	**Total Daily Ridership**	**Additional Event Day Ridership**	**Total Daily Ridership on Event Day**
Auto	27	2	29	0	29
Transit	180	13	193	0	193
Walk	1,165	85	1,250	1,570	2,820
Bicycle	88	6	94	0	94
Total	**1,460** **93%**	**106** **7%**	**1,566** **100%**	**1,570**	**3,136**

SOURCE: Adavant Consulting/LCW Consulting

A limited number of trips to and from the landings are estimated to be by auto (2 percent), as the proposed project would not include off-street parking spaces to serve the landings, and because on-street parking on streets in the area currently are time-limited short-term parking. Thus, trip by auto are anticipated to be primarily made by taxi, Transportation Network Company (TNC) vehicles (e.g., Uber, Lyft), and private vehicles dropping off and picking up ferry and water taxi passengers.

The transit mode includes riders connecting with nearby Muni routes (i.e., 55 16th Street bus route, T Third light rail line) and the free shuttle routes serving Mission Bay (i.e., the UCSF, Kaiser Permanente, and the Mission Bay TMA shuttles). While neither Muni buses nor shuttles currently stop on Terry A.

35 San Francisco Bay Area Water Emergency Transportation Authority and U.S. Department of Transportation Federal Transit Administration, *Downtown San Francisco Ferry Terminal Expansion Project Final EIS/EIR*, Final, State Clearinghouse No. 2011032066. Certified September 2017.

Francois Boulevard, the proposed project would include a nearby new transit stop on the east side of Terry A. Francois Boulevard north of 16th Street, that could accommodate one or more Muni and shuttle routes. Trip by walking to and from Mission Bay destinations are anticipated to be the majority of the trips (80 percent). About 6 percent of trips are anticipated to be by bicycle.

Because the Ferry and Water Taxi Landings would be located directly across the street from the Chase Center, ferry service serving events were assumed to be by walking.

Peak Hour Ridership Forecasts

The commuter peak hour demand was estimated by dividing the expected morning and evening ridership by the length of each commute period (three hours in the morning and 2.5 hours in the evening), and assuming that the peak hour demand would be about 15 percent higher than the period average hour. The event day peak hour demand was assumed to occur during the second half of the evening commute period. **Table 10** presents the project mode share and peak hour ridership by mode of travel for days without and with an event for which ferry service would be provided.

TABLE 10
FERRY LANDING AND WATER TAXI LANDING RIDERSHIP BY MODE OF ACCESS IN MISSION BAY – WEEKDAY A.M. AND P.M. PEAK HOURS

	A.M. Peak Hour			P.M. Peak Hour					
	Event and No Event Days			No Event Day			Event Days		
Mode	**By Ferry**	**By Water Taxi**	**Total**	**By Ferry**	**By Water Taxi**	**Total**	**By Ferry**	**By Water Taxi**	**Total**
Auto	5	0	5	6	0	6	6	0	6
Transit	35	2	37	41	2	43	41	2	43
Walk	223	10	233	269	13	282	1,001	66	1,067
Bicycle	17	1	18	20	1	21	20	1	21
Total	**280**	**13**	**293**	**336**	**16**	**352**	**1,068**	**69**	**1,137**

NOTE: Assumes that commuter travel during the peak hour is 15 percent greater than the hourly average during the peak period.

SOURCE: Adavant Consulting/LCW Consulting

Table 11 provides an estimate of peak hour ridership by mode of travel and directionality (i.e., getting off or on the ferry or water taxi in Mission Bay). Based on directional travel data from the Mission Bay SEIR,[36] it was assumed that approximately 70 percent of the commuter peak hour travel would be in the prevailing commuter direction, towards Mission Bay in the morning and leaving Mission Bay in the afternoon. During the p.m. peak hour, all event-related travel by ferry or water taxi was assumed to be towards Mission Bay during the evening peak hour (i.e., half of the annual event day ridership of 1,570 passengers, of which 93 percent would be by ferry and 7 percent would be by water taxi).

[36] City and County of San Francisco and San Francisco Redevelopment Agency, 1998. *Final Mission Bay Subsequent Environmental Impact Report*. Planning Department File No. 96.771E, San Francisco Redevelopment Agency Case No. ER 919-97, State Clearinghouse No. 97092058. Certified September 17, 1998.

TABLE 11
FERRY LANDING AND WATER TAXI LANDING RIDERSHIP BY DIRECTION OF TRAVEL AND MODE OF ACCESS IN MISSION BAY – WEEKDAY A.M. AND P.M. PEAK HOURS

	A.M. Peak Hour			P.M. Peak Hour					
	Event and No Event Days			No Event Day			Event Days		
Mode	**Off**	**On**	**Total**	**Off**	**ON**	**Total**	**Off**	**On**	**Total**
Auto	4	1	5	1	5	6	1	5	6
Transit	25	12	37	13	30	43	13	30	43
Walk	164	69	233	86	196	281	871	196	1,067
Bicycle	12	6	18	6	15	21	6	15	21
Total	**205**	**88**	**293**	**106**	**246**	**352**	**891**	**246**	**1,137**

NOTE: Assumes that commuter travel during the peak hour is 15 percent greater than the hourly average during the peak period.

SOURCE: Adavant Consulting/LCW Consulting

Because trips associated with the Ferry and Water Taxi Landings would be concentrated prior to departure or following the arrival of a vessel, the number of passengers getting on or off a vessel was estimated for use in the transportation impact analysis. **Table 12** summarizes the estimated peak hour ridership per vessel by type and directionality during each peak hour. The ridership per vessel was obtained by dividing the number of peak hour riders shown in Table 10 by the average number of ferry or water taxi vessels operating during each peak hour. As shown in Table 12, the maximum number of passengers arriving to board a ferry or a water taxi would be 49 and 6, respectively.

TABLE 12
FERRY LANDING AND WATER TAXI LANDING RIDERSHIP PER VESSEL AND DIRECTION OF TRAVEL IN MISSION BAY - WEEKDAY A.M. AND P.M. PEAK HOURS

	A.M. Peak Hour			P.M. Peak Hour					
	Event and No Event Days			No Event Day			Event Days		
Vessel Type	**Off**	**On**	**Total**	**Off**	**On**	**Total**	**Off**	**On**	**Total**
Per ferry	53	23	76	21	49	70	174	49	223
Per water taxi	6	2	8	2	6	8	12	6	18

SOURCE: Adavant Consulting/LCW Consulting

Loading and Parking Demand

- **Commercial Truck Loading** – Neither the Ferry nor Water Taxi Landing would be expected to generate commercial truck loading demand on a regular basis. Commercial truck loading demand could occur mainly during infrequent maintenance operations (i.e., the float, canopy and gangway would be dry-docked on a 10-year cycle for regular maintenance).

- **Passenger Loading/Unloading** – As noted above, the proposed project would generate 29 trips by auto on a daily basis and up to seven trips during the peak hour by auto, which includes trips by taxi, TNC vehicles, and private auto drop-off and pick-up. These trips would be concentrated prior to departure or following the arrival of a ferry, about four to five vessels per hour during each peak period. Thus, the auto trips would result in a maximum passenger loading/unloading demand of about two vehicles simultaneously.

- **Parking –** Because the proposed project would not include any off-street vehicle parking spaces and because the existing on-street parking in the surrounding area is time-limited short-term parking, auto travel to the site would mostly be by taxi, TNC vehicles, and private auto drop-off and pick-up. Thus, the proposed project would generate virtually no parking demand.

Project Impacts

Impact TR-1: The proposed project would not conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system; would not conflict with an applicable congestion management program or other standards established by the county congestion management agency for designated roads or highways; and would not conflict with adopted policies, plans or programs regarding public transit, bicycle, pedestrian facilities, or otherwise decrease the performance or safety of such facilities. (Less than Significant)

VMT Analysis

The proposed project is not a land-use project, and therefore a VMT per capita analysis is not applicable to the project. However, as discussed above, transportation projects may substantially induce additional automobile travel. The following identifies thresholds of significance and screening criteria used to determine if transportation projects would result significant impacts by inducing substantial additional automobile travel.

Pursuant to OPR's proposed transportation impact guidelines, a transportation project would substantially induce automobile travel if it would generate more than 2,075,220 VMT per year. This threshold is based on the fair share VMT allocated to transportation projects required to achieve California's long-term greenhouse gas emissions reduction goal of 40 percent below 1990 levels by 2030.

OPR's proposed transportation impact guidelines includes a list of transportation project types that would not likely lead to a substantial or measureable increase in VMT. If a project fits within the general types of projects (including combinations of types) described below, then it is presumed that VMT impacts would be less than significant and a detailed VMT analysis is not required. Accordingly, the proposed project would not result in a substantial increase in VMT because it would include the following components and features:

1. Active Transportation, Rightsizing (aka Road Diet), and Transit Projects:

   Creation of new or expansion of existing transit service

2. Other Minor Transportation Projects:

   Removal of off- or on-street parking spaces

   Adoption, removal, or modification of on-street parking or loading restrictions (including meters, time limits, accessible spaces, and preferential/reserved parking permit programs)

The proposed project is a transportation project and would not generate new vehicle trips. The proposed project includes facilities that would support expansion of the existing water transit service, and would include changes to the on-street parking lanes landside to support bus and shuttles, and passenger loading/unloading activities. These features fit within the general types of projects identified by OPR that would not substantially induce automobile travel. Therefore, the overall impact of the proposed project on VMT would be less than significant.

Transit Impacts

The proposed project includes changes to the planned reconfiguration of Terry A. Francois Boulevard to accommodate access for passengers arriving at or departing from the Ferry Landing and Water Taxi Landing by transit. A transit stop with a bus pullout space would be provided on Terry A. Francois Boulevard north of 16th Street. The stop would be approximately 140 feet long and would include a 5-foot wide walkable median between the bus pullout space and the cycle track identical to the proposed median on Terry A. Francois Boulevard south of 16th Street. The transit stop could accommodate UCSF, Kaiser Permanente, and Mission Bay TMA shuttle buses already operating in Mission Bay and that could be rerouted to serve the Ferry Landing once ferry service is implemented. The transit stop could also serve the planned extension of Muni's 22 Fillmore route into Mission Bay once construction of 16th Street between Illinois Street and Terry A. Francois Boulevard is completed. These changes to on-street operations would not conflict with existing or potential Muni and shuttle service operations in the project vicinity, or cause a substantial increase in operating costs or delays to transit.

The proposed project would provide facilities to accommodate the extension of water transit service from the downtown Ferry Building into Mission Bay. As presented in Table 10, with implementation of the proposed project, there would be about 37 transit trips during the a.m. peak hour and 43 transit trips during the p.m. peak hour traveling to and from the Ferry and Water Taxi Landings. Transit riders would walk to existing or planned transit or shuttle stops, generally located one block west of the project site. Because the number of transit trips to and from the landings during the peak hours would be minimal and would be distributed among a number of Muni and shuttle routes and to and from the landings, the additional transit riders would not result in a substantial increase in any one route as to affect its ridership capacity utilization. Furthermore, it is anticipated that most transit trips would be via the free shuttles within Mission Bay, whose frequencies are adjusted to reflect changes in passenger demand.

As discussed above, the extension of water transit service into Mission Bay is part of WETA's strategic plan, and the additional ridership would be accommodated on the Alameda/Oakland, Larkspur, and Vallejo routes that would service Mission Bay. These routes are served by vessels with capacities of 400 to 750 passengers, and the additional passengers traveling to and from Mission Bay would be accommodated without substantially affecting the capacity utilization of these routes. Late evening post-event ferry service for a limited number of Chase Center events would not affect commuter ferry service operations.

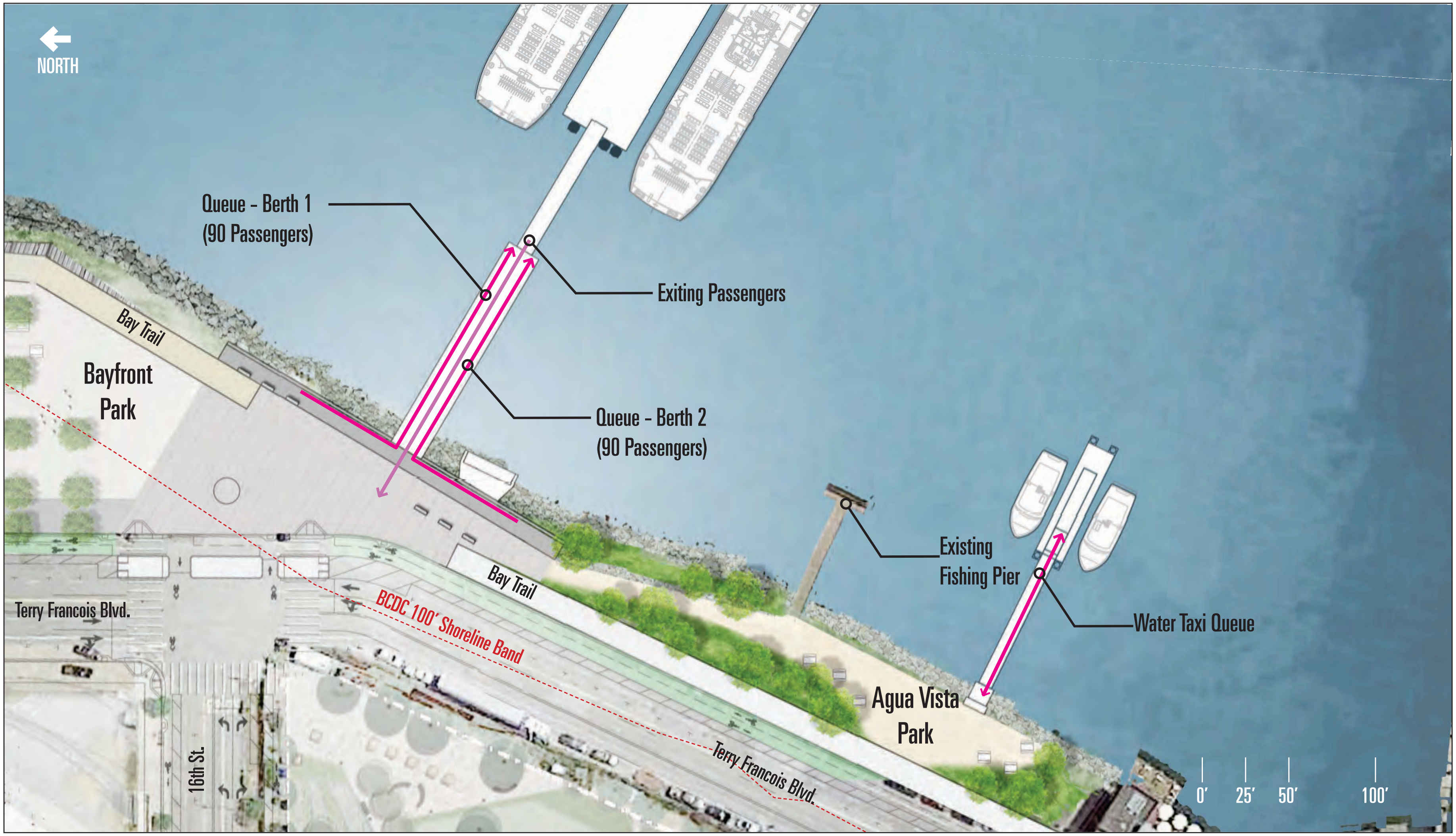
Overall, because the proposed project would not substantially affect the capacity utilization of the local and regional transit routes, and would not affect the operations of the adjacent and nearby Muni bus routes, transit impacts of the proposed project would be less than significant.

Pedestrian Impacts

The proposed project would accommodate extension of the water transit system into Mission Bay, and therefore add pedestrians approaching and leaving the Ferry and Water Taxi Landings. Pedestrian access to and from the landings would primarily be via 16th Street, although some pedestrians, depending on their ultimate origin or destination in Mission Bay, may access the east side of Terry A. Francois Boulevard north or south of the landings (e.g., at the intersections with South Street or Illinois/Mariposa streets). With realignment of Terry A. Francois Boulevard to the east and construction of the Chase Center, the intersections of Terry A. Francois Boulevard/16th Street and Terry A. Francois Boulevard/South Street will be signalized, and will include pedestrian countdown signals and crosswalks consistent with the continental design recommendations in the Better Streets Plan.

Table 11 above presents the number of passengers projected to arrive or leave Mission Bay via ferry and water taxi on a daily and peak hour basis, during commute periods without and with evening events at the Chase Center.

- **Weekday A.M. Peak Hour.** During the a.m. peak hour, it is anticipated that the majority of passengers would be arriving to Mission Bay, and only a limited number of passengers would use the ferry or water taxi to access the Ferry Building or East Bay or North Bay destinations. During the a.m. peak hour there would be about 275 pedestrian trips to or from the landings (i.e., 5 by auto drop-off or pick-up, 37 by transit, and 233 by walking). After exiting the ferry or water taxi, pedestrians would disperse to the west, north, and south, and would be accommodated on sidewalks and crosswalks that would be implemented through the realignment of Terry A. Francois Boulevard and construction of the Chase Center without substantially affecting pedestrian conditions.
- **Weekday P.M. Peak Hour.** During the weekday p.m. peak hour, it is anticipated that the majority of passengers would be leaving Mission Bay, and that there would be about 331 pedestrian trips to and from the landings (i.e., 6 by auto drop-off or pick-up, 43 by transit, and 282 by walking). **Figure 22** presents the passenger operations at the Ferry Landing for the weekday commute period. As indicated on the figure, two queuing areas would be provided for passengers waiting for the ferry, each queueing area accommodating about 90 passengers, for a total queueing area of 180 passengers. Because the total p.m. peak hour ridership of 352 passengers presented in Table 11 represents an average demand per vessel of about 70 passengers per vessel as presented in Table 12, a queueing area of 200 linear feet would accommodate the demand without impeding on the Bay Trail. On days when there would be an evening event at the Chase Center, the number of arriving boat passengers leaving the landings during the p.m. peak hour would increase to 891 (the 246 passengers traveling to the landings to wait for a boat to arrive during the p.m. peak hour would remain the same).
- **Late Evening Post-Event Conditions. Figure 23** presents the passenger operations at the Ferry Landing for conditions following an evening event at the Chase Center for which ferry service would be provided. Similar to the p.m. commute conditions, two queueing areas would be provided: one approximately 250 linear feet, accommodating about 110 passengers, and one approximately 450 linear feet accommodating about 200 passengers. Post-event, there would be about 785 attendees leaving by the four ferries that would serve the event (i.e., half of the projected additional 1,570 ferry ridership occurring on event days, as presented in Table 8). It is anticipated that prior to the end of the event, two ferries would be docked waiting for passengers, and that the first two vessels would have the greatest number of passengers. Passengers for these first two

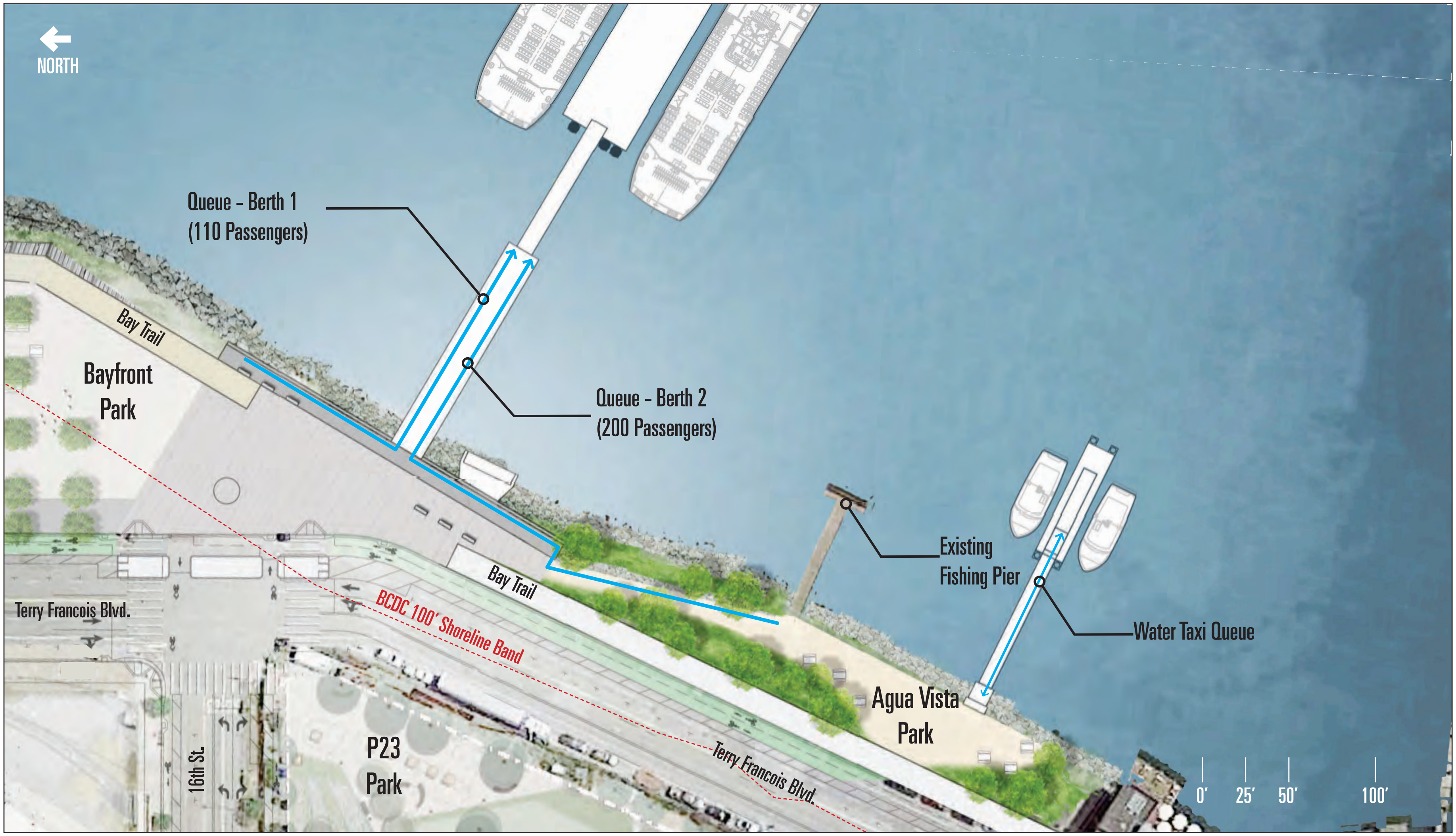


SOURCE: SF Port/Surface Design, Inc./COWI

Mission Bay Ferry Landing and Water Taxi Landing Project

Figure 22
Passenger Operations - Commute Period Conditions

ESA



SOURCE: SF Port/Surface Design, Inc./COWI

Figure 23
Passenger Operations - Post Event Conditions

ESA

> ferries would board immediately onto the vessels, without queueing. The two queueing areas, with capacity for a total of 310 passengers, would accommodate the average demand for the subsequent two vessels. The queue would be managed by temporary line barriers and Parking Control Officers (PCOs). In addition, as part of the Transportation Management Plan for large events at the Chase Center, PCOs would be posted at key intersections, including at Terry A. Francois Boulevard/16th Street and Terry A. Francois Boulevard/South Street to manage pedestrian, bicycle, and vehicular flows.[37]

The proposed project would not include on-site vehicle parking or any driveways into the project site, and, as shown on Table 8 and Table 11, the number of vehicle trips traveling to and from the project site would be limited (29 daily vehicle trips, and up to 6 vehicle trips during the p.m. peak hour). As discussed below under Loading Impacts, these trips would be accommodated within the proposed passenger loading/unloading zones on the east and west side of Terry A. Francois Boulevard. The additional vehicles would not result in potentially hazardous conditions to pedestrians walking along or across Terry A. Francois Boulevard.

Overall, while the addition of pedestrian trips traveling to and from the Ferry and Water Taxi Landings would incrementally increase pedestrian volumes on adjacent streets, the additional trips would not substantially affect pedestrian flows, and the vehicle trips at the project's passenger loading/unloading zones would not create potentially hazardous conditions, or interfere with pedestrian accessibility, and the proposed project impacts on pedestrians would be less than significant.

Bicycle Impacts

The proposed project would not include any bicycle facilities, such as bicycle racks or bike share stations as part of the Ferry and Water Taxi Landings, however, these facilities will be provided along Terry A. Francois Boulevard, within the Chase Center complex, and/or within Bayfront Park.

As presented in Table 9 and Table 10, some passengers are anticipated to travel to and from the Ferry and Water Taxi Landings by bicycle. The number of trips by bicycle would be about 94 trips on a daily basis, and between 18 and 21 trips during the a.m. and p.m. peak hours.

Bicyclists would use the planned cycle track on Terry A. Francois Boulevard, and existing and planned bicycle lanes on 16th Street. As part of the reconfiguration of Terry A. Francois Boulevard and the Chase Center project, the intersection of Terry A. Francois Boulevard/16th will be signalized and bicycle signals will be provided. In addition, two-stage turn queue boxes will be installed to facilitate turns between the bicycle lanes on 16th Street and the cycle track on the east side of Terry A. Francois Boulevard. These improvements, which will be implemented prior to construction of the proposed project, will improve bicycle access to the project site.

The proposed project includes on-street passenger loading/unloading zones on either side of Terry A. Francois Boulevard to accommodate passengers arriving or departing by auto. The passenger loading/ unloading zones would consist of a 5-foot wide walkable median between the drop-off/pick-up lane and the

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[37] City and County of San Francisco, *Event Center and Mixed-Use Development at Mission Bay Blocks 29-32 Environmental Impact Report*, November 2015, Volume I, page 5.2-29.

cycle track. The median would provide separation and protection for waiting and arriving passengers, and therefore passenger loading/unloading activities would not conflict with bicyclists traveling within the planned cycle track and vehicles dropping off or picking up passengers would not stop within the intersection of Terry A. Francois Boulevard/16th Street, or conflict with bicyclists traveling between Terry A. Francois Boulevard and 16th Street. The proposed project would not include any curb cuts or other changes to the public right-of-way on Terry A. Francois Boulevard that could create hazards for people bicycling, and therefore, would not create a new hazard or conflict with bicycling or bicycle accessibility.

Overall, although the proposed project would result in an increase in the number of vehicles and bicycles in the vicinity of the project site, this increase would not be substantial enough to affect bicycle travel or facilities in the area, create potentially hazardous conditions for bicyclist or interfere with bicycle accessibility, and therefore, for the above reasons, impacts to bicyclists would be less than significant.

Freight Truck and Passenger Loading Impacts

The proposed project includes changes to the planned reconfiguration of Terry A. Francois Boulevard to accommodate access for passengers arriving at or departing from the Ferry and Water Taxi Landings by vehicles (i.e., taxis, TNC vehicles, and private vehicles). Two passenger loading/unloading zones, each about 100 feet in length, would be provided on either side of Terry A. Francois Boulevard directly south of its intersection with 16th Street to serve vehicles traveling northbound and southbound on Terry A. Francois Boulevard.

- The passenger loading/unloading zone on the east side of Terry A. Francois Boulevard would replace about five on-street parking spaces planned to be located adjacent to the cycle track. A5-foot wide walkable median between the drop-off/pick-up lane and the cycle track would be provided for passenger waiting, loading, and unloading. The median would provide separation and protection for waiting and arriving passengers from vehicular and bicycle traffic.
- The passenger loading/unloading zone on the west side of the street would be adjacent to the planned sidewalk, and would replace about five curbside on-street parking spaces.

As noted above, up to six passengers are anticipated to arrive or depart the Ferry and Water Taxi Landings by auto during the peak hour of the morning and evening commute periods. Because there would be multiple ferries and water taxis arriving and departing during the one-hour period, these trips would primarily occur prior to departure or following the arrival of a ferry or water taxi. The auto trips result in a maximum passenger loading/unloading demand of two vehicles at one time, and as each passenger loading/unloading zone would accommodate up to four vehicles actively loading and unloading passengers, the demand would be accommodated without affecting bicycle, pedestrian, or vehicular travel in each direction of travel on Terry A. Francois Boulevard.

As neither the Ferry or Water Taxi Landings would be expected to generate commercial truck loading demand on a regular basis, dedicated off-street or on-street commercial loading spaces are not proposed as part of the project, nor are there off-street truck loading requirements by the Port for ferry and water taxi landings. As discussed above, commercial truck loading demand would be related to infrequent maintenance operations (i.e., the float, canopy and gangway would be dry-docked on a 10-year cycle for regular maintenance). Commercial truck loading would be accommodated within the planned on-street commercial loading spaces planned for the west side of Terry A. Francois Boulevard between South and 16th streets as part of the Chase Center.

In summary, because the proposed project's loading demand would be accommodated within the proposed on-street passenger loading/unloading zones on Terry A. Francois Boulevard, without creating potentially hazardous conditions affecting traffic, transit, bicycles, or pedestrians, or significant delays affecting transit, the proposed project impacts related to loading would be less than significant.

Construction Impacts

Construction of the proposed project is estimated to take about 20 months (between June 2019 and February 2021), and typical hours of construction would be on weekdays and weekends between 7:00 a.m. and 8:00 p.m. Most of the fabrication of materials for construction (e.g., floats and gangway, pier canopy) would take place off site and delivered to the project site primarily via barges. The majority of construction staging would be conducted within a temporary staging area adjacent to the proposed landings, and from the water via barges. As shown on Figure 7 in the Project Description, a temporary staging area would be provided between the proposed landing locations for staging and construction activities that would occur landside (primarily construction of the pier deck, utilities, passenger amenities, and landscaping). Construction activities would not encroach on or block access to the Terry A. Francois Boulevard travel lanes or cycle track.

During the project construction period, temporary and intermittent transportation impacts would result from truck movements to and from the project site for concrete and material deliveries. Construction activities would generate construction worker trips to and from the project site and a temporary demand for parking and public transit. Prior to construction, as part of the building permit process, the construction contractor(s) would be required to meet with Public Works and SFMTA staff to develop and review truck routing plans for demolition, disposal of excavated materials, materials delivery and storage, as well as staging for construction vehicles. The construction contractor would be required to meet the City of San Francisco's Regulations for Working in San Francisco Streets, (the Blue Book) as well as the public works code, including those regarding sidewalk and travel lane closures, and transit, pedestrian and bicycle circulation and safety, and would meet with SFMTA staff to determine if any special traffic permits would be required. In addition to the regulations in the Blue Book, the contractor would be responsible for complying with all city, state and federal codes, rules and regulations.

Overall, proposed project construction would maintain pedestrian circulation adjacent to the project site, and would not require travel lane closures that would disrupt or substantially delay vehicles, including transit in the vicinity, or bicyclists traveling on Terry A. Francois Boulevard. Furthermore, construction activities would be temporary in nature and required to meet City rules and guidance (i.e., the Blue book and public works requirements) so that work can be done safety and with the least possible interference with pedestrians, bicyclists, vehicles and transit, and would therefore not result in potentially hazardous conditions. For the reasons described above, the proposed project's construction-related transportation impacts would be less than significant. However, **Improvement Measure I-TR-1: Construction Management Plan and Public Updates** is recommended to reduce the less-than- significant construction-related transportation impacts of the proposed project.

Improvement Measure I-TR-1: Construction Management Plan and Public Updates. The Port or the Port's contractor shall comply with the following:

Construction Management Plan—The Port should develop and, upon review and approval by the SFMTA and Public Works, implement a Construction Management Plan, addressing transportation-related circulation, access, staging and hours of delivery. The Construction Management Plan shall disseminate appropriate information to contractors and affected agencies with respect to coordinating construction activities to minimize overall disruption and ensure that overall circulation in the project area is maintained to the extent possible, with particular focus on ensuring transit, pedestrian, and bicycle connectivity. The Construction Management Plan shall supplement and expand, rather than modify or supersede, any manual, regulations, or provisions set forth by the SFMTA, Public Works, or other City departments and agencies, and the California Department of Transportation. Management practices could include: best practices for accommodating pedestrians and bicyclists, and identifying routes for construction trucks to utilize.

Carpool, Bicycle, Walk, and Transit Access for Construction Workers—To minimize parking demand and vehicle trips associated with construction workers, the construction contractor should include as part of the Construction Management Plan methods to encourage carpooling, bicycle, walk and transit access to the project site by construction workers (such as providing secure bicycle parking spaces, participating in free-to-employee and employer ride matching program from www.511.org, participating in emergency ride home program through the City of San Francisco (www.sferh.org), and providing transit information to construction workers.

Construction Worker Parking Plan—As part of the Construction Management Plan that shall be developed by the construction contractor, the location of construction worker parking could be identified as well as the person(s) responsible for monitoring the implementation of the proposed parking plan. The use of on-street parking to accommodate construction worker parking should be discouraged.

Project Construction Updates for Adjacent Businesses and Residents—To minimize construction impacts on access to nearby residences and businesses, the Port should provide nearby residences and adjacent businesses with regularly-updated information regarding project construction, including construction activities, peak construction vehicle activities (e.g., concrete pours), travel lane closures, and parking lane and sidewalk closures. A regular email notice should be distributed by the Port that shall provide current construction information of interest to neighbors, as well as contact information for specific construction inquiries or concerns.

Conclusion

Due to the limited addition of project-related vehicles (about 29 daily vehicle trips, and between five and seven vehicle trips during the peak hours), the proposed project is not anticipated to result in a conflict with any established plans or policies related to transportation and circulation. In addition, as discussed above, the proposed project would not induce additional automobile travel. Implementation of the proposed project would result in less-than-significant transit, pedestrian, bicycle, loading and construction-related impacts. Therefore, the proposed project would not conflict with any plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system or congestion management program. This impact would be less than significant and no mitigation measures are required.

Impact TR-2: The proposed project would not result in substantially increased hazards due to a design feature (e.g., sharp curves of dangerous intersection) or incompatible uses. (Less than Significant)

The proposed project would include the construction of a Ferry Landing that would accommodate two ferry vessels at one time and a smaller Water Taxi Landing. Each landing would include a pier or platform, gangway, and float, and associated landside improvements such as utilities, seating, lighting, and landscaping treatments. The proposed project would be located within the San Francisco Bay and within San Francisco Port property east of Terry A. Francois Boulevard, and would not include any driveways into the project site, or any design features that would be considered a major traffic hazard. The proposed on-street passenger loading/unloading zones on either side of Terry A. Francois Boulevard south of 16th Street, and the proposed transit stop on the east side of the street would be located within the parking lane, which would not create a traffic hazard. Therefore, the proposed project would not include sharp curves or other roadway design elements that would create dangerous conditions for people driving. The proposed project would result in a less-than-significant impact related to hazards associated with a design feature and no mitigation is required.

Impact TR-3: The proposed project would not result in inadequate emergency access. (Less than Significant)

Emergency access to the project site would remain mostly unchanged from existing conditions. Emergency service providers would continue to access the project site, as well as the Bayfront Park and Agua Vista Park, via Terry A. Francois Boulevard, and would continue to travel unimpeded, similar to existing conditions. The proposed project would include two on-street passenger loading/unloading zones (100 feet in length) on either side of Terry A. Francois Boulevard that could be used by emergency vehicles in case of an emergency. The proposed project would not result in a substantial increase in vehicles on the adjacent streets, and because multiple travel lanes are provided on most streets in the vicinity of the project site, emergency vehicle travel would not be impeded or hindered. In addition, the Ferry and Water Taxi Landings would be accessible by fire boats housed at San Francisco Fire Department Station 35 at Pier 22.5 on The Embarcadero at Harrison Street. Thus, for the above reasons, the proposed project would not inhibit emergency vehicle access to the project site and vicinity. Therefore, the proposed project's impacts related to emergency access would be less than significant and no mitigation measures would be required.

Impact TR-4: The proposed project would not conflict with adopted policies, plans or programs regarding public transit, bicycle or pedestrian facilities, or cause a substantial increase in transit demand that cannot be accommodated by existing or proposed transit capacity or alternative travel modes. (Less than Significant)

The proposed project would accommodate extension of the existing water transit system into Mission Bay consistent with WETA's 2016 Strategic Plan. During weekday commute periods, it is anticipated that ferry service would be provided via existing ferry routes linked via downtown San Francisco's Ferry Building terminal and Alameda/Oakland, Larkspur, and Vallejo terminals, and the additional riders would be accommodated within the ferry serving these routes (i.e., vessels with a passenger capacity of between 400 and 750 passengers). Within Mission Bay, access would be primarily by walking and shuttle routes serving Mission Bay. Late evening special event service to the Chase Center would not affect commute routes, and would provide an additional transit option for attendees. Both ferry and water taxi access to Mission Bay would reduce vehicle trips and vehicle miles traveled. Therefore, the proposed project would not result in changes in the City's transportation and circulation system that would conflict with adopted policies, plans, or programs regarding transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities, or cause a substantial increase in travel demand that cannot be accommodated by existing or propose transit capacity or alternative travel modes. Furthermore, the proposed project would not conflict with adopted plans, policies, or programs related to alternative modes of travel. Therefore, this impact would be less than significant and no mitigation measures would be required.

Impact C-TR-1: The proposed project in combination with past, present, and reasonably foreseeable future projects, would not result in substantial cumulative transportation impacts. (Less than Significant)

Cumulative development and transportation infrastructure projects that are expected to be implemented by the cumulative horizon year 2040 are presented in Table 5 and shown on Figure 12. As discussed in the Approach to Analysis, above, the planned realignment of Terry A. Francois Boulevard to the west to allow for the creation of the planned Bayfront Park, and the provision of a two-way cycle track on the east side of the street was considered in the design of the proposed project. Specifically, the proposed transit stop on the east side of Terry A. Francois Boulevard directly north of 16th Street, and the proposed on-street passenger loading/unloading zones on either side of Terry A. Francois Boulevard south of 16th Street were designed considering the planned reconfiguration of Terry A. Francois Boulevard.

Cumulative VMT Impacts

VMT by its very nature is largely a cumulative impact. The amount and distance past, present, and future projects might cause people to drive contribute to the physical secondary environmental impacts associated with VMT. It is likely that no single project by itself would be sufficient in size to prevent the region or state in meeting its VMT reduction goals. Instead, a project's individual VMT contributes to cumulative VMT impacts. The VMT and induced automobile travel project-level thresholds are based on levels at which new projects are not anticipated to conflict with state and regional long-term greenhouse gas emission reduction targets and statewide VMT per capita reduction targets set in 2020. The proposed project is a transportation project and includes features that would alter the transportation network (e.g., construction of facilities that could be used by ferries and water taxis and removal of on-street parking to provide a transit stop and two passenger loading/unloading zones), and, as discussed in Impact TR-1, would not substantially induce automobile travel. Therefore, because the proposed project would not induce automobile travel, the proposed project would not be considered to result in a cumulatively considerable contribution in VMT.

Cumulative Traffic Hazards Impacts

As described above, a number of cumulative transportation network projects are currently underway or planned that would enhance the transportation network in the project vicinity, particularly for pedestrians and bicyclists. These include the reconfiguration of Terry A. Francois Boulevard, including a two-way cycle track, extension of 16th Street between Illinois Street and Terry A. Francois Boulevard, new traffic signals at the intersections of Terry A. Francois Boulevard at South Street and at 16th Street, and Bay Trail improvements within the Bayfront Park and Agua Vista Park. Cumulative projects, including the proposed project's Ferry and Water Taxi Landings, would not introduce unusual design features, and these projects would be designed to meet City, National Association of City Transportation Officials, and Federal Highway Administration standards, as appropriate. Increases in vehicles, including those to and from the proposed project, could result in the potential for increased vehicle-vehicle conflicts, but the increased potential for conflicts would not be considered new or substantial worsening of a traffic hazard, and would not result in significant cumulative traffic hazard impacts. Therefore, the proposed project, in combination with past, present, and reasonably foreseeable development projects, would result in less-than-significant cumulative traffic hazard impacts.

Cumulative Transit Impacts

A number of Muni transit service improvements are currently underway or planned to be implemented, and therefore, under 2040 cumulative conditions, there would be an increase in the frequencies and capacity of Muni routes serving the project area (e.g., Central Subway/T Third, extension of the 22 Fillmore to Mission Bay). Under 2040 cumulative conditions, capacity on the T Third light rail and on the 22 Fillmore bus route would increase over existing conditions, and the capacity utilization would be less than Muni's established 85 percent capacity utilization standard,[38] and would not result in significant cumulative Muni transit impacts. Therefore, the proposed project, in combination with past, present, and reasonably foreseeable development in San Francisco, would result in less-than-significant cumulative Muni transit impacts.

Under 2040 cumulative conditions, the BART line to the East Bay would have a capacity utilization of 112 percent during the weekday p.m. peak hour,[39] and would therefore operate above the regional standard utilization standard of 100 percent. This is a significant cumulative transit impact. However, the proposed project would not increase BART ridership to or from San Francisco, and therefore would not contribute considerably to BART capacity utilization exceeding the 100 percent standard. Therefore, the proposed project would not contribute considerably to cumulative impacts on regional transit. Therefore, the proposed project's contribution to cumulative regional transit impacts would be less than significant.

Overall, for the above reasons, the proposed project's contribution to cumulative transit impacts would be less than significant.

Cumulative Pedestrian Impacts

Cumulative projects currently being implemented are projected to enhance pedestrian conditions in the project vicinity, including realignment of Terry A. Francois Boulevard, upgrades to the Bay Trail within the Bayfront Park, new traffic signals at the intersections of Terry A. Francois Boulevard/16th Street and Terry A. Francois Boulevard/South Street, new sidewalks along 16th Street between Third Street and

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[38] City and County of San Francisco, *Event Center and Mixed-Use Development at Mission Bay Blocks 29-32 Environmental Impact Report*, November 2015, Volume I, page 5.2-223.

[39] San Francisco Planning Department, Memorandum: Updated BART Regional Screenlines – Revised, October 2016.

Terry A. Francois Boulevard, and new sidewalks on the west side of Terry A. Francois Boulevard between Mariposa and South streets.

Walk trips may increase between the completion of the proposed project and the 2040 cumulative conditions due to growth in the area and the proposed project; however, the increase would not result in substantial overcrowding on sidewalks and crosswalks in the immediate vicinity of the project site. At most of the nearby intersections, there is a projected increase in background vehicle traffic between existing and 2040 cumulative conditions. The overall increase in traffic volumes under 2040 cumulative conditions would result in an increase in the potential for vehicle-pedestrian conflicts at intersections in the study area. This general increase in vehicle traffic that is expected through the future 2040 cumulative conditions is not anticipated to create potentially hazardous conditions for pedestrians, or otherwise interfere with pedestrian accessibility to the site and adjoining areas, and would not result in significant cumulative pedestrian impacts. For the above reasons, the proposed project, in combination with past, present, and reasonably foreseeable development in San Francisco, would result in less-than-significant cumulative pedestrian impacts.

Cumulative Bicycle Impacts

Bicycling trips in the area may increase between the completion of the project and the cumulative scenario due to general growth in the area. A number of projects currently being implemented will enhance cumulative conditions for bicyclists in the project vicinity: Terry A. Francois Boulevard will be reconfigured with a two-way cycle track on the east side of the street; bicycle lanes will be provided on 16th Street between Third Street and the reconfigured Terry A. Francois Boulevard; the intersections of Terry A. Francois Boulevard/16th Street and Illinois Street/Mariposa Street will be signalized and bicycle signals will be provided; at the intersection of Terry A. Francois Boulevard/16th Street two-stage turn queue boxes will be installed to facilitate turns between the bicycle lanes on 16th Street and the cycle track on the east side of Terry A. Francois Boulevard. The proposed project would not conflict with these projects and there are no other San Francisco Bicycle Plan or other bicycle projects planned on streets in the vicinity of the project site.

Under 2040 cumulative conditions, there is a projected increase in vehicles at many of the study intersections in the vicinity of the proposed project, which may result in an increase in vehicle-bicycle conflicts at intersections and driveways in the study area. While there would be a general increase in vehicle traffic that is expected through the future 2040 cumulative conditions, this increase, in combination with increased bicycle use, is not anticipated to create potentially hazardous conditions for bicycles, or otherwise interfere with bicycle accessibility to the site and adjoining areas, and would not result in significant cumulative bicycle impacts. Therefore, for the above reasons, the proposed project, in combination with past, present, and reasonably foreseeable development in San Francisco, would result in less-than-significant cumulative impacts on bicyclists.

Cumulative Loading Impacts

The proposed project would result in very minimal commercial truck loading demand, and therefore would not contribute to impacts from other development projects near the project site. Cumulative development projects would be expected to make accommodation for their respective projected truck loading demand on-site or on-street such that it would not result in potentially hazardous conditions, and therefore, would not result in significant cumulative truck loading impacts. The proposed project's passenger loading/unloading demand would be met within the proposed on-street transit stop and passenger loading/unloading zones on Terry A. Francois Boulevard. No cumulative development projects have been identified that would contribute to the passenger loading/unloading demand on the east side of Terry A. Francois Boulevard, and would not result in significant cumulative passenger loading impacts. Therefore, for the above reasons, the proposed project, in combination with past, present, and reasonable foreseeable development in San Francisco, would result in less-than-significant cumulative loading impacts.

Cumulative Emergency Access Impacts

As discussed above, with the planned reconfiguration of Terry A. Francois Boulevard, two mixed-flow travel lanes in each direction would be maintained, and emergency vehicle access to the project site would remain similar to existing conditions. As noted above, as part of ongoing projects, 16th Street will be extended between Illinois Street and the reconfigured Terry A. Francois Boulevard, which will enhance emergency vehicle access in the area. None of the other known cumulative development projects would substantially affect circulation in the project vicinity. Under cumulative conditions, there would be a projected increase in vehicles on study area streets, however, the increase would not impede or hinder emergency vehicle travel, as discussed in the paragraph below.

Because multiple travel lanes would remain on adjacent streets, vehicles would be able to pull over to the side of the street and provide a clear travel path when an emergency vehicle with sirens is approaching, and emergency vehicles would not be substantively delayed. Therefore, for the above reasons, the proposed project, in combination with past, present and reasonably foreseeable development in San Francisco, would result in less-than-significant cumulative emergency vehicle access impacts.

Cumulative Construction Impacts

The construction of the proposed project may overlap with the construction of other projects, although the majority of the currently known cumulative projects considered in the Approach to Analysis in proximity to the project site are under construction and are likely to be completed prior to construction of the proposed project. Construction of Bayfront Park may partially overlap with project construction. Given the limited number of development projects whose construction schedules may partially overlap with proposed project construction, and given that portions of proposed construction activities would be conducted off-site, and via barges, construction activities would not result in significant cumulative construction-related transportation impacts.

The construction manager for each cumulative project would be required to work with the various departments of the City to ensure that construction contractors comply with Blue Book regulations and public works requirements, which would address construction vehicle routing, traffic control, and pedestrian and bicyclist movement adjacent to the construction area. Similar to the proposed project, sponsors and construction managers of cumulative development projects would be required to coordinate with various City departments such as SFMTA and Public Works, and coordinate any temporary sidewalk and travel lane closures through the TASC to develop coordinated plans that would address construction-related vehicle routing, traffic control, and pedestrian movements adjacent to the construction area for the duration of construction overlap.

Therefore, for the above reasons, the proposed project, in combination with past, present and reasonably foreseeable development in San Francisco, would result in less-than-significant cumulative construction-related transportation impacts.

Based on the foregoing, in combination with past, present, and reasonable foreseeable future projects, the proposed project would not contribute considerably to any substantial cumulative increase in VMT, impacts to the effectiveness of the circulation system, impacts related to design features or incompatible uses, inadequate emergency access, or conflicts with alternate modes of transportation. Therefore, this impact would be less than significant and no mitigation measures would be required.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
6. NOISE — Would the project:					
a) Result in exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☒	☐	☐
b) Result in exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐	☐
c) Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐	☐
d) Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐	☐
e) For a project located within an airport land use plan area, or, where such a plan has not been adopted, in an area within two miles of a public airport or public use airport, would the project expose people residing or working in the area to excessive noise levels?	☐	☐	☐	☐	☒
f) For a project located in the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☐	☒
g) Be substantially affected by existing noise levels?	☐	☐	☐	☐	☒

The project site is not within an airport land use plan area, [40] nor is it in the vicinity of a private airstrip. Therefore, Initial Study topics e) and f) are not applicable.

Impact NO-1: The proposed project would not result in the exposure of persons to or generation of noise levels in excess of established standards, nor would the proposed project result in a substantial permanent increase in ambient noise levels or otherwise be substantially affected by existing noise. (Less than Significant)

Applicable Noise Standards[41]

In San Francisco, regulation of noise is stipulated in the Noise Ordinance, i.e. article 29 of the Police Code (Regulation of Noise), which states that the City's policy is to prohibit unnecessary, excessive, and offensive noises from all sources subject to police power. Sections 2907 and 2908 of article 29 regulate construction equipment and construction work at night, while section 2909 provides for limits on stationary-source noise from machinery and equipment. Sections 2907 and 2908 are enforced by the Department of Building Inspection, and section 2909 is enforced by the Department of Public Health. Summaries of these and other relevant sections are presented below.

Sections Regulating Construction Noise

Sections 2907(a) and (b) of the Police Code state that it shall be unlawful for any person, including the City and County of San Francisco, to operate any powered construction equipment, regardless of age or date of acquisition, if the operation of such equipment emits noise at a level in excess of 80 dBA when measured at a distance of 100 feet from such equipment, or an equivalent sound level at some other convenient distance. Exemptions from this requirement include:

- Impact tools and equipment with intake and exhaust mufflers recommended by the manufacturers and approved by the Director of Public Works as best accomplishing maximum noise attenuation; and
- Pavement breakers and jackhammers equipped with acoustically attenuating shields or shrouds recommended by the manufacturers and approved by the Director of Public Works as best accomplishing maximum noise attenuation.

Section 2908 prohibits any person, between the hours of 8:00 p.m. of any day and 7:00 a.m. of the following day, from erecting, constructing, demolishing, excavating for, altering, or repairing any building or structure if the noise level created is in excess of the ambient noise level by 5 dBA at the nearest property line unless a special permit has been applied for and granted by the Director of Public Works.

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[40] City/County Association of Governments (C/CAG) of San Mateo County, *Airport Land Use Compatibility Plan for the Environs of San Francisco International Airport*, November, 2012. See also, Alameda County Community Development Agency (ACCDA), *Oakland International Airport*, *Airport Land Use Compatibility Plan*, December, 2012.

[41] In a decision issued on December 17, 2015, the California Supreme Court held that CEQA does not generally require an agency to consider the effects of existing environmental conditions on a proposed project's future users or residents except where a project or its residents may exacerbate existing environmental hazards (*California Building Industry Association v. Bay Area Air Quality Management District,* December 17, 2015, Case No. S213478. Accordingly, the discussion of exposure of the proposed project's future residents to existing ambient noise is provided for informational purposes only.

Sections Regulating Operational Noise

Section 2909 establishes a not-to-exceed noise standard for fixed sources of noise, such as building mechanical equipment and industrial or commercial processing machinery. Unlike the state building code (Title 24) standard, which is applicable to interior living space only, the standards in section 2909(a), (b), and (c) are applicable outdoors, at the property line of the affected use, and vary based on the residential or commercial nature of the noise generator’s use. For example, the noise limits for operation of commercial and industrial properties provide that no person shall produce or allow to be produced a noise level more than 8 dBA above the local ambient level at the property plane. For noise sources emanating from residential properties, the noise limits are 5 dBA above the ambient level at any point outside of the property plane of a residential use. The noise limits for public property provide that no person shall produce a noise level more than 10 dBA above the local ambient level at a distance of 25 feet or more on public property.

As is common for noise standards, the permitted noise level for fixed residential interior noise limits identified in section 2909(d) is lower at night than during the day. For example, maximum noise levels at any sleeping or living room in any dwelling unit located on residential property must not exceed 45 dBA between 10:00 p.m. and 7:00 a.m., and 50 dBA between 7:00 a.m. and 10:00 p.m. None of the noise limits set forth in this section apply to activity for which the City and County of San Francisco has issued a permit that contains noise limit provisions that are different from those set forth in this article. Additionally, the Directors of Public Health, Public Works, or Building Inspection, or the Entertainment Commission, or the Chief of Police may grant variances to noise regulations, over which they have jurisdiction pursuant to section 2916.

Existing Noise in Project Site Vicinity

Ambient noise levels in the project vicinity are typical of noise levels found in San Francisco, which are dominated by vehicular traffic, including, cars, trucks, Muni buses, and emergency vehicles. Third Street is the most heavily traveled roadway in the area, and generates traffic noise in excess of 70 dBA at ground level locations.[42] While land uses in the project site vicinity do not generate a substantial amount of noise, high traffic volumes along the surrounding streets result in a relatively loud noise environment.

The closest sensitive receptors to the project site include condominiums at 610 Illinois Street located approximately 820 feet the southwest, UCSF Mission Bay Medical Center located approximately 900 feet to the west and UCSF Hearst Tower student housing 1,000 feet to the northwest. The nearest day care facility is on the UCSF Mission Bay campus 2,200 feet to the northwest. All other residential uses to the south are over 1,000 feet distant, south of Mariposa Street.

Ambient long-term (24-hour) and short-term (15-minute) noise measurement data were collected in October of 2014, April of 2015, and November of 2017 in the project area, which characterizes noise conditions at the nearest noise-sensitive off-site locations. Short-term measurement data were collected at

[42] San Francisco Department of Public Health, Map of Areas Potentially Requiring Noise Insulations, March 2009. Available at: http://www.sf-planning.org/ftp/files/publications_reports/library_of_cartography/Noise.pdf. Reviewed February 8, 2016.

locations where residential and hospital land uses exist near the project site, as described in **Table 13**. Long-term noise data were collected for the UCSF Hearst Tower project located northwest of the project site on Third Street, and are presented in **Table 14**.

TABLE 13
SHORT-TERM AMBIENT NOISE LEVEL DATA IN THE PROJECT AREA

Measurement Location	Time	Noise Levels in dBA		
		Hourly L_{eq}	L_{90}	L_{max}
1. UCSF Hospital 900 feet west of the project site	8:56 – 9:11 a.m.	67.0	61	81.2
2. 610 Illinois Street 820 feet southwest of the project site	11:21 – 11:36 a.m.	72.6	61	94.8

NOTE: L_{eq} represents the constant sound level; L_{max} is the maximum noise level. L90 is the background noise level. Time of day of short term monitoring reflect daytime hours during which construction activities could occur.

SOURCE: ESA, 2014, 2017.

TABLE 14
LONG- TERM AMBIENT NOISE LEVEL DATA IN THE PROJECT AREA

Measurement Location	Day-Night Noise level (DNL)	Noise Levels in dBA			
		Daytime hourly average Leq	Daytime hourly average L_{90}	Nighttime hourly average Leq	Nighttime hourly average L_{90}
3a. UCSF Mission Bay Housing Block 20 – No Giants Game Nearby residential receptor 1,000 feet from the project site	75	71	61	68	55
3b. UCSF Mission Bay Housing Block 20 – With Giants Game Nearby residential receptor 1,000 feet from the project site	75	71	61	68	56

NOTE: Nighttime noise levels represented are for the hours between 10:00 p.m. and 12:00 a.m. as the hours most likely to be affected by crowd egress from future events at the Chase Center.

SOURCE: ESA, 2014.

Noise from Proposed Project Operations

Generally, traffic must double in volume to produce a noticeable increase in the ambient noise level in the project vicinity. While the project may result in a small increment of noise from vehicles accessing the site by taxi or ride share, this trip increment is assumed to be negligible in the transportation analysis and is not considered herein. This increase in vehicle trips would not cause traffic volumes to double on nearby streets, and would not have a noticeable effect on ambient noise levels in the project site vicinity. Therefore, operational noise from vehicle traffic would not significantly increase the existing ambient noise levels in the project vicinity.

In addition to vehicle-related noise, ferry arrival and idling operations would generate noise. Short-term (15-minute) noise measurements collected adjacent to Gate B of the existing WETA ferry terminal at the San Francisco Ferry Building are provided in **Table 15** as comparable ambient noise conditions that would result during ferry arrival and idling. Water taxis would have smaller engines and consequently generate lower noise levels than the ferry operations.

TABLE 15
NOISE FROM FERRY ARRIVAL AND IDLING

Location	Time Period	Leq (dBA)	Noise Sources
Short-term Measurement: Promenade along SF ferry terminal with ferry approach, idle, and departure.	01/18/11 10:56 – 11:11 a.m.	15-minute Leq 66 dBA Lmax: 75 dBA	Ferry engine idle and cooling water discharge.

SOURCE: ESA, 2011

As indicated in Table 15 ferry idling generates a steady-state noise level of 66 dBA, Leq at a distance of approximately 120 feet. This noise level would attenuate to approximately 49 dBA at the nearest noise-sensitive land use 900 feet away. This level of noise contribution would not meaningfully increase the existing noise levels in the area which were monitored to be 56 dBA, L90 during nighttime periods. The eventual presence of the Chase Center currently under construction across Terry A. Francois Boulevard from the Ferry Landing and Water Taxi Landing and the nearest receptors will provide additional attenuation. Consequently, operational noise of the proposed Ferry and Water Taxi Landing would not result in the exposure of persons to or generation of noise levels in excess of established standards, nor would the proposed project result in a substantial permanent increase in ambient noise levels or otherwise be substantially affected by existing noise.

Impact NO-2: During construction, the proposed project would not result in a substantial temporary or periodic increase in ambient noise levels and vibration in the project vicinity above levels existing without the project. (Less than Significant)

Construction Noise from the Proposed Project

Demolition, excavation, and construction would cause a temporary increase in noise levels within the project vicinity. Construction equipment would generate noise and possibly vibrations that could be considered an annoyance by occupants of nearby properties. The Port estimates that project construction activities would occur over a period of approximately 20 months. The magnitude of construction-related noise impacts during this period would depend on a number of factors that include the type and size of equipment operated during a given construction phase, the duration of a given construction phase, the distance between the noise source(s) and the affected receptor(s), and the presence (or absence) of barriers. Impacts would generally be limited to demolition and the periods during which structural elements would be constructed. However, there would be times when noise could interfere with indoor activities in nearby residences and other businesses near the project site.

As noted above, construction noise is regulated by the Noise Ordinance (article 29 of the Police Code). The ordinance requires that noise levels from individual pieces of construction equipment, other than impact tools, not exceed 80 dBA at a distance of 100 feet from the source. Impact tools (e.g., jackhammers, hoe rams, impact wrenches) must have manufacturer-recommended and City-approved mufflers for both intake and exhaust. Section 2908 of the Ordinance prohibits construction work between 8:00 p.m. and 7:00 a.m., if noise would exceed the ambient noise level by 5 dBA at the project property line, unless a special permit is authorized by the Director of the Department of Public Works or the Director of Building Inspection. The project would be required to comply with regulations set forth in the Noise Ordinance.

The nearest sensitive receptors to the project site are a residential condominium complex on Illinois Street, approximately 820 feet west of the project site and UCSF Hospital, approximately 900 feet west of the project site and UCSF student residential dwellings, approximately 1,000 feet northwest of the project site. These uses could experience temporary and intermittent noise associated with pile driving and construction activities.

Table 16 shows the hourly noise levels (L_{max}) produced by various types of common construction equipment based on a distance of 50 feet between the equipment and noise receptor. 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 one or two minutes of full power operation followed by three or four minutes at lower power settings. The L_{max} noise levels shown in Table 16 would therefore be expected to only occur occasionally throughout the construction day.

TABLE 16
MAXIMUM NOISE LEVELS FROM CONSTRUCTION EQUIPMENT

Construction Equipment	Noise Level at 50 Feet (dB, L_{max})	Noise Level at 100 Feet (dB, L_{max})
Dump Truck	76	70
Excavator	81	76
Impact Pile Driver	101	95
Air Compressor	78	72
Backhoe	78	72
Grader	85	79
Front End Loader	79	73
Dozer	82	76
Tractor	84	78
Paver	77	71
Roller	80	74

SOURCE: Federal Highway Administration, Roadway Construction Noise Model User's Guide, 2006.

Noise associated with demolition activities would include operation of a crane, a tug boat, a generator and trenching equipment as well as loading and idling of haul trucks. Dredging would be performed from water side barges using a clamshell bucket and smaller dredge bucket where debris from old pile stumps are expected. Dredge material would be placed into scows for transfer to the agency approved disposal site(s). Scows will have a grid to screen out debris. Debris would be removed from the grid and placed in a debris barge for transfer to the disposal site.

Impact pile driving would be required for both the Ferry Landing and the Water Taxi Landing. Pile driving is assumed to occur over a two-month period. The pier deck would be constructed over water working from both the land and water-based vessel. Formwork would be constructed, rebar placed, and concrete poured. Equipment would consist of generators and a small land-based crane for placement of formwork and rebar. Concrete trucks and a concrete pump truck would work from land during placement of concrete.

According to section 2907 of the City's Noise Ordinance, it is prohibited to operate any powered construction equipment (non-impact), regardless of age or date of acquisition, if the operation of such equipment emits noise at a level in excess of 80 dBA when measured at a distance of 100 feet from such equipment. As can be seen from Table16, construction equipment used for building construction would operate within the constraints of the noise ordinance standards except for pile drivers which, as impact equipment, are exempt from this restriction.

Section 2908 of the City's Noise Ordinance prohibits any person, between the hours of 8:00 p.m. of any day and 7:00 a.m. of the following day, from erecting, constructing, demolishing, excavating for, altering, or repairing any building or structure if the noise level created is in excess of the ambient noise level by 5 dBA at the nearest property line unless a special permit has been applied for and granted. Project construction activities would occur during daytime hours and the restrictions of section 2908 of the City's Noise Ordinance would not be applicable.

During project construction, the noise levels experienced at the nearest off-site receptors would vary depending on the distance from the construction equipment within the site to the receptor. Although the existing noise levels in the area are somewhat elevated (see Table 1), the addition of construction noise at the nearest off-site receptors to the south could be noticeable at times given the proximity.

A conservative estimate of construction noise levels was conducted using the general assessment approach recommended by the U.S. Federal Transit Administration (USFTA) and the construction equipment to be used for the project's construction phases as provided by the Port. **Table 17** shows the estimated construction noise level contributions that would occur at the nearest off-site sensitive uses during construction at the project site as well as the resulting noise level (the contribution from construction activity added to the existing noise environment). The estimated noise levels at the off-site sensitive receptors were calculated using the Federal Highway Administration's Roadway Construction Noise Model and were based on the concurrent operation of the four noisiest pieces of equipment identified for each phase.

TABLE 17
EXTERIOR NOISE AT OFF-SITE SENSITIVE USES FROM PROJECT CONSTRUCTION

Construction Phase	Nearest Off-site Sensitive Land Uses Location	Approximate Distance to Project Site (ft.)[a]	Existing Monitored Daytime Noise level (dBA L_{eq})	Estimated Construction Noise Level (dBA L_{eq})	Resultant Noise Level (Existing + Construction) (dBA L_{eq})	Increase over Existing (dBA L_{eq})
Demolition	610 Illinois Street (live-work loft use)	820	73	70	75	+2
Dredging	610 Illinois Street (live-work loft use)	820	73	57	73	0
Pile Driving	610 Illinois Street (live-work loft use)	820	73	70	75	+2
Pier Construction	UCSF Hospital	900	67	57	67	0
Float Installation	610 Illinois Street (live-work loft use)	820	73	70	75	+2
Utilities and Paving	610 Illinois Street (live-work loft use)	820	73	60	73	0

[a] The approximate distances are measured from the nearest edge of the construction activity to the nearest sensitive-receptor property line.

As shown in Table 17, the estimated construction noise levels generated by the project would range from 57 to 70 dBA L_{eq} at the nearest noise-sensitive land uses, which would not be a substantial increase over existing monitored levels. As discussed in the Project Description, to reduce potential impacts from noise due to pile-driving, the Port would implement one or more of the following Best Management Practices as needed:

- Use vibratory methods for installation of steel piles to the extent practicable
- Use cushion blocks between hammer and piles
- Implement a "soft start" technique

Construction noise impacts would be temporary in nature and would be limited to the 15-month period of construction. Moreover, the project demolition and construction activities would be required to comply with the Noise Ordinance requirements, which prohibit construction after 8:00 p.m. Although construction-related noise could be annoying at times, it would be temporary, and the noisiest phases of construction are typically of shorter duration. Further, construction noise would not be expected to exceed noise levels commonly experienced in an urban environment. Therefore, construction noise impacts would be less than significant.

Construction Vibration from the Proposed Project

Groundborne vibration from construction activities that involve impact activities, primarily pile driving, could produce detectable vibration at nearby sensitive buildings and sensitive receptors unless proper precaution is followed.

There are no adopted state or local policies or standards for groundborne vibration. Vibration intensity is expressed as *peak particle velocity* (PPV), the maximum speed at which the ground moves while it temporarily shakes. Since ground shaking speeds are very slow, PPV is measured in inches per second. The average person is quite sensitive to ground motion. Levels as low as 0.02 inch per second can be detected by the human body when background noise and vibration levels are low and levels of 0.1 inches per second are considered "strongly perceptible." According to Caltrans, new structures can be exposed to groundborne vibration PPV levels of up to 0.5 inch per second without experiencing structural damage.[43]

Pile driving activities are proposed during the first two to three months of construction. The impact pile driver noise would occur for only several hours per pile. The magnitude of vibration caused by pile driving is a function of distance from the receptor or structure of concern and the nature of surrounding soils. Groundborne vibration from pile driving would occur as close as 115 feet from the existing Mission Rock Resort restaurant. At this distance, vibration from pile driving would be approximately 0.12 inches per second PPV. This would be below the structural damage criterion of 0.5 inches per second PPV. Consequently, proposed compaction activities would result in less than significant vibration impacts with respect to building damage.

Vibration levels can also result in interference or annoyance impacts at residences or other land uses where people sleep, such as hotels and hospitals. Vibration impact criteria published by Caltrans relative to these land uses are stated in terms of PPV, in inches per second. For adverse human reaction, this analysis applies the “strongly perceptible” threshold of 0.1 inches per second PPV.[44]

The closest land use where people would be expected to sleep would be the condominiums at 610 Illinois Street, approximately 820 feet from the Water Taxi Landing. At this distance, vibration from pile driving would be approximately 0.014 inches per second PPV. This would be below the “strongly perceptible” threshold of 0.1 inches per second PPV. Therefore, due to the distance of receptors from the Ferry and Water Taxi Landing pile locations, impacts from vibration with respect to human annoyance would be less than significant. The pile driving would only occur during working hours: 7:00 a.m. to 8:00 p.m.

Land uses with operations that could be considered to have high sensitivity to vibrations include vibration-sensitive research and manufacturing, hospitals with vibration-sensitive equipment, and university research operations. The degree of sensitivity to vibration depends on the specific equipment that would be affected by the vibration as well as on the design of the specific building in which the equipment is located. Equipment such as electron microscopes and high resolution lithographic equipment can be very sensitive to vibration, and even normal optical microscopes can sometimes be

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43 Caltrans, *Transportation and Construction Vibration Guidance Manual*, September 2013.
44 Caltrans, *Transportation and Construction Vibration Guidance Manual*, September 2013

difficult to use when vibration is well below the human annoyance level. Existing medical or research uses near the project site that contain vibration-sensitive equipment could experience vibration levels during construction that exceed 0.008 inches per second (65 VdB) and potentially disturb the operation of sensitive medical equipment. Construction vibration effects on sensitive equipment would be a concern for users of research buildings and could be an inconvenience. However, these users are not considered sensitive receptors, and therefore, construction vibration effects are not considered a significant environmental effect under CEQA. Nevertheless, even though this is a less than significant impact of the project, the human annoyance associated with the temporary increases in noise levels during construction could be reduced with implementation of **Improvement Measure I-NO-2**, Neighbor Notification of Vibration-Inducing Construction Operations.

Improvement Measure I-NO-2: Neighbor Notification of Vibration-Inducing Construction Activities

At least one week prior to the start of pile driving activities, the Port shall notify owners and occupants within 500 feet of the project site of the dates, hours, and expected duration of such activities.

Impact C-NO-1: The proposed project would not make a considerable contribution to any cumulative significant noise impacts. (Less than Significant)

Cumulative development projects that would be close enough (i.e., within 500 feet) to contribute to localized increases in noise of the proposed Ferry and Water Taxi Landing would primarily consist of the future Chase Center. All other cumulative projects are sufficiently distant such that attenuation would reduce the contribution of the project to a less than cumulatively considerable level. Chase Center, which is slated to commence basketball operations in fall 2019, will largely be complete by the planned initiation of construction activity for the proposed project in June 2019. Consequently, it is not anticipated that there would be a cumulative construction noise impact within the project area. Additionally, given the relatively modest contribution of construction noise to surrounding uses as analyzed in Impact NO-2, the project’s contribution of construction noise would not be cumulatively considerable.

With respect to operational noise, as discussed in the Draft EIR for the Chase Center, operational noise impacts from crowds gathering at the Muni T-Line platform during quieter nighttime periods during events and from mobile sources (vehicle traffic) were identified as significant and unavoidable impacts of the Chase Center development. While ferry and water taxi operations would contribute operational noise to that generated by Chase Center operations, project operations would be separated from the nearest affected receptors by the presence of the Chase Center and associated commercial structures which would effectively shield operational noise of the proposed project. Ferry operations of the proposed project would also result in a reduction of vehicle trips to the Chase Center, reducing the severity of the traffic noise contribution identified in the Draft EIR. Consequently, cumulative noise impacts of the proposed project would be less than significant.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
7. AIR QUALITY — Would the project:					
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐	☐
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒	☐	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal, state, or regional ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☒	☐	☐
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐	☐

The Bay Area Air Quality Management District (BAAQMD) is the regional agency with jurisdiction over the nine-county San Francisco Bay Area Air Basin (SFBAAB), which includes: San Francisco, Alameda, Contra Costa, Marin, San Mateo, Santa Clara, and Napa Counties, and portions of Sonoma and Solano Counties. BAAQMD is responsible for attaining and maintaining air quality in the SFBAAB within federal and state air quality standards, as established by the federal Clean Air Act (CAA) and the California Clean Air Act (CCAA), respectively. Specifically, BAAQMD has the responsibility to monitor ambient air pollutant levels throughout the SFBAAB and to develop and implement strategies to attain the applicable federal and state standards. The CAA and the CCAA require plans to be developed for areas that do not meet air quality standards, generally.

The most recent air quality plan, the 2017 Clean Air Plan, was adopted by BAAQMD in April 2017. The plan's primary goals are to protect public health and protect the climate. The plan includes a wide range of proposed control measures, which consist of actions to reduce combustion-related activities, decrease fossil fuel combustion, improve energy efficiency, and decrease emissions of greenhouse gases (GHGs). The 2017 Clean Air Plan updates the Bay Area 2010 Clean Air Plan and complies with state air quality planning requirements as codified in the California Health and Safety Code. The air basin is designated non-attainment for both the 1- and 8-hour state ozone standards. In addition, emissions of ozone precursors in the SFBAAB contribute to air quality problems in neighboring air basins. Under these circumstances, state law requires the Clean Air Plan to include all feasible measures to reduce emissions of ozone precursors and their transport to neighboring air basins.

The 2017 Clean Air Plan contains 85 measures to address reduction of several pollutants: ozone precursors, particulate matter, air toxics, and/or GHGs. Other measures focus on potent GHGs such as methane and black carbon, or harmful fine particles that affect public health.

Criteria Air Pollutants

In accordance with the state and federal CAAs, air pollutant standards are identified for the following six criteria air pollutants: ozone, carbon monoxide (CO), particulate matter (PM), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead. These air pollutants are termed criteria air pollutants because they are regulated by developing specific public health- and welfare-based criteria as the basis for setting permissible levels. In general, the SFBAAB experiences low concentrations of most pollutants when compared to federal or state standards. The SFBAAB is designated as either in attainment[45] or unclassified for most criteria pollutants with the exception of ozone, $PM_{2.5}$, and PM_{10}, which are designated as non-attainment for either the state or federal standards. By its very nature, regional air pollution is largely a cumulative impact in that no single project is sufficient in size to, by itself, result in non-attainment of air quality standards. Instead, a project's individual emissions contribute to existing cumulative air quality impacts. If a project's contribution to cumulative air quality impacts is "considerable," then the project's impact on air quality would be considered significant.

Table 18 identifies air quality significance thresholds followed by a discussion of each threshold. Projects that would result in criteria air pollutant emissions below these significance thresholds would not violate an air quality standard, contribute substantially to an air quality violation, or result in a cumulatively considerable net increase in criteria air pollutants within the SFBAAB.

TABLE 18
CRITERIA AIR POLLUTANTS SIGNIFICANCE THRESHOLDS

	Construction Thresholds	Operational Thresholds	
Pollutant	**Average Daily Emissions (lbs./day)**	**Average Daily Emissions (lbs./day)**	**Annual Average Emissions (tons/year)**
ROG	54	54	10
NO_x	54	54	10
PM_{10}	82 (exhaust)	82	15
$PM_{2.5}$	54 (exhaust)	54	10
Fugitive Dust	Construction Dust Ordinance or other Best Management Practices	Not Applicable	

SOURCE: BAAQMD, *California Environmental Quality Act Air Quality Guidelines*, May 2017

Ozone Precursors. As discussed previously, the SFBAAB is currently designated as non-attainment for ozone. Ozone is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving reactive organic gases (ROG) and oxides of nitrogen (NO_x). The potential for a project to result in a cumulatively considerable net increase in criteria air pollutants, which may contribute to an existing or projected air quality violation, are based on the state and federal Clean Air Act's emissions limits for stationary sources. The federal New Source Review (NSR) program was

45 "Attainment" status refers to those regions that are meeting federal and/or state standards for a specified criteria pollutant. "Non-attainment" refers to regions that do not meet federal and/or state standards for a specified criteria pollutant. "Unclassified" refers to regions where there is not enough data to determine the region's attainment status.

created by the federal CAA to ensure that stationary sources of air pollution are constructed in a manner that is consistent with attainment of federal health based ambient air quality standards. Similarly, to ensure that new stationary sources do not cause or contribute to a violation of an air quality standard, BAAQMD Regulation 2, Rule 2 requires that any new source that emits criteria air pollutants above a specified emissions limit must offset those emissions. For ozone precursors ROG and NO_x, the offset emissions level is an annual average of 10 tons per year (or 54 pounds (lbs.) per day).[46] These levels represent emissions by which new sources are not anticipated to contribute to an air quality violation or result in a considerable net increase in criteria air pollutants.

Although this regulation applies to new or modified stationary sources, land use development projects result in ROG and NO_x emissions as a result of increases in vehicle trips, architectural coatings applied, and construction activities. Therefore, the above thresholds can be applied to the construction and operational phases of land use projects, and those projects that result in emissions below these thresholds would not be considered to contribute to an existing or projected air quality violation or result in a considerable net increase in ROG and NO_x emissions. Due to the temporary nature of construction activities, only the average daily thresholds are applicable to assessing the significance of construction phase emissions.

Particulate Matter (PM_{10} and $PM_{2.5}$). BAAQMD has not established an offset limit for $PM_{2.5}$. However, the emissions limit in the federal NSR for stationary sources in nonattainment areas is an appropriate significance threshold. For PM_{10} and $PM_{2.5}$, the emissions limit under NSR is 15 tons per year (82 lbs. per day) and 10 tons per year (54 lbs. per day), respectively. These emissions limits represent levels at which a source is not expected to have an impact on air quality.[47] Similar to ozone precursor thresholds identified above, land use development projects typically result in particulate matter emissions as a result of increases in vehicle trips, space heating and natural gas combustion, landscape maintenance, and construction activities. Therefore, the above thresholds can be applied to the construction and operational phases of a land use project. Again, because construction activities are temporary in nature, only the average daily thresholds are applicable.

Fugitive Dust. Fugitive dust emissions are typically generated during construction. Studies have shown that the application of best management practices (BMPs) at construction sites significantly controls fugitive dust.[48] Individual measures have been shown to reduce fugitive dust by anywhere from 30 to 90 percent.[49] BAAQMD has identified a number of BMPs to control fugitive dust emissions from

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46 BAAQMD, *Revised Draft Options and Justification Report, California Environmental Quality Act Thresholds of Significance,* October 2009, page 17. Available: http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/Revised%20Draft%20CEQA%20Thresholds%20%20Justification%20Report%20Oct%202009.ashx?la=en. Accessed February 9, 2016.

47 BAAQMD, *Revised Draft Options and Justification Report, California Environmental Quality Act Thresholds of Significance,* October 2009, page 16.

48 Western Regional Air Partnership. *2006. WRAP Fugitive Dust Handbook.* September 7, 2006. Available: http://www.wrapair.org/forums/dejf/fdh/content/FDHandbook_Rev_06.pdf. Accessed February 9, 2016.

49 BAAQMD, *Revised Draft Options and Justification Report, California Environmental Quality Act Thresholds of Significance,* October 2009, page 27.

construction activities.[50] The City's Construction Dust Control Ordinance (Ordinance 176-08, effective July 30, 2008) requires a number of measures to control fugitive dust to ensure that construction projects do not result in visible dust. The BMPs employed in compliance with the City's Construction Dust Control Ordinance is an effective strategy for controlling construction-related fugitive dust. The Port has incorporated similar provisions into the Port Building Code. For projects involving more than 0.5 acre, the Construction Dust Control Ordinance requires the project sponsor to submit a dust control plan for approval by the San Francisco Department of Public Health prior to issuance of a building permit by the Department of Building Inspection or the Port. The ordinance requires that all site preparation work, demolition, or other construction activities within San Francisco that have the potential to create dust or expose or disturb more than 10 cubic yards, or 500 square feet, of soil comply with specified dust control measures, whether or not the activity requires a permit from the building inspection department or the Port.

Other Criteria Pollutants. Regional concentrations of CO in the Bay Area have not exceeded the state standards in the past 11 years and SO_2 concentrations have never exceeded the standards. The primary source of CO emissions from development projects is vehicle traffic. Construction-related SO_2 emissions represent a negligible portion of the total basin-wide emissions and construction-related CO emissions represent less than five percent of the Bay Area total basin-wide CO emissions. As discussed previously, the Bay Area is in attainment for both CO and SO_2. Furthermore, BAAQMD has demonstrated, based on modeling, that in order to exceed the California ambient air quality standard of 9.0 ppm (8-hour average) or 20.0 ppm (1-hour average) for CO, project traffic in addition to existing traffic would need to exceed 44,000 vehicles per hour at affected intersections (or 24,000 vehicles per hour where vertical and/or horizontal mixing is limited). Therefore, given the Bay Area's attainment status and the reduction in CO and SO_2 emissions that could result from a transit project that decreases vehicle miles travelled, the proposed project would not result in a cumulatively considerable net increase in CO or SO_2, and a quantitative analysis is not required.

Local Health Risks and Hazards

In addition to criteria air pollutants, individual projects may emit toxic air contaminants (TACs). TACs collectively refer to a diverse group of air pollutants that are capable of causing chronic (i.e., of long-duration) and acute (i.e., severe but of short-term) adverse effects to human health, including carcinogenic effects. TACs are defined in California Health and Safety Code section 39655 as air pollutants which may cause or contribute to an increase in mortality or serious illness, or which may pose a present or potential hazard to human health. Human health effects of TACs include birth defects, neurological damage, cancer, and death. There are hundreds of different types of TACs with varying degrees of toxicity. Individual TACs vary greatly in the health risk they present; at a given level of exposure, one TAC may pose a hazard that is many times greater than another.

[50] BAAQMD, *CEQA Air Quality Guidelines*, May 2017. Available: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en. Accessed December 20, 2017.

Unlike criteria air pollutants, TACs do not have ambient air quality standards but are regulated by BAAQMD using a risk-based approach. This approach uses a health risk assessment to determine which sources and pollutants to control as well as the degree of control. A health risk assessment is an analysis in which human health exposure to toxic substances is estimated, and considered together with information regarding the toxic potency of the substances, to provide quantitative estimates of health risks.[51]

Air pollution does not affect every individual in the population in the same way, and some groups are more sensitive to adverse health effects than others. Land uses such as residences, schools, children's day care centers, hospitals, and nursing and convalescent homes are considered to be the most sensitive to poor air quality because the population groups associated with these uses have increased susceptibility to respiratory distress or, as in the case of residential receptors, their exposure time is greater than for other land uses. Exposure assessment guidance typically assumes that residences would be exposed to air pollution 24 hours per day, 350 days per year, for 70 years. Therefore, assessments of air pollutant exposure to residents typically result in the greatest adverse health outcomes of all population groups.

Exposures to fine particulate matter ($PM_{2.5}$) are strongly associated with mortality, respiratory diseases, and lung development in children, and other endpoints such as hospitalization for cardiopulmonary disease.[52] In addition to $PM_{2.5}$, diesel particulate matter (DPM) is also of concern. The California Air Resources Board (ARB) identified DPM as a TAC in 1998, primarily based on evidence demonstrating cancer effects in humans.[53] The estimated cancer risk from exposure to diesel exhaust is much higher than the risk associated with any other TAC routinely measured in the region.

In an effort to identify areas of San Francisco most adversely affected by sources of TACs, San Francisco partnered with BAAQMD to inventory and assess air pollution and exposures from mobile, stationary, and area sources within San Francisco. Areas with poor air quality, termed the "Air Pollutant Exposure Zone," were identified based on health-protective criteria that consider estimated cancer risk, exposures to fine particulate matter, proximity to freeways, and locations with particularly vulnerable populations. The project site is not located within the Air Pollutant Exposure Zone. Each of the Air Pollutant Exposure Zone criteria is discussed below.

Excess Cancer Risk. The 100 per one million persons (100 excess cancer risk) criterion is based on United State Environmental Protection Agency (USEPA) guidance for conducting air toxic analyses and making risk management decisions at the facility and community-scale level.[54] As described by BAAQMD, the

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51 In general, a health risk assessment is required if the BAAQMD concludes that projected emissions of a specific air toxic compound from a proposed new or modified source suggest a potential public health risk. The project proponent is then subject to a health risk assessment for the source in question. Such an assessment generally evaluates chronic, long-term effects, estimating the increased risk of cancer as a result of exposure to one or more TACs.

52 SFDPH, *Assessment and Mitigation of Air Pollutant Health Effects from Intra-Urban Roadways: Guidance for Land Use Planning and Environmental Review*, May 2008.

53 California Air Resources Board (ARB), Fact Sheet, "The Toxic Air Contaminant Identification Process: Toxic Air Contaminant Emissions from Diesel-fueled Engines," October 1998.

54 BAAQMD, *Revised Draft Options and Justification Report, California Environmental Quality Act Thresholds of Significance*, October 2009, page 67. Available: http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/Revised%20Draft%20CEQA%20Thresholds%20%20Justification%20Report%20Oct%202009.ashx?la=en. Accessed February 9, 2016.

USEPA considers a cancer risk of 100 per million or less to be within the "acceptable" range of cancer risk. Furthermore, in the 1989 preamble to the benzene National Emissions Standards for Hazardous Air Pollutants (NESHAP) rulemaking,[55] the USEPA states that it "…strives to provide maximum feasible protection against risks to health from hazardous air pollutants by (1) protecting the greatest number of persons possible to an individual lifetime risk level no higher than approximately one in one million and (2) limiting to no higher than approximately one in ten thousand [100 in one million] the estimated risk that a person living near a plant would have if he or she were exposed to the maximum pollutant concentrations for 70 years." The 100 per one million excess cancer cases is also consistent with the ambient cancer risk in the most pristine portions of the Bay Area based on BAAQMD regional modeling.[56]

Fine Particulate Matter. In April 2011, the USEPA published the Policy Assessment for the Particulate Matter Review of the National Ambient Air Quality Standards. In this document, USEPA staff concludes that the current federal annual $PM_{2.5}$ standard of 15 $\mu g/m^3$ should be revised to a level within the range of 13 to 11 $\mu g/m^3$, with evidence strongly supporting a standard within the range of 12 to 11 $\mu g/m^3$. Air pollution hot spots for San Francisco are based on the health protective $PM_{2.5}$ standard of 11 $\mu g/m^3$, as supported by the USEPA's Particulate Matter Policy Assessment, although lowered to 10 $\mu g/m^3$ to account for error in emissions modeling programs.

Proximity to Freeways. According to the ARB, studies have shown an association between the proximity of sensitive land uses to freeways and a variety of respiratory symptoms, asthma exacerbations, and decreases in lung function in children. Siting sensitive uses in proximity to freeways increases both exposure to air pollution and the potential for adverse health effects. As evidence shows that sensitive uses in an area within a 500-foot buffer of any freeway are at an increased health risk from air pollution,[57] lots that are within 500 feet of freeways are included in the Air Pollutant Exposure Zone.

Health Vulnerable Locations. Based on BAAQMD's evaluation of health vulnerability in the Bay Area, those zip codes (94102, 94103, 94105, 94124, and 94130) in the worst quintile of Bay Area Health vulnerability scores as a result of air pollution-related causes were afforded additional protection by lowering the standards for identifying lots in the Air Pollutant Exposure Zone to: (1) an excess cancer risk greater than 90 per one million persons exposed, and/or (2) $PM_{2.5}$ concentrations in excess of 9 $\mu g/m^3$.[58]

The above citywide health risk modeling was also used as the basis in approving a series of amendments to the San Francisco Building and Health Codes, generally referred to as the Enhanced Ventilation Required for Urban Infill Sensitive Use Developments or Health Code, article 38 (Ordinance 224-14, effective December 8, 2014) (article 38). The purpose of article 38 is to protect the public health and

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55 54 Federal Register 38044, September 14, 1989.

56 BAAQMD, *Revised Draft Options and Justification Report, California Environmental Quality Act Thresholds of Significance*, October 2009, page 67. Available: http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/Revised%20Draft%20CEQA%20Thresholds%20%20Justification%20Report%20Oct%202009.ashx?la=en. Accessed February 9, 2016.

57 California Air Resources Board, *Air Quality and Land Use Handbook: A Community Health Perspective.* April 2005. Available online at: http://www.arb.ca.gov/ch/landuse.htm.

58 San Francisco Planning Department and San Francisco Department of Public Health, *2014 Air Pollutant Exposure Zone Map (Memo and Map)*, April 9, 2014. These documents are part of San Francisco Board of Supervisors File No. 14806, Ordinance No. 224-14 Amendment to *Health Code* article 38.

welfare by establishing an Air Pollutant Exposure Zone and imposing an enhanced ventilation requirement for all urban infill sensitive use development within that zone. In addition, projects within the Air Pollutant Exposure Zone require special consideration to determine whether the project's activities would add a substantial amount of emissions to areas already adversely affected by poor air quality. The project site is not located within the Air Pollutant Exposure Zone nor is it within a health vulnerable zip code.

Clean Construction Ordinance. The Air Pollutant Exposure Zone was also used as the basis for approving a series of amendments to the San Francisco Environment and Administrative Codes, generally referred to as the Clean Construction Ordinance, or Environment Code Section 25 (Ordinance 28-15, effective April 19, 2015). The purpose of the Clean Construction Ordinance is to protect the public health, safety and welfare by requiring contractors on City public works projects to reduce diesel and other PM emissions generated by construction activities. Section 6.25 of the San Francisco Administrative Code establishes the City's Clean Construction Ordinance.

The Clean Construction Ordinance requires all work required to be performed under a public works contract to (1) use only off-road equipment and off-road engines fueled by biodiesel fuel grade B20 or higher, (2) use engines equipped with Tier 2 + Level 3 Verified Diesel Emissions Control Strategies (VDECS), (3) restrict idling of diesel engines to two minutes, (4) prohibit use of portable diesel engines where alternative sources of power are available, and (5) implement proper maintenance/tune-ups of equipment.

Impact AQ-1: The proposed project's construction activities would generate fugitive dust and criteria air pollutants but would not violate an air quality standard, contribute substantially to an existing or projected air quality violation, or result in a cumulatively considerable net increase in criteria air pollutants. (Less than Significant)

Construction activities (short-term) typically result in emissions of ozone precursors and PM in the form of dust (fugitive dust) and exhaust (e.g., vehicle tailpipe emissions). Emissions of ozone precursors and PM are primarily a result of the combustion of fuel from on-road and off-road vehicles and other construction equipment. However, ROGs are also emitted from activities that involve painting, other types of architectural coatings, or asphalt paving. The proposed project would involve demolition of existing piles, and both in-water and shore side construction. In-water work would involve dredging, pier pile installation, installation of float guide piles and donut fender piles. Installation of the pier deck would require both in-water and shore side cranes and trucks. Utility work would all be constructed shore side. Construction of the Water Taxi Landing also would involve dredging, pile driving and float and gangway installation. During the proposed 15-month construction period, construction activities would have the potential to result in emissions of ozone precursors and PM, as discussed below.

Fugitive Dust

The proposed project-related trenching, drilling, and paving activities may cause wind-blown dust that could contribute particulate matter into the local atmosphere. Although there are federal standards for air pollutants and implementation of state and regional air quality control plans, air pollutants continue to have impacts on human health throughout the country. California has found that particulate matter exposure can cause health effects at lower levels than national standards. The current health burden of particulate matter demands that, where possible, public agencies take feasible available actions to reduce sources of particulate matter exposure. According to the ARB, reducing particulate matter $PM_{2.5}$ concentrations to state and federal standards of 12 $\mu g/m^3$ in the San Francisco Bay Area would prevent between 200 and 1,300 premature deaths.[59]

Dust can be an irritant causing watering eyes or irritation to the lungs, nose, and throat. Demolition, excavation, grading, and other construction activities can cause wind-blown dust that adds particulate matter to the local atmosphere. Depending on exposure, adverse health effects can occur due to this particulate matter in general and also due to specific contaminants such as lead or asbestos that may be constituents of soil.

The Construction Dust Control Ordinance requires all site preparation work, demolition, or other construction activities within San Francisco that have the potential to create dust or expose or disturb more than 10 cubic yards, or 500 square feet, of soil to comply with specified dust control measures.

Building permits will not be issued without written notification from the Director of Public Health that states that the applicant has a site-specific Dust Control Plan, if required, unless the Director waives the requirement. The Construction Dust Control Ordinance requires the project sponsors and contractors who are responsible for construction activities to minimize visible dust on the site. Minimum dust control measures that apply to all projects include watering all construction areas sufficiently to prevent dust from becoming airborne; providing as much water as necessary to control dust (without creating runoff) in any area of land clearing, earth movement, excavation, drillings, and other dust-generating activity; during excavation and dirt- moving activities, wet sweep or vacuum the streets, sidewalks, paths, and intersections where work is in progress at the end of the workday; covering any inactive stockpiles greater than 10 cubic yards or 500 square feet of excavated materials, and using dust enclosures, curtains, and dust collectors as necessary to control dust in the excavation area.

Other dust control measures that may be included in a Dust Control Plan, include but are not limited to wetting down the area around soil improvements; an analysis of wind direction; placement of dust monitors; recordkeeping for particulate monitoring results; inspections and record keeping for visible dust; and establishing a hotline for surrounding community members to call and report visible dust problems. Reclaimed water must be used if required by article 21, section 1100 et seq., of the San Francisco Public Works Code.

City Ordinance 175-91 requires the use of non-potable water for soil compaction and dust control undertaken in conjunction with any construction or demolition project occurring within the boundaries of San Francisco, unless permission is obtained from the San Francisco Public Utilities Commission (SFPUC). SFPUC operates a recycled water fill station at the Southeast Water Pollution Control Plant, which provides recycled water at no charge.

59 ARB, *Methodology for Estimating Premature Deaths Associated with Long-term Exposure to Fine Airborne Particulate Matter in California*, Staff Report, Table 4c, October 24, 2008.

The proposed project site landside construction area is approximately 20,850 square feet (less than 0.5-acre); therefore, the Port would not be required to prepare a site-specific Dust Control Plan pursuant to the Dust Control Ordinance. The Port would be required to designate an individual to monitor compliance with the dust control requirements contained in the ordinance. Compliance with the regulations and procedures set forth by the San Francisco Dust Control Ordinance would ensure that potential dust-related air quality impacts would be reduced to a less-than-significant level.

Construction-Related Criteria Air Pollutants

Construction activities would result in emissions of criteria air pollutants from the use of tug boats, service vessels, off- and on-road vehicles and equipment. To evaluate construction emissions of criteria pollutants, a quantitative analysis was conducted. Construction-related criteria air pollutants generated by the proposed project were quantified using the California Emissions Estimator Model (CalEEMod) and assumes compliance with the Clean Construction Ordinance. For public projects located outside an Air Pollutant Exposure Zone, like the proposed project, the Clean Construction Ordinance requires off-road equipment and off-road engines use biodiesel fuel grade B20 and utilize only off-road equipment that either meets or exceeds Tier 2 standards for off-road engines or operates with the most effective ARB verified diesel emission control strategy (VDECS). However, biodiesel has secondary impacts with respect to increased emissions of NOx compared to standard diesel. Consequently, the Port intends to comply with the alternative fuel component of the Clean Construction Ordinance through use of renewable diesel, which reduces NOx emissions as well as DPM emissions.

Construction of the proposed Ferry Landing would occur over an approximately 15-month period with construction activity occurring five days a week. Construction of the Water Taxi Landing could be constructed over a 12.5-month period concurrently during the same overall 15-month period of the Ferry Landing construction or on a possible separate schedule.

Construction-related emissions were calculated separately for off-road equipment and vehicle trips which were calculated using the CalEEMod emissions estimator model and in-water ad marine-related emissions occurring during demolition, pile driving, and in-water construction which were calculated using emission factors generated by CARB's Commercial Harbor Craft Emissions Model for tug boats and barge and dredge equipment (Appendix AQ). The off-road equipment fleet reflect the CalEEMod default for San Francisco County, which includes a composite of Tiered engines for 2019 which as a whole are cleaner than the Tier 2 requirement of the Clean Construction Ordinance. Emissions reduction from the use of renewable diesel were incorporated using post-processing adjustments.[60] Emissions were converted from tons/year to pounds/day using the estimated construction duration of 326 working days and are summarized in **Table 19.** As shown in Table 19, the unmitigated project construction emissions would be below the threshold of significance for ROG, NOx, PM_{10}, and $PM_{2.5}$; therefore, the construction-related air quality impacts of the proposed project with respect to criteria air pollutants would be less than significant.

60 SF Department of Environment, S. Tanikawa, *Greenhouse Gas Implications for Switching from Petroleum Diesel to Renewable Diesel in San Francisco's Municipal Fleet*. October 1, 2015 Page 8.

TABLE 19
DAILY PROJECT CONSTRUCTION EMISSIONS OF THE PROPOSED PROJECT

	Proposed Project Pollutant Emissions (Average Pounds per Day)			
	ROG	NOx	Exhaust PM_{10}	Exhaust $PM_{2.5}$
Off-Road Equipment Construction Emissions (from CalEEMod)	2.057	19.28	0.69	0.65
On-Road Construction Emissions (from CalEEMod)	0.23	9.22	0.04	0.04
In Water Demolition - tug to maneuver barge	1.40	2.03	0.05	0.05
Dredging – berth dredge, survey boat, and tug to transport materials and maneuver barge	5.04	10.75	0.27	0.27
Pile Driving - tug to maneuver barge	2.80	4.71	0.11	0.11
In Water Construction - tug to maneuver barge	4.02	5.83	0.15	0.15
Total	**15.54**	**51.82**	**1.31**	**1.28**
Significance Threshold	54.0	54.0	82.0	54.0

SOURCE: BAAQMD, 2017; ESA, 2018

Impact AQ-2: During project operations, the proposed project would result in emissions of criteria air pollutants but not at levels that would violate an air quality standard, contribute to an existing or projected air quality violation, or result in a cumulatively considerable net increase in criteria air pollutants. (Less than Significant)

Transit improvement projects can result in emissions of criteria air pollutants and toxic air contaminants primarily from an increase in fleet emissions outweighing emission reductions realized from the resultant reduction in vehicle miles travelled. Additionally, transit improvement projects may also result in criteria air pollutants and toxic air contaminants from landscape maintenance, and architectural coating applications.

The impacts associated with WETA's planned expansion of water transit routes and services, including new service to the Mission Bay area, were analyzed in the Program EIR for the Implementation and Operations Plan[61], and therefore are not assessed in this Initial Study. Emissions associated with operation of the proposed ferry landing (both ferries and associated reductions in vehicle trips) were analyzed in the Program EIR and therefore are not assessed in this document.

The majority of "new" operational emissions from the project would result from ferry and water taxi operations that were not analyzed as a part of WETA's 2003 Program EIR. Additionally, maintenance dredging at the Ferry Landing and Water Taxi Landing are expected to be required approximately every 7 to 14 years in order to maintain a safe navigational depth. While the project may result in a small increment of emissions from vehicles accessing the site by taxi or ride share, this trip increment is

[61] URS Corporation, 2003. *Final Program Environmental Impact Report: Expansion of Ferry Transit Service in the San Francisco Bay Area.*

assumed to be negligible in the transportation analysis and is not considered herein. Based on ferry user projections of the 2003 EIR, the project would result in approximately 0.66 trips reduced per rider, which would reduce total vehicle miles traveled (VMT) in the Bay Area by about 545,622 miles per year from special event ferry trips. Motor vehicle and stationary source emissions were estimated using the CalEEMod model assuming the project would be operational in 2021. Similarly, water taxi operations were calculated to reduce total vehicle miles traveled in the Bay Area by about 243,520 miles per year.

Operational Ferry Emissions

The air quality analysis for the proposed project does include an estimate of emissions from direct special event service to the Chase Center that was not considered in WETA's 2003 Program EIR. Special event service would be provided for all Golden State Warriors' games (41 regular season games), including pre-season (3 games) and post-season (up to 16 playoff games). Service also would be provided for approximately 20 additional events (e.g., concerts, family shows, other sporting events, conventions, corporate events) per year at the Chase Center. Therefore, ferry service would be provided for 80 special events per year.

Pre-game arrival would be part of the normal commuter service for events that occur Monday through Friday. Special event service would be provided for approximately 12 Warriors' games that occur on the weekend or on holidays. Weekend service may also be provided for concerts and other events at the Chase Center. WETA has indicated that service for such events would not be provided unless attendance was anticipated to exceed 5,000. Under a maximum special event service operating scenario, up to 4 vessel trips would occur per event occurring Monday through Friday and 8 vessel trips per event on the weekend or holidays. Therefore, assuming 75 percent of non-Warriors' events occur during the work week, emissions from ferry operations for special event service is based on a total of 388 trips per year.

Ferry vessel types and the corresponding range of engine sizes were provided by the Port and applied to an average ferry trip duration of 0.64 hours which reflects the three potential destination ports. Ferry vessels would be operated by both Golden Gate Ferry and San Francisco Bay Ferry, which operate a variety of vessels with engines ranging in manufacturer year from 1997 to 2017, the latter of which reflect Tier 4 engines. Emission factors were determined for a composite ferry fleet engine size of 5,667 horsepower using ARB's Commercial Harbor Craft Estimation Data Base for a conservatively assumed average engine model year of 2009. Additionally, emissions from idling of ferries at the Ferry Landing were calculated assuming 20 minutes of idling time per trip. These estimated emissions from ferry operations are presented in **Table 20**, below.

Operational Water Taxi Emissions

It is anticipated that 10-15 water taxi trips would occur per day with more on days with Golden State Warriors' games or other events at the Chase Center. The operational impact analysis below considers at a project level for the site-specific impacts of improvements for the proposed project, and impacts associated with the increase in vessels while they are in use and/or are temporarily docked at the project site.

TABLE 20
DAILY AND ANNUAL PROJECT OPERATIONAL EMISSIONS OF THE PROPOSED PROJECT

	Proposed Project Pollutant Emissions (Average pounds per day)			
	ROG	**NOx**	**Exhaust PM_{10}**	**Exhaust $PM_{2.5}$**
Special Event Ferry Trips	2.44	19.84	0.72	0.72
Ferry Idling	0.49	3.98	0.14	0.14
Water Taxi Trips	2.24	13.17	0.26	0.26
Water Taxi Idling	0.04	0.21	0.00	0.00
Dredging	0.54	3.77	0.07	0.07
Vehicle Trip Reduction – Ferries	-2.69	-0.47	-0.31	-0.13
Vehicle Trip Reduction – Water Taxis	-0.60	-0.11	-0.07	-0.03
Total	**2.45**	**40.39**	**0.83**	**1.05**
Significance Threshold	54.0	54.0	82.0	54.0
	Proposed Project Pollutant Emissions (tons per year)			
	ROG	**NOx**	**Exhaust PM_{10}**	**Exhaust $PM_{2.5}$**
Special Event Ferry Trips	0.45	3.62	0.13	0.13
Ferry Idling	0.09	0.73	0.03	0.03
Water Taxi Trips	0.41	2.40	0.05	0.05
Water Taxi Idling	0.01	0.04	0.00	0.00
Dredging	0.10	0.69	0.01	0.01
Vehicle Trip Reduction – Ferries	-0.49	-0.09	-0.06	-0.02
Vehicle Trip Reduction – Water Taxis	-0.11	-0.02	-0.01	-0.01
Total	**0.45**	**7.37**	**0.15**	**0.19**
Significance Threshold	10	10	15	10

SOURCE: BAAQMD, 2017; ESA, 2017

Emissions from water taxi operations were assumed at 15 trips per day plus an additional eight trips for each of the 80 special events per year for a total of 6,123 trips per year. Water taxi types and the corresponding range of engine sizes were applied to an average water taxi trip duration of 0.5 hours which reflects a conservative estimate for potential destinations such as Pier 1.5, Pier 39, Fisherman's Wharf, Sausalito, Berkeley, and Richmond. Emission factors were determined for a composite water taxi fleet engine size of 425 horsepower using ARB's Commercial Harbor Craft Estimation Data Base for an assumed average engine model year of 2014. Additionally, emissions from idling of water taxis at the Water Taxi Landing were calculated assuming 20 minutes of idling time per trip. Estimated emissions from water taxi operations are presented in Table 20, above.

Also included in Table 20 are estimated emissions due to future maintenance dredging. Emissions were calculated only for year 2027, with an assumed vessel engine year of 2017 (ten years old) with dredge spoils destinations the average of the Montezuma site or to the edge of the air basin toward the Deep Ocean Disposal Site.

As shown in Table 20, estimated project construction emissions would be below the threshold of significance for ROG, NOx, PM_{10}, and $PM_{2.5}$; therefore, the operational air quality impacts of the proposed project with respect to criteria air pollutants would be less than significant and no mitigation measures are necessary.

Impact AQ-3: The proposed project's construction and operational activities would generate toxic air contaminants, including diesel particulate matter, but would not expose sensitive receptors to substantial pollutant concentrations. (Less than Significant)

The project site is not located within the Air Pollutant Exposure Zone, as described above. The closest sensitive receptors to the project site include residential condominiums at 610 Illinois Street, approximately 820 feet to the southwest, UCSF Mission Bay Medical Center located approximately 900 feet to the west and UCSF Hearst student housing 1,000 feet to the northwest. The nearest day care facility is on the University Day Care at Mission Bay 2,400 feet to the northwest while the nearest school is Potrero Kids 1,650 feet to the south. All other residential uses to the south are over 1,000 feet away, south of Mariposa Street. None of these receptors are located within an Air Pollutant Exposure Zone, nor are there any sensitive receptors within 1,000 feet of the project site that are located within the Air Pollutant Exposure Zone.

Regarding construction emissions, off-road equipment (which includes construction-related equipment) and tugs and other marine vessels are a large contributor to diesel particulate matter (DPM) emissions in the State of California, although since 2007, the ARB has found the emissions to be substantially lower than previously expected.[62] Newer and more refined emission inventories have substantially lowered the estimates of DPM emissions from off-road equipment.[63] This reduction in emissions is due, in part, to refined emissions estimation methodologies. For example, revised PM emission estimates for the year 2010, for which DPM is a major component of total PM, have decreased by 83 percent from previous 2010 emissions estimates for the SFBAAB.[64]

Additionally, a number of federal and state regulations are mandating cleaner off-road equipment engines, ranging from Tier 1 to Tier 4. Tier 1 emission standards were phased in between 1996 and 2000 and Tier 4 Interim and Final emission standards for all new engines were phased in between 2008 and 2015. Emission modeling conducted for the proposed project assumes the off-road construction fleet predicted by ARB for the construction years of 2019 and 2020, which is a composite of equipment with Tier 0 through Tier 4 Final engines, which cumulatively have lower emissions than if all equipment were to have Tier 2 engines (the minimum level of compliance with the Clean Construction Ordinance).

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62 ARB, *Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Proposed Amendments to the Regulation for In-Use Off-Road Diesel-Fueled Fleets and the Off-Road Large Spark-Ignition Fleet Requirements,* p.1 and p. 13 (Figure 4), October 2010.

63 ARB, *Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Proposed Amendments to the Regulation for In-Use Off-Road Diesel-Fueled Fleets and the Off-Road Large Spark-Ignition Fleet Requirements,* October 2010.

64 ARB, "In-Use Off-Road Equipment, 2011 Inventory Model," Query accessed online, April 2, 2012, http://www.arb.ca.gov/msei/categories.htm#inuse_or_category.

In addition, construction activities do not lend themselves to analysis of long-term health risks because of their temporary and variable nature. As explained in BAAQMD's CEQA Air Quality Guidelines:

> Due to the variable nature of construction activity, the generation of TAC emissions in most cases would be temporary, especially considering the short amount of time such equipment is typically within an influential distance that would result in the exposure of sensitive receptors to substantial concentrations. Concentrations of mobile-source diesel PM emissions are typically reduced by 70 percent at a distance of approximately 500 feet …. In addition, current models and methodologies for conducting health risk assessments are associated with longer-term exposure periods of 9, 40, and 70 years, which do not correlate well with the temporary and highly variable nature of construction activities. This results in difficulties with producing accurate estimates of health risk.[65]

Therefore, project-level analyses of construction activities have a tendency to overestimate assessments of long-term health risks.

The proposed project would require construction activities over an approximate 15-month construction period. The proposed project construction activities would result in short-term emissions of DPM and other TACs. A screening-level assessment of health risks and hazards (HRA) resulting from project construction and operation was conducted to assess the potential impacts of DPM and TAC emissions (see Appendix AQ). Project-level analyses of construction activities have limited accuracy in estimating long-term health risks. The HRA conducted for the proposed project relied on conservative and worst-case assumptions to overestimate potential health risks at the nearest sensitive receptor locations. This allows for a conservative assessment of the proposed project's impacts on long-term health risk from construction activities. Because the project was not anticipated to result in significant health risks, the screening-level approach is applied to estimate the worst-case health risks associated with project construction and operation. Consistent with the City-wide Cancer Risk Reduction Plan HRA prepared by the City Planning department, an estimate of health risks from TACs (primarily DPM) and annual average exhaust $PM_{2.5}$ concentrations at sensitive receptor locations within 1,000 meters of the proposed project's boundaries was calculated. For the proposed project, sources would include construction emissions, ferry and water taxi idling, and maintenance dredging. The screening HRA was conducted following methods in BAAQMD's Health Risk Screening Analysis Guidelines (BAAQMD 2012a, 2012b) and in the Office of Environmental Health Hazard Assessment's (OEHHA) Air Toxics Hot Spots Program Guidance (OEHHA 2015).

ESA used the most recent version of the AERSCREEN air dispersion screening model to estimate concentrations of DPM and $PM_{2.5}$ at off-site sensitive receptors. AERSCREEN produces estimates of "worst-case" 1-hour concentrations for a single source, without the need for hourly meteorological data, and also includes conversion factors to estimate "worst-case" 3-hour, 8-hour, 24-hour, and annual concentrations at each receptor location. AERSCREEN is based on the American Meteorological Society/Environmental Protection Agency regulatory air dispersion model (AERMOD version 9.3.0). AERSCREEN is intended to produce concentration estimates that are equal to or greater than the estimates produced by AERMOD with a fully developed set of meteorological and terrain data, but the degree of conservatism varies depending

65 BAAQMD, CEQA Air Quality Guidelines, May 2012, page 8-6.

on the application. Where project-specific information is not available, ESA used default parameter sets that are designed to produce conservative (i.e., overestimates of) air concentrations.[66,67] See Appendix AQ for the AERSCREEN modeling outputs and additional details on the HRA.

There are a number of additional reasons why the screening-level HRA is conservative. For example, although the OEHHA guidance recommends assuming a period of time spent out of the home each day for residential sensitive receptors, this analysis conservatively assumes that children are exposed 24 hours per day, and assumes adult residents are home 73 percent of the time. Additionally, it is assumed that residential receptors are exposed 350 days per year to project construction emissions for the entire construction duration, with the emissions occurring over 260 workdays each year. These assumptions are highly conservative, since most residents do not remain in their homes for these periods of time throughout the year. This analysis follows OEHHA guidance in evaluating outdoor air; however, indoor air concentrations may be different due to filtration or other reductions resulting from the building shell or HVAC systems. The combination of several high-end and conservative estimates used as exposure parameters may substantially overestimate chemical intake. The excess lifetime cancer risks calculated in this screening HRA are therefore likely to be overestimated.

As noted above, the estimated risks in the screening HRA are based primarily on a series of conservative assumptions related to predicted environmental concentrations, exposure, and chemical toxicity. The use of conservative assumptions tends to produce upper-bound estimates of risk. The use of conservative assumptions is likely to result in overestimates of exposure and therefore risk, although it is difficult to quantify the uncertainties associated with all the assumptions made in this screening HRA. BAAQMD acknowledges this uncertainty by stating, "the methods used [to estimate risk] are conservative, meaning that the real risks from the source may be lower than the calculations, but it is unlikely that they will be higher."[68]

The results of the HRA are presented in **Table 21** which identifies the increased cancer risk and localized $PM_{2.5}$ concentrations at the maximally impacted residential receptors, hospital receptor, day care receptor and school receptor, respectively. As shown in the table, cancer risk from project construction and operation plus existing background risk would be 83.8 or less, which would not result in a total excess cancer risk of greater than 100 in one million at the most impacted receptor. This would be below the level for causing a new location to meet the APEZ excess cancer risk criteria, and thus would be a less-than-significant impact. Additionally, emissions in combination with background concentrations would result in $PM_{2.5}$ concentrations of 8.7 $\mu g/m^3$ or less, which would be below the levels for causing a new location to meet the APEZ criteria of 10 $\mu g/m^3$. Therefore, health risk impacts would be less than significant.

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66 United States Environmental Protection Agency. 2016. *User's Guide for the AMS/EPA Regulatory Model – AERMOD*. December. Available at: https://www3.epa.gov/ttn/scram/models/aermod/aermod_userguide.pdf.

67 United States Environmental Protection Agency. 2016. *AERMOD Implementation Guide*. December. Available at: https://www3.epa.gov/ttn/scram/models/aermod/aermod_implementation_guide.pdf.

68 BAAQMD. 2016. *Frequently Asked Questions – Toxic Air Contaminants*. Available at: http://gate1.baaqmd.gov/~/media/files/planning-andresearch/care-program/task-force-meetings/021705-tf/20050217_tf_faqs.pdf?la=en.

TABLE 21
LIFETIME CANCER RISK AND PM2.5 CONCENTRATION CONTRIBUTIONS AT OFF-SITE RECEPTORS

Source	Lifetime Excess Cancer Risk (in one million)	PM2.5 Concentration ($\mu g/m^3$)
Residential Receptor		
Background	42.3	8.47
Construction – Off-road Emissions	26.0	0.18
Operation – Vessel Idling and Dredging	20.3	0.03
Cumulative Total[a]	**83.8**	**8.68**
APEZ	100.0	10.00
Significant?	No	No
Hospital Receptor		
Background	58.5	8.58
Construction – Off-road Emissions	2.4	0.02
Operation – Vessel Idling and Dredging	1.9	0.00
Cumulative Total[a]	**62.4**	**8.60**
APEZ Criteria	100.0	10.00
Significant?	No	No
Daycare Receptor		
Background	49.6	8.58
Construction – Off-road Emissions	5.4	0.04
Operation – Vessel Idling and Dredging	2.6	0.01
Cumulative Total[a]	**56.6**	**8.63**
APEZ Criteria	100.0	10.00
Significant?	No	No
School Receptor		
Background	38.4	8.46
Construction – Off-road Emissions	1.0	0.07
Operation – Vessel Idling and Dredging	1.1	0.01
Cumulative Total[a]	**40.4**	**8.54**
APEZ Criteria	100.0	10.00
Significant?	No	No

NOTE: Unmitigated values.

[a] Cumulative cancer risk totals are not a summed value due to separate exposure parameters for construction and operation.

Impact AQ-4: The proposed project would not conflict with, or obstruct implementation of the 2017 Clean Air Plan. (Less than Significant)

The most recently adopted air quality plan for the SFBAAB is the 2017 Clean Air Plan. The 2017 Clean Air Plan is a road map that demonstrates how the San Francisco Bay Area will achieve compliance with the state ozone standards as expeditiously as practicable and how the region will reduce the transport of ozone and ozone precursors to neighboring air basins. In determining consistency with the 2017 Clean Air Plan, this analysis considers whether the project would: (1) support the primary goals of the plan, (2) include applicable control measures from the plan, and (3) avoid disrupting or hindering implementation of control measures identified in the plan.

The primary goals of the plan are to: (1) reduce emissions and decrease concentrations of harmful pollutants, (2) safeguard the public health by reducing exposure to air pollutants that pose the greatest health risk, and (3) reduce greenhouse gas emissions. To meet the primary goals, the plan recommends specific control measures and actions. These control measures are grouped into various categories and include stationary and area source measures, mobile source measures, transportation control measures, land use measures, and energy and climate measures. The plan recognizes that to a great extent, community design dictates individual travel mode, and that a key long-term control strategy to reduce emissions of criteria pollutants, air toxics, and greenhouse gases from motor vehicles is to channel future Bay Area growth into vibrant urban communities where goods and services are close at hand, and people have a range of viable transportation options. To this end, the 2017 Clean Air Plan contains 85 measures to reduce several pollutants: ozone precursors, particulate matter, air toxics, and GHGs in the SFBAAB.

The measures most applicable to the proposed project are transportation control measures. The transportation measures in this plan describe a comprehensive strategy to decrease motor vehicle use by promoting the use of alternative modes of travel, including transit. The proposed project's impact with respect to GHGs are discussed in Section 8, Greenhouse Gas Emissions, which demonstrates that the proposed project would comply with the applicable provisions of the City's Greenhouse Gas Reduction Strategy.

Because the proposed project would result in a reduction of vehicle trips and vehicle miles travelled in the SFBAAB, it would be implementing one of the primary goals of the plan. Furthermore, the proposed project would be consistent with the San Francisco General Plan, as discussed in Section C, Compatibility with Existing Zoning and Plans. Transportation control measures that are identified in the 2017 Clean Air Plan are implemented by the San Francisco General Plan and the Planning Code, for example, through the City's Transit First Policy, bicycle parking requirements, and transit impact development fees. Compliance with these requirements would ensure the project includes relevant transportation control measures specified in the 2017 Clean Air Plan. Therefore, the proposed project would include applicable control measures identified in the plan to the meet the plan's primary goals.

Examples of a project that could cause the disruption or delay of Clean Air Plan control measures are projects that would preclude the extension of a transit line or bike path, or projects that propose excessive parking beyond parking requirements. The proposed project would expand transit alternatives within the region within a dense, walkable urban area near a concentration of commercial uses with substantial employment and local rail service. It would not preclude the extension of a transit line or a bike path or any other transit improvement, and thus would not disrupt or hinder implementation of control measures identified in the plan.

For the reasons described above, the proposed project would not interfere with implementation of the 2017 Clean Air Plan. As the proposed project would be consistent with the applicable air quality plan that demonstrates how the region will improve ambient air quality and achieve the state and federal ambient air quality standards, this impact would be less than significant.

Impact AQ-5: The proposed project would not create objectionable odors that would affect a substantial number of people. (Less than Significant)

Typical odor sources of concern include: wastewater treatment plants, sanitary landfills, transfer stations, composting facilities, petroleum refineries, asphalt batch plants, chemical manufacturing facilities, fiberglass manufacturing facilities, auto body shops, rendering plants, and coffee roasting facilities. During construction, diesel exhaust from construction equipment would generate some odors. However, construction-related odors would be temporary and would not persist upon project completion. Observation indicates that the project site is not substantially affected by sources of odors.[69] Additionally, the proposed project would not introduce significant sources of new odors in the vicinity as the project includes a maritime use that is consistent with historic land use in the area. Therefore, odor impacts from the proposed project would be less than significant.

Impact C-AQ-1: The proposed project, in combination with past, present, and reasonably foreseeable future development in the project area would result in less–than-significant cumulative air quality impacts. (Less than Significant)

As discussed above, regional air pollution is, by its very nature, largely a cumulative impact. Emissions from past, present and future projects contribute to the region's adverse air quality on a cumulative basis. No single project by itself would be sufficient in size to result in regional nonattainment of ambient air quality standards. Instead, a project's individual emissions contribute to existing cumulative adverse air quality impacts.[70] The project-level thresholds for criteria air pollutants are based on levels by which new sources are not anticipated to contribute to an air quality violation or result in a considerable net increase in criteria air pollutants. Therefore, because the proposed project's construction (Impact AQ-1) and operational (Impact AQ-2) emissions would not exceed the project-level thresholds for criteria air pollutants, the proposed project would not be considered to result in a cumulatively considerable contribution to regional air quality impacts.

Although the project would add new sources of TACs (e.g., diesel ferry and water taxi operations), the project site is not located within an Air Pollutant Exposure Zone. The project's incremental increase in localized TAC emissions resulting from diesel ferry and water taxi operations would not contribute

[69] Reconnaissance of project site and vicinity was conducted by ESA staff on September 29, 2017.
[70] BAAQMD, *CEQA Air Quality Guidelines*, May 2011, page 2-1.

substantially to cumulative TAC emissions that could affect nearby sensitive land uses. Therefore, cumulative air quality impacts would be considered less than significant.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
8. GREENHOUSE GAS EMISSIONS — Would the project:					
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐	☐
b) Conflict with any applicable plan, policy, or regulation of an agency adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☒	☐	☐

Impact C-GG-1: The proposed project would generate greenhouse gas emissions, but not at levels that would result in a significant impact on the environment or conflict with any policy, plan, or regulation adopted for the purpose of reducing greenhouse gas emissions. (Less than Significant)

Greenhouse gas (GHG) emissions and global climate change represent cumulative impacts. GHG emissions cumulatively contribute to the significant adverse environmental impacts of global climate change. No single project could generate enough GHG emissions to noticeably change the global average temperature; instead, the combination of GHG emissions from past, present, and future projects have contributed and will continue to contribute to global climate change and its associated environmental impacts.

BAAQMD has prepared guidelines and methodologies for analyzing GHGs. These guidelines are consistent with CEQA Guidelines sections 15064.4 and 15183.5 which address the analysis and determination of significant impacts from a proposed project's GHG emissions. CEQA Guidelines section 15064.4 allows lead agencies to rely on a qualitative analysis to describe GHG emissions resulting from a project. CEQA Guidelines section 15183.5 allows for public agencies to analyze and mitigate GHG emissions as part of a larger plan for the reduction of GHGs and describes the required contents of such a plan. Accordingly, San Francisco has prepared Strategies to Address Greenhouse Gas Emissions[71] which presents a comprehensive assessment of policies, programs, and ordinances that collectively represent San Francisco's qualified GHG reduction strategy in compliance with the CEQA guidelines. These GHG reduction actions have resulted in a 23.3 percent reduction in GHG emissions in 2012 compared to 1990 levels,[72] exceeding the year 2020 reduction goals outlined in BAAQMD's Bay Area 2017 Clean Air Plan, Executive Order (EO) S-3-05, and Assembly Bill (AB) 32 (also known as the Global Warming Solutions

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71 San Francisco Planning Department, *Strategies to Address Greenhouse Gas Emissions in San Francisco*, 2010. This document is available online at: http://www.sf-planning.org/index.aspx?page=2627.

72 ICF International, *Technical Review of the 2012 Community-wide GHG Inventory for the City and County of San Francisco*, January 21, 2015. Available: http://sfenvironment.org/sites/default/files/fliers/files/icf_verificationmemo_2012sfecommunityinventory_2015-01-21.pdf, accessed March 16, 2015.

Act).[73] San Francisco's Municipal Transportation Agency (SFMTA) developed a Climate Action Strategy in 2011. This document shows a project increase in GHG's from transit, including ferry operations, with a simultaneous and much larger decrease in GHG emissions from private vehicles as a result of increased transit.

Given that the City' has met the State and region's 2020 GHG reduction targets and San Francisco's GHG reduction goals are consistent with, or more aggressive than, the long-term goals established under EO S-3-05,[74] EO B-30-15,[75,76] and Senate Bill (SB) 32[77,78] the City's GHG reduction goals are consistent with EO S-3-05, EO B-30-15, AB 32, SB 32 and the Bay Area 2017 Clean Air Plan. Therefore, proposed projects that are consistent with the City's GHG reduction strategy would be consistent with the aforementioned GHG reduction goals, would not conflict with these plans or result in significant GHG emissions, and would therefore not exceed San Francisco's applicable GHG threshold of significance.

The following analysis of the proposed project's impact on climate change focuses on the project's contribution to cumulatively significant GHG emissions. Because no individual project could emit GHGs at a level that could result in a significant impact on the global climate, this analysis is in a cumulative context, and this section does not include an individual project-specific impact statement.

Individual projects contribute to the cumulative effects of climate change by directly or indirectly emitting GHGs during construction and operational phases. The proposed project would increase GHG emissions from construction activity, from operations of ferry and water taxi vessels and from occasional maintenance dredging. However, the proposed project would also result in decreased GHG emissions from regional motor vehicle trips by providing a transit service that reduces region-wide vehicle miles travelled. **Table 22** presents an accounting of GHG emissions increases and reductions associated with the proposed project. Refer to Section 7, Air Quality and Appendix AQ for underlying assumptions and methodologies. As

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73 Executive Order S-3-05, Assembly Bill 32, and the *Bay Area 2010 Clean Air Plan* set a target of reducing GHG emissions to below 1990 levels by year 2020.

74 Office of the Governor, Executive Order S-3-05, June 1, 2005. Available: http://www.pcl.org/projects/2008symposium/proceedings/Coatsworth12.pdf, accessed March 16, 2016. Executive Order S-3-05 sets forth a series of target dates by which statewide emissions of GHGs need to be progressively reduced, as follows: by 2010, reduce GHG emissions to 2000 levels (approximately 457 million metric tons of carbon dioxide equivalents ($MTCO_2E$)); by 2020, reduce emissions to 1990 levels (approximately 427 million $MTCO_2E$); and by 2050 reduce emissions to 80 percent below 1990 levels (approximately 85 million $MTCO_2E$). Because of the differential heat absorption potential of various GHGs, GHG emissions are frequently measured in "carbon dioxide-equivalents," which present a weighted average based on each gas's heat absorption (or "global warming") potential.

75 Office of the Governor, Executive Order B-30-15, April 29, 2015. Available: https://www.gov.ca.gov/news.php?id=18938, accessed March 3, 2016. Executive Order B-30-15, issued on April 29, 2015, sets forth a target of reducing GHG emissions to 40 percent below 1990 levels by 2030 (estimated at 2.9 million $MTCO_2E$).

76 San Francisco's GHG reduction goals are codified in Section 902 of the Environment Code and include: (i) by 2008, determine City GHG emissions for year 1990; (ii) by 2017, reduce GHG emissions by 25 percent below 1990 levels; (iii) by 2025, reduce GHG emissions by 40 percent below 1990 levels; and by 2050, reduce GHG emissions by 80 percent below 1990 levels.

77 Senate Bill 32 amends California Health and Safety Code Division 25.5 (also known as the California Global Warming Solutions Act of 2006) by adding Section 38566, which directs that statewide greenhouse gas emissions to be reduced by 40 percent below 1990 levels by 2030.

78 Senate Bill 32 was paired with Assembly Bill 197, which would modify the structure of the State Air Resources Board; institute requirements for the disclosure of greenhouse gas emissions criteria pollutants, and toxic air contaminants; and establish requirements for the review and adoption of rules, regulations, and measures for the reduction of greenhouse gas emissions.

reflected in Table 22, the proposed project would result in a marginal net increase in GHG emissions within the region by approximately 41 metric tons of CO_2e (carbon dioxide-equivalents) per year.

TABLE 22
ANNUALIZED GHG EMISSIONS OF THE PROPOSED PROJECT

Source	Metric Tons CO2e/year
Project Construction[1]	+40
Special Event Ferry Trips	+196
Ferry Idling	+39
Water Taxi Trips	+130
Water Taxi Idling	+2
Maintenance Dredging[2]	+10
Ferry VMT Reduction	-308
Water Taxi VMT Reduction	-69
Total GHG Emissions	**+41**
BAAQMD Significance Threshold for meeting 2020 GHG Reduction Targets	**1,100**

NOTES:
1 Annualized emissions from all of project construction are amortized over an assumed 30-year project life.
2 Annualized emissions from maintenance dredging are amortized over an assumed 7-year maintenance interval.

SOURCE: ESA 2017

The proposed project would be subject to regulations adopted to reduce GHG emissions as identified in the GHG reduction strategy. As discussed below, compliance with the applicable regulations would reduce the project's GHG emissions related to energy use.

The proposed project would comply with any applicable provisions of the Port of San Francisco Green Building Standards Code, Stormwater Management Ordinance, Water Conservation and Irrigation ordinances, and Energy Conservation Ordinance, which would promote energy and water efficiency, thereby reducing the proposed project's energy-related GHG emissions.[79]

Thus, the proposed project was determined to be consistent with San Francisco's GHG reduction strategy.[80]

The Port is required to comply with these regulations, which have proven effective. San Francisco's GHG emissions have measurably decreased when compared to 1990 emissions levels, demonstrating that the City has met and exceeded EO S-3-05, AB 32, and the Bay Area 2017 Clean Air Plan GHG reduction goals for the year 2020. Other existing regulations, such as those implemented through AB 32, will continue to reduce the proposed project's contribution to climate change. In addition, San Francisco's local GHG

79 Compliance with water conservation measures reduce the energy (and GHG emissions) required to convey, pump and treat water required for the project.
80 San Francisco Planning Department, *Greenhouse Gas Analysis: Compliance Checklist for Mission Bay Ferry Landing and Water Taxi Landing, December 20, 2017*.

reduction targets are consistent with the long-term GHG reduction goals of EO S-3-05, EO B-30-15, AB 32, SB 32 and the Bay Area 2017 Clean Air Plan. Therefore, because the proposed project is consistent with the City's GHG reduction strategy, it is also consistent with the GHG reduction goals of EO S-3-05, EO B-30-15, AB 32, SB 32 and BAAQMD's 2017 Clean Air Plan. The project would not conflict with these plans and, therefore, would not exceed San Francisco's applicable GHG threshold of significance.

SFMTA developed a Climate Action Strategy in 2011. The proposed project would serve to implement Strategy 4: Transit Improvements of the SFMTA Climate Action Strategy. Specifically, this strategy directs the SFMTA to expand regional transit core capacity to serve growth and mode shifts. The proposed project would serve to implement this strategy by increasing the availability of transit options to workers and residents of San Francisco. As such, the proposed project would result in a less-than-significant impact with respect to GHG emissions.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
9. WIND AND SHADOW — Would the project:					
a) Alter wind in a manner that substantially affects public areas?	☐	☐	☒	☐	☐
b) Create new shadow in a manner that substantially affects outdoor recreation facilities or other public areas?	☐	☐	☒	☐	☐

Wind

In San Francisco, average winds speeds are the highest in the summer and lowest in winter. However, the strongest peak wind speeds occur in winter. The highest average wind speeds occur in mid-afternoon and the lowest in the early morning. Based on over 40 years of recordkeeping, the highest mean hourly wind speeds (approximately 20 mph) occur midafternoon in July, while the lowest mean hourly wind speeds (in the range of 6 to 9 mph) occur throughout the day in November. Meteorological data collected at the old San Francisco Federal Building at 50 United Nations Plaza over a 6-year period[81] show that westerly[82] through northwesterly winds are the most frequent and strongest winds during all seasons. Of the 16 primary wind directions, four have the greatest frequency of occurrence: these are northwest, west-northwest, west, and southwest. Analysis of the Federal Building wind data shows that during the hours from 6:00 a.m. to 8:00 p.m., about 70 percent of the winds blow from five adjacent directions of the 16 directions, as follows: northwest (10 percent of all winds), west-northwest (14 percent of all winds), west (35 percent of all winds), west-southwest (accounting for 2 percent of all winds), and southwest (9 percent of all winds). In San Francisco, including Mission Bay, over 90 percent of all measured winds with speeds

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81 Arens, E. et al., "Developing the San Francisco Wind Ordinance and its Guidelines for Compliance," Building and Environment, Vol. 24, No. 4, p. 297-303, 1989.

82 Wind directions are reported as directions from which the winds blow.

over 13 mph blow from these five directions. The other 10 percent of winds over 13 mph are from storms and can come from any other direction.

Located on the eastern waterfront of San Francisco, the project site is fully exposed to storm winds that approach from over the Bay from the east and northeast. The existing pedestrian wind conditions on parcels of land in the Mission Bay South Plan area can be characterized as windy. However, prior wind tunnel testing conducted within Mission Bay South Plan area has demonstrated that existing wind conditions within the Plan area have improved over time as planned buildings have been constructed in accordance with the Mission Bay South Design for Development. In addition, the drydocks to the southeast provide further wind protection.

Shadow

In an urban environment, shadow is a function of the height, size, and massing of buildings and other elements of the built environment, and the angle of the sun. The angle of the sun varies due to the time of day (from rotation of the earth) and the change in seasons (due to the earth's elliptical orbit around the sun and the earth's tilted axis). The longer mid-day shadows are cast during the winter (when the mid-day sun is lowest in the sky) and the shorter mid-day shadows are cast during the summer (when the mid-day sun is higher in the sky). At the time of the summer solstice (which falls approximately on June 21 of every year), the mid-day sun is highest in the sky, and the longest day and shortest night occur on this date. Conversely, the shortest day and longest night occur on the winter solstice (which falls on approximately December 21 of every year). The vernal and fall equinoxes (when day and night are equal in length) represent the halfway point between solstices.

The Mission Bay South Design for Development includes Sunlight Access to Open Space design standards. These standards were prepared with the objective of encouraging new developments to ensure sunlight access to public open spaces and limit the extent and duration of shadows on these public open spaces. The Mission Bay South Design for Development notes that shadow studies have determined that development complying with the design standards would reasonably limit areas of shadow on public open spaces during the active months of the year (March to September) and during the most active times of the day (10:00 a.m. to 4:00 p.m.).

Impact WS-1: The proposed project would not alter wind in a manner that substantially affects public areas. (Less than Significant)

Average wind speeds in San Francisco are the highest in the summer and lowest in winter. However, the strongest peak winds occur in winter, under storm conditions. Throughout the year the highest typical wind speeds occur in mid-afternoon and the lowest in the early morning. Of the primary wind directions, four have the greatest frequency of occurrence and also make up the majority of the strong winds that occur. These winds include the northwest, west-northwest, west and west-southwest (referred to as prevailing winds).

The San Francisco Planning Code establishes wind comfort and wind hazard criteria used to evaluate new development in four areas of the City. As none of these areas includes the project site, the wind comfort and wind hazard criteria established in the planning code would not be applicable. The cited planning code sections provide that any new building or addition in these areas of the City that would cause wind speeds to exceed the hazard level of 26-mph-equivalent wind speed (as defined in the planning code) more than one hour of any year must be modified to meet this criterion. (The 26 mph standard accounts for short-term—3-minute averaged—wind observations at 36 mph as equivalent to the frequency of an hourly averaged wind of 26 mph. As noted above, winds over 34 mph make it difficult for a person to maintain balance, and gusts can blow a person over.) The San Francisco Planning Department generally refers to the wind hazard criterion to determine the significance for CEQA purposes evaluate wind effects of new development in all areas of the City.

As explained above, building structures near or greater than 100 feet in height could create pedestrian level conditions such that the wind hazard criterion of 26-mph-equivalent wind speed for a single hour of the year would be exceeded. There is no threshold height that triggers the need for wind-tunnel testing to determine whether the building design would result in street-level winds that exceed the standard. It is generally understood, however, from many prior wind-tunnel tests on a variety of projects in San Francisco that most, if not all, buildings under 100 feet do not result in adverse wind effects at street level, barring unusual circumstances. Because the project elements would all be less than 100 feet tall and are not located near any other tall buildings, the project would not alter wind in a manner that substantially affects public areas.

Impact WS-2: The proposed project would not create new shadow in a manner that substantially affects outdoor recreation facilities or other public areas. (Less than Significant)

Planning Code section 295, which was adopted in response to Proposition K (passed November 1984), mandates that new structures above 40 feet in height that would cast additional shadows on properties under the jurisdiction of, or designated to be acquired by, the Recreation and Parks Department cannot be approved by the Planning Commission (based on recommendation from the Recreation and Parks Commission) if the shadow "will have any adverse impact on the use" of the park, unless the impact is determined to be insignificant. Though the project is adjacent to Agua Vista Park, this park is owned by the Port Authority, not Recreation and Parks, and is therefore not subject to the height limitations. Furthermore, the height of the proposed project would be below the 40 feet necessary to trigger the provisions of Planning Code section 295.

Impact C-WS-1: The proposed project, in combination with other past, present, and reasonably foreseeable projects, would not result in cumulatively considerable impacts related to wind and shadow. (Less than Significant)

Other projects in the vicinity of the Ferry and Water Taxi Landing project site include buildings that would be taller than existing conditions. The existing pedestrian wind conditions on large vacant parcels of land in the Mission Bay South Plan area can be characterized as windy. However, prior wind tunnel testing conducted within Mission Bay South Plan area has demonstrated that existing wind conditions within the Plan area have improved over time as planned buildings have been constructed in accordance with the Mission Bay South Design for Development. Section C, Compatibility with Existing Zoning and Plans, discusses potential conflicts with applicable design plans and policies. Groups of buildings built according to these guidelines substantially slow winds in their vicinity.

Under cumulative conditions, past, present, and reasonably foreseeable future buildings 100 feet and taller within the project vicinity would have the potential to result in localized wind effects that could be adverse. Wind tunnel testing was conducted for the nearby Chase Center to evaluate the pedestrian wind environment that would exist with the project, in combination with reasonably foreseeable cumulative development, on public use areas around the project site. In the immediate project vicinity, this included assumed cumulative development on currently undeveloped portions of Blocks 27, 25, X3 and 33, located north, west, southwest and south of the project site, respectively. See Section 5.1, Cumulative Projects, for the discussion of cumulative impacts. Cumulative development would alter wind speeds among individual off-site study test points. The off-site wind hazards that would occur under cumulative-plus-project conditions would be fewer than would occur under both existing conditions (reduced from 7 to 3) and existing-plus project conditions (reduced from 6 to 3). Furthermore, the duration of the wind hazards that would occur under cumulative-plus-project conditions -54 hours – would be less than would occur under existing conditions (106 hours) and existing-plus-project conditions (139 hours). Consequently, cumulative wind hazard impacts would be less than significant.

No new buildings in the project vicinity would cast a shadow over any Recreation and Parks owned parcels. As discussed in Section C, Compatibility with Existing Zoning and Plans above, the "Design for Development" indicates that the prior shadow studies have determined that development within the Mission Bay South plan area complying with the design standards would reasonably limit areas of shadow on public open spaces during the active months of the year and during the most active times of the day. Accordingly, the project's shadow impact and its contribution to cumulative shadow impacts, on publicly accessible open space or outdoor recreation facilities or other public areas within the Mission Bay plan area would be less significant.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
10. RECREATION — Would the project:					
a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facilities would occur or be accelerated?	☐	☐	☒	☐	☐
b) Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?	☐	☐	☒	☐	☐
c) Physically degrade existing recreational resources?	☐	☐	☒	☐	☐

Existing nearby parks include the proposed Bayfront Park to the north. The proposed project and staging areas overlap with the existing Agua Vista Park. As of fall 2017, Bayfront Park is currently in pre-construction phases; when built, it will feature approximately 14,000 square feet of plaza space and 32,000 square feet of landscaping. Bayfront Park provides connections to adjacent Port open spaces through a 16-foot-wide Bay Trail which is and will continue to be used for pedestrian and bicycle traffic.

Currently, Agua Vista Park features an existing asphalt path and a fishing pier. Existing onsite public access improvements consist of an existing portion of the Bay Trail which traverses the landside portion of the site and several concrete picnic tables, outdoor lighting, and bike racks all of which are part of the existing Agua Vista Park. Existing off-site public access improvements adjacent to the site include the approximately 750-square foot fishing pier built in 1971 as a part of the existing Agua Vista Park, and an approximately 300- square foot outfall overlook. Additional improvements to Agua Vista Park are anticipated to occur after the Ferry and Water Taxi Landing are completed.

The San Francisco Bay Trail is a bicycle and pedestrian trail that will eventually allow continuous travel around the shoreline of San Francisco. The sections through the project vicinity include benches and dedicated pedestrian/bicycle trails which connect to bicycle lanes on Illinois Street south of the project vicinity. The Bay Trail traverses Agua Vista Park and is frequently used by pedestrians, cyclists, and other users, all of which comprise existing non-contact recreational uses of the site.

The project site is located in a developed urban neighborhood that does not contain large regional park facilities, but does include a number of neighborhood parks and open spaces, as well as other recreational facilities. The General Plan's Recreation and Open Space Element (ROSE), revised and updated in April 2014, does not identify the project site area as a high needs open space area.

Impact RE-1: The proposed project would not result in a substantial increase in the use of existing parks and recreational facilities, the deterioration of such facilities, include recreation facilities, or require the expansion of recreational facilities, or physically degrade existing recreational resources. (Less than significant)

As noted above, the ROSE does not identify the portions of Mission Bay which include the project site as a "high needs area" of the city. The ROSE defines a "high needs area" of the city as an area "with high population densities, high concentrations of seniors and youth, and lower income populations that are located outside of existing park service areas."[83] As shown on Maps 4a through 4d of the ROSE, the project site is located within the ½-mile service area of "Active Use/Sports Fields" and "Passive Use/ Tranquil Spaces" and the ½-mile service area of "Proposed Open Spaces in Large Plan Areas." As shown on Maps 5a, 5c, and 5d in the ROSE, the project site is also within an area of the city that exhibits lower population densities and seniors relative to the city as a whole. The project site also is within an area with a lower percentage of low-income households relative to the city as a whole (Map 5b). Based on these variables, a composite map was generated to identify areas of the city that receive priority when opportunities to acquire land for development of new parks arise and when funding decisions for the renovation of existing parks are made (Map 7 of the ROSE).[84] As shown on Map 7, the project site is not located within a "high needs area."

For the project, the Port would construct a single-float, two-berth Ferry Landing and a separate single float, two-berth Water Taxi Landing, as well as associated structures and landscaping. The proposed

83 San Francisco Planning Department, ROSE, April 2014, p. 13. Available online at http://www.sf-planning.org/ftp/General_Plan/Recreation_OpenSpace_Element_ADOPTED.pdf.

84 ROSE, April 2014, Maps 4 through 7. Available: http://www.sf-planning.org/ftp/General_Plan/Recreation_OpenSpace_Element_ADOPTED.pdf.

recreational facilities for the project include concrete benches, repaved promenades and the Bay Trail section, and new landscaping. Proposed landside improvements would be integrated with the separately-planned and permitted improvements for Agua Vista Park. These new facilities are built on a previously modified and impacted site; as such, they would not have an adverse physical effect on the environment.

The project would not result in physical degradation of nearby parks. Given the number of parks in the area, and the amenities currently provided, it is unlikely that implementation of the proposed project would result in the substantial physical deterioration of City Parks. However, the project could impact park users of the fishing pier at Agua Vista Park. Increased boat traffic from the ferry and water taxi landings could affect whether localized fish populations stay in this area or move elsewhere. However, because the area is already used by commercial and recreational boats and is an existing industrial area, the ferry and water taxi would likely not impact recreational fishing or the movement of fish populations.

The project site is not located within a high needs area of the city, as designated by SFRPD. With the availability of open space in the immediate vicinity of the project site, and given that the project would not generate population growth, project-generated demand could be accommodated by the existing local resources and regional recreational resources, such as Jackson Playground, Esprit Park, Potrero Hill Mini Park, and non-SFRPD parks such as Agua Vista Park, Mariposa Park, Bayfront Park, and Mission Bay Commons Park. Additionally, the area is served by two overlapping regional trails that are still being expanded and connected, but currently exist, the Bay Trail and the Blue Greenway. Overall, the proposed project would not create a substantial increase in the use of existing neighborhood or regional recreational facilities such that physical deterioration or degradation of existing facilities would occur, nor would it result in the need for the expansion or construction of recreational facilities. Therefore, this impact would be less than significant and no mitigation measures are necessary.

Impact C-RE-1: The proposed project, in combination with other past, present, or reasonably foreseeable projects would result in less-than-significant impacts to recreational resources. (Less than Significant)

Implementation of the cumulative development projects would increase the residential, recreational, and employment-related populations in the project vicinity. This population increase could increase the demand for recreational facilities and could necessitate the construction of new or expanded recreational facilities, including those adjacent to the project site. Transportation improvements in the project vicinity could also encourage visitors to travel to the project site and increase the use of the recreational facilities on the project site. Construction of improved Bay Trail segments would provide longer trail opportunities for residents, employees, and visitors to the project site.

In addition, the expanded 5.5-acre Bayfront Park would provide recreational facilities and open space in the area.[85] Bayfront Park is a planned linear park comprising Mission Bay plan parcels P21 through P24, and when completed, will extend from Mission Bay Boulevard south to Mariposa Street. The north portion of the park (P21, located east of Terry A. Francois Boulevard, between Mission Bay Boulevard

[85] Mission Bay Parks, 2017, http://missionbayparks.com/bay-front-park/.

South and just south of Pierpoint Lane) is complete, and includes a landscaped parking lot and boat launch. Construction for the south portion of Bayfront Park (P23 and P24, located west of Terry A. Francois Boulevard, between 16th Street and Mariposa Street), and construction of this portion of the park were completed in 2016. Following realignment of Terry A. Francois Boulevard, the central portion (P22) of Bayfront Park located east of the project site and consisting of approximately 5.5 acres will be developed. Potential park uses for this portion of Bayfront Park being considered at this time include, but are not limited to, pathways, outdoor performance area, kiosks, outdoor dining areas, and informal playing field(s). Both the realignment of Terry A. Francois Boulevard and Bayfront Park public access improvements on P22 are triggered by development on Block 29-32 and would be implemented by the master developer, FOCIL-MB, LLC, prior to occupancy of buildings at the project site. Agua Vista Park is an existing shoreline landscaped area and fishing pier located east of the project site across from the existing alignment of Terry A. Francois Boulevard. Agua Vista Park is on Port of San Francisco property and is adjacent to the proposed project. Improvements to Agua Vista Park are anticipated to occur after Ferry and Water Taxi Landing project is complete.

The new recreational facilities on the project site and vicinity would accommodate and be designed for use by nearby residents and workers, as well as visitors from surrounding neighborhoods and other parts of San Francisco. The City has accounted for such growth as part of the Recreation and Open Space Element of the General Plan.[86] In addition to the new Bayfront Park, San Francisco voters passed two bond measures, in 2008 and 2012, to fund the acquisition, planning, and renovation of the City's network of recreational resources, which will provide additional recreation facilities and opportunities in the City. Therefore, the proposed project would not combine with past, present, or reasonably foreseeable future projects to create a significant cumulative impact related to recreation. This impact would be less than significant.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
11. UTILITIES AND SERVICE SYSTEMS — Would the project:					
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☐	☒
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒	☐
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☒	☐	☐
d) Have sufficient water supply available to serve the project from existing entitlements and resources, or require new or expanded water supply resources or entitlements?	☐	☐	☒	☐	☐

86 San Francisco Planning, 2014, http://openspace.sfplanning.org/.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
11. UTILITIES AND SERVICE SYSTEMS — Would the project:					
e) Result in a determination by the wastewater treatment provider that would serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☐	☒
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☒	☐	☐
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☒	☐	☐

The proposed project does not include restrooms or any other facilities or processes that would produce wastewater. Therefore, there would be no wastewater discharges to the City's combined sewer system and Initial Study topics a) and e) are not applicable to the proposed project. In addition, the project would not require the construction of any new water or wastewater facilities, and there is no impact related to Initial Study topic b).

Impact UT-1: The proposed project would not require construction of new stormwater drainage facilities or expansion of existing facilities. (Less than Significant)

The proposed project includes construction of several over-water features including a new pier and platform and associated gangways and floats for the Ferry and Water Taxi Landings. As discussed in Section 15, Hydrology and Water Quality, stormwater controls for these features would be constructed as required by article 4.2 of the San Francisco Public Works Code, section 147, and the San Francisco Stormwater Management Requirements and Design Guidelines. The stormwater controls would include measures to manage stormwater runoff from the over-water features prior to discharge to the Bay. Because these features would be constructed as part of the project and would be designed in accordance with regulatory requirements to manage runoff, impacts related to requiring construction of new stormwater drainage facilities or expansion of existing facilities for these features would be less than significant for the over-water features.

As also discussed in Section 15, the landside portion of the project site is in an area served by a separate stormwater drainage system under the jurisdiction of the Port. Because the project includes the construction of approximately 5,775 square feet of new impervious surfaces, the Port would construct stormwater controls to manage runoff from storms that produce a rainfall depth of 0.63 inch in 24 hours and a rainfall intensity of approximately 0.2 inch per hour (referred to as the 85th percentile, 24-hour storm). These features would be constructed as part of the proposed project and neither expansion of the existing separate stormwater system nor construction of a new stormwater system would be required. Therefore, impacts related to the construction of new or expanded stormwater drainage systems for stormwater runoff from the landside portions of the project area would be less than significant.

Impact UT-2: The SFPUC has sufficient water supply available to serve the project from existing entitlements and resources, and the proposed project would not require expansion or construction of new water supply resources or facilities. (Less than Significant)

During operation, the project would periodically use approximately 100 gallons of water to wash off the pier, platform, and float surfaces and would also use potable water for landscape irrigation in the plaza area. As discussed in the Project Description, the landscaped area would be vegetated with low water use and climate appropriate plants. The maximum amount of water used for landscaping would be approximately 2,500 gallons per year.[87] An additional approximately 8,000 gallons of water would be needed to "trim" the ballast tanks so the float is level at the outset of the project. This would be a one-time need. In 2015, the SFPUC had an available potable water supply of 67.7 million gallons per day (mgd) for its retail customers, including all of San Francisco and several customers outside of San Francisco.[88] The retail water supply is projected to increase to 70.5 mgd by the year 2020. During fiscal year 2015 to 2016, the SFPUC delivered 66 mgd of potable water to its retail customers.[89] This is less than the available supply, largely due to water conservation efforts. The estimated water use under the proposed project is an extremely small part of the total water deliveries and would be easily met by existing water supplies. Therefore, the SFPUC has sufficient water supply to serve the project from existing entitlements and resources and this impact would be less than significant.

Impact UT-3: The proposed project would be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs. (Less than Significant)

The proposed project is not anticipated to generate a significant amount of waste. As discussed in the Project Description, the permanent fill proposed for the project would be offset by removal of approximately 25 existing remnant piles within the proposed dredge area that are likely creosote-treated. As described below under Impact HZ-4, the piles would be segregated from other wastes, appropriately stored and labeled, and transported to an authorized treated wood waste disposal facility in accordance with the alternative management standards. Most of the project components such as the pier canopy, float, and gangway would be fabricated off-site. Therefore, the installation of these components would not generate a significant amount of solid waste. Recycling collection, compost, and disposal services at the project site would be collected in on-site bins.

The proposed project would be subject to the San Francisco Construction and Demolition Debris Recovery Program (Ordinance Number 27-06) which requires that 65 percent of mixed construction and demolition waste be diverted from landfills. More broadly, the San Francisco Board of Supervisors adopted the Zero Waste to Landfill Resolution (Resolution No. 002-03-COE), which set a goal for the city of San Francisco to achieve zero waste by 2020. As a result, the majority of waste generated by demolition

87 The maximum amount of irrigation water is calculated using the Maximum Applied Water Allowance from San Francisco's Water Efficient Irrigation Ordinance. The Maximum Applied Water Allowance = 35.1 x 0.62 x [(Evapotranspiration Adjustment Factor x Landscape Area in Square Feet)]. In accordance with the Water Efficient Irrigation Ordinance, the value used for the Evapotranspiration Adjustment Factor is 0.45. As described in the Project Description, the landscaped area is 256 square feet.

88 San Francisco Public Utilities Commission, 2015 Urban Water Management Plan for the City and County of San Francisco, June 2016.

89 San Francisco Public Utilities Commission, Water Resources Division, Annual Report, Fiscal Year 2015-2016.

and construction would be recycled. In order to meet these requirements, a licensed solid waste hauler, such as Recology, would provide collection and hauling of construction and demolition waste at the project site. Waste would first be taken to the Recology Transfer Station where recyclable materials would be identified and recovered. Remaining waste that cannot be recycled or composted would then be transported to the Hay Road landfill by Recology.

In September of 2015, the City of San Francisco entered into a landfill disposal agreement with Recology, under which Recology provides the transport and disposal of the City's municipal solid waste at the Recology Hay Road Landfill located in Vacaville. This agreement, is anticipated to continue for approximately nine years, at which time the City will have an opportunity to renew the agreement for an additional six years.[90] The Hay Road Landfill has a permitted capacity of 2,400 tons/day and on average receives an average of approximately 1,850 tons per day from all sources.[91] The landfill has a remaining capacity of 30,433,000 cubic yards and has an estimated closure date of 2077.[92] The proposed project would not generate a significant amount of waste as the majority of waste during construction and demolition would be recycled. The project would be served by a landfill with sufficient space to meet disposal needs; therefore, the project would have a less-than-significant impact on landfill capacity.

Impact UT-4: The construction and operation of the proposed project would comply with all applicable statutes and regulations related to solid waste. (Less than Significant)

As stated above, the proposed project would be required to comply with the San Francisco Board of Supervisors Resolution 27-06 which requires that that 65 percent of construction and demolition materials be diverted from landfills. Additionally, the project would need to meet the requirements of Resolution Number 002-03, which set a goal for San Francisco to divert all waste from landfills by 2020. As such, the proposed project would comply with the California Integrated Waste Management Act (AB 939) which required the implementation of waste management plans and mandated that local jurisdictions divert at least 50 percent of all solid waste, using 1990 as a baseline level. The proposed project would also meet the requirements of The State Model Ordinance of the California Solid Waste Reuse and Recycling Access Act of 1991, and AB 341 both of which created requirements for businesses to have sufficient recycling programs. It is anticipated that all solid waste would be hauled by a licensed solid waste hauler and that any waste that cannot be recycled would be disposed of at Hay Road Landfill. The proposed project would comply with all relevant federal, state, and local requirements regarding solid waste. Therefore, the project would have a less-than-significant impact on solid waste statutes and regulations.

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90 San Francisco Department of the Environment, 2015. "Landfill Disposal Agreement Informational Hearing Pursuant to Board Resolution 171-05" Accessed at: https://sfenvironment.org/sites/default/files/notice/.../hay_road_fnd_revised_7_21.pdf Accessed on October 18, 2017.

91 San Francisco Planning Department, *Agreement for Disposal of San Francisco Municipal Solid Waste at Recology Hay Road Landfill in Solano County* Final Negative Declaration, *Planning Department* Case No. 2014.0653, May 21, 2015. Available online at: http://sfmea.sfplanning.org/2014.0653E_Revised_FND.pdf, accessed May 27, 2016.

92 California Department of Resources Recycling and Recovery (CalRecycle), 2017. *Facility/ Site Summary Details: Recology Hay Road (48-AA-0002)* Accessed at: http://www.calrecycle.ca.gov/SWFacilities/Directory/48-aa-0002/Detail/ Accessed on October 18, 2017.

Impact C-UT-1: The proposed project would not make a considerable contribution to any cumulative significant effects related to utilities or service systems. (Less than Significant)

As discussed in Impact UT-1, the project site would be served by a new stormwater system to be constructed as part of the proposed project to drain runoff into the Bay. The proposed project when combined with other reasonably foreseeable projects would not result in cumulative impacts that require the construction of new stormwater drainage facilities nor require the expansion of existing facilities. This cumulative impact would be less than significant, and no mitigation is necessary.

As described in Impact UT-2, potable water use under the proposed project would be an extremely small portion of the SFPUC's available retail water supply. In accordance with the California Water Code, the SFPUC requires a water supply assessment for projects over specified thresholds. The purpose of the water supply assessment is to confirm that there are adequate potable water supplies in the regional water system to serve the total estimated water demand for these projects as well as the reasonably foreseeable cumulative demand in the region over the next 20 years under a range of hydrologic conditions. Approval of the water supply assessment for larger projects is required for project approval. Because projects over the specified threshold would not be approved unless there is an approved water supply assessment and because the project's water demand is such a small portion of the available water supply, cumulative impacts on water supply would be less than significant, and no mitigation is necessary.

As described in Impact UT-3, the proposed project would be served by a landfill with sufficient capacity to accommodate the project's solid waste disposal needs. The project is not anticipated to generate a significant amount of solid waste. The proposed project would be required to divert at least 65 percent of mixed demolition and construction debris. During construction, remnant piles and other debris removed in order to offset permanent fill would be segregated and transported to an authorized waste disposal site. As a result, the proposed project would comply with all relevant statutes and regulations applicable to solid waste and would not have a significant impact on landfill capacity. The construction of the proposed project when combined with all other reasonably foreseeable projects would not result in cumulative impacts that would require the construction of new facilities nor the expansion of existing facilities. Therefore, the proposed would have no contribution to cumulative impacts and no mitigation is necessary.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
12. PUBLIC SERVICES — Would the project:					
a) Result in substantial adverse physical impacts associated with the provision of, or the need for, new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any public services such as fire protection, police protection, schools, parks, or other services?	☐	☐	☒	☐	☐

Impact PS-1: The proposed project would not result in an increase in demand for police protection, fire protection, schools, or other services to an extent that would result in substantial adverse physical impacts associated with the construction or alteration of governmental facilities. (Less than Significant)

Fire Protection

The San Francisco Fire Department (SFFD) provides fire protection and emergency medical services for approximately 900,000 people in the City and County of San Francisco. The SFFD has 48 facilities, 45 of which are fire stations within the City. The SFFD headquarters are located at 698 Second St, approximately 1.1 miles north of the project site.[93] The SFFD uses a fleet of private and public ambulances to provide emergency medical transportation to San Francisco hospitals. The nearest SFFD stations to the proposed Ferry Landing site that would provide first response for fire suppression, rescue, and emergency medical services include the following:

- Station 4 in the Public Safety Building at Third Street and Mission Rock Street (one-half mile from the project site)
- Station 8 at 36 Bluxome Street and Fourth Street (one mile from the project site)
- Station 25 at 3305 Third Street at Cargo Way (1.8 miles from the project site)
- Station 29 at 299 Vermont Street at 16th Street (1.3 miles from the project site)

The City's Public Safety Building, located at Third Street and Mission Rock Street, includes Station Number 4. This station is the closest to the project site and has a staff of 26 persons total with nine persons on staff per shift. Station number 4 has one truck and one engine.[94] In emergency situations, the SFFD can control the traffic signals at the intersection of Mission Rock Street with Third Street and Terry A. Francois Boulevard, allowing SFFD emergency vehicles to travel through these intersections unimpeded.

In FY 2014-2015, SFFD as a whole received 130,406 calls for service. Approximately 20 percent of the calls required emergency response by only fire personnel while 23 percent of the calls required response from only emergency medical staff. The remaining 57 percent required a response from both emergency medical services and fire responders.[95] In the first year of its establishment, Station No. 4 received 1,092 calls for service.[96] As of January 2018, the average response time for Code 3 Medical Calls for stations in the project vicinity was three minutes and 31 seconds. The average response time for Code 3 All Calls was three

93 City and County of San Francisco Fire Department. 2017. *About Us.* Available at: http://sf-fire.org/ABOUT-US Accessed: October 16, 2017.

94 Kennedy, Jessica. Senior Analyst/Support Services. San Francisco Fire Department. Email to Jessica Viramontes, ICF International. Received on January 20, 2016. *Seawall Lot 337 and Pier 48 Mixed-Use Project EIR* Accessed at: http://sfmea.sfplanning.org/MissionRockEIRVol1.pdf Accessed on October 16, 2017.

95 Kennedy, Jessica. Senior Analyst/Support Services. San Francisco Fire Department. January 20, 2016— email to Jessica Viramontes, ICF International; Kennedy, Jessica. Senior Analyst/Support Services. San Francisco Fire Department. *Seawall Lot 337 and Pier 48 Mixed-Use Project EIR* Accessed at: http://sfmea.sfplanning.org/MissionRockEIRVol1.pdf Accessed on October 16, 2017.

96 Kennedy, Jessica. Senior Analyst/Support Services. San Francisco Fire Department. January 20, 2016— email to Jessica Viramontes, ICF International; Kennedy, Jessica. Senior Analyst/Support Services. San Francisco Fire Department. *Seawall Lot 337 and Pier 48 Mixed-Use Project EIR* Accessed at: http://sfmea.sfplanning.org/MissionRockEIRVol1.pdf Accessed on October 16, 2017.

minutes and 44 seconds. These response times are well below the SFFD response time goal of four minutes and 30 seconds for Code 3 Medical Calls. The SFFD anticipates that response times may increase slightly during special events but not above the established response time goals of the department.[97]

In the event of a major fire aboard a vessel or waterfront facility, the United States Coast Guard would assist in the coordination of emergency response per the U.S. Coast Guard (USCG) Sector San Francisco Marine Firefighting Contingency Plan.[98] The United States Coast Guard (USCG) 11th District Headquarters is located on Coast Guard Island in Alameda. Sector San Francisco, the sector responsible for Northern California, is stationed on Yerba Buena Island. Sector San Francisco has field units located throughout the Bay Area including Station Golden Gate at the Marin County side of the Golden Gate Bridge, Station San Francisco on Yerba Buena Island, and two patrol boats at Yerba Buena Island. USCG personnel provide support to firefighting agencies and are trained to provide basic life support and CPR. USCG personnel would provide fire protection services in order to save a life or to prevent a significant threat due to a fire.

The Port is coordinating with the SFPUC to design a connection to a proposed Auxiliary Water Supply System (AWSS) manifold that would be constructed above ground in Bayfront Park. This AWSS connection would allow SFFD boats to use water from the Bay as an auxiliary, emergency water source. This system is not a part of this project; however, the Ferry Landing is designed to accommodate the landing of SFFD fireboats. During emergencies, the fire boats would be able to run hoses to the AWSS manifold that would be located across from the entrance of the landing. The SFFD has three fireboats, the *Phoenix,* the *Guardian,* and the *St. Francis,* all of which are approximately 88 feet in length. The *Phoenix* has a pumping capacity of over 9,600 gallons per minute (gpm), equal to that of a landside pumping station. The *Guardian* has the largest pumping capacity of any fireboat in the world, 24,000 gpm.[99]

The proposed project would not cause a permanent increase of residents or employees within the City. Although the project would intermittently increase activity in the vicinity while the ferry provides commuting and special event services, the increase in demand for fire protection services would be met by the existing fire department, equipment, and facilities. The SFFD would not require any expansion or alteration of existing facilities in order to maintain service ratios and response times. Therefore, the proposed project would have a less-than-significant impact on fire protection services in the area.

Police Protection

The San Francisco Police Department (SFPD) provides law enforcement services in the City and County of San Francisco. The San Francisco City Charter mandates that the SFPD maintain a sworn staff of 1,971 officers available for field duty within the city of San Francisco. In 2015 the SFPD averaged a total of

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97 Conley, Nalungo. San Francisco Fire Department, Support Services. January 23, 2018 – email to Jessica O'Dell, ESA.

98 San Francisco Planning Department. 2011 *The 34th America's Cup and James R. Herman Cruise Terminal and Northeast Wharf Plaza DEIR*. Accessed at: http://sf-planning.org/environmental-impact-reports-negative-declarations Accessed on October 16, 2017.

99 San Francisco Fire Department, communications with Assistant Deputy Chief Ken Lombardi, January 11, 2015 and January 21, 2015. Accessed through *Event Center and Mixed-Use Development at Mission Bay Blocks 29-32 DSEIR*

1,716 full-duty sworn officers.[100] Since 2012, the SFPD has initiated a hiring plan and is on target to reach the mandated number of officers by December 2017.[101] The project site lies within the jurisdiction of the SFPD's Southern District which extends south from Mission Street to Mariposa Street and east toward the San Francisco Bay. The closest station within the district is the Public Safety Building located at 1251 3rd Street, approximately 0.5 mile from the proposed Ferry Landing site.[102]

In 2017, the Southern District had a sworn staff of approximately 120.[103] The Southern District contains seven patrol sectors, five on the mainland and two on Treasure Island. Additionally, the district has multiple foot beats and officers who patrol using bicycles.[104] The SFPD's Southern District routinely provides law enforcement services for large events within the district including San Francisco Giants home games at AT&T Park, Oracle World, Mac World, Google Convention, St. Patrick's Day Parade, and Gay Pride Parade. In order to provide increased police protection for special events, the SFPD's Event Commander coordinates with event sponsors in order to determine the level of SFPD personnel necessary to provide adequate service for the event.[105]

The SFPD has dispatch time goals of 2 minutes for Priority A (life threatening) calls, 10 minutes for Priority B (potential for harm to life and property) calls, and 90 minutes for Priority C (crime committed with no threat to life or property) calls. In November 2017, the SFPD averaged 5:25 (minutes: seconds) for dispatch to Priority A calls, 6:16 for Priority B, and 7:10 for Priority C calls.[106] In 2016, of the crimes reported in the Southern District, 7,209 were categorized as Larceny/Theft (including Theft from Vehicle) and 934 were categorized as Assault.[107]

The proposed project would not result in a substantial growth in population or employment in the City. The project would cause temporary, incremental increases in pedestrian traffic and population in the area during commute periods and during special event ferry services. The SFPD indicated that a second officer would be needed to staff the intersection of Terry A. Francois Boulevard and 16th Street to manage pedestrian and vehicle traffic during special events. The Southern Station would increase staffing in the project vicinity during special events by utilizing staff from other SFPD districts and collaborating with

[100] Walsh, Peter. Lieutenant, Administration Bureau. San Francisco Police Department. Email to Jessica Viramontes, ICF International. Received on November 6, 2015. *Seawall Lot 337 and Pier 48 Mixed-Use Project EIR* Available: http://sfmea.sfplanning.org/MissionRockEIRVol1.pdf Accessed on October 16, 2017.

[101] Scott, William. Chief, San Francisco Police Department. FY 2017-18 Budget Presentation to Police Commission. Available: https://sanfranciscopolice.org/sites/default/files/Documents/PoliceCommission/PoliceCommission020817-SFPD BudgetPresentationFY17-18.pdf.

[102] San Francisco Police Department, *2014 Annual Report*. Available: http://sf-police.org/index.aspx? page=3992, accessed October 11, 2017.

[103] McDonnell, Dion. Sergeant, San Francisco Police Department. Meeting with ESA on November 21, 2017.

[104] Walsh, Peter. Lieutenant, Administration Bureau. San Francisco Police Department. Email to Jessica Viramontes, ICF International. Received on November 6, 2015. *Seawall Lot 337 and Pier 48 Mixed-Use Project EIR* Available: http://sfmea.sfplanning.org/MissionRockEIRVol1.pdf Accessed on October 16, 2017.

[105] McDonnell, Dion. Sergeant, San Francisco Police Department. Meeting with ESA on November 21, 2017.

[106] San Francisco Fire Department, Division Police Operations-Dispatch Goals. Email to Jessica O'Dell, ESA from Officer Anh Nguyen. Received on December 27, 2017.

[107] Nguyen, Anh. Officer, San Francisco Police Department. Email to Jessica O'Dell, ESA. Received December 27, 2017.

Chase Center security staff. Although special events may affect response times, the SFPD indicated that overall, the proposed project would aid in traffic and pedestrian management in the project vicinity.[108]

Despite small increases in demand for police protection services, these needs would be met through existing SFPD services in the Southern District. The operation of the proposed project is not anticipated to adversely impact the SFPD's service, response times, or service ratios levels. The SFPD would not need to build new or alter existing facilities in order to maintain service levels in the vicinity. Thus, the proposed project would have a less-than-significant impact upon the provision of police services in the area.

Schools

There are no San Francisco Unified School District (SFUSD) schools within the Mission Bay neighborhood. The closest public schools to the project site include:

- Bessie Carmichael (Grades PreK-TK-5), 375 7th Street 94103. Approximately 1.6 miles northwest of the project site
- Bessie Carmichael Middle School (Grades 6-8), 824 Harrison Street. Approximately 1.4 miles northwest of the project site.
- Daniel Webster Elementary School (Grades K-5), 465 Missouri Street. Approximately 0.9 miles southwest of the project site.
- Downtown High School (Grades 9-12), 693 Vermont Street. Approximately 1.2 miles west of the project site.
- International Studies Academy (Grades 9-12), 655 De Haro Street. Approximately 1.1 miles west of the project site.
- John O'Connell High School (Grades 9-12), 2355 Folsom Street. Approximately 2.1 miles west of the project site.[109]

In April 2017, the San Francisco Unified School Board voted to build an elementary school in the Mission Bay neighborhood. The proposed school will serve elementary and potentially middle-school-aged students and will be constructed on a lot that is bordered by Owens Street, Sixth Street, and Nelson Rising Lane, approximately 0.6 miles west of the Ferry Landing site. It is anticipated that the school will open within about five years.[110]

As described in Section 3, Population and Housing, the proposed project would not cause an increase in residents or employees within the City. As a result, the proposed project would not increase the number of students in the area that are served by SFUSD. SFUSD would have no need to alter or expand physical facilities. Therefore, the proposed project would have no impact on SFUSD services.

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108 Corry, Bernard and McDonnell, Dion. Sergeants, San Francisco Police Department. Meeting with ESA on November 21, 2017.

109 San Francisco Unified School District (SFUSD), 2014, *San Francisco Unified School District 2016-2017.* Available: http://www.sfusd.edu/en/assets/sfusd-staff/enroll/files/2016-17/2016-17_schools_map.pdf Accessed on October 16, 2017.

110 Zimmer, Jessica, 2017. *New Mission Bay public school to be launched within five years.* San Francisco Unified School District. Available: http://www.sfusd.edu/en/news/media-coverage/2017-media-coverage-archive/07/new-mission-bay-public-school-to-be-launched-within-five-years.html Accessed on: October 17, 2017.

Parks

San Francisco has over 220 public parks, playgrounds, and open spaces.[111] Between San Francisco Recreation and Park District land, state-owned, and federal-owned land, there are approximately 5,330 acres of publicly owned space in San Francisco for residents to enjoy.[112] There are a number of parks and recreation spaces within the project vicinity, including Mission Bay Commons Park (approximately one-third mile northwest of the project site), the Mission Bay park system (approximately 1.2 miles from the project site), and Mariposa Park (approximately 0.6 miles from the project site). The proposed project would be adjacent to Agua Vista Park and will share bicycle parking and amenities with the park. The project site would also be near the proposed Bayfront Park and the Bay Trail.

The proposed project site is adjacent to and near many parks and recreation spaces. The proposed project also would share a bicycle parking area with Agua Vista Park. An increase in demand for public spaces and parks would typically occur due to an increase in population in a given area. As the project would not result in a permanent increase in population, the proposed project would not create a demand for parks and open spaces outside of what is projected in relation to City growth. As noted in Section 10, Recreation, while the project would not lead to a permanent increase in use of these nearby parks, it is possible that while waiting for the ferry to arrive, passengers would utilize Agua Vista Park and Bayfront Park. While this may lead to intermittent increases in park usage, the proposed project would not require the construction of new park facilities in order to accommodate an increase in use of parks and open spaces. The Ferry Landing and Water Taxi Landing would be open to the public during the day, which would provide additional public access and open space. The project would also include improvements to a portion of Bayfront Park and Agua Vista Park and add additional amenities to these existing park facilities. Therefore, the project would have a less-than-significant impact on park use in the City.

Other Services

An impact to general public services such as an increase in demand for hospitals or libraries generally would occur due to a permanent increase in population in a given area. The construction and operation of the proposed project would not lead to a permanent increase in population. Thus, the project would have a less-than-significant-impact on demand for other public services.

Impact C-PS-1: The proposed project, combined with past, present, and reasonably foreseeable future projects in the vicinity, would not result in significant physical impacts on the environment associated with the construction or alteration of public service facilities. (Less than Significant)

The geographic scope of cumulative projects relevant to this project are projects within the Mission Bay neighborhood that are served by the police department, fire stations, parks, and schools in the vicinity. Due to the rapid pace of development in the Mission Bay neighborhood, cumulative projects within the vicinity of the project have the potential to have a significant impact on the provision of public services in the Mission Bay neighborhood. With the addition of large housing and multi-use projects such as the

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111 San Francisco Parks and Recreation (SFPR) 2017. “Parks and Open Spaces”. Available: http://sfrecpark.org/parks-open-spaces/ Accessed October 12, 2017.

112 City and County of San Francisco. 2014 *San Francisco General Plan: Recreation and Open Space Element.* Available: http://generalplan.sfplanning.org/Recreation_OpenSpace_Element_ADOPTED.pdf. Accessed October 16, 2017.

projects listed in Table 5, it is possible that the resulting increase in population from cumulative projects could lead to a need for expanded public service facilities.

However, the proposed project would not lead to an increase in population in the vicinity and, as a result, would not have a significant impact on public services. The operation of ferry service would cause an intermittent increase in activity in the project vicinity that could lead to a minor increase in demand for police and fire protection services. However, this slight increase in demand for police and fire protection could be met by existing services. Additionally, the impact of the proposed project on fire and schools, parks, and other services would be less than significant. Therefore, construction of the Ferry and Water Taxi Landings would not contribute to cumulative impacts on public services. Thus, the proposed project, in combination with past, present, and reasonably foreseeable future projects, would not result in a considerable cumulative impact on public services.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
13. BIOLOGICAL RESOURCES — Would the project:					
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special- status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☒	☐	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☒	☐	☐	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☒	☐	☐	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☒	☐	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒	☐
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☐	☒

This section describes the existing terrestrial and aquatic biological resources within the vicinity of the proposed project in Mission Bay. Information used in preparation of this section is from a biological reconnaissance survey conducted by Environmental Science Associates (ESA) biologists on August 22, 2017, database queries from the California Natural Diversity Database (CNDDB) and U.S. Fish and Wildlife Service (USFWS), and published scientific literature. In addition, ESA reviewed and incorporated applicable information from the following resources:

- Mission Bay Ferry Landing and Water Taxi Landing Endangered Species and Essential Fish Habitat Biological Assessment, submitted to the regulatory agencies November 3, 2017[113]
- Downtown San Francisco Ferry Terminal Expansion Project Biological Opinion[114]
- Port of San Francisco Regional General Permit for Shoreline Maintenance Repair, Rehabilitation, and Replacement Activities Biological Opinion[115]
- Crane Cove Park Phase 1 Biological Assessment[116]
- The 34th America's Cup and James R. Herman Cruise Terminal and Northeast Wharf Plaza Biological Assessment[117]

Habitat quality and species distribution were considered in evaluating the likelihood of special-status species occurrence in the project area. The project site does not fall within any local, regional, or state habitat conservation plan; therefore, Initial Study topic 13f is not applicable to the proposed project.

Marine Habitats

Open Water (Pelagic) Habitat

Because of its proximity to the Pacific Ocean, the open water (pelagic zone) environment of Mission Bay, and the larger Central Basin of San Francisco Bay, is similar to the open water coastal environment. Pelagic habitat is the predominant marine habitat in aquatic portions of the project area and includes the area between the water surface and the Bay floor. The water column can be further subdivided into shallow-water/shoal and deepwater/channel areas.[118] The pelagic water column habitat is predominantly inhabited by planktonic organisms that either float or swim in the water, fish, marine birds, and marine mammals.

The open water habitat within the Central Basin of San Francisco Bay is listed by the RWQCB as an impaired water body for chlordane, dichloro-diphenyl-trichloroethane (DDT), dieldrin, dioxin compounds,

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113 Environmental Science Associates. 2017. Mission Bay Ferry Landing and Water Taxi Landing Endangered Species and Essential Fish Habitat Biological Assessment. November 2017.

114 National Marine Fisheries Service. 2014. Biological Opinion – Downtown San Francisco Ferry Terminal Expansion Project, San Francisco, Ca. Issued June 30, 2014.

115 Environmental Science Associates. 2015. Biological Assessment – Port of San Francisco Regional General Permit for Shoreline Maintenance Repair, Rehabilitation, and Replacement Activities. April 2015.

116 Environmental Science Associates. 2015. Crane Cove Park Phase 1 Biological Assessment – Port of San Francisco Pier 70 Master Plan Area. November 2015.

117 ESA. 2011. The 34th America's Cup and James R. Hermon Cruise Terminal and Northeast Wharf Plaza Biological Assessment. Prepared for U.S. Coast Guard, USACE, and the National Park Service. December 2011.

118 National Oceanic and Atmospheric Administration (NOAA). 2007. Report on the Subtidal Habitats and Associated Biological Taxa in San Francisco Bay. August.

furan compounds, polychlorinated biphenyls (PCBs), mercury, selenium, and invasive species.[119] Beneficial uses of the Central Basin include estuarine habitat, commercial and sport fishing, wildlife habitat, water contact recreation, water non-contact recreation, and navigation.

Intertidal Habitats

Intertidal habitats, or the regions of the Bay that lie between low and high tides, in the project area include natural and artificial rock (concrete and quarried rip-rap), concrete bulkheads, and steel pier pilings. These intertidal habitats provide highly diverse and varied locations for marine flora and fauna. The Central Bay's proximity to the Golden Gate and Pacific Ocean has resulted in an intertidal zone inhabited by many coastal as well as estuarine species.

The angular and piled rip-rap rocks that have been placed to protect numerous shoreline locations in the Central Bay, including the shoreline of the project area, provide numerous havens in which assorted marine species are able to survive and flourish.

Subtidal Habitats

Central San Francisco Bay contains both soft sediment and hard substrate subtidal (below the low tide) habitat. Soft bottom substrate ranges between soft mud with high silt and clay content and areas of coarser sand. The latter tend to occur in locations subjected to high tidal or current flow. Soft mud locations are typically located in areas of reduced energy that enable deposition of sediments that have been suspended in the water column, such as in protected slips, under wharfs, and behind breakwaters and groins.

These hard substrate areas provide habitat for an assemblage of marine algae, invertebrates and fishes, similar to the hard substrate in the intertidal zone of the Central Bay. Submerged hard bottom substrate is typically covered with a mixture of turf organisms that is dominated by hydroids, bryozoans, tunicates, encrusting sponges, encrusting diatoms, and anemones. In the intertidal and near subtidal zones, barnacles (*Balanus glandula*, *Amphibalanus amphitrite* and *A. improvisus*) are commonly present along with the Bay mussel (*Mytilus trossulus/galloprovincialis*), the invasive Asian mussel (*Musculista senhousia*), and the native or Olympia oyster (*Ostrea lurida*). Barnacles can also be found subtidally on pier pilings, exposed rock outcroppings and debris (NOAA, 2007).

In addition, three species of caprellids (i.e., detritivores, carnivores, and deposit feeders) are commonly observed only in the Central Bay.[120] Pacific rock crab (*Cancer antennarius*) and the red rock crab (*C. productus*) inhabit rocky, intertidal and subtidal areas in the Pacific Ocean, and likely use San Francisco Bay as an extension of their coastal habitats.[121] Adult (age 1-year +) Pacific rock crabs are most

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119 State Water Resources Control Board, 2010 Integrated Report (Clean Water Act Section 303(d) List / 305(b) Report) — Statewide. Available: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml. Accessed November 27, 2017.

120 National Oceanic and Atmospheric Administration (NOAA). 2007. Report on the Subtidal Habitats and Associated Biological Taxa in San Francisco Bay. August.

121 Hieb, K. 1999. Cancer Crabs. In: James J. Orsi. 1999. Report on the 1980-1995 Fish, Shrimp, and Crab Sampling in the San Francisco Estuary, California.

commonly found in Central Bay in both the fall and spring months. Juveniles are most common in Central Bay from January to May and in South Bay from July to December.[122] Pacific rock crabs move seasonally from channels (January to April) to shoals (June to December).[123] The Pacific and red rock crabs are frequent targets of sport anglers from piers and jetties.

The predominant Bay floor habitat on the southern San Francisco waterfront, which includes the project area, is unconsolidated soft sediment composed of combinations of mud/silt/clay (particles 0.001 to 0.062 mm in diameter), however, in lesser quantities, portions of the substrate also include sand (particles 0.062 to 2.0 mm in diameter), and pebble/cobble (particles 2 to 256 mm in diameter), with varying amounts of intermixed shell fragments. Exposure to wave and current action, temperature, salinity, and light penetration determine the composition and distribution of organisms within these soft sediments.[124] Based on many geologic and marine biological studies conducted within the Bay-Delta, unconsolidated sediments are present throughout the Bay-Delta and are the predominant substrate type.

The muddy-sand benthic community of Central Bay consists of a diverse polychaete worm community represented by several subsurface deposit feeding capitellid species, a tube dwelling filter feeding species (*Euchone limnicola*), a carnivorous species (*Exogone lourei*), and the maldanid polychaete *Sabaco elongatus*. There are also several surface deposit feeding *Ameana* spp. persisting throughout the year.[125]

The harbor and main channel areas of Central Bay are characterized as a mix of the benthic communities from surrounding areas (deep and shallow-water and slough marine communities) and include the obligate amphipod filter-feeder *Ampelisca abdita* and the tube dwelling polychaete *Euchone limnicola*. As a result of increased water flow and sedimentation in the harbor areas of Central Bay, the majority of the species reported that inhabit seafloor sediments in this region of the Bay-Delta are deposit and filter feeders, including the amphipods *Grandidierella japonica*, *Monocorophium acherusicum*, and *Monocorophium alienense*, and the polychaetes *Streblospio benedicti* and *Pseudopolydora diopatra*. There is also a relatively high number of subsurface deposit feeding polychaetes and oligochaetes in these areas including *Tubificidae* spp., *Mediomastus* spp., *Heteromastus filiformis*, and *Sabaco elongatus*. There is also sufficient community complexity and abundance to support relatively high abundances of three carnivorous polychaete species: *Exogone lourei*, *Harmothoe imbricata*, and *Glycinde armigera*.

The most common large mobile benthic invertebrate organisms in the Central Bay include blackspotted shrimp (*Crangon nigromaculata*), the bay shrimp (*Crangon franciscorum*), Dungeness crab (*Metacarcinus magister*), and the slender rock crab (*Cancer gracilis*). Although other species of shrimp are present in the Central Bay, their numbers are substantially lower when compared to the number of bay and blackspotted shrimps present.[126] All of these mobile invertebrates are present throughout the Central Bay and provide an important food source for carnivorous fishes, marine mammals, and birds in

122 Hieb, K. 1999. Cancer Crabs. In: James J. Orsi. 1999. Report on the 1980-1995 Fish, Shrimp, and Crab Sampling in the San Francisco Estuary, California.
123 Ibid.
124 National Oceanic and Atmospheric Administration (NOAA). 2007. Report on the Subtidal Habitats and Associated Biological Taxa in San Francisco Bay. August.
125 Ibid.
126 Ibid.

San Francisco Bay's food web. Dungeness crabs use most of the Bay as an area for juvenile growth and development prior to returning to the ocean as sexually mature adults.[127] Because of the strong ocean influence in Central Bay, additional species of red and brown algae are found attached to submerged and intertidal hard substrate, including pier pilings. The dominant algal species that occur in the project area are sea lettuce (*Ulva lactuca*), rockweed (*Fucus gardneri*), and Turkish towel (*Chondracanthus exaspertatus*). Other common species from the San Francisco waterfront include *Cladophora sericea, Codium fragile, Laminaria sinclairii, Egregia spp., Halymenia schizymenioides menziesii, Sargassum muticum, Polyneura latissima, Cryptopleura violacea, and Gelidium coulteri*.[128] In addition, the species *Codium fragile* subspecies *tomentosoides, Bryopsis hypnoides*, *Ahnfeltiopsis leptophyllus* can be found inhabiting either hard or soft substrate.[129] All submerged aquatic vegetation in the Central Bay is considered critical essential fish spawning habitat for Pacific herring.[130]

Developed/Ruderal

The small terrestrial portion of the project area includes roads, a portion of the Bay Trail, proposed staging areas, as well as adjacent landscaped or heavily disturbed areas. The heavily-degraded nature of the terrestrial habitat within the project area is a result of its proximity to historical ship building operations and other waterfront industry, which has resulted in an environment of little or no value to plant and wildlife species. Developed areas support little vegetation other than ornamental landscaping, which is comprised mainly of non-native plantings. Ruderal habitat occurs in portions of the project area that are subject to repeated or otherwise profound disturbance. Such areas support weedy or opportunistic plant species that can easily colonize disturbed areas. The few trees that do exist within the project area are the result of urban landscaping efforts and would not be harmed by the proposed project. The developed and ruderal portions of the project area do not support any special-status plant or wildlife species.

Potentially Jurisdictional Waters and Wetlands

No wetlands or other submerged aquatic vegetation occur in or near the project area. The shallow bay habitat within the project area is considered Waters of the U.S. and Waters of the State, subject to U.S. Army Corps of Engineers (USACE) and State Water Resources Control Board jurisdiction pursuant to the Clean Water Action (sections 404 and 401), Rivers and Harbor Act, and Porter-Cologne Act. The area also falls within the Bay Conservation and Development Commission (BCDC) bay and shoreline band jurisdiction.

Wildlife Movement Corridors

Wildlife movement corridors link together areas of suitable wildlife habitat that are otherwise separated by rugged terrain, changes in vegetation, or by areas of human disturbance or urban development. Topography and other natural factors, in combination with urbanization, have fragmented or separated

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[127] Tasto, R. N. 1979. "San Francisco Bay: Critical to the Dungeness Crab?" In: T. J. Conomos, editor, San Francisco Bay: The Urbanized Estuary. Pacific Div Am Ass Adv Sci, San Francisco, California: 479 490.

[128] National Oceanic and Atmospheric Administration (NOAA). 2007. Report on the Subtidal Habitats and Associated Biological Taxa in San Francisco Bay. August

[129] Ibid.

[130] The Magnuson-Stevens Act defines "essential fish habitat" as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.

large open-space areas. The fragmentation of natural habitat creates isolated "islands" of vegetation that may not provide sufficient area to accommodate sustainable populations and can adversely affect genetic and species diversity. Movement corridors mitigate the effects of fragmentation by allowing animals to move between remaining habitats, which in turn allows depleted populations to be replenished and promotes genetic exchange between populations.

Central San Francisco Bay serves as a migration corridor for anadromous fish between the Pacific Ocean and spawning habitat, primarily within the Sacramento and San Joaquin River watersheds, but also in a handful of tributaries to San Francisco Bay. However, the location of the project area along the San Francisco waterfront is not within the migration routes normally taken by anadromous fish species. Additionally, all in-water work would occur outside the window when these migrations occur. As such, the proposed project would not impact any wildlife corridors.

Special-Status Wildlife

Chinook salmon

The Chinook salmon (*Oncorhynchus tshawytscha*) that inhabit San Francisco Bay are comprised of three distinct races: winter-run, spring-run, and fall/late fall-run.[131] These races are distinguished by the seasonal differences in adult upstream migration, spawning, and juvenile downstream migration. Chinook salmon are anadromous fish, spending three to five years at sea before returning to fresh water to spawn. These fish pass through San Francisco Bay waters to reach their upstream spawning grounds. In addition, juvenile salmon migrate through the Bay en route to the Pacific Ocean.

Sacramento River winter-run Chinook salmon, listed as endangered under the federal and state endangered species acts, migrate through San Francisco Bay from December through July with a peak in March.[132] Spawning is confined to the mainstem Sacramento River and occurs from mid-April through August.[133] Juveniles emerge between July and October and are resident in their natal stream for 5 to 10 months, followed by an indeterminate residency period in estuarine habitats.[134]

Central Valley spring-run Chinook, listed as threatened under the federal and state endangered species acts, migrate to the Sacramento River from March to September with a peak spawning period between late August and October.[135] Juvenile salmon emerge between November and March and are resident in streams for a period of 3 to 15 months before migrating to downstream habitats.[136]

The Central Valley fall/late fall-run Chinook salmon is a California species of special concern. These salmon enter the Sacramento and San Joaquin rivers from June through December and spawn from October through December, with a peak in November.

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[131] These races are referred to as Evolutionarily Significant Units (ESUs)
[132] Moyle, P.B. 2002. Inland Fishes of California, University of California Press, Berkeley and Los Angeles, CA.
[133] Ibid.
[134] Ibid.
[135] Ibid.
[136] Ibid.

While all three chinook salmon races are found in San Francisco Bay, the Central Valley fall/late fall-run are the only race that spawns in San Francisco Bay tributary streams. However, most stream habitat in San Francisco Bay lacks the necessary flow regime, habitat availability, and/or water quality to support spawning salmonids. Additionally, individuals are rarely documented within the project area or the immediate vicinity; and any occurrence would only be temporary as the surrounding bay habitat is primarily utilized as a migration corridor between the Pacific Ocean and spawning habitat in the Central Valley.[137]

Steelhead

Similar to Chinook salmon, steelhead (*Oncorhynchus mykiss*) within California are subdivided into Distinct Population Segments (DPS) based on their life history. Within Central San Francisco Bay, both the federally threatened Central California Coast (CCC) and federally threatened California Central Valley (CCV) steelhead may utilize the channel habitat adjacent to the project area as a migratory corridor from the Pacific Ocean to spawning habitat.

Steelhead are anadromous (sea-run) forms of rainbow trout and are nearly indistinguishable from resident rainbow trout that also reside in the same streams in which they spawn, with the exception of being larger when hatched.[138] Winter-run steelhead are at or near sexual maturity when they enter freshwater during late fall and winter, and spawn from late December through April, with the peak between January and March. Juvenile steelhead typically rear in freshwater for a longer time period than other salmonids, typically ranging from one to three years. The actual time; however, is highly variable with the individual. Throughout their range, steelhead typically remain at sea for one to four growing seasons before returning to freshwater to spawn.[139]

Steelhead typically enter the Bay in early winter, using the main channels in the Bay-Delta to migrate to upstream spawning habitat, as opposed to small tributaries. However, migrating steelhead may be seen in the San Francisco Bay and Suisun Marsh and Bay as early as August.[140]

Little is known about transit times and migratory pathways of steelhead within San Francisco Bay. A 2008-2009 study on the migration and distribution of juvenile hatchery-raised steelhead released in the lower Sacramento River shows that steelhead spend an average of 2.5 days in transit time within San Pablo and San Francisco Bays. The study concluded that transit time was greater in the upper estuary than in the lower estuary (San Francisco Bay).[141] This could be due to the lower salinity in the upper

[137] Interagency Ecological Program for the San Francisco Bay Estuary (IEP); San Francisco Bay Study. 2010-2014. 2014. Unpublished Raw Mid-water and Otter Trawl Data.

[138] Moyle, P.B. 2002. Inland Fishes of California, University of California Press, Berkeley and Los Angeles, CA.

[139] Burgner, R.L., J.Y. Light, L. Margolis, T. Okazaki, A. Tautz, and S. Ito. 1992. Distribution and origins of steelhead trout (Oncorhynchus mykiss) in offshore waters of the north Pacific Ocean. International North Pacific Fisheries Commission. Bull. No. 51.

[140] Leidy, R.A. 2000. Steelhead. Pp. 101-104 In P.R. Olofson (ed.). Goals Project. Baylands Ecosystem Species and Community Profiles: Life histories and environmental requirements of key plants, fish and wildlife. Prepared by the San Francisco Bay Area Wetlands Ecosystem Goals Project. San Francisco Bay Regional Water Quality Control Board, Oakland, California.

[141] Klimley, P., D. Tu, W. Brostoff, P. LaCivita, A. Bremner, and T. Keegan. 2009. Juvenile Salmonid Outmigration and Distribution in the San Francisco Estuary: 2006-2008 Interim Draft Report. Prepared for U.S. Army Corps of Engineers.

estuary that serves as a transition zone between fresh and salt water, allowing steelhead to transition from freshwater to saltwater. Once steelhead reach San Francisco Bay, salinities are similar to ocean water, which may lead steelhead to spend less time in this portion of the estuary. Although information on migratory pathways of juvenile steelhead was largely inconclusive in the study, a positive correlation between smolt captures and water depth was observed between 3 and 37 feet, which suggests that the deeper the water, the more fish were present (up to 37 feet deep).[142] Studies conducted by NMFS and CDFW indicate that the primary migration corridor for steelhead is through the northern reaches of Central San Francisco Bay (Raccoon Straight and north of Yerba Buena Island).[143,144] Additionally, a recent study that evaluated 30-years of Interagency Ecological Program (IEP) monthly mid-water fish trawl data and three-years of acoustic tag data of hatchery-raised salmonids suggests that the presence of out-migrating juvenile salmonids (steelhead and salmon) along the Port of San Francisco waterfront appeared to be more the result of capture by tidal flow rather than active foraging or intentional swimming to those areas of the Bay.[145]

CCV steelhead historically occurred throughout the Sacramento and San Joaquin river systems: from the upper Sacramento/Pit River systems south to the Kings and possibly Kern River systems in wet years.[146] Currently, the Central Valley steelhead DPS includes steelhead in all river reaches accessible to the Sacramento and San Joaquin Rivers and their tributaries in California. CCV steelhead rarely occur south of the San Francisco Bay Bridge, and as such, are not expected to occur within the project area.

While CCC steelhead are known to occur within multiple Central San Francisco Bay streams, none are in proximity to the project area. The nearest watershed that supports CCC steelhead is the San Mateo Creek watershed which empties into San Francisco Bay approximately 10 miles south of the project area.[147] As such, any occurrence of CCC steelhead within the project area would be temporary, and only occur as steelhead move through the project-adjacent open water habitat during migration between the Pacific Ocean and freshwater spawning grounds.

142 Klimley, P., D. Tu, W. Brostoff, P. LaCivita, A. Bremner, and T. Keegan. 2009. Juvenile Salmonid Outmigration and Distribution in the San Francisco Estuary: 2006-2008 Interim Draft Report. Prepared for U.S. Army Corps of Engineers.

143 Baxter, R., Hieb, K., DeLeon, S., Fleming, K., and J. Orsi. 1999. Report on the 1980-1995 fish, shrimp, and crab sampling in the San Francisco estuary, California. Prepared for The Interagency Ecological Program for the Sacramento-San Joaquin Estuary. California Department of Fish and Game, Stockton, California.

144 National Marine Fisheries Service (NMFS). 2001. Biological Opinion for the San Francisco-Oakland Bay Bridge East Span Seismic Safety Project.

145 Jahn, A. 2011. Young Salmonid Out-migration Through San Francisco By with Special Focus on their Presence at the San Francisco Waterfront. Draft Report. Prepared for the Port of San Francisco. January 2011.

146 Yoshiyama, R. M., E. R. Gerstung, F. W. Fisher, and P. B. Moyle. 1996. Historical and present distribution of chinook salmon in the Central Valley drainage of California. Dep. Wildl., Fish, and Conservation Biology, 54 p. (Available from Department of Wildlife, Fish, and Conservation Biology, University of California, Davis, CA 95616.)

147 Leidy, R.A., G.S. Becker, B.N. Harvey. 2005. Historical distribution and current status of steelhead/rainbow trout (Oncorhynchus mykiss) in streams of the San Francisco Estuary, California. Center for Ecosystem Management and Restoration, Oakland, CA.

Green sturgeon

The federally threatened, southern DPS of North American green sturgeon (*Acipenser medirostris*) are the most widely distributed member of the sturgeon family and the most marine-oriented of the sturgeon species, entering rivers only to spawn. Juveniles rear in fresh water for as long as 2 years before migrating to sea. Green sturgeon are thought to spawn every 3 to 5 years in deep pools with turbulent water velocities and prefer cobble substrates but can use substrates ranging from clean sand to bedrock. Females produce 60,000 to 140,000 eggs that are broadcast to settle into the spaces between cobbles. Adult green sturgeon migrate into freshwater beginning in late February with spawning occurring in the Sacramento River in late spring and early summer (March through July), with peak activity in April and June. After spawning, juveniles remain in fresh and estuarine waters for one to four years and then begin to migrate out to the sea.[148] The upper Sacramento River has been identified as the only known spawning habitat for green sturgeon in the southern distinct population segment.[149] According to recent studies, green sturgeon adults begin moving upstream through the Bay during the winter (Kelly et al. 2003). Adults in the San Joaquin Delta are reported to feed on benthic invertebrates including shrimp, amphipods, and occasionally small fish, while juveniles have been reported to feed on opossum shrimp and amphipods.[150]

Within bays and estuaries, sufficient water flow is required to allow adults to successfully orient to the incoming flow and migrate upstream to spawning grounds. Subadult and adult green sturgeon occupy a diversity of depths within bays and estuaries for feeding and migration. Tagged adults and subadults within the San Francisco Bay-Delta have been observed occupying waters over shallow depths of less than 33 feet, either swimming near the surface or foraging along the bottom. Green sturgeon migrating between the Pacific Ocean and spawning habitat in the Sacramento River watershed rarely travel south of the San Francisco Bay Bridge. Typically, adults take a more direct route from San Pablo Bay, passing through Raccoon Strait adjacent to Angel Island, and out the Golden Gate Bridge.[151] So while sturgeon do have the potential to temporarily occur year-round within the project area, their preferred migration routes suggest a low-likelihood for presence. As such, green sturgeon have the potential to be present throughout all marine portions of the project area at any time of the year.

Longfin smelt

The longfin smelt (*Spirinchus thaleichthys*) is a small, slender-bodied pelagic fish listed as threatened under the California Endangered Species Act and are a candidate for listing under the Federal Endangered Species Act. They typically measure approximately 3 inches in length as adults and generally live for two years, although some three-year smelt have been observed.

[148] Moyle, P. B., R. M. Yoshiyama, J. E. Williams, and E. D. Wikramanayake. 1995. Fish Species of Special Concern in California. Second edition. Final report to California Department of Fish and Game, contract 2128IF.

[149] Moyle, P.B. 2002. Inland Fishes of California, University of California Press, Berkeley and Los Angeles, CA.

[150] Moyle, P. B., R. M. Yoshiyama, J. E. Williams, and E. D. Wikramanayake. 1995. Fish Species of Special Concern in California. Second edition. Final report to California Department of Fish and Game, contract 2128IF.

[151] Kelly, J.T, A.P Klimley, and C.E. Crocker. Movements of green sturgeon, *Acipenser medirostris*, in the San Francisco Bay Estuary. 2007. Environmental Biology of Fishes (2007) 79:281-295.

Pre-spawning longfin smelt migrate upstream into the lower reaches of rivers during the late fall and winter. Smelt have adhesive eggs which are deposited on sand, gravel, rocks, submerged aquatic vegetation, and other hard substrates during spawning. Spawning typically occurs during the late winter and early spring (mid- to late February) but varies among years in response to factors such as seasonal water temperatures. During spawning, each female produces approximately 5,000 to 24,000 eggs. It is estimated that total reproduction within a year is in the hundreds of millions of eggs or more.[152] As with most fish, mortality rates for eggs and larvae in longfin smelt are high. Those that survive to the planktonic larval stage are transported into the western Delta and Suisun Bay during the late winter and spring where juveniles rear.

Longfin smelt have a two-year lifecycle and reside as juveniles and pre-spawning adults in the more saline habitats within San Pablo Bay and Central Bay during a majority of their life.[153] Movement patterns based on catches in CDFW fishery sampling suggest that longfin smelt actively avoid water temperatures greater than 22° C (72° F).[154] These conditions occur within the Delta during the summer and early fall, when longfin smelt inhabit more marine waters further downstream in the bays and are not present within the Delta.

Longfin smelt are most likely to occur within Central San Francisco Bay during the late summer months before migrating upstream in fall and winter. During winter months, when fish are moving upstream to spawn, high outflows may push many back into San Francisco Bay.[155]

Pacific herring

Pacific herring (*Clupea pallasii*) are a CDFW managed species and are protected within San Francisco Bay under the Marine Life Management Act (MLMA) which provides guidance, in the form of Fisheries Management Plans (FMP), for the sustainable management of California's historic fisheries. CDFW, in partnership with the fishing industry and conservation groups, is currently updating the Pacific herring FMP, which will formalize a strategy for the future management of the fishery.

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 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 San Francisco Bay during the summer and move into deeper waters in the fall. The waterfront adjacent to the project area has been identified as a herring spawning location; however, no suitable spawning habitat is present within the footprint of the proposed project. CDFW reported herring spawning within the vicinity of the

152 Moyle, P.B. 2002. Inland Fishes of California, University of California Press, Berkeley and Los Angeles, CA.
153 Ibid.
154 Baxter, R., Hieb, K., DeLeon, S., Fleming, K., and J. Orsi. 1999. Report on the 1980-1995 fish, shrimp, and crab sampling in the San Francisco estuary, California. Prepared for The Interagency Ecological Program for the Sacramento-San Joaquin Estuary. California Department of Fish and Game, Stockton, California.
155 Moyle, P.B. 2002. Inland Fishes of California, University of California Press, Berkeley and Los Angeles, CA.

project area, between Pier 64 and Pier 70, during the 2012-2013, 2014-2015, and 2015-2016 spawning seasons.[156,157,158,159] No in-water work is scheduled to occur during herring spawning season.

California least tern

The state and federally endangered California least tern (*Sternula antillarum browni*) is the smallest tern in North America and it forages over open water or protected bays, skimming low over the water or diving for small fish. The California least tern breeds on sandy beaches along the coast of California south to Mexico, and winters in Mexico, Central America, and south to South America. The majority of nesting colonies and overall breeding populations are found in southern California, with smaller populations in the San Francisco Bay Area and in Baja California. Tern nests in colonies are on relatively open, sandy beaches kept free of vegetation by the natural scouring of tidal action. Colonies are established in areas relatively free of human or predatory disturbance, near water foraging areas. Least terns will readily abandon nesting areas if disturbed. Arrival at breeding sites occurs in late-April for southern California and mid-May in the San Francisco Bay-Delta. The nearest nesting colony to the project area is at Alameda Point at the western end of Alameda.

Within San Francisco Bay, breeding colonies are typically located in abandoned salt ponds and along undisturbed portions of estuarine shoreline. No suitable nesting habitat exists within or near the project area.

Ridgway's rail

Ridgway's rails[160] (*Rallus longirostris obsoletus*), state and federally listed as endangered, are secretive birds and are difficult to observe in dense marsh vegetation; they prefer to run and hide rather than fly from threats. This state and federally endangered, non-migratory bird maintains home ranges in tidal and brackish marshes of about 11 acres and has high site fidelity. Ridgway's rail is an omnivore, feeding on a variety of marsh crabs, mussels, clams, and amphipods.[161] The breeding season for Ridgway's rail begins by February, with nesting starting in mid-March and extending into August. The end of the breeding season is typically defined as the end of August, which corresponds with the time eggs laid during renesting attempts have hatched and young are mobile.

Ridgway's rails occur within a range a tidal and brackish marshes. The quality of marsh strongly influences the density of the population it can support. Physical characteristics critical to Ridgway's rails include marsh size, location relative to other marshes, existence of functional high tide refuge, presence of

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156 CDFW. 2013. Summary of the 2012-2013 Pacific Herring Spawning Population and Commercial Fisheries in San Francisco Bay. November 2013.

157 CDFW. 2013. Summary of the 2013-2014 Pacific Herring Spawning Population and Commercial Fisheries in San Francisco Bay. November 2014.

158 CDFW. 2013. Summary of the 2014-2015 Pacific Herring Spawning Population and Commercial Fisheries in San Francisco Bay. November 2015.

159 CDFW. 2013. Summary of the 2015-2016 Pacific Herring Spawning Population and Commercial Fisheries in San Francisco Bay. November 2016.

160 Formerly California clapper rail.

161 USFWS. 2013. Recovery Plan for the Tidal Marsh Ecosystems of Northern and Central California. Region 8, Sacramento, California. Aug, 2013.

buffers or transitional zones between marshes and upland areas, marsh evolution, and hydrology. Currently, there are fewer than 15 such patches in the San Francisco Bay-Delta, none of which occur within the project area or vicinity.[162]

Other breeding and migratory birds

Several mature street trees and shrubs occur locally to the project site and provide nesting and foraging habitat for resident and migratory birds. Raptors are not expected to nest near the project site, but pine trees located south of the site could support nesting by a few common bird species such as Anna's hummingbird (*Calypte anna*) and northern mockingbird (*Mimus polyglottos*), among others. In addition, a dilapidated pier greater than 250 feet northeast of the project site has historically supported Caspian tern (*Hydroprogne caspia*) nesting, and could also support nesting by western gull (*Larus occidentalis*). This pier is a remnant portion of the dilapidated Pier 64-66 structures, removed as part of preparations for the America's Cup. Portions of Pier 64 were formerly used as nesting habitat by birds, including Caspian terns, which are not a special-status species but did use the remnants of the former Pier 64 as a nesting site. Consequently, as part of the Pier 64 fill removal project, the USACE permit required the construction of a new replacement nesting platform near Pier 64 to compensate for this loss. This replacement platform, constructed in June 2016, consists of an approximately 1,500 square-foot wooden platform, supported by ten 12-inch wood piles, that serves as roosting and nesting habitat for Caspian terns. However, as noted above, the platform is over 340 feet away from the project area and is therefore not expected to suffer any impact under the proposed project.

The federal Migratory Bird Treaty Act (MBTA) and California Fish and Game Code protect raptors, most native migratory birds, and breeding birds that would occur at the proposed project site and/or nest in the surrounding vicinity.

Marine mammals

Few species of marine mammals are found within San Francisco Bay; only Pacific harbor seals (*Phoca vitulina richardsi*), California sea lions (*Zalophus californianus*), and harbor porpoises (*Phocoena phocoena*) are sighted year-round. Other marine mammal species that have occasionally been seen in San Francisco Bay include the gray whale (*Eschrichtius robustu*s), individual humpback whales (*Megaptera novaeangliae*), bottlenose dolphin (*Tursiops truncates*), and northern elephant seal (*Mirounga angustirostris*); and less frequently the Guadalupe fur seal (*Arctocephalus townsendi*) and northern fur seal (*Callorhinus ursinus*).[163] Most cetacean sightings tend to occur in the Central Bay (the area bound by the Golden Gate Bridge, the San Francisco – Oakland Bay Bridge, and Richmond Bridge). The most common marine mammals sighted year round in San Francisco Bay are Pacific harbor seals and California sea lions, which are the species most likely to occur in the project area. Harbor porpoises are also occasionally sighted and have the potential to be in proximity to the project site.

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[162] USFWS. 2013. Recovery Plan for the Tidal Marsh Ecosystems of Northern and Central California. Region 8, Sacramento, California. Aug, 2013.

[163] California Department of Transportation (CalTrans). 2015. San Francisco-Oakland Bay Bridge East Span Seismic Safety Project. Pier E3 Demonstration Project Biological Monitoring Programs. October 2015.

In general, the presence of marine mammals in San Francisco Bay is related to distribution and presence of prey species and foraging habitat. Additionally, harbor seals and sea lions, the most likely marine mammal species to occur within the project area, use various intertidal substrates that are exposed at low to medium tide levels for resting and breeding.[164] California sea lions are noted for using anthropogenic structures such as floating docks, piers, and buoys to haul out of the water to rest. Marine mammal haul-out locations do not occur in the project area, as such, the presence of marine mammals within the project area is likely to be confined to a few individuals and not the large numbers seen elsewhere within San Francisco Bay.

Impact BI-1: The proposed project would have a substantial adverse effect, either directly or through habitat modification, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife, U.S. Fish and Wildlife Service, or National Marine Fisheries Service, and would have a substantial adverse effect on any riparian habitat or sensitive natural community. (Less than Significant with Mitigation)

Special-status Plants

The project area is not suitable for special-status plants to inhabit or colonize because of poor substrate quality, historic industrial land uses, or inability to compete with non-native plants species. For these reasons, no impacts on special-status plants are expected as a result of the proposed project. In addition, no riparian habitat occurs within the project area.

Special-status Fishes and Marine Mammals During Construction

As discussed above, the occurrence of special-status aquatic species within the project area may occur but would be temporary in nature. Short-term impacts on special-status fishes and other aquatic biological resources could occur from pile driving, dredging, and other in-water construction activities. Impacts that are typically associated with these activities include temporary elevated sound pressure levels associated with pile-driving, short-term loss of benthic habitat and associated benthos, and short-term loss and disruption of potential fishery habitat. As such, in-water construction activities would be restricted to a National Oceanic and Atmospheric Administration (NOAA) approved environmental work window (June 1 – November 30) when special-status aquatic species are least likely to be present in the study area.[165] Implementation of the **Mitigation Measure M-BI-1a** and **M-BI-1b** would ensure that, if special-status aquatic species are present within the project area during in-water construction, the impact on these species would be minimized or avoided and would be less than significant.

The project would not require in-water work during the Pacific herring spawning or hatching season (December 1 – February 28); hence, no avoidance and minimization measures are required for this species.

[164] National Oceanic and Atmospheric Administration (NOAA). 2007. Report on the Subtidal Habitats and Associated Biological Taxa in San Francisco Bay. August.

[165] U.S. Army Corps of Engineers (USACE). 2001. Long-term management strategy for the placement of dredged material in the San Francisco Bay region. *Management Plan 2001*.

Mitigation Measure M-BI-1a: Pile Driving

The avoidance and minimization measures specific to pile driving activities, below, have been developed in accordance with the majority of the measures outlined in the 2013 NLAA Programmatic criteria, in order to reduce project effects on sensitive resources. Avoidance and minimization measures that would reduce project noise effects include the following:

- All pile driving shall be conducted within the established Bay area environmental work windows between June and November in order to avoid potential impacts to fish species for this area of San Francisco Bay. These windows were promulgated in a programmatic biological opinion (NMFS and CDFW) for the Long Term Management Strategy program for managing sediment within the San Francisco Bay.

- The Port shall develop a NMFS-approved sound monitoring plan prior to the start of pile driving. This plan shall provide detail on the methods used to monitor and verify sound levels during pile driving activities. The sound monitoring results shall be made available to NMFS.

- Vibratory pile drivers may be used for the installation of 36-inch diameter steel pilings. Vibratory pile driving shall be conducted following the USACE "Proposed Procedures for Permitting Projects that will Not Adversely Affect Selected Listed Species in California". USFWS and NMFS completed section 7 consultation on this document which establishes general procedures for minimizing impacts to natural resources associated with projects in or adjacent to jurisdictional waters.[166]

- A "soft start" technique to impact hammer pile driving shall be implemented, at the start of each work day or after a break in impact hammer driving of 30 minutes or more, to give fish and marine mammals an opportunity to vacate the area.

- During the use of an impact hammer, a bubble curtain or other sound attenuation method may be utilized to reduce sound levels. If NMFS sound level criteria are still exceeded with the use of attenuation methods, the contractor shall revise sound attenuation methods as per the approved sound monitoring plan. A NMFS-approved biological monitor shall be available to conduct surveys before and during impact pile driving as specified by NMFS. The monitor shall inspect the established work zone and adjacent Bay waters and document the following during impact pile-driving:

  - Maintain the safety zones established in the sound monitoring plan around sound source, for the protection of marine mammals in association with sound monitoring station distances.

  - Halt work activities when a marine mammal enters the Level A[167] safety zone and resume only after the animal has been gone from the area for a minimum of 15 minutes.

  - Maintain sound levels below 90 dBA in air when pinnipeds (seals and sea lions) are present.[168]

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166 National Oceanic and Atmospheric Administration (NOAA). 2007. Report on the Subtidal Habitats and Associated Biological Taxa in San Francisco Bay. August.

167 Defined as any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild.

168 National Oceanic and Atmospheric Administration (NOAA). 2007. Report on the Subtidal Habitats and Associated Biological Taxa in San Francisco Bay. August.

Mitigation Measure M-BI-1b: Dredging

The Port shall require the selected contractor to use clamshell dredging equipment and conduct dredging between June 1 and November 30 in accordance with Long Term Management Strategy dredging windows to minimize potential adverse effects on fish and invertebrate species.

The Port shall assess the environmental risk to aquatic resources in developing sediment capping design and mitigate potential impacts based upon regulatory and resource agency review and a RWQCB approved cap design. Dredging for capping shall be conducted between June 1 and November 30 in accordance with Long Term Management Strategy dredging windows to minimize potential adverse effects on fish and invertebrate species.

Special-status Fishes and Marine Mammals from Vessel Collisions

The NOAA West Coast Region recognizes that vessel collisions with marine mammals, especially large whales, can result in animal injury or death. Large whale species on the California coast, including blue, fin, humpback, and gray whales are considered the most vulnerable marine mammals to ship strikes because their offshore migration routes and feeding areas intersect with busy shipping lanes. Because these whales seldom enter San Francisco Bay, they would not be subject to increased vessel strike hazards from new ferry service. NOAA has developed and circulated guidance for mariners to reduce the risk associated with vessel strikes or disturbance of whales to discountable levels. As the regulatory body that oversees compliance with the Marine Mammal Protection Act of 1972, NOAA has not identified vessel collisions with marine mammals is an issue within San Francisco Bay, and they have not issued guidance to avoid key species: sea lions, harbor seals, or harbor porpoises. Marine mammal haul-out locations do not occur in the project area, or on proposed vessel routes; hence, interactions with these species are not expected from vessel traffic. The operation of vessels within San Francisco Bay is expected to have a less than significant impact on marine mammals as a result of vessel collisions.

Special-status and Migratory Birds

Work near active nests in trees and shrubs near the project site could disturb active bird nesting. If nesting birds are present, the increase in noise and visual disturbance associated with demolition activities and new construction could disrupt nesting efforts. The loss of an active nest would be considered a significant impact under CEQA. Moreover, disruption of nesting migratory or native birds is not permitted under the federal MBTA or the California Fish and Game Code, as it could constitute unauthorized take. The Caspian tern nesting platform located northeast of the project area is greater than 250 feet from proposed activities. Based on informal CDFW guidance, this distance is sufficient to avoid any noise or movement disturbances that could affect nesting success. Hence, no impacts are anticipated to this species or other birds that may nest on the offshore platform.

Compliance with existing state and federal regulations, as well as the overall lack of suitable habitat within the project area, would likely prevent impacts on nesting birds; however, implementation of **Mitigation Measure M-BI-1c, Nesting Bird Protection Measures** would ensure that the proposed project would not have a significant impact on nesting birds by providing pre-construction nesting surveys, and establishing no-work buffer zones around active nests identified on or near the project sites.

Mitigation Measure M-BI-1c: Nesting Bird Protection Measures

Nesting birds and their nests shall be protected during construction by use of the following measures:

1. A qualified wildlife biologist shall conduct pre-construction nesting surveys during the avian nesting breeding season (approximately February 15 to September 15) within 7 days prior to construction. Surveys shall be performed for the project site, vehicle and equipment staging areas, and suitable habitat within 250 feet to locate any active passerine (perching bird) nests and within 500 feet to locate any active raptor (bird of prey) nests.

2. If active nests are located during the pre-construction nesting bird surveys, the qualified wildlife biologist shall evaluate if the schedule of construction activities could affect the active nests and the following measures shall be implemented based on their determination:

    a. If construction is not likely to affect the active nest, construction may proceed without restriction.

    b. If it is determined that construction may affect the active nest, the qualified biologist shall establish a no-disturbance buffer around the nest(s) and all project work would halt within the buffer until a qualified biologist determines the nest is no longer in use. Typically, these buffer distances are up to 250 feet for passerines and 500 feet for raptors; however, the buffers may be adjusted downward for some species, or if an obstruction, such as a building, is within line-of-sight between the nest and construction activities.

    c. Modifying nest buffer distances, allowing certain construction activities within the buffer, and/or modifying construction methods in proximity to active nests shall be done at the discretion of the qualified biologist and in coordination with the Port, who would notify CDFW. Necessary actions to remove or relocate an active nest(s) shall be coordinated with the Port and approved by CDFW.

    d. Any work that must occur within established no-disturbance buffers around active nests shall be monitored by a qualified biologist. If adverse effects in response to project work within the buffer are observed and could compromise the nest, work within the no-disturbance buffer(s) shall halt until the nest occupants have fledged.

    e. Any birds that begin nesting within the project site and survey buffers amid construction activities shall be assumed to be habituated to construction-related or similar noise and disturbance levels and no work exclusion zones shall be established around active nests in these cases; however, should birds nesting nearby begin to show disturbance associated with construction activities, no-disturbance buffers shall be established as determined by the qualified wildlife biologist.

Rafting and Foraging Waterfowl

San Francisco Bay is an important wintering and stop-over site for migratory waterfowl on the Pacific Flyway. It is estimated that more than 300,000 wintering waterfowl use the region and associated ponds.[169] A few of the more common marine birds that regularly inhabit or utilize the marine habitat on the San Francisco waterfront and in and near the Project area include Caspian tern (*Hydroprogne caspia*), Forster's tern (*Sterna forsteri*) cormorants (*Phalacrocorax* spp.), western gull, (*Larus occidentalis*), herring gull

[169] National Oceanic and Atmospheric Administration. 2007. Report on the Subtidal Habitats and Associated Biological Taxa in San Francisco Bay. Prepared by NOAA National Marine Fisheries Service. Santa Rosa, CA. June 2007. 86 pages.

(*L. argentatus*), mew gull (*L. canus*) and California brown pelican (*Pelecanus occidentalis*). Among the diving benthivores guild, canvasback (*Aythya valisineria*), greater scaup (*A. marila*), lesser scaup (*A. affinis*), and surf scoter (*Melanitta perspicillata*) are the most common.[170]

Both topography and urban and industrial development have limited habitat availability on the San Francisco waterfront, resulting in habitat loss and relatively small, disconnected tidal marshes.[171] As a result of historic industrialization, shoreline habitat at the project waterfront is limited to large boulder riprap, which supports minimal avian foraging habitat. The riprapped shoreline immediately borders shallow bay habitat, which occurs between Mean Lower Low Water (MLLW) and 18 feet below MLLW. Though the developed waterfront provides fewer habitat opportunities for waterfowl than comparable undeveloped shoreline areas, the shallow open water foraging and rafting habitat on the waterfront is considered an important resource for waterfowl.

Several studies outside of the San Francisco region have shown that boat traffic disturbance can cause waterbirds to expend energy flying and flushing from roosting and foraging sites and thereby spend less time feeding.[172] Flying is a high energy activity for waterfowl, and frequent or repeated flight could contribute to the loss of energy that could be stored for breeding or migration.[173] Large flocks appear to be more susceptible to disturbance than small flocks and canvasback and scaup appear to be especially vulnerable.[174] To further study the potential issue, the U.S. Geological Survey (USGS) began a series of ecological studies in 2004, funded in part by WETA and by the 34th America's Cup race sponsors, to study the effects of commuter ferries and vessel traffic on waterbirds in San Francisco Bay. Study objectives were to examine species-specific behaviors of waterbirds from ferry traffic, examine waterbird avoidance behavior of watercraft, and document the distribution of waterbirds along ferry routes using aerial surveys. As of January 2018, the preliminary findings of the USGS waterbird studies have not been formalized and studies have not been publically released. Based on discussions with the USGS, the initial findings suggest that waterbirds alter their behavior to avoid passing watercraft and some bird species respond more negatively to vessel traffic than others.[175] The USGS has prioritized the mapping of high quality waterbird foraging areas in San Francisco Bay, which includes shoal and mud flat areas. While the USGS studies have documented behavioral changes in waterbirds as the birds move to avoid passing ferry traffic, which reduces the amount of uninterrupted waterbird rafting habitat, published studies have not identified ferry traffic as contributing to reduced bird vigor or productivity.

170 National Oceanic and Atmospheric Administration. 2007. Report on the Subtidal Habitats and Associated Biological Taxa in San Francisco Bay. Prepared by NOAA National Marine Fisheries Service. Santa Rosa, CA. June 2007. 86 pages.

171 Goals Project, 1999. Baylands Ecosystem Habitat Goals. A report of habitat recommendations prepared by the San Francisco Bay Area Wetlands Ecosystem Goals Project. U.S. Environmental Protection Agency, San Francisco, Calif./ S.F. Bay Regional Water Quality Control Board, Oakland, Calif.

172 Korschgen, C.E. and R.B. Dahlgren, "13.2.15. Human Disturbances of Waterfowl: Causes, Effects, and Management" (1992). Waterfowl Management Handbook. 12.

173 Ibid.

174 Mori, Y., Sodhi, N.,·Kawanishi, S., and S. Yamagishi. 2001. The effect of human disturbance and flock composition on the flight distances of waterfowl species. J. Ethol (2001) 19:115–119. U.S. Fish and Wildlife Service (USFWS). 1992. Status and trends report on wildlife of the San Francisco Estuary. Prepared under USEPA cooperative agreement CE-009519-0. Sacramento, CA. January.

175 De la Cruz, Susan. USGS. 2017. Telephone conversation with Port of S.F. staff and ESA wildlife biologist Brian Pittman, January 10, 2018.

Pier construction and dredging would result in temporary disturbance to shallow bay habitat that occasionally supports migratory waterfowl and diving birds such as surf scoter, canvasback, and lesser and greater scaup. Following construction, the proposed ferry traffic routes (see Figure 10 in the Project Description) would also bisect shallow areas of the Bay used as foraging and roosting areas for these and other species. It is anticipated based on research findings that waterfowl may become accustomed to the ferry traffic routes and avoid the direct path of the vessel routes.[176] This suggests that the use of designated travel corridors would reduce the frequency of vessel-induced incidents of waterbird flushing and thereby lessen the likelihood that ferry traffic would have biological consequences that cause a loss of overall avian fitness. An increased frequency of waterfowl flushing from use of non-designated travel routes would be a significant impact on biological resources as a result of the proposed project. Disturbances to waterfowl would be reduced to less than significant with the implementation of **Mitigation Measure M-BI-1d, Use of Designated Ferry Routes**.

Mitigation Measure M-BI-1d: Use of Designated Ferry Routes

To minimize potential direct impacts on rafting waterbirds, ferry commute routes shall occur within defined travel routes during normal service, shall travel down existing deeper channel areas as much as possible, and make use of the shortest routes across shallow areas where waterbird rafting is anticipated, to leave as much undisturbed shallow open-water habitat as possible.

Impact BI-2: The proposed project would have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act through direct removal, filling, hydrological interruption, or other means. (Less than Significant with Mitigation)

Proposed in-water and upland project construction could result in substantial adverse effects to waters of the U.S. under the jurisdiction of the USACE, waters of the State under the jurisdiction of the RWQCB, and waters and land under BCDC and State Lands Commission jurisdiction. However, none of these jurisdictional waters are wetlands. Potential significant impacts resulting from construction activities include, but are not limited to, permanent fill in jurisdictional non-wetland waters, temporary disturbance of jurisdictional non-wetland waters, degradation of water quality and open water aquatic habitat, and accidental discharge of sediment or toxic materials. As such, the **Mitigation Measure M-BI-2** would be required to reduce these significant impacts to less than significant levels.

Mitigation Measure M-BI-2: Construction Activities

Construction activities shall avoid or minimize adverse effects on jurisdictional waters to the full extent feasible. Specifically:

- A Spill Prevention Control and Countermeasure (SPCC) Plan shall be prepared by the selected contractor to address the emergency cleanup of any hazardous material and shall be available on site. The SPCC shall be submitted to the Port and RWQCB for review and approval.

[176] Hocken, D., Gorman, M., Keller, V., and M.A. Barker. 1992. Examination of the Effects of Disturbance on Birds with Reference to its Importance in Ecological Assessments. Journal of Environmental Management (1992) 36,253-286.

- The party undertaking construction work shall exercise every reasonable precaution to protect listed species and EFH-protected species and their habitat(s) from construction by-products and pollutants such as demolition debris, construction chemicals, fresh cement, saw-water, or other deleterious materials. Construction may be conducted from both land and water as deemed appropriate by the Port. Care shall be used by equipment operators to control debris so that it does not enter the Bay.

- A Materials Management Disposal Plan (MMDP) shall be prepared by the selected contractor to prevent any debris from falling into the Bay during construction to the maximum extent practicable. The measures identified in the MMDP shall be based on the Best Available Technology, and shall include, but not be limited to, the following measures:

  - During construction, the barges performing the work shall be moored in a position to capture and contain the debris generated during any sub-structure or in-water work. In the event that debris does reach the Bay, personnel in workboats within the work area shall immediately retrieve the debris for proper handling and disposal. All debris shall be disposed of at an authorized upland disposal site;
  - Measures to ensure that fresh cement or concrete shall not be allowed to enter San Francisco Bay. Construction waste shall be collected and transported to an authorized upland disposal area, as appropriate, and per federal, state, and local laws and regulations;
  - All hazardous material shall be stored upland in storage trailers and/or shipping containers designed to provide adequate containment. Short-term laydown of hazardous materials for immediate use shall be permitted with the same anti-spill precautions;
  - All construction material, wastes, debris, sediment, rubbish, trash, fencing, etc., shall be removed from the site once the proposed project is completed and transported to an authorized disposal area, as appropriate, in compliance with applicable federal, state, and local laws and regulations;
  - Construction material shall need to be covered every night and during any rainfall event (if there is one);
  - Construction crews shall reduce the amount of disturbance within the project site to the minimum necessary to accomplish the project; and
  - Measures to prevent site water from entering the Bay.

  The MMDP shall be submitted to the RWQCB for review and approval.

- Vessels and equipment that rely on internal combustion engines for power and/or propulsion shall be kept in good working condition, and compliant with California emission regulations.

- Vehicles and equipment that are used during the course of construction shall be fueled and serviced off-site, with the exception of small amounts of oil/gas for small generators, and cranes on barges, using 55 gallon drums, etc. Fueling locations shall be inspected after fueling to document that no spills have occurred. Any spills shall be cleaned up immediately. No in-water fueling shall be permitted.

Impact BI-3: The proposed project would not interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory corridors, or impede the use of native wildlife nursery sites. (Less than Significant)

It is unlikely that wildlife passage through the project area would be hindered since it is located on an urban and industrialized waterfront. Additionally, the terrestrial habitat that does fall within the project area is of poor quality.

Special-status aquatic species may temporarily utilize the San Francisco waterfront as a movement corridor, however, migrating salmonids and green sturgeon are less common south of the Bay Bridge, when traveling between the Pacific Ocean and Central Valley spawning habitat, than the Central Bay habitat more adjacent to the Golden Gate Bridge.[177] Additionally, their presence within the project area would only be temporary and would likely occur outside the window in which dredging or pile driving would occur. Pacific herring are known to occur along the San Francisco waterfront, however, a lack of suitable spawning and rearing habitat within the project area makes their occurrence unlikely.

Of all special-status fish aquatic species, longfin smelt have the greatest likelihood for potential occurrence within the project area. Survey records from the CDFW IEP survey program routinely encounter longfin smelt within Central San Francisco Bay.[178] On average, between 2010 and 2014, the IEP midwater and bottom trawls captured approximately 33 fish/year, at the 7 monitoring stations in closest proximity to the project area combined. However, because longfin smelt distribution within the estuary is driven by fluctuations in salinity, they are unlikely to occur in large numbers within the project area outside of late-summer. As such, the proposed project would not interfere substantially with the movement of any native resident or migratory fish, or wildlife species, and any potential impacts would occur at less-than-significant levels.

Impact BI-4: The proposed project would not conflict with any local policies or ordinances protecting biological resources, including tree preservation policies and ordinances. (No Impact)

The few trees that exist within the project area would not be impacted by the proposed project; therefore, the project would not conflict with the City of San Francisco's Tree Protection Legislation. As such, no impact would occur.

Impact C-BI-1: The proposed project would not result in cumulative impacts to special-status plant and wildlife species, or to their habitat. (Less than Significant)

For biological resources, the geographic scope for cumulative impacts includes the project area, the Mission Bay neighborhood and Pier 70 area, and surrounding water of Central San Francisco Bay. During construction, pile driving and dredging have the potential to result in significant impacts to special-status aquatic species through water quality impairment and an increases underwater noise. However, the implementation of **Mitigation Measures M-BI-1a** and **M-BI-1b** would reduce significant impacts to

177 Interagency Ecological Program for the San Francisco Bay Estuary (IEP); San Francisco Bay Study. 2010-2014. 2014. Unpublished Raw Mid-water and Otter Trawl Data.

178 Interagency Ecological Program for the San Francisco Bay Estuary (IEP); San Francisco Bay Study. 2010-2014. 2014. Unpublished Raw Mid-water and Otter Trawl Data.

special status plant and wildlife species and their habitat from these activities to less than significant levels. Of the other projects within the vicinity of the proposed project, only Crane Cove Park has an in-water construction component of a similar scope to that of the proposed project. The majority of the in-water work required for Crane Cove Park involves the placement of fill, as a cap, on contaminated sediments along the shoreline. While the cap placement, in combination with the limited fill required under the proposed project would result in a cumulative increase of fill in San Francisco Bay, the combined activities would not result in significant cumulative impacts to special-status species or habitat.

Although the upland portion of the project site lacks suitable habitat required to support special-status plant or terrestrial wildlife species, migrating bird species may temporarily utilize the project area for nesting or foraging habitat. As such, **Mitigation Measure M-B1-1c** would ensure any significant impacts to avian species from project construction would be less than significant. Terrestrial projects with the potential to result in cumulative impacts include the construction of the Chase Center, improvements to Agua Vista Park and Bayfront Park, and nearby UCSF development projects. All of these projects occur within the same urban, industrial setting as the proposed project, and therefore have little potential for substantially impacting special-status plant and wildlife species.

Once constructed, there would be an increase in vessel traffic when the facility becomes operational. Increased vessel traffic has the potential to disturb benthic sediments and result in localized impacts to water quality. However, any sediment resuspension from vessel traffic is likely to be significantly less than described for the proposed dredging activities. Additionally, vessels would operate at low speeds within the vicinity of the landings, which should limit the resuspension of sediment and benthic disturbance to levels that are insignificant to fish.

There is the potential that vessel traffic would result in increased noise or additional water quality impairment that may startle fish and marine mammals and result in their exclusion from the project area. However, there is limited empirical data on the impact of vessel traffic on fish behavior. Observations by WETA from similar ferry operations at WETA's other ferry terminal facilities in Vallejo, Larkspur, Sausalito, and other similar locations on San Francisco Bay indicate these impacts would be minor, localized, and limited to short periods of time during the arrival and departure of vessels.[179]

While the proposed project, in combination with other reasonable foreseeable projects has the potential to cumulatively impact biological resources, the project's contribution to cumulative biological impacts would not be considerable, and therefore would be less than significant.

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[179] National Marine Fisheries Service (NMFS). 2014. Biological Opinion – Downtown San Francisco Ferry Terminal Expansion Project, San Francisco, Ca. Issued June 30, 2014.

Topics:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact	Not Applicable
14. GEOLOGY AND SOILS — Would the project:					
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☒	☐	☐
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? (Refer to Division of Mines and Geology Special Publication 42.)	☐	☐	☒	☐	☐
ii) Strong seismic ground shaking?	☐	☐	☒	☐	☐
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐	☐
iv) Landslides?	☐	☐	☐	☒	☐
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐	☐
c) Be located on geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☒	☐	☐
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code, creating substantial risks to life or property?[180]	☐	☐	☒	☐	☐
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☐	☒
f) Change substantially the topography or any unique geologic or physical features of the site?	☐	☐	☐	☒	☐
g) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☒	☐	☐

CEQA does not require lead agencies to consider how existing hazards or conditions might affect a project's users or residents, except where the project would significantly exacerbate an existing environmental hazard. Accordingly, hazards resulting from a project that places development in an existing or future seismic hazard area or an area with unstable soils are not considered impacts under CEQA unless the project would significantly exacerbate the seismic hazard or unstable soil conditions. Thus, the analysis below evaluates whether the proposed project would exacerbate future seismic hazards or unstable soils at the project site and result in a substantial risk of loss, injury, or death. The impact is considered significant if the proposed project would exacerbate existing or future seismic

[180] Note that the current *California Building Code* is no longer based on the *Uniform Building Code* but rather the *International Building Code* but nonetheless still contains relatively similar guidance on expansive soils.

hazards or unstable soils by increasing the severity of these hazards that would occur or be present without the project.

The project site is located along the San Francisco waterfront where the topography is characterized by relatively gentle slopes. This area is mapped as "flatland" by the USGS[181] and there are no zones of potential earthquake-induced landslides mapped along the waterfront under California's Seismic Hazards Mapping Act of 1990.[182] Therefore, there is no impact regarding Initial Study topic 14a.iv.

The project does not include restrooms or any other facilities or processes that would produce wastewater. Therefore, neither discharge to the City's combined sewer system nor construction of new wastewater disposal systems would be required, and Initial Study topic 14e is not applicable to the proposed project.

The project site is located along the San Francisco Bay waterfront which is flat and has no unique topographic, geologic, or physical features. The Ferry and Water Taxi Landings would be constructed over the water of San Francisco Bay on new piers, platforms, and floats. Therefore, there is no impact related to Initial Study topic 14f.

The project site is located at the southern end of Mission Bay, a shallow embayment and tidal flat along the eastern shoreline of San Francisco that was filled for industrial development in the late 1800s and early 1900s.[183] The site is located close to the northeast extent of Potrero Hill. Historical development of this portion of the waterfront has resulted in fairly flat topography as a result of cutting rock from historic bedrock highs and using as fill within the tidal flats of Mission Bay. The landside portion of the project site has an approximate elevation of 11.58 feet above mean lower low water (MLLW). Features of the project would be constructed at approximately 13 feet above MLLW. The shoreline is protected with riprap revetment that was upgraded in 2011.

The project site and surrounding area are underlain by Franciscan Complex bedrock. Off shore, the bedrock is overlain by upper layered sediments, then young bay mud. On shore, the bedrock is overlain by young bay mud, then artificial fill. The geotechnical design report for the project, describes these units as follows, from youngest to oldest:[184]

- **Artificial Fill** (Recent). Artificial fill was used to reclaim tidal flats from San Francisco Bay at the project site, and is present only in the onshore portion of the project site. Much of the land to the east of 3rd Street was not yet filled in 1906 and the source of fill likely included Franciscan Complex rock quarried from Potrero Hill as well as debris from the 1906 San Francisco earthquake and fire. The fill is very heterogeneous, ranging from cobbles and boulders, sands and gravels with trace to minor fines, silty and clayey sands and gravels, and

181 United States Geological Survey (USGS), *Summary Distribution of Slides and Earth Flows in the San Francisco County, California,* Open File Report 97-745 Part C, by C.M. Wentworth, S.E. Graham, R.J. Pike, G.S. Beukelman, D.W. Ramsey, and A.D. Barron, 1997. Available: https://pubs.usgs.gov/of/1997/of97-745/sf-sef.pdf. Accessed on October 18, 2017.

182 California Division of Mines and Geology, Seismic Hazard Zones, San Francisco Quadrangle, California Division of Mines and Geology, Official Map, effective November 17, 2000, http://gmw.consrv.ca.gov/shmp/download/quad/SAN_FRANCISCO_NORTH/maps/ozn_sf.pdf, accessed October 17, 2017.

183 Geotechnical Consultants, Inc., Geotechnical Design Report, Mission Bay Ferry Landing, San Francisco, California. October, 2017.

184 Ibid.

clay. The fill also contains red brick fragments, pier timbers and other construction debris. The rock fragments include serpentinite which is known to contain naturally-occurring asbestos. The fill in the project vicinity has an oily sheen and strong petroleum odor. The fill thickness ranges from 13 to 18.5 feet.

- **Young Bay Mud** (Holocene aged).[185] The young bay mud is found in both the onshore and offshore portions of the project area. It is described as a soft, normally consolidated, fat clay to elastic silt that is characterized by low shear strength and high compressibility. Onshore, the young bay mud is absent in some areas, but reaches thicknesses of up to 5.5 feet in other areas. Offshore, the thickness ranges from 12.5 to 55 feet.

- **Upper Layered Sediments** (Pleistocene aged).[186] The upper layered sediments are present only in the offshore portion of the project site. These sediments generally consist of mixtures of silt, clay, and sand with minor gravel that are moist to wet and hard. The thickness of upper layered sediments ranges from 0 to 13 feet.

- **Franciscan Complex** (Jurassic- to Cretaceous-aged).[187] Franciscan Complex bedrock underlies the entire project area. This bedrock consists of an assemblage of sandstone, serpentinite, serpentinite breccia, and shale. The bedrock is typically slightly to moderately weathered, with some isolated zones highly weathered bedrock. The rock hardness is highly variable, ranging from soft to very hard and the bedrock is locally fractured. The rock strength ranges from friable to strong, depending on the degree of weathering and fracturing. Onshore, the depth to bedrock ranges from 17 to 24 feet below ground surface (bgs). Based on soil borings completed for the geotechnical investigation of the site, the top of the bedrock is encountered at depths of 12.5 to 41 feet below the mudline in the offshore portion of the project site, corresponding to elevations ranging from -4.7 to -46.9 feet MLLW. Geophysical testing indicates the bedrock surface may be as deep as -59 feet MLLW at points between the borings.

The depth to groundwater in the onshore portions of the project site ranges from approximately 6 to 12 feet bgs, and fluctuates in response to tide levels in San Francisco Bay and rainfall.

Impact GE-1: The proposed project would not result in exposure of people and structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, seismic ground-shaking, or liquefaction and related effects. (Less than Significant)

Fault Rupture

Fault rupture almost always follows pre-existing faults, which are zones of weakness. There is a very low potential for fault rupture within the project site because the site is not located within an Alquist-Priolo Earthquake Fault Zone[188] and no active or potentially active faults cross the site.[189] Therefore, project impacts related to fault rupture would be less than significant.

[185] The Holocene epoch spans the time period from the present to 11,500 years ago.
[186] The Pleistocene epoch spanned the time period between 11,500 and 1.8 million years ago.
[187] The Jurassic and Cretaceous periods spanned the time period from approximately 160 to 70 million years ago.
[188] California Geological Survey, Alquist-Priolo Earthquake Fault Zones. Available: http://www.conservation.ca.gov/cgs/rghm/ap/Pages/affected.aspx. Accessed October 17, 2017.
[189] Geotechnical Consultants, Inc., Geotechnical Design Report, Mission Bay Ferry Landing, San Francisco, California. October, 2017.

Ground Shaking

Like the rest of the San Francisco Bay Area, the project site would be subject to ground shaking in the event of an earthquake on one of the regional faults. The intensity of the seismic shaking, or strong ground motion, at the project site would be dependent on the distance between the project site and the epicenter of the earthquake, the magnitude of the earthquake, and the geologic conditions underlying and surrounding the project site. Earthquakes occurring on faults closest to the project site would most likely generate the largest ground motions. The intensity of earthquake-induced ground motions can be described in terms of *peak ground acceleration*, which is represented as a fraction of the acceleration of gravity (g).[190]

The USGS estimates that it is nearly certain that a M_w 6.7 or higher earthquake will occur on one of the California regional faults in the 30-year period between 2014 and 2044, with a 72 percent likelihood in the San Francisco Region.[191] The USGS considers the Hayward-Rodgers Creek and Calaveras faults to be particularly ready to rupture. The likelihood of a M_w 6.7 or higher earthquake occurring on these faults before 2044 is 32 percent and 25 percent, respectively.[192] The likelihood of a M_w 6.7 or higher earthquake occurring on the northern segment of the San Andreas fault before 2044 is 33 percent.

Ground shaking at the site will result from a large earthquake on any of the regional faults. The closest faults to the project site are the San Andreas fault and the Hayward fault, which are considered capable of generating earthquakes of maximum moment magnitude (Mw) of 7.9 and 7.3, respectively.[193] Site-specific analyses indicate that peak ground accelerations of 0.522 g could occur at the project site which correlates with severe to violent ground shaking. However, the project would not exacerbate ground shaking or expose people or structures to substantial adverse effects related to ground shaking for the reasons discussed below.

As described in the Project Description, the Ferry Landing would consist of a pier deck and steel barge float, supported on new 24-inch piles, and connected by a gangway. The Water Taxi Landing would consist of a landside platform and pre-cast concrete float, supported on new 24-inch piles, and connected by a gangway. The proposed pier, platform, floats, and piles would be designed and constructed in accordance with the most current Port of San Francisco Building Code, which incorporates California Building Code requirements. The Building Code specifies definitions of seismic sources and the procedure used to calculate seismic forces on structures during ground shaking to ensure that damage would be minimized in the event of a major earthquake. The Port of San Francisco Building Code requirements would be supplemented by other accepted seismic design standards including:

- ASCE Minimum Design Loads for Buildings and Other Structures (ASCE/SEI 7-10)
- ASCE Seismic Design of Pile Supported Piers and Wharves (ASCE/COPRI 61-14)

[190] Acceleration of gravity (g) = 980 centimeters per second squared. 1.0 g of acceleration is a rate of increase in speed equivalent to a car traveling 328 feet from rest in 4.5 seconds.

[191] United States Geological Survey (USGS) and United States Department of the Interior, UCERF3: A New Earthquake Forecast for California's Complex Fault System. Fact Sheet 2015–3009, March 2015.

[192] Geotechnical Consultants, Inc., Geotechnical Design Report, Mission Bay Ferry Landing, San Francisco, California. October, 2017.

[193] Geotechnical Consultants, Inc., Geotechnical Design Report, Mission Bay Ferry Landing, San Francisco, California. October, 2017.

During review of the building permit for the proposed project, the Port of San Francisco's Chief Harbor Engineer, in consultation with the Port, would determine necessary engineering and design features to reduce potential damage to the proposed structures from ground shaking. This would ensure compliance with all Port of San Francisco Building Code provisions regarding structural safety. Construction of the pier, platform, floats, and piles as proposed under the project and compliance with Port of San Francisco Building Code requirements and supplemental standards (subject to review by the Chief Harbor Engineer) would ensure that the structures would remain substantially sound in the event of an earthquake, and would not pose a threat to nearby people or structures. Further, the project would not affect the magnitude of earthquakes on any of the regional faults nor alter the nature of any of the native geologic materials making them more susceptible to ground shaking. Therefore, impacts related to ground shaking would be less than significant.

Liquefaction and Related Effects

Liquefaction is a phenomenon in which saturated granular sediments temporarily lose their shear strength during periods of earthquake-induced, strong ground shaking. Liquefaction-related phenomena include earthquake-induced settlement and lateral spreading. The susceptibility of a site to liquefaction and related effects is a function of the depth, density, and water content of the granular sediments at the site in relation to the magnitude of earthquakes likely to affect the site. Saturated, unconsolidated silts, sands, silty sands, and gravels within 50 feet of the ground surface are most susceptible to these effects.

Liquefaction

The project site is located within a potential liquefaction hazard zone identified by the California Geological Survey, although the mapping does not extend into the Bay.[194] The liquefaction map of the Community Safety Element of the San Francisco General Plan, which is based on mapping by the California Geologic Survey, also indicates that the project site is within a potential liquefaction hazard zone. However, these maps identify liquefaction hazards on a regional basis, and are used to determine where analysis is needed to evaluate site-specific liquefaction hazards.

The site-specific geotechnical design report for the proposed project concludes that zones within the fill at the project site consisting of gravel and cobbles with brick debris and minor silty and clayey fines, as well as zones of silty gravelly sand are potentially liquefiable.[195] However, because of the variable nature of the fill and the large proportion of gravel and larger size rock fragments in these zones, there would not be a substantial loss in soil strength during liquefaction. Therefore, project impacts related to liquefaction would be less than significant.

[194] California Division of Mines and Geology, Seismic Hazard Zones, San Francisco Quadrangle, California Division of Mines and Geology, Official Map, effective November 17, 2000, http://gmw.consrv.ca.gov/shmp/download/quad/SAN_FRANCISCO_NORTH/maps/ozn_sf.pdf, accessed October 17, 2017.

[195] Geotechnical Consultants, Inc., Geotechnical Design Report, Mission Bay Ferry Landing, San Francisco, California. October, 2017.

Earthquake-Induced Settlement

Settlement of the ground surface can be accelerated and accentuated by earthquakes. During an earthquake, settlement can occur as a result of the relatively rapid rearrangement, compaction, and settling of subsurface materials (particularly loose, noncompacted, and variably sandy sediments above the water table). Settlement can occur both uniformly and differentially (i.e., where adjoining areas settle at different rates). Areas are susceptible to differential settlement if underlain by compressible sediments, such as poorly engineered artificial fill or Bay Mud. Near the foot of Market Street, settlements of as much as 4 feet occurred during the 1906 earthquake on the San Andreas fault and some settlement was also reported during the 1868 earthquake on the Hayward fault.[196] The site-specific geotechnical design report for the proposed project estimates that isolated areas of the fill could experience up to approximately 1 to 3 inches of settlement in response to a major earthquake.[197] Project impacts related to earthquake-induced settlement would be less than significant.

Lateral Spreading

Of the liquefaction hazards, lateral spreading generally causes the most damage. This is a phenomenon in which large blocks of intact, non-liquefied soil move downslope on a liquefied substrate of large aerial extent.[198] When lateral displacement occurs, the mass moves toward an unconfined area, such as a descending slope or stream-cut bluff. Slopes ranging between 0.3 and 3 percent can displace the surface by several meters to tens of meters. Areas of observed lateral spreading in San Francisco are mainly limited to areas where fill has been placed over marsh and Bay Mud deposits.[199] After the 1906 earthquake on the San Andreas fault, lateral movements of approximately 2 feet were observed at the waterfront, near the foot of Market Street, and some lateral movement apparently occurred in this area as a result of the 1868 earthquake on the Hayward fault.[200] The site-specific geotechnical design report for the proposed project concludes that because there is a low potential for loss of soil strength as a result of liquefaction, there is a low potential for significant impacts related to lateral spreading at the project site.[201]

Conclusion

As discussed above, the site-specific geotechnical design report concludes that the large amount of gravel and the size of other rock fragments in the site fill materials reduces the potential for a substantial loss in soil strength during liquefaction and the potential for lateral spreading would also be low. Isolated areas of the fill could experience up to approximately 1 to 3 inches of settlement in response to a major

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196 Youd, T.L., and S.N. Hoose, "Historic Ground Failures in Northern California Triggered by Earthquakes," Geological Survey Professional Paper 993, 1978.

197 Geotechnical Consultants, Inc., Geotechnical Design Report, Mission Bay Ferry Landing, San Francisco, California. October, 2017.

198 Youd, T.L. and D.M. Perkins, "Mapping Liquefaction Induced Ground Failure Potential," Proceedings of the American Society of Civil Engineers, Journal of the Geotechnical Engineering Division, 1978.

199 Youd, T.L., and S.N. Hoose, "Historic Ground Failures in Northern California Triggered by Earthquakes," Geological Survey Professional Paper 993, 1978.

200 Ibid.

201 Geotechnical Consultants, Inc., Geotechnical Design Report, Mission Bay Ferry Landing, San Francisco, California. October, 2017.

earthquake, which is very minor amount of settlement. Further, the project would not affect the magnitude of earthquakes on any of the regional faults nor alter the nature of any of the native geologic materials making them more liquefaction or related effects. Therefore, these impacts of the project related to fault rupture, ground shaking, and liquefaction and related effects would be less than significant.

Impact GE-2: The proposed project would not result in substantial loss of topsoil or erosion. (Less than Significant)

Construction of the shoreline improvements in 2011 and the paved Bay Trail removed any top soil (a fertile soil horizon that typically contains a seed base) within the project site. Therefore, the excavation and grading conducted as part of the proposed project would not result in a substantial loss of top soil and there would be no impact related to this topic.

Construction of the landside improvements including the paved and landscaped areas, new utilities, and installation of ancillary features such as the new electrical service, backflow preventer, fire hydrant, and fire standpipe would involve land disturbance in an approximately 0.42-acre area. This land disturbance could create the potential for wind- and water-borne soil erosion. However, because the disturbance area would be greater than 5,000 square feet, project-related construction activities would be subject to the erosion control measures of article 4.2 of the San Francisco Public Works Code, section 146, Construction Site Runoff. In accordance with article 4.2, section 146, the construction contractor would implement an erosion control plan that specifies erosion control measures to be implemented during construction. Once the proposed changes are constructed, stormwater controls would be constructed in accordance with article 4.2 of the San Francisco Public Works Code, section 147, Stormwater Management.

Erosion control requirements during construction and required stormwater controls following construction are further described in Section 15, Hydrology and Water Quality. With implementation of these requirements, impacts related to erosion would be less than significant.

Impact GE-3: The proposed project would not be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse. (Less than Significant)

Construction activities that could cause a geologic unit or soil to become unstable include soil excavation, construction-related dewatering, and pile driving. Excavation for the Ferry Landing, Water Taxi Landing, and landside improvements would be limited to a depth of 3.5 feet bgs for the installation of utilities. This shallow excavation would not induce slope instability. Further, no construction-related groundwater dewatering would be required for the project because the maximum depth of excavation would be 3.5 feet bgs, which is above the groundwater table (expected at 6 to 12 feet below ground surface).

Driving of displacement piles may cause the ground to heave up to several inches, and under some conditions, the heave could adversely affect adjacent structures or cause landslide, lateral spreading, subsidence, liquefaction, or collapse. However, the majority of the piles for the Ferry Landing pier and float and the Water Taxi Landing platform and float would be constructed in the Bay where the sediment surface is relatively level and there are no adjacent structures that could be damaged. The nearest structure to landside piles to be constructed under the project is the Mission Rock Resort located on the

Bay shoreline, approximately 135 feet south of the proposed Water Taxi Landing. The landside piles for the Water Taxi Landing platform would penetrate the riprap revetment along the shoreline and the artificial fill which contains gravel, cobbles, boulders, timbers and other construction debris. These materials would not be subject to landsliding, lateral spreading, subsidence, liquefaction, or collapse. Further, no substantial heave would occur because of the granular nature of the geologic materials. Any minor heave that could occur from landside pile driving would not adversely affect the Mission Rock Resort. Therefore, project impacts related to unstable geologic units and soil would be less than significant.

Impact GE-4: The proposed project would not be located on expansive soil, as defined in the California Building Code and would not cause substantial risks to life or property. (Less than Significant)

Expansive soils are characterized by their ability to undergo significant volume change (i.e., to shrink and swell) due to variations in moisture content. They can damage structures and buried utilities and increase maintenance requirements. The presence of expansive soils is not an issue because the sediments underlying offshore portions of the project site are permanently saturated and would not experience variations in moisture content. In addition, all of the landside features would involve only grading or shallow excavation to a maximum depth of 3.5 feet bgs. The excavations would encounter only the artificial fill which is sandy and gravelly with only minor amounts of silt and clay, and would not be expansive. Therefore, project impacts related to expansive soils would be less than significant.

Impact GE-5: The proposed project would not directly or indirectly destroy a unique paleontological resource or site or unique geologic feature. (Less than Significant)

Paleontological resources are the fossilized remains of plants and animals, including vertebrates (animals with backbones), invertebrates (e.g., starfish, clams, ammonites, and marine coral), and fossils of microscopic plants and animals (microfossils). The age and abundance of fossils depend on the location, topographic setting, and particular geologic formation in which they are found. Fossil discoveries provide a historical record of past plant and animal life and can assist geologists in dating rock formations. In addition, fossil discoveries can expand the understanding of the time periods and geographic range of existing and extinct flora or fauna.

The Society for Vertebrate Paleontology (SVP) has outlined criteria for screening the paleontological potential of rock units and has established assessment and mitigation procedures tailored to accommodating such potential.[202] High- and low-potential rocks are determined by applying the following criteria:

- **High Potential.** Geologic units from which vertebrate or significant invertebrate or plant fossils have been recovered in the past, or rock formations that would be lithologically and temporally suitable for the preservation of fossils. Only invertebrate fossils that provide new information on existing flora or fauna or on the age of a rock unit would be considered significant.

[202] Society of Vertebrate Paleontology (SVP), Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources, 2010.

- **Low Potential.** Geologic units that are not known to have produced a substantial body of significant paleontological material, as demonstrated by paleontological literature and prior field surveys, and that are poorly represented in institutional collections.

Although not discussed in SVP standards, artificial fills and soils are materials with little or no potential to contain paleontological resources. While such materials were originally derived from rocks, they have been weathered or reworked such that fossils would not likely be preserved.

A search of the paleontological locality database of the University of California Museum of Paleontology identified 13 vertebrate fossil localities in Pleistocene-aged sediments within San Francisco, including one locality near Islais Creek and two localities near the Bay Bridge.[203] Species represented include the ground sloth, mammoth, horse, mastodon, and camel. In accordance with SVP criteria for assigning paleontological potential ratings to rock units, the Pleistocene-aged upper layered sediments which underlie the young bay mud in the Bay would have a high paleontological potential because vertebrate fossils have been recovered from similarly aged sediments in the project site vicinity. Sedimentary rocks of the Franciscan Complex have also produced significant fossils important for understanding the age, depositional environments, and tectonic history of the San Francisco area.[204] For example, fossil material was uncovered in an excavation for a new building in the northeast quadrant of San Francisco.

However, no fossil localities have been identified at the project site, and the only project activities that would encounter the Pleistocene-aged upper layered sediments or Franciscan Complex bedrock would be the installation of piles. Pile installation would involve limited disruption of the underlying geologic units, and would be unlikely to encounter paleontological resources.

Fossil remains would be unlikely in the artificial fill of the project site. Although plant and invertebrate fossil remains have been found in young bay mud, which occurs at variable depths throughout the project site, these fossils are abundant and their occurrence would not be noteworthy. Further, no vertebrate fossils have been identified in the young bay mud in San Francisco. Therefore, the artificial fill and young bay mud are considered to have a low paleontological potential.

Because of the low potential to encounter paleontological resources as a result of any of the project activities, impacts related to the destruction of unique paleontological resources would be less than significant. As stated above in the approach to analysis, there are no unique geologic features at the project site, therefore there would be no impact related to the destruction of unique geologic features.

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203 University of California Museum of Paleontology, UCMP Specimen Search. Available: http://ucmpdb.berkeley.edu/. Accessed October 18, 2017.

204 Elder, William, Mesozoic Molluscan Fossils from the Golden Gate National Recreation Area and their Significance to Franciscan Complex Terrane Reconstructions, San Francisco Bay Area, California, December 2015. Available: https://www.nature.nps.gov/geology/paleontology/pub/grd3_3/goga1.htm. Accessed December 2, 2015.

Impact C-GE-1: The proposed project would not make a considerable contribution to any cumulative significant effects related to geology or soils. (Less than Significant)

Although the entire Bay Area is located within a seismically active region with a high risk of seismic hazards and a wide variety of geologic conditions, the geographic scope of potential cumulative geology and soils impacts is restricted to the project site and immediate vicinity because related risks are relatively localized or even site-specific.

As discussed above under Impacts GE-1 and GE-2, compliance with applicable regulatory requirements would ensure that the proposed project would not result in significant impacts related to seismicity or erosion. All cumulative development in San Francisco, including those projects listed in Table 5, shown on Figure 12, and described in Initial Study Section B, Project Setting, under "Cumulative Setting," would be subject to the same or equivalent regulatory framework, which would ensure that these projects would not collectively increase seismic or erosion hazards. Therefore, cumulative impacts related to seismicity and erosion would be less than significant.

Because the soils in the project area are not unstable or expansive as discussed under Impact GE-3 and 4, the project would not contribute to any cumulative impacts related to construction on unstable or expansive soils. In addition, the proposed project would not contribute to any cumulative impacts related to the creation of unstable geologic units or soils. While other projects in the vicinity of the proposed project could potentially encounter paleontological resources, the proposed project would not contribute to this potential cumulative impact because of the low potential to encounter paleontological resources, as discussed under Impact GE-5.

For the above reasons, the proposed project, in combination with other past, present, and reasonably foreseeable projects, would not make a cumulatively considerable contribution to a significant geology and soils impact.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
15. HYDROLOGY AND WATER QUALITY — Would the project:					
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☒	☐	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒	☐

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
15. HYDROLOGY AND WATER QUALITY — Would the project:					
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion of siltation on- or off-site?	☐	☐	☐	☒	☐
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site?	☐	☐	☐	☒	☐
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☒	☐	☐
f) Otherwise substantially degrade water quality?	☐	☐	☒	☐	☐
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other authoritative flood hazard delineation map?	☐	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures that would impede or redirect flood flows?	☐	☐	☒	☐	☐
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒	☐
j) Expose people or structures to a significant risk of loss, injury or death involving inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☐	☐

CEQA does not require lead agencies to consider how existing hazards or conditions might affect a project's users or residents, except where the project would significantly exacerbate an existing environmental hazard. Accordingly, hazards resulting from a project that places development in an existing or future flood hazard or tsunami hazard area are not considered impacts under CEQA unless the project would significantly exacerbate the flood or tsunami hazard. Thus, the analysis below evaluates whether the proposed project would exacerbate an existing or future flood hazard or tsunami hazard in the project area, resulting in a substantial risk of loss, injury, or death. The impact is considered significant if the proposed project would exacerbate flood or tsunami hazards by increasing the frequency or severity of flooding or a tsunami, or cause flooding to occur in an area that would not be subject to flooding without the project.

The project site is located in the Downtown San Francisco Groundwater Basin which is not used as a drinking water supply and there are no plans for development of this basin for groundwater production. The proposed project would not deplete groundwater resources in this groundwater basin or interfere with groundwater recharge for a number of reasons. The Ferry and Water Taxi Landings would be constructed on piers over the Bay and therefore would not affect groundwater recharge. The proposed landslide improvements would include construction of approximately 5,765 square feet of impervious surfaces which would not substantially interfere with groundwater recharge. Further, the project site is located on the Bay shore where groundwater would be brackish[205] and would not use groundwater for any purposes. Therefore, there would be no impact related to Initial Study topic 15b.

The Ferry and Water Taxi Landings would be constructed on piers over the Bay that would drain directly to the Bay. Therefore, these facilities would not affect drainage patterns on land or cause on- or off-site siltation or flooding. The proposed landside improvements would create and/or replace approximately 5,765 square feet of impervious surfaces. Incorporation of stormwater management features in accordance with San Francisco's Stormwater Management Requirements (described below) would ensure that drainage from the new impervious surfaces would not cause on- or off-site erosion, siltation, or flooding. The topography of the area would be the same as existing conditions. Therefore, construction of the landside improvements would not alter drainage patterns or cause on- or off-site flooding. For these reasons, there would be no impact related to Initial Study topics 15c and 15d.

The project does not include the construction of housing. Therefore, Initial Study topic 15g is not applicable to the proposed project.

The project site is not located near a volcano or geologic conditions that would generate mudflow. Additionally, the project is not located in an area where there are levees or dams, and it is not located in a dam inundation zone.[206] Therefore, there is no impact related to Initial Study topic 15i.

Impact HY-1: The proposed project would not violate any water quality standards or waste discharge requirements and would result in less-than-significant impacts to water quality. (Less than Significant)

Regulation of San Francisco Bay Water Quality

All waters of the United States, including San Francisco Bay, are subject to regulation by the San Francisco Bay Regional Water Quality Control Board (RWQCB) pursuant to Section 401 of the Clean Water Act. Waters of the United States generally correspond to those waters delineated as federally jurisdictional pursuant to Section 404 of the Clean Water Act. In California, the Porter-Cologne Act is the principal law governing water quality regulation. It establishes a comprehensive program to protect water quality and the beneficial uses of water. The Porter-Cologne Act applies to surface waters, wetlands, and ground water and to both point and nonpoint sources of pollution. Regulatory standards and objectives for water quality in the Bay are established in the Water Quality Control Plan for the San Francisco Bay Basin, commonly referred to as the Basin Plan.[207] The Basin Plan identifies existing and potential beneficial uses for surface and ground waters and provides numerical and narrative water quality objectives designed to protect those uses.

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205 Brackish water occurs where seawater mixes with fresh water. It has more salinity than fresh water, but not as much as seawater, and is not suitable for drinking or most industrial purposes.

206 City and County of San Francisco, San Francisco General Plan, Community Safety, and Element of the General Plan of the General Plan of the City and County of San Francisco, October, 2012.

207 San Francisco Bay Regional Water Quality Control Board (RWQCB), *Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan)*, May 4, 2017. Available: https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/planningtmdls/basinplan/web/docs/BP_all_chapters.pdf. Accessed November 24, 2017.

The open tidal waters of the San Francisco Bay below the highest astronomical tide[208] are subject to regulation under Section 404 of the Clean Water Act. Those waters below the Mean High Water elevation are also regulated under Section 10 of the Rivers and Harbor Act. Under Section 401 of the Clean Water Act, every applicant for a federal permit or license for any activity that may result in a discharge to a water of the United States must obtain a State Water Quality Certification from the RWQCB that the proposed activity would comply with state water quality standards.

The project site is located adjacent to the Central Basin of San Francisco Bay. Beneficial uses of the Central Basin include estuarine habitat, commercial and sport fishing, wildlife habitat, water contact recreation, water non-contact recreation, and navigation. The RWQCB has listed the Central Basin as an impaired water body for chlordane, dichloro-diphenyl-trichloroethane (DDT), dieldrin, dioxin compounds, furan compounds, polychlorinated biphenyls (PCBs), mercury, selenium, and invasive species.[209] The sediments of the Central Basin are listed for mercury and polycyclic aromatic hydrocarbons.

Regulatory Requirements for Management of Construction-Related Stormwater Runoff

Discharges of construction-related stormwater runoff on Port property are subject to the Port of San Francisco requirements for construction-related stormwater runoff. In accordance with these requirements, any project that disturbs more than 5,000 square feet of ground surface must submit an Erosion and Sediment Control Plan that identifies potential pollutant sources during construction and documents best management practices (BMPs) that would be implemented to prevent the discharge of construction site pollutants in stormwater runoff. Examples of land-disturbing activities that require an Erosion and Sediment Control Plan include building demolition, clearing, grading, grubbing, filling, stockpiling, excavating, and transporting soil. Guidance provided by the Port identifies the minimum erosion and sediment controls that must be implemented for each construction project.

The Erosion and Sediment Control Plan must be reviewed and approved by the Port before construction begins. The Port also conducts inspections of the project site at a minimum 1) before construction, 2) during construction, and 3) upon completion to ensure compliance with the Erosion and Sediment Control Plan.

Impacts Related to Landside Construction Activities

Landside construction activities under the proposed project would include removing existing landscaping, concrete and asphalt sidewalks, and utilities. Following these demolition activities, new seating, hardscape, signage, irrigation, landscape, and lighting would be constructed. For the Ferry Landing, a connecting ramp would also be constructed. The platform for the Water Taxi Landing would connect to the land and require limited amounts of soil excavation. These activities would expose soil during construction and without proper controls these activities could result in erosion and excess

208 The Highest Astronomical Tide is the elevation of the highest predicted astronomical tide expected to occur at a specific tide station over the National Tidal Datum Epoch.

209 State Water Resources Control Board, 2010 Integrated Report (Clean Water Act Section 303(d) List / 305(b) Report) — Statewide. Available: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml. Accessed November 28, 2015.

sediments carried in stormwater runoff. Stormwater runoff from temporary on-site use and storage of vehicles, fuels, wastes, and building materials could also carry pollutants if these materials were improperly handled.

The overall area of disturbance would be 20,850 square feet (greater than 5,000 square feet); therefore, the construction contractor would be required to prepare an Erosion and Sediment Control Plan, subject to review and approval by the Port. The Erosion and Sediment Control Plan would specify the appropriate BMPs to control erosion and sedimentation during construction along with good housekeeping BMPs to prevent stormwater contact with hazardous materials stored at the construction site and limit the potential for a release of these hazardous materials that could affect water quality.

Implementation of the Erosion and Sediment Control Plan requirements in accordance with article 4.2 of the San Francisco Public Works Code would ensure that water quality impacts related to violation of water quality standards or degradation of water quality due to discharge of project construction-related stormwater runoff would be less than significant.

Impacts Related to Dredging

As discussed in the Project Description, construction of the proposed project would require dredging to a depth of -15 feet Mean Lower Low Water (MLLW)[210] plus a 2 foot over depth at the Ferry Landing to provide adequate depth and safe navigation and approach for vessels. At the Water Taxi Landing, dredging would be required to a depth of -8 feet MLLW plus a 1 foot over depth. In all, approximately 129,373 cubic yards of sediment would be dredged for construction of the proposed project, including 125,787 cubic yards for construction of the Ferry Landing and 3,586 cubic yards for the Water Taxi Landing. Based on pre-dredge sediment characterization results, the Port may perform additional dredging within the Ferry Landing dredge boundary and sediment capping based upon regulatory and resource agency review, which could result in approximately 7,500 cy of additional dredged sediment.

During future operations after project construction, maintenance dredging at the Ferry Landing would be conducted by the ferry operator (likely WETA or another operator) as needed to ensure continued vessel access. Maintenance dredging will be coordinated with the Port. Based on calculated average sedimentation rates, maintenance dredging at the Ferry Landing is expected to be required approximately every 7 to 14 years in order to maintain a safe navigational depth. This maintenance dredging estimate is based upon a minimum allowable water depth of -10 feet MLLW (or a maximum tolerance of approximately 5 feet of sedimentation with a periodic return to -15 feet MLLW). Maintenance dredging at the Water Taxi Landing would be the responsibility of the Port. Based on calculated average sedimentation rates, maintenance dredging at the Water Taxi Landing is expected to be required approximately every 7 to 10 years. This maintenance dredging estimate is based upon a minimum allowable water depth of -6 feet MLLW (or a maximum tolerance of approximately 2 feet of sedimentation with a periodic return to -8 feet MLLW).

[210] Mean Lower Low Water is the lower of each day’s two low tides averaged over time.

These dredging activities would disturb sediment, resulting in turbidity and resuspension of sediment, which could locally degrade the water quality of the Central Basin. Turbidity is a condition in which the concentration of particles suspended in the water is increased, making the water appear cloudy. The suspended sediment can potentially lower the concentration of dissolved oxygen in water, increase the salinity of the water, and decrease light penetration into the water. In addition, nutrient loading can occur as a result of resuspension of sediments during dredging. Substantially depressed oxygen levels (i.e., below 5 mg/L) can cause respiratory stress to aquatic life, and concentrations below 3 mg/L can cause mortality. This could, in turn, affect certain beneficial uses and habitat for benthic organisms (bottom dwellers) and sessile organisms (organisms attached to the benthic environment), and result in other effects on other marine species. See also Section 13, Biological Resources.

However, as discussed in the Project Description, dredging and debris removal would be performed from water side barges using a clamshell bucket and would be transferred to an adjacent barge and then placed at permitted disposal sites. Clamshell dredges remove bottom sediment through the direct application of mechanical force to dislodge and excavate the material at almost *in situ* densities. With this technique, any suspended sediment from the ascent of the dredged material descends through the water column to the bottom and is rapidly dispersed due to current and tidal conditions, causing minimal turbidity impacts. Further, oxygen levels affected by dredging are only expected to remain low for a short period, and dredging activities would be scheduled to occur between June and November, specifically not during the peak herring spawning period. Also, tidal flushing would rapidly improve depressed oxygen levels by introducing oxygenated water into the project area. Therefore, resuspension of sediments would be temporary and would not cause long-term effects.[211] Further, studies conducted by the San Francisco Estuary Institute have also indicated that there is no risk to the ecosystem due to increased nutrient loading caused by dredging activities[212] and that sediment disruption caused by dredging activities does not pose an environmental risk related to decreased dissolved oxygen concentrations.[213]

In addition, the BMPs discussed in the Project Description would be implemented and further detailed in the Dredge Operations Plan submitted to the permitting agencies for approval before dredging begins. These BMPs are subject to modification and additions based upon regulatory and resource agency review and include:

- In-water construction activities (i.e., demolition, dredging and pile installation) shall be restricted to the National Oceanic and Atmospheric Administration (NOAA) approved environmental work window (June 1 to November 30).
- No debris, rubbish, creosote-treated wood, soil, silt, sand, cement, concrete, or washings thereof, or other construction-related materials or wastes, oil, or petroleum products shall be allowed to

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211 San Francisco Bay Conservation and Development Commission (BCDC), *Long-Term Management Strategy for Bay Area Dredged Material, Final Environmental Impact Statement/Environmental Impact Report*, August 1998.

212 San Francisco Estuary Institute (SFEI), "Effects of Short-term Water Quality Impacts Due to Dredging and Disposal on Sensitive Fish Species in San Francisco Bay," SFEI Contribution 560, San Francisco Estuary Institute, Oakland, California, 2008.

213 Ibid.

enter into or placed where it would be subject to erosion by rain, wind, or waves and enter into jurisdictional waters.

- No fresh concrete or concrete washings shall enter the water.
- Protective measures shall be utilized to prevent accidental discharges to waters during fueling, cleaning, and maintenance.
- Floating booms shall be used to contain debris discharged into waters and any debris shall be removed as soon as possible, and no later than the end of each workday.
- Machinery or construction materials not essential for project improvements shall not be allowed at any time in the intertidal zone. The construction contracts shall be responsible for checking daily tide and current reports.
- The Port shall have a spill contingency plan for hazardous waste spills into the San Francisco Bay.

Implementation of the specified BMPs would be ensured through the requirements of permits issued by the USACE under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act, and subsequent water quality certification by the RWQCB under Section 401 of the Clean Water Act as well as BCDC under the McAteer-Petris Act.

The Dredge Material Management Office (DMMO) is a joint program comprised of the San Francisco Bay Conservation and Development Commission (BCDC), San Francisco Bay RWQCB, State Lands Commission, the San Francisco District USACE, and the U.S. Environmental Protection Agency (US EPA). The California Department of Fish and Wildlife, the National Marine Fisheries Service, and the U.S. Fish and Wildlife Service also provide advice and expertise to the process. The purpose of the DMMO is to cooperatively review sediment quality sampling plans, review the results of sediment sampling and make suitability determinations for material proposed for disposal. The goal of this interagency group is to foster a comprehensive and consolidated approach to handling dredged material management. The agencies then jointly review sediment characterization documents at bi-weekly meetings as part of their individual agency permitting processes.

The Port completed sediment sampling in July 2017 to evaluate the suitability of the dredged material for unconfined aquatic disposal at the San Francisco Deep Ocean Disposal Site (SF-DODS) or beneficial reuse at the Montezuma Wetlands Restoration Project (MWRP).[214] On the basis of this sampling, approximately 108,840 cubic yards of dredged sediment would be suitable for placement at SF-DODS or the MWRP as foundation or cover material. The remaining approximately 28,033 cubic yards of sediment would require disposal at an upland landfill based on elevated levels of total polynuclear aromatic hydrocarbon (PAH) concentrations. A sediment cap consisting of clean sand may also be required based on elevated PAH in sediments that would remain in place once dredging is completed. The DMMO concurred with these disposal recommendations and the need for additional sampling in a letter dated December 18, 2017.[215]

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214 Pacific EcoRisk and Boudreau Associates LLC, *Sediment Analysis and Characterization Report for Port of San Francisco Mission Bay Ferry Landing and Water Taxi Landing Project*, December 2017.

215 Department of the Navy, San Francisco District, U.S. Army Corps of Engineers, Subject: File Number 2017-00264S: Port of San Francisco; Mission Bay Ferry and Water Taxi Dredging, Episode 1; Test Results; DMMO Serial Number:17-102, December 18, 2017.

The Port submitted a sampling and analysis plan for the additional sampling to the DMMO on January 3, 2018.[216] The results of this additional sampling would be used by the Port and DMMO to evaluate the need for placing a sediment cap of clean sand.

With implementation of water quality control measures specified in the permit requirements described above, impacts on water quality as a result of dredging would be less than significant.

Impacts Related to In-Water and Over-Water Construction Activities

In-Water Construction Activities

In-water construction activities under the proposed project include the removal of existing remnant piles within the dredge area and installation of new piles. More details regarding these in-water construction activities are provided in the Project Description. During operation of the proposed Ferry and Water Taxi Landings, in-water activities would be primarily limited to maintenance of the floats on a 10-year cycle and repairs and/or replacement of piles, as needed.

These in-water construction activities would result in short-term disturbance of localized Bay sediments, which could result in adverse water quality effects because the sediments contain chemicals from historic activities, and disturbance of the sediments could temporarily increase turbidity and resuspend these sediments in Bay waters. The related impacts would be similar to those described above for dredging activities.

Over Water Construction Activities

Over water construction activities include construction of the pier at the Ferry Landing, platform at the Water Taxi Landing, and the gangways and floats at both landings. The pier deck would be constructed of concrete, working from both land and water-based vessels. The platform would be constructed of either steel or concrete. Concrete trucks and a concrete pump truck would work from land during placement of concrete. The floats and gangways would be fabricated off-site, and would be assembled and installed onsite. Installation of the gangways would be accomplished using a derrick crane.

During construction of these new structures, construction materials and debris could enter the Bay and affect Bay water quality, particularly if construction activities occur on windy days. If improperly handled, concrete, fuels, paints, solvents, cleaning agents, and other chemicals used during construction could also degrade Bay water quality if spilled. Without proper precautions, these pollutants could be discharged directly to the Bay and this could substantially affect Bay water quality and could potentially be toxic to aquatic organisms.

Proposed Best Management Practices (BMPs). As discussed in the Project Description, the Port would implement general BMPs for pollution prevention and construction management during both in-water and over-the-water construction activities to avoid impacts to water quality. These BMPs are listed above

[216] Pacific EcoRisk and Boudreau Associates LLLC, Mission Bay Ferry Landing and Water Taxi Landing Project, Amendment 1to Sediment Characterization Sampling and Analysis Plan (SAP), January 3, 2018.

under the analysis of dredging impacts, and would be subject to modification and additions based upon regulatory and resource agency review. In addition, the existing remnant timber piles would be pulled with cable choker or removed with a vibratory hammer if necessary and every effort would be made to remove the entire pile length. Use of this method would minimize sediment disturbance and associated water quality effects during pile removal. Piles would then be placed on a flat barge, transported to an appropriate facility and disposed of at a permitted facility.

Construction activities within and over the Bay would be subject to the requirements of permits issued by the USACE under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act that would receive water quality certification from the RWQCB under Section 401 of the Clean Water Act. The permits would specify these BMPs, and possibly additional BMPs for the protection of water quality. Implementation of water quality control measures proposed as part of the project and enforced through compliance with permit requirements would ensure that water quality impacts related to project construction activities within and over the Bay would be less than significant.

Impacts Related to Changes in San Francisco Bay Circulation

The proposed pier for the Ferry Landing would be supported on ten 24-inch octagonal concrete piles and the float would utilize eight 36-inch diameter steel guide and donut fender piles. The proposed platform for the Water Taxi Landing would be supported on two 16-inch steel piles, and the float would utilize four 20-inch square concrete guide piles. Installation of new piles has the potential to effect current velocities in the Bay and could result in associated changes in sediment transport, water quality, and salinity. However, based on numerical modeling for nearby projects[217], any potential changes in these factors caused by the installation of the Ferry Landing and Water Taxi Landing in-water structures is expected to be confined to the immediate vicinity of the structures. Further, wind and wind-waves, which cause mixing within the water column, would be expected to further reduce the potential effects of the proposed facilities on the Bay tidal currents, sediment transport, salinity and water quality. Therefore, impacts related to changes in water circulation would be less than significant for the proposed project.

Impacts Related to Littering

Trash is a concern for San Francisco Bay because South San Francisco Bay is listed as an impaired water body under Section 303(d) of the CWA for trash. The use of the new Ferry and Water Taxi Landings would increase the potential for littering. Due to the proximity of the project area to the Bay, litter could be directly discarded to the Bay, carried to the Bay via wind or stormwater runoff, or even carried by sea gulls. Many kinds of materials likely to be included in refuse are harmful to aquatic life. For example, plastic “six pack” holders are known to seriously harm various aquatic organisms, including special status marine birds and mammals, when they become entangled in the plastic openings. Litter generated at the proposed project site has the potential to increase the risk of feeding and choking hazards for brown pelicans, double crested cormorants, and harbor seals. In the marine environment, salt and sun

[217] Coast & Harbor Engineering. 2011 and 2014. Draft Coastal Harbor Engineering Impact Analysis, 34th America’s Cup, San Francisco Bay, June 14, 2011, and Technical Report Coastal Engineering Analysis, Remediation Concept Design and Impact Analysis. Port of San Francisco Central Basin California. Prepared for Port of San Francisco, 2014.

can also break down the trash, especially plastic bottles, into ever smaller, eventually microscopic components, increasing nutrient loading, reducing available dissolved oxygen, and potentially creating suffocating films on the water surface that can adversely affect water quality. Additionally, many components of trash, especially degraded plastics, can be toxic to aquatic wildlife, and litter can attract predators that could potentially affect avian breeding success.

However, in accordance with article 6 of the San Francisco Health Code, Garbage and Refuse, the Port would be required to supply appropriate containers placed in appropriate locations for the collection of refuse. In accordance with this article, the refuse containers must be constructed with tight fitting lids or sealed enclosures, and the contents of the container may not extend above the top of the rim. The Port must also have adequate refuse collection service. Further, article 6 prohibits the dumping of refuse from any wharfs or bulkheads along the waterfront and also dumping into any waterways or onto any streets or lands within San Francisco. In addition, the Port would be required to implement the Trash Provisions of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California. Accordingly, storm drain capture systems or the equivalent would be required to prevent the discharge of trash to Bay waters. With implementation of these regulatory requirements, impacts related to littering would be less than significant.

Conclusion

With implementation of the water quality protective measures included in the project and compliance with regulatory requirements applicable to the proposed construction activities, project impacts related to the violation of water quality standards or waste discharge requirements or other degradation of water quality as a result of landside construction, dredging, in-water and over-the-water construction, and littering would be less than significant.

Landside construction and demolition activities would be subject to the regulatory requirements of article 4.2 of the San Francisco Public Works Code, section 146, Construction Site Runoff. For dredging as well as in-water and over-the-water construction activities the Port would implement general BMPs included in the Project Description and enforced through permits issued under section 404 of the Clean Water Act, section 10 of the Rivers and Harbors Act, and water quality certification by the RWQCB under section 401 of the Clean Water Act. Trash management would be conducted in accordance with article 6 of the San Francisco Health Code, Garbage and Refuse.

Based on numerical modeling for nearby projects, including the 34th Americas Cup and Central Basin at Crane Cove Park, the installation of new piles under the proposed project would not induce changes in current velocities that would result in adverse water quality effects beyond the immediate vicinity of the structures. Therefore, water quality impacts related to installation of new piles would be less than significant.

Overall, the hydrologic impacts related to water quality, construction-related stormwater runoff, landsides construction, dredging, in-water and over-water construction activities, changes in San Francisco Bay circulation, and littering would be less than significant.

Impact HY-2: The proposed project would not create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff. (Less than Significant)

Regulatory Requirements for Management of Post-Construction Stormwater Runoff

Development projects that discharge stormwater to either the City's combined sewer system or a separate stormwater system must comply with the City's Stormwater Management Ordinance included in article 4.2 of the San Francisco Public Works Code, section 147, which was last updated on April 27, 2016. The SFPUC and the Port have developed the San Francisco Stormwater Management Requirements and Design Guidelines in accordance with the requirements of the Small MS4 General Stormwater Permit and article 4.2, section 147.

In areas served by separate stormwater systems, such as the project site, the Stormwater Management Requirements and Design Guidelines require that projects that create and/or replace 5,000 square feet or more of impervious surface implement source controls and BMPs to meet performance requirements and also manage the 85th percentile, 24-hour storm. To help project developers achieve compliance with stormwater management requirements, the Stormwater Management Requirements and Design Guidelines provide many tools, including but not limited to:

- A set of stormwater BMP fact sheets
- A vegetation palette to assist in bioretention BMP-appropriate plant selection
- Sizing calculators to determine the required size of each BMP
- Illustrative examples of green infrastructure

The Stormwater Management Requirements and Design Guidelines also require developers to use certain preferred BMPs to the maximum extent feasible before considering use of remaining BMPs. The preferred BMP hierarchy prioritizes infiltration-based BMPs, rainwater harvesting, and vegetated roofs followed by lined bioretention (e.g., lined bioretention materials with an underdrain, commonly known as a "flow-through planter"). If none of these BMPs are feasible on site, projects may be able to incorporate high-rate filtration BMPs (e.g., tree-box filters and media filters) into their site design pending approval by the SFPUC and Port. As the implementing agency, the SFPUC inspects stormwater BMPs once they are constructed, and any issues noted by the inspection must be corrected. The owner is responsible for completing an annual self-certification inspection and must submit completed checklists and maintenance logs for the year to the SFPUC. In addition, the SFPUC inspects all stormwater BMPs every third year. Any issues identified by either inspection must be resolved.

Impacts Related to Post Construction Stormwater Runoff

Landside Improvements

The proposed landslide improvements would include construction of approximately 5,765 square feet of impervious surfaces in an area that is served by a separate stormwater system under Port jurisdiction. The new impervious surfaces could increase stormwater runoff from the project site and introduce new stormwater pollutants. However, the project would be required to comply with article 4.2 of the

San Francisco Public Works Code, section 147, and the Stormwater Management Requirements and Design Guidelines for the management of stormwater runoff from these new surfaces. Because the project would create and/or replace 5,000 square feet or more of impervious surfaces, source controls and BMPs must be implemented to manage runoff from the 85th percentile, 24-hour storm. These requirements ensure that the flow rate and volume of stormwater discharged to the separate stormwater system is reduced and that the quality of stormwater runoff is improved.

A Stormwater Control Plan would be required in accordance with the Stormwater Management Requirements and Design Guidelines. This plan would describe source controls and BMPs that would be implemented to achieve the specified stormwater treatment as well as methods for post-construction operation and maintenance of the BMPs. The plan would be reviewed and approved by the Port to certify compliance with the Stormwater Design Guidelines, and the Port would inspect stormwater BMPs once they are constructed to confirm that they perform as designed.

Implementation of these requirements would ensure that project-related stormwater discharges to the Port's separate stormwater system would not exceed the capacity of the separate stormwater system, or provide an additional source of polluted runoff. Therefore, this impact would be less than significant for the landside improvements.

Over Water Features

The proposed project includes the construction of a pier at the Ferry Landing, platform at the Water Taxi Landing, and gangways and floats at each landing. These structures would be constructed over the Bay and would not be considered new impervious surfaces under the Stormwater Management Requirements. All deck surfaces (pier, platform, gangways, and floats) would be gently graded or sloped to direct runoff towards the edges of structures and into the Bay, and no specific storm water drainage or treatment facilities are required for these structures. The structures would redirect rainwater that would have normally fallen directly into the Bay, and would not increase the amount of stormwater runoff. Similarly, they would not create an additional source of polluted runoff because no hazardous materials would be used at the Ferry or Water Taxi Landings. Because these structures would not discharge to a stormwater collection system and would not create a new source of polluted runoff, this impact would be less than significant for the over-the-water features.

Impact HY-3: The proposed project would not exacerbate flooding conditions such that people or structures would be exposed to a significant risk from flooding under existing or future conditions. (Less than Significant)

Existing Flood Zones

Some low-lying areas along San Francisco's Bay shoreline are subject to flooding during periods of extreme high tides, storm surge, and waves, although these occurrences are relatively rare in San Francisco compared to areas prone to hurricanes or other major coastal storms or to developed areas near or below sea level. In 2008, the City and County of San Francisco adopted interim flood maps depicting the 100-year flood hazard zone along the City's Bay shoreline. The landside portion of the project site is located within a currently identified 100-year flood hazard zone based on the City's interim floodplain maps.[218] The flood elevation is 12.1 feet based on the 1988 North American Vertical Datum (NAVD88),[219] just slightly higher than the existing site elevation of 11.4 feet NAVD88. This flood elevation is based on total water elevations in the Bay which consider the contribution of wind waves, swell, and runup as well as the effects of storm surge.

Future Flood Zones

Sea levels are rising globally due to climate change, and they are expected to continue to rise at an accelerating rate for the foreseeable future. The sea level at the San Francisco tidal gage has risen approximately 0.08 inch per year since 1897, resulting in about 0.64 foot of sea level rise between that time and 2016.[220] The National Research Council's (NRC) 2012 report, Sea Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future (the NRC Report) provides a scientific review of sea level rise for the West Coast and provides the most recent regional sea level rise predictions for 2030, 2050, and 2100, relative to the year 2000 sea level.[221] In this report, the NRC projects that sea levels in the Bay Area will rise 11 inches by 2050 and 36 inches by 2100, as presented in **Table 23**. As presented in the NRC Report, these sea level rise projections represent likely sea level rise values based on the current understanding of global climate change and assuming a moderate level of greenhouse gas (GHG) emissions[222] and extrapolation of continued accelerating land ice melt patterns.

TABLE 23
SEA LEVEL RISE ESTIMATES FOR SAN FRANCISCO BAY RELATIVE TO THE YEAR 2000

Year	Projection (inches)	Upper Range (inches)
2030	6	12
2050	11	24
2100	36	66

SOURCE*:* National Research Council, 2012

The NRC Report also includes ranges of sea level rise that could occur based on different estimates of GHG emissions and ice melt patterns. The extreme upper limit of the ranges represents unlikely but possible levels of sea level rise that are based on very high GHG emissions scenarios and significant ice

218 City and County of San Francisco, San Francisco Interim Floodplain Map, East, Final Draft, July 8, 2008.
219 COWI, *Sea Level Rise Risk and Adaptive Management Plan for Mission Bay Ferry Landing and Water Taxi Project*. March 18, 2018.
220 NOAA, Mean Sea Level Trend 9414290 San Francisco, California. Available: https://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=9414290. Accessed November 19, 2017.
221 National Research Council, *Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future*. Washington, DC: The National Academies Press, 2012. Available: http://www.nap.edu/catalog.php?record_id=13389. Accessed November 19, 2017.
222 Future emissions of greenhouse gases depend on a collection of human decisions at local, regional, national, and international levels as well as potential unknown technological developments. For this reason, future changes in greenhouse gas emissions cannot be accurately estimated, and a range of emissions levels is considered in the NRC Report. Estimates of sea level rise relative to thermal expansion of the oceans were formulated using the mid-level, or moderate level, of predicted changes in greenhouse gas emissions (from a combination of fossil and non-fossil fuels), as well as an assumption of high economic growth; this represents scenario "A1B" as described by the Intergovernmental Panel on Climate Change (IPCC).

melt that is not currently anticipated but could occur. Assuming the maximum level of GHG emissions and ice melt, the NRC anticipates that sea levels in the Bay Area could rise up to 24 inches by 2050 and 66 inches by 2100 as presented in Table 23.

These estimates represent the long-term increase in Mean Sea Level and the associated average daily high tide conditions (represented by Mean Higher High Water, or MHHW)[223] that could result from sea level rise; they do not take into account extreme tides, storm surge, storm waves, or El Niño storm events, all of which can result in water levels that are temporarily higher than MHHW.

The California Coastal Commission supports the use of the NRC Report as the best science currently available in its Sea Level Rise Policy Guidance, which it adopted in 2015. The California Coastal Commission guidance emphasizes the importance of regularly updating sea level rise projections as the science continues to advance.[224] The Planning Department currently considers the NRC Report to be the best science currently available on sea level rise affecting San Francisco for both CEQA and planning purposes.

In March 2013, the California Ocean Protection Council updated its 2010 Statewide sea level rise guidance to adopt the NRC Report as the current, best available science on sea level rise for California.[225] Later, in April 2017, a Working Group of the Ocean Protection Council's Science Advisory Team released a report synthesizing the state of sea level rise science entitled "Rising Seas in California: An Update on Sea-Level Science" (Rising Seas Report). The Rising Seas Report was prepared and peer reviewed by some of California's and the nation's foremost experts in coastal processes, climate and sea-level rise science, observational and modeling science, the science of extremes, and decision making under uncertainty. Sea level rise projections provided in the Rising Seas Report are based on probabilistic modelling using low and high GHG emission estimates through the year 2150.

The Ocean Protection Council considers the Rising Seas Report, along with other authoritative peer-reviewed science to be the currently best available science to base future planning and investing decisions on for California, as long as the other peer reviewed reports are not less precautionary than the foundation set forth by the Rising Seas Report. On November 17, 2017, the council published a draft update to its sea level rise guidance and the Rising Seas Report provides the scientific foundation for the updated guidance. The updated guidance states that decisions about which sea-level rise projections to select should be based on many factors, including project location, lifespan of the project, the degree of sea-level rise exposure and associated impacts, the adaptive capacity of the project, and the degree of risk

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223 Mean Higher High Water is the higher of each day's two high tides averaged over time.

224 California Coastal Commission, *Sea Level Rise Policy Guidance, Interpretive Guidelines for Addressing Sea Level Rise in Local Coastal Programs and Coastal Development Permits, Unanimously Adopted August 12, 2015.* Available: http://documents.coastal.ca.gov/assets/slr/guidance/August2015/0_Full_Adopted_Sea_Level_Rise_Policy_Guidance.pdf. Accessed November 28, 2015.

225 *State of California Sea-Level Rise Guidance Document.* Developed by the Coastal and Ocean Working Group of the California Climate Action Team (CO-CAT), with science support provided by the Ocean Protection Council's Science Advisory Team and the California Ocean Science Trust. March 2013 Update (hereinafter "*State of California Sea-Level Rise Guidance Document*"). Available: http://www.opc.ca.gov/webmaster/ftp/pdf/docs/2013_SLR_Guidance_Update_FINAL1.pdf. Accessed November 19, 2017.

tolerance. A step-wise process for project planning is provided. The Ocean Protection Council adopted the updated guidance at its meeting on March 14, 2018.[226]

The updated guidance provides sea level rise values for Low Risk Aversion, Medium-High Risk Aversion, and Extreme Risk Aversion. The Extreme-Risk aversion values are recommended for high consequence projects with little to no adaptive capacity. Medium – High Risk Aversion values are a precautionary projection to be used for less adaptive, more vulnerable projects. Low Risk Aversion values are appropriate for adaptive, low consequence project., The Ferry Landing and Water Taxi Landings are adaptive projects; therefore, the Low Risk Aversion values are appropriate for project design.

The Ocean Protection Council provides two estimates of sea level rise beyond 2050 based on low and high global emission scenarios. These estimates are shown in **Table 24**. The Ocean Protection Council does not provide direct guidance on which scenarios should be used for project design.

TABLE 24
SEA LEVEL RISE ACCORDING TO OCEAN PROTECTION COUNCIL
"LIKELY RANGE" PROJECTION (FEET)

Year	Low Emissions Scenario	High Emissions Scenario
2030	-	0.5
2050	-	1.1
2070	1.5	1.9
2100	2.4	3.4

SOURCE*:* Ocean Protection Council, 2018

The sea level rise risk assessment and adaptive management plan for the proposed project estimates future Bay water levels at the project site by adding these estimates of sea level rise to the still-water elevation[227] and total water level at the project site.

The total water elevation represents the maximum elevation the Bay water reaches when the dynamic effects of wind-waves, swell, or runup are added to the still water elevation. A shoreline exceeded by the static water elevation will experience long-term flooding while an area exceeded by the total water elevation could experience short-term flooding if the storm duration is prolonged. These elevations vary according to weather conditions, and the Bay water elevation with a 100-year return period represents a one percent annual risk, consistent with the evaluation of current 100-year flood zones.

As summarized in **Table 25**, the estimated one percent still-water elevation at the project site at the time of project completion in 2020 is 9.8 feet NAVD88 and is expected to increase to 11.3 feet NAVD88 by 2070 (the end of the design life of the project) and 12.2 feet NAVD88 by 2100 under the low GHG-emission scenario.

226 California Natural Resources Agency, 2018. *State of California Sea-Level Rise Guidance: 2018 Update*. Available: http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20180314/Item3_Exhibit-A_OPC_SLR_Guidance-rd3.pdf.

227 Water elevation that results from the superposition of the astronomical tide, storm surge, and tsunamis (if applicable) over an observation period. It does not include the dynamic effects of wave action and therefore constitutes a static water surface elevation over the course of minutes or hours.

The estimated one percent total water level elevation is 12.1 feet NAVD88 in 2020 and is expected to increase to 13.6 feet NAVD88 by 2070 and 14.5 feet NAVD88 by 2100 under the low GHG-emissions scenario. The elevation of the project site is approximately 11.4 feet NAVD88. Therefore, based on these sea level rise estimates, the project site would not be substantially flooded as a result of sea level rise that is projected to occur through 2070 under the low GHG-emissions scenario, but could temporarily experience over-topping due to wave action. By 2100, the project site could experience shallow flooding of 0.8 feet under the low GHG-emissions scenario.

TABLE 25
WATER ELEVATIONS ASSOCIATED WITH OCEAN PROTECTION COUNCIL SEA LEVEL RISE PROJECTIONS

	Elevations, NAVD88			
	One Percent Still Water Elevation		One Percent Total Water Elevation	
Year	Low GHG-Emissions Scenario	High GHG-Emissions Scenario	Low GHG-Emissions Scenario	High GHG-Emissions Scenario
2020	9.8	9.8	12.1	12.1
2050	9.8	10.9	12.1	13.2
2070	11.3	11.7	13.6	14.0
2100	12.2	13.2	14.5	15.5

SOURCES: COWI, 2018; Orion Environmental Associates, 2013

Under the high GHG-emissions scenario, the estimated one percent still-water elevation would increase to 11.7 feet NAVD88 by 2070, and to 13.2 feet by 2100. The estimated one percent total water level elevation is expected to increase to 14.0 feet NAVD88 by 2070, and 15.5 feet by 2100. Based on these sea level rise estimates, the project site (at an elevation of 11.4 feet NAVD88) could experience some shallow flooding under the high GHG-emissions scenario as a result of sea level rise that could occur through 2070, and could temporarily experience over-topping due to wave action. Flooding depths could increase to almost 2 feet by 2100.

Sea Level Rise Inundation Mapping

The SFPUC, as part of the planning for its Sewer System Improvement Program, developed a series of maps published in 2014 that represent areas of inundation along both San Francisco Bay and Pacific Ocean shorelines of San Francisco. The Port updated the maps in 2016 to include its piers and wharves.[228] These maps use a 1-meter horizontal grid resolution[229] based on the 2010/2011 California Coastal Mapping Program LiDAR. The inundation maps use data from the Federal Emergency Management

228 AECOM, Port of San Francisco Sea Level Rise Inundation Mapping Technical Memorandum. March 2016.

229 The horizontal grid resolution of a digital elevation model (DEM) defines the scale of the features that are modeled; this is generally the minimum resolution necessary to depict levees, berms, and other topographic features important to diverting floodwaters.

Agency's (FEMA) California Coastal Mapping and Analysis Project, which includes detailed coastal engineering analyses and mapping of the San Francisco Bay shoreline.

The inundation maps evaluate scenarios that represent the NRC projections of sea level rise in combination with the effects of storm surge. They represent permanent inundation that could occur as a result of total sea level rises (over and above year 2000 MHHW) based on daily tidal fluctuations. Each scenario also addresses temporary inundation that could occur from extreme tides and from 1-year, 2-year, 5-year, 25-year, 50-year, and 100-year storm surge. Flooding as a result of storm surge would occur on a temporary basis, during and immediately after a storm event or extreme tide.

The scenarios listed below are representative of San Francisco Bay water elevations that could occur by the year 2050 and the year 2100, based on the NRC's projected levels of sea level rise and considering a 100-year storm surge.

- 12 inches above year 2000 MHHW (representative of NRC's projected sea level rise by 2050);
- 36 inches above year 2000 MHHW (representative of NRC's projected sea level rise by 2100);
- 52 inches above year 2000 MHHW (representative of NRC's projected sea level rise by the year 2050 in combination with a 100-year storm surge); and
- 77 inches above year 2000 MHHW (representative of NRC's projected sea level rise by the year 2100 in combination with a 100-year storm surge).

The following scenarios are representative of the maximum San Francisco Bay water elevations that could occur by the year 2100, based on the NRC's upper range of sea level rise and considering 100-year storm surge.

- 66 inches above year 2000 MHHW (representative of NRC's upper range of sea level rise by 2100); and
- 107 inches above year 2000 MHHW (representative of NRC's upper range of sea level rise by the year 2100 in combination with a 100-year storm surge).

The Port cautions that its maps represent a "do nothing" scenario, in which no site-specific measures are taken to prevent future flooding and no area-wide measures such as waterfront protection structures are constructed. In the event that the City undertakes area-wide measures to protect against inundation in the future, the mapping would need to be revised to reflect the modified inundation areas with implementation of these measures.

MHHW near the project site is at an elevation of 6.4 feet NAVD88.[230] **Table 26**, presents water elevations near the project site associated with each of the sea level rise scenarios discussed above, based on the existing MHHW elevation. The elevation of the project site is approximately 11.35 feet NAVD88.

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230 San Francisco Public Utilities Commission, *Climate Stressors and Impact: Bayside Sea Level Rise Mapping, Final Technical Memorandum.* June 2014.

TABLE 26
WATER ELEVATIONS ASSOCIATED WITH SEA LEVEL RISE PROJECTIONS

Sea Level Rise Scenario	Elevation (feet, NAVD88)
2000 MHHW with no sea level rise	6.4
2000 MHHW plus 100-year storm surge	9.8
2000 MHHW plus 12 inches of sea level rise	7.4
2000 MHHW plus 12 inches of sea level rise and 100-year storm surge	10.7
2000 MHHW plus 36 inches of sea level rise	9.4
2000 MHHW plus 36 inches of sea level rise and 100-year storm surge	12.8
2000 MHHW plus 66 inches of sea level rise (upper range)	11.9
2000 MHHW plus 66 inches of sea level rise and 100-year storm surge (upper range)	15.3

SOURCES*:* San Francisco Public Utilities Commission, 2014; Orion Environmental Associates, 2017

The inundation maps indicate that under existing conditions, only the immediate waterfront portion of the project site would be inundated with 12 inches of sea level rise which is expected by 2050, even when the effects of 100-year storm surge are considered. Similarly, the site would not be subject to daily tidal inundation with 36 inches of sea level rise which is expected by 2100, except for the immediate waterfront. However, when the effects of 100-year storm surge are considered in addition to 36 inches of sea level rise, the flood level would be approximately 12.8 feet NAVD88 and much of the landside portion of the project site could be temporarily inundated to an elevation of 1.4 foot NAVD88. With 66 inches of sea level rise, and when the effects of 100-year storm surge are considered, the flood level would be approximately 15.3 feet NAVD88. The entire landside portion of the project site could be temporarily flooded to a maximum elevation of 3.9 feet NAVD88.

Bay Conservation and Development Commission Sea Level Rise Policies

Projects within the BCDC's jurisdiction are subject to the policies provided in the San Francisco Bay Plan.[231] In accordance with these policies, projects within the BCDC's jurisdiction must conduct a sea level rise risk assessment and must be designed to cope with 100-year flood levels expected by mid-century.[232] If it is likely that the project would remain in place longer than mid-century (2050), the project must have a sea level adaptation strategy to address flood risks at the end of the century.

[231] San Francisco Bay Conservation and Development Commission, San Francisco Bay Plan, Available online at http://www.bcdc.ca.gov/plans/sfbay_plan.html. Accessed on November 23, 2017.

[232] San Francisco Bay Conservation and Development Commission, Climate Change Policies Fact Sheet. Available online at http://www.bcdc.ca.gov/BPA/SLRfactSheet.html. Accessed on November 23, 2017.

Impacts Related to Existing Flood Hazards

Landside Improvements

As discussed above, the landside portion of the project site is located within a 100-year flood hazard zone based on the City's interim floodplain maps.[233] Factors that could impede or redirect flood flows include the construction of new structures or changes in topography within the flood hazard zone, as well as an increase in stormwater runoff from the project site. The project would not redirect or impede flood flows because no substantial new structures that could impede flood flows would be constructed within this zone, and the project would not change the topography of the project site in any way that would redirect flood flows. Runoff from the 5,765 square feet of new impervious surfaces would be directed to the Port's separate stormwater system, and would not contribute to flooding effects in the project area. Therefore, this impact would be less than significant for the landside improvements.

Over-Water Improvements

Construction of the overwater components of the project, including the new pier, platform, gangways, and floats, could exacerbate flooding and increase the potential for coastal erosion along the waterfront portion of the project site if they changed the shape and configuration of the shoreline or altered circulation patterns in San Francisco Bay at the project site and its vicinity. The project would not alter the Bay shoreline in anyway, and as discussed above under "Impacts Related to Changes in San Francisco Bay Circulation", the new piles installed for the pier, platform, and floats would not adversely alter circulation patterns in the Bay. Therefore, this project impact would be less than significant for the over water improvements.

Impacts Related to Future Flood Hazards

As discussed in the Project Description, the project design life is 50 years, therefore the project improvements should be designed to withstand the effects of sea level rise through the year 2070, assuming that construction is complete by 2020. Based on the NRDC's most likely projections, sea levels are expected to rise 1.6 feet by 2070, relative to conditions in 2000. This would result in a future MHHW elevation of 8.0 feet NAVD88 at the project site in the year 2070, and a corresponding 100-year storm surge elevation of 11.3 feet which is nearly equal to the current site elevation. When wind waves, swell, and runup as well as the effects of storm surge are considered, total water levels in the Bay could reach 13.6 feet NAVD88 by 2070, which is above the site elevation.[234]

Landside Improvements

Based on sea level rise projections prepared for the SFPUC and Port, total water levels in the Bay could reach 13.6 feet NAVD88 by 2070 and the site could temporarily be inundated to a depth of about 2 feet. However, the project would not change the existing topography of the project site in any way that would redirect flood flows. Runoff from the 5,765 square feet of new impervious surfaces with project

[233] City and County of San Francisco, San Francisco Interim Floodplain Map, East, Final Draft, July 8, 2008.

[234] COWI, *Sea Level Rise Risk and Adaptive Management Plan for Mission Bay Ferry Landing and Water Taxi Project*. March 18, 2018.

development would be directed to the Port's separate stormwater system, and would not contribute to flooding effects in the project area. Therefore, this impact would be less than significant for the landside improvements.

Over-Water Improvements

The proposed project includes the construction of a pier, platform, gangways, and floats above the Bay, all of which could be adversely affected by sea level rise without proper design. As discussed in the Project Description, the top of the pier deck at the Ferry Landing would be at an elevation of 13.5 feet NAVD88 which is slightly below the projected total water elevation in 2070 of 13.6 feet. It is anticipated that some wave overtopping can be expected towards the end of the service life in 2070. The wave overtopping is expected to occur for a short duration (1-2 hours) and would not cause significant flooding of the Ferry Landing. The elevation of the top of the platform at the Water Taxi Landing would be 11.4 feet NAVD88, which is equal to the landside elevation and 2.2 feet below the projected total water elevation. The float at both the ferry and water taxi landings would be designed to move vertically along guide piles, and the top of the guide piles would be above the total water elevation which would allow for the floats to accommodate the projected increase in Bay water levels. The top of each gangway would be at the elevation of the adjoining pier or platform and the bottom would adjust to the float elevation.

The project has substantial adaptive capacity for adjustment in the event that sea levels rise more than anticipated. The floats at both landings would be able to adjust to changing water levels in the Bay because the top of the guide piles would be at an elevation of 19 feet NAVD88 or higher, well above the projected future water level of 13.6 feet. Further, the top elevation of the pier at the Ferry Landing could be raised. While the platform of the Water Taxi Landing could be temporarily flooded, this flooding would not expose people to substantial flooding risks because the landing would likely not be in operation during storms. The platform could also easily be reconstructed to a higher elevation, if needed. Similarly, if wave overtopping occurred at the Ferry Landing pier deck, this flooding would not expose people to substantial flooding risks because the landing would likely not be in operation during storms.

Similar to existing conditions, construction of these overwater project components could exacerbate future flooding conditions and increase the potential for coastal erosion along the waterfront portion of the project site if it changed the shape and configuration of the shoreline or altered circulation patterns in San Francisco Bay at the project site and in the vicinity. The project would not alter the Bay shoreline in anyway, and as discussed above, the new piles installed for the pier, platform, and floats would not adversely alter circulation patterns in the Bay. Therefore, this project impact would be less than significant for the over water improvements.

Impact HY-4: The proposed project would not expose people or structures to a significant risk of loss, injury or death involving inundation by seiche, tsunami, or mudflow. (Less than Significant)

Tsunamis (seismic sea waves) are long-period waves that are typically caused by underwater seismic disturbances, volcanic eruptions, or submerged landslides that typically travel at speeds of up to 500 miles per hour. Tsunami wave heights are typically up to 3 feet in the open water and can be barely perceptible to watercraft. The wave height may increase in height to 30 feet or more when they reach land, potentially causing large amounts of damage.[235] A seiche is caused by oscillation of the surface of an enclosed body of water such as the San Francisco Bay due to an earthquake or large wind event. Seiches can result in long-period waves that cause run-up or overtopping of adjacent landmasses, similar to tsunami run-up.

San Francisco may experience distant-, regional-, and local-source tsunamis. The Tsunami Annex to San Francisco's Emergency Response Plan defines a distant-source tsunami as one generated by an earthquake or other source event located over 1000 kilometers (621 miles) from San Francisco.[236] Travel times for distant-source tsunamis vary from 4 to 15 hours. A regional-source tsunami results from a source less than 621 miles from San Francisco and has a travel time of 1 to 2 hours. A near-source tsunami results from a source less than 62 miles from San Francisco and could reach San Francisco within 10 to 15 minutes. The primary tsunami threat to the San Francisco Bay Area is from a distant-source earthquake originating from a subduction fault such as the Aleutian-Alaska-Cascadia Subduction Zone.[237] Approximately 94 percent of the 54 historic tsunamis to reach San Francisco were caused by distant source events and resulted in maximum wave heights of 4 feet in San Francisco. A near-source tsunami caused by a Bay Area earthquake is not seen as a major threat to CCSF because the majority of Northern California's faults are strike-slip and are less likely to cause damaging tsunamis.[238]

In 2009, the California Geological Survey, California Emergency Management Agency, and the Tsunami Research Center at the University of California completed the state's official tsunami inundation maps.[239] Based on this mapping, the project site is located in a potential tsunami inundation zone. However, the map presents a "worst case" scenario based on over 50 local and distant tsunami sources. Future tsunami events may not produce inundation throughout the full hazard area shown on the 2009 map. Conversely, it is possible that actual tsunami inundation could exceed that shown on the map in a major tsunami event.

A 2008 study conducted in support of the Tsunami Annex to San Francisco's Emergency Response Plan used probabilistic hazard modeling, and estimated that San Francisco may experience a 3-foot distant-source tsunami once every 50 to 60 years, and a 9-foot tsunami every 426 years. In the project vicinity, the maximum elevation of a potential wave from a local source tsunami is 6.3 feet NAVD88 and the

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235 City and County of San Francisco, *Emergency Response Plan, an Element of the CCSF Emergency Management Program, Tsunami Annex*, August 2016.

236 City and County of San Francisco, *Emergency Response Plan, an Element of the CCSF Emergency Management Program, Tsunami Annex*, August 2016.

237 Subduction zones are plate tectonic boundaries where two plates converge, and one plate is thrust beneath the other. This process results in geohazards, such as earthquakes and volcanoes.

238 Strike-slip faults are vertical (or nearly vertical) fractures where the blocks of earth move mostly horizontally past one another.

239 California Emergency Management Agency, California Geological Survey, University of Southern California, Tsunami Inundation Map for Emergency Planning, San Francisco North Quadrangle/San Francisco South Quadrangle (San Francisco Bay), June 15, 2009. Available: http://www.conservation.ca.gov/cgs/geologic_hazards/Tsunami/Inundation_Maps/SanFrancisco/Documents/Tsunami_Inundation_SouthSFNorthSF_SFBay_SanFrancisco.pdf.

maximum elevation of a potential wave from a distant-source tsunami is 10.3 feet NAVD88 based on this modeling.[240]

Impacts Related to Tsunami of Seiche Inundation

The landside portion of the project site is at an elevation of 11.35 feet NAVD88, the proposed pier at the ferry landing would be at an elevation of 13.52 feet NAVD88, and the platform at the water taxi landing would be at an elevation of approximately 11.4 feet NAVD. All of these would be above the maximum estimated tsunami elevation of 10.3 feet NAVD88. While the floats would rest on the Bay water surface, and could be affected by a tsunami, they would likely experience only slight damage because they float on the water surface and are designed to accommodate changes in water levels. None of the proposed improvements would exacerbate conditions related to tsunami inundation, or expose additional people to loss, injury, or death as a result of tsunami inundation. Based on this analysis, impacts related to inundation by tsunami and seiche would be less than significant.

Impact C-HY-1: The proposed project, in combination with other past, present, or reasonably foreseeable projects, would result in less-than-significant cumulative impacts to hydrology and water quality. (Less than Significant)

The geographic scope of potential water quality and hydrology cumulative includes the Central Basin of San Francisco Bay, which is identified as an impaired water body on the basis of several parameters.

Implementation of regulatory requirements would ensure that the proposed project would not result in adverse water quality effects related to construction activities in, above, and adjacent to the Bay as discussed in Impact HY-1. Applicable regulatory requirements include section 404 of the Clean Water Act, section 10 of the Rivers and Harbors Act, section 401 of the Clean Water Act, BCDC permitting requirements, and article 4.2 of the San Francisco Public Works Code, section 146. Implementation of article 6 of the San Francisco Health Code, Garbage and Refuse would ensure that impacts related to littering would be less than significant. Other projects listed in Table 5 would be subject to the same regulatory requirements which would ensure that cumulative impacts related to hydrology and water quality would be less than significant.

Other projects that involve construction of new structures in the Bay could adversely affect circulation and associated sedimentation and flushing, a potentially significant cumulative impact. However, as discussed in Impact HY-1, the potential change in circulation under the proposed project would restricted to the immediate vicinity of the new Ferry Landing and Water Taxi Landing. Therefore, the project's contribution to changes in circulation would not be cumulatively considerable (less than significant).

Similarly, implementation of the City's Stormwater Management Ordinance included in article 4.2 of the San Francisco Public Works Code, section 147 (described in Impact HY-2) would ensure that cumulative

[240] City and County of San Francisco, *Emergency Response Plan, an Element of the CCSF Emergency Management Program, Tsunami Annex*, August 2016. Note that mean sea level is at an elevation of 3.31 feet NAVD88 near the project site. The elevations reported in the tsunami annex are reported in feet above mean sea level. These elevations were converted from mean sea level to NAVD88 by adding 3.26 feet.

impacts related to exceeding the capacity of a stormwater drainage system and providing substantial sources of polluted runoff would be less than significant.

As discussed in Impact HY-3, the project would not change the topography of the project site in any way that would redirect flood flows. Stormwater runoff would be directed to the Port's separate stormwater system and would not contribute to flooding effects in the project area under existing or future conditions. Similarly, the project would not exacerbate conditions related to tsunami inundation as discussed in Impact HY-4. The project would not contribute to any cumulative impacts related to these topics (less than significant).

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
16. HAZARDS AND HAZARDOUS MATERIALS — Would the project:					
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐	☐
b) 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?	☐	☐	☒	☐	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☒	☐	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☒	☐	☐
h) Expose people or structures to a significant risk of loss, injury or death involving fires?	☐	☐	☒	☐	☐

As discussed in Section 7, Air Quality, the nearest school to the project site is Potrero Kids, approximately 0.31 miles to the south. Because there are no schools within one-quarter of a mile of the site, Initial Study topic 16c is not applicable to the proposed project.

The project site is located approximately 9 miles from San Francisco International Airport and 3 miles from Oakland International Airport; it is not located within an airport land use plan area or in the vicinity of a private airstrip and would not interfere with air traffic in any way. Therefore, Initial Study topics 16e and 16 f are not applicable to the proposed project.

Soil and Groundwater Quality

The proposed project site is located within the Mission Bay plan area. An investigation conducted in 1997 evaluated soil and groundwater quality throughout the Mission Bay plan area and identified petroleum hydrocarbons and metals in soil and groundwater at concentrations greater than health-based cleanup levels throughout much of the plan area.[241] The investigation also identified petroleum products floating on groundwater (free product) in the vicinity of Illinois and 16th streets, and attributed the free product to former petroleum bulk storage as well as pipelines and transfer facilities in the vicinity. This area is collectively referred to as the Pier 64 area and has been investigated and cleaned up under the regulatory oversight of the San Francisco Bay Region Water Quality Control Board (RWQCB). For remedial planning purposes, the Pier 64 area was divided into several operable units. The project site is located within the "Other Areas of the Site Operable Unit" (OAS) which extends along much of the Bay shoreline to the north and south of 16th Street.[242]

As a whole, the OAS was historically part of the San Francisco Bay then used for a number of industrial purposes, though not all of these purposes occurred at the project site. The Arctic Oil Works petroleum dock was present in the OAS as early as 1884. By 1914, the OAS included the Pier 64 dock and marine terminal, which remained in place until the late 1950s when pier and dock operations were reconfigured. Between 1914 and about 1950, Loop Lumber and Southern Pacific freight slip operations dominated this area. In the 1950s, the extensive onshore dock area and Southern Pacific freight slip were removed and China Basin Way and the shoreline were created. Underground petroleum pipelines were placed near the shore in order to service Pier 64 and the Unocal dock to the south. From at least 1951 to 1976, Triple A Machine Shop used large portions of the dock and structures on the Pier 64 dock area for ship repair operations, including a 55,000 square foot shop and warehouse area. Since 1976, China Basin Way was renamed Terry A. Francois Boulevard. A public fishing pier and Agua Vista Park were established in the area between Terry A. Francois Boulevard and the Bay.

Remediation of the Pier 64 area was conducted under RWQCB Order No. R2-2005-0028.[243] As part of this remediation, petroleum pipelines previously located to the north and south of the project site were removed in 2006. The pipeline removal included excavation of soil two feet on either side of the pipelines and two feet beneath the highest groundwater level.[244] To avoid construction adjacent to the Bay, the two pipelines at the southern end of the project site were cut 15 feet inland from the shoreline, drained of any

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241 Environ Corporation, 1999. *Risk Management Plan, Mission Bay Area, San Francisco, California.* May 11.

242 BBL Environmental Services, Inc., 2006. *Pier 64 Phase II Completion Report, Former Petroleum Terminals and Related Pipelines located at Pier 64 and the Vicinity, City and County of San Francisco.* June.

243 California Regional Water Quality Control Board, San Francisco Bay Region, 2005. Order No. R2-2005-0028, Adoption of Final Site Cleanup Requirements and Rescission of Order Nos. 98-028, 99-064, 01-137, and R2-2003-0018. June 15.

244 BBL Environmental Services, Inc., 2006. *Pier 64 Phase II Completion Report, Former Petroleum Terminals and Related Pipelines located at Pier 64 and the Vicinity, City and County of San Francisco.* June.

residual petroleum, sealed with an expanding plug, filled with cement grout, and left in place. Soil from the excavations was disposed of off-site as a non-Resource Conservation and Recovery Act (RCRA) hazardous waste.

In 2014, the RWQCB issued order R2-2014-022 rescinding Order R2-2005-2028 because site remediation and groundwater monitoring within the Pier 64 area satisfied the requirements of that order.[245] Order R2-2014-022 states that any residual contamination in the Pier 64 area poses acceptable risks to human health and the environment and can be effectively managed using the existing Mission Bay Risk Management Plan, described below. As noted in Section 14, Geology and Soils, the artificial fill in the vicinity of the project site has an oily sheen and a strong petroleum odor.

Risk Management

Mission Bay Risk Management Plan

The Mission Bay Risk Management Plan (RMP) was prepared and approved by the RWQCB in 1999 to address risk management measures that must be implemented prior to development, during development (during construction), and after development of specific parcels within the Mission Bay plan area, including the Pier 64 area.[246] The 1999 RMP was revised in 2006 to reflect remedial actions conducted within the Pier 64 area in 2001 and 2005.[247] The revised RMP determined that, based on completion of the necessary remedial actions, the risk management measures required prior to development no longer apply to the OAS. All of the RMP risk management measures required during development and after development still apply and are listed below. Many of the required measures are now addressed by San Francisco regulations, as discussed below under “Applicable Regulations.”

RMP Measures Required During Development (Section 4 of the RMP)

- Control dust in accordance with the requirements of the RMP and a site-specific dust plan
- Control site runoff in accordance with the RMP requirements
- Minimize the potential for creating conduits in new utility trenches
- Manage soil in accordance with the RMP requirements
- Control access during construction
- Manage groundwater produced during construction-related dewatering
- Provide quarterly reports during development
- Document completion of construction work

RMP Measures Required Following Development (Section 5 of the RMP)

- Construct a cap over the affected area

[245] California Regional Water Quality Control Board, San Francisco Bay Region, 2014. Order No. R2-2014-0022, Rescission of Site Cleanup Requirement (Order No. R2-2005-0028. June 5.

[246] Environ Corporation, 1999. *Risk Management Plan, Mission Bay Area, San Francisco, California.* May 11.

[247] BBL Environmental Services, Inc., 2006. *Revised Risk Management Plan, Former Petroleum Terminals and Related Pipelines Located at Pier 64 and Vicinity, City and County of San Francisco, California*. August.

- Limit future development within the RMP area
- Restrict the use of groundwater in the RMP area
- Implement specific protocols for subsurface activities that penetrate the cap
- Implement a long-term monitoring program

RMP Requirements Regarding Regulatory Oversight and Enforcement (Section 6 of the RMP)

- Notify owners and lessees of RMP compliance obligations
- Submit dust monitoring notification to the RWQCB and the Department of Public Health and implement required dust monitoring and reporting
- For project sites over one-acre in size, submit a stormwater pollution prevention plan (SWPPP) to the RWQCB and implement the requirements of the SWPPP
- Conduct quarterly inspections of soil stockpiles
- Notify the RWQCB if unanticipated contamination or an underground feature such as an underground storage tank or sump is discovered during construction.

Deed Restriction

As stated in the revised RMP, Catellus (the then owner of the OAS) and the City and County of San Francisco each recorded a Covenant and Environmental Restriction (deed restriction) on the property that, among other things, requires property owners to comply with the terms of the Mission Bay RMP. Because this Covenant and Environmental Restriction run with the property as discussed in the RMP, current and future site owners (including the Port) are subject to the requirements of the RMP.

Applicable Regulations

Hazardous Materials and Dust

The City and County of San Francisco has enacted local ordinances and regulations to address the potential to encounter hazardous materials in the soil and groundwater, and to ensure the safe handling of hazardous materials and hazardous wastes. The following sections of the San Francisco Health Code, implemented by San Francisco Department of Public Health as the Hazardous Materials Unified Program Agency and briefly summarized below, address the potential to encounter hazardous materials in the soil and the use of hazardous materials:

- Article 21 (Hazardous Materials) provides for safe handling of hazardous materials in the City. It requires any person or business that handles, sells, stores, or otherwise uses specified quantities of hazardous materials to keep a current certificate of registration and to implement a hazardous materials business plan (HMBP). Threshold quantities are 500 pounds for solids, 55 gallons for liquids, and 200 cubic feet for compressed gases. Every business that must implement an HMBP must also obtain a certificate of registration certifying that the HMBP meets the requirements of article 21. This article would not apply to the proposed project because hazardous materials would not be stored at the Mission Bay Ferry Landing or Water Taxi Landing during operation.

- Article 22A (Analyzing the Soils for Hazardous Waste, known as the Maher Ordinance and updated in 2013) applies to projects that involve disturbance of more than 50 cubic yards of soil, if they are located bayward of the historic high tide line, have been zoned or used for industrial purposes, are located within 150 feet of an elevated highway, have soil or groundwater contamination, or are within 100 feet of a known or suspected underground storage tank. In accordance with this article, covered projects must prepare a site history report to identify whether past site uses may have caused contamination, conduct soil and/or groundwater testing for the presence of the potentially hazardous constituents (including methane), prepare a soils analysis report, and prepare a site mitigation plan (if contamination is identified).

If hazardous materials remain in the soil or groundwater, health department approval of the site mitigation plan may be conditioned upon submittal of a dust control plan, health and safety plan, and possibly a cap maintenance plan to prevent exposure to hazardous materials in soil or groundwater after construction of the project. A deed restriction may also be required. Upon completion of site mitigation, the site owner must submit certification that the project has received certification or verification from the appropriate state or federal agency that mitigation is complete, before the health department can issue a letter of no further action.

For departments, boards, commissions and agencies of the CCSF that authorize construction or improvements on land under their jurisdiction where no building or grading permit is required, the ordinance requires protocols be developed between that entity and the health department that will achieve the environmental and public health and safety goals of article 22A. This article applies to the proposed project, and compliance would be achieved through compliance with the requirements of the Mission Bay RMP.

- Article 22B (Construction Dust Control Requirements) and Port Building Code section 106.A.3.2.3 collectively constitute the Construction Dust Control Ordinance which was adopted in July 2008. The ordinance applies to all site preparation work, demolition, or other construction activities within Port jurisdiction that have the potential to create dust. Projects that expose or disturb more than 10 cubic yards or 500 square feet of soil must comply with specified dust control measures whether or not the activity requires a permit from the Port Building Group. For projects over 0.5 acre, the Dust Control Ordinance requires that the project sponsor submit a Dust Control Plan for approval by the health department prior to issuance of a building permit by the building inspection department. Building permits will not be issued without written notification from the Director of Public Health that the applicant has a site-specific Dust Control Plan, unless the Director waives the requirement.

  The Construction Dust Control Ordinance requires project sponsors and contractors responsible for construction activities to control construction dust on the site or to implement other practices that result in equivalent dust control. Dust suppression activities may include sufficient watering of all active construction areas to prevent dust from becoming airborne; increased watering frequency may be necessary whenever wind speeds exceed 15 miles per hour. Reclaimed water must be used if required by article 21, section 1100 et seq. of the San Francisco Public Works Code. The Construction Dust Control Ordinance applies to the proposed project, and compliance would be achieved through compliance with the requirements of the Mission Bay RMP.

Alternative Management Standards for Treated Wood Waste

Treated wood, including creosote-treated piles and structures, contains hazardous chemicals at elevated levels and can be characterized as a hazardous waste under California regulations.[248] However, the Department of Toxic Substances Control (DTSC) has developed alternative management standards that

[248] California Department of Toxic Substances Control, *Requirements for Generators of Treated Wood Waste (TWW, Fact Sheet*, December 2008.

allow for disposal of treated wood as a nonhazardous waste. These standards, contained in title 22 of the California Code of Regulations, division 4.5, chapter 34, simplify and facilitate the safe and economical disposal of treated wood waste. They provide for less stringent storage requirements, extended accumulation periods, shipment by a nonhazardous waste hauler without a hazardous waste manifest, and disposal at specific nonhazardous waste landfills. The alternative management standards specify different management requirements for households, businesses that generate treated wood waste incidental to their normal course of business, and businesses that generate treated wood waste during their normal course of business.

In accordance with these standards, employees who handle the treated wood waste or would otherwise be expected to come into contact with the waste must be trained in the applicable regulations related to the handling of treated wood waste. In addition, the standards require that treated wood waste be segregated from other wastes, appropriately stored and labeled, and transported to an authorized treated wood waste disposal facility. The alternative management standards specify that treated wood waste should not be burned, scavenged, or stored in contact with the ground, and allow for disposal of the treated wood waste at a Class III landfill. Reuse of creosoted-treated pilings and structures is not allowed unless they are reused onsite, or if the use is consistent with allowable reuses for creosote-treated wood.

Naturally-Occurring Asbestos

In 2001, the California Air Resources Board adopted the Asbestos Airborne Toxic Control Measures (ATCM) for Construction, Grading, Quarrying, and Surface Mining Operations in areas of serpentine and other ultramafic rocks (contained in title 17 of the California Code of Regulations, section 93105), which became effective in July 2002. The Asbestos ATCM protects public health and the environment by requiring the use of best available dust mitigation measures to prevent the offsite migration of asbestos-containing dust from road construction and maintenance activities, construction and grading operations, and quarrying and surface mining operations in areas of ultramafic rock, serpentine, or naturally occurring asbestos. BAAQMD implements the regulation.

Asbestos-containing material is defined in Title 17 of the California Code of Regulations section 93105(h)(9) as any material that has an asbestos content of 0.25 percent or greater. Construction activities that would disturb greater than 1 acre of land where asbestos-containing materials are present must implement an Asbestos Dust Mitigation Plan. Construction activities that disturb 1 acre or less of land are not required to implement a dust mitigation plan, but must implement specific measures to control the generation of asbestos-containing dust.

Port of San Francisco Contract Specifications

The Port of San Francisco's standard construction specifications include a Risk Management Plan Compliance (RMP Compliance) section. This section assists contractors working at the Mission Bay project area in meeting the objectives delineated in the RMP. In accordance with this section, contractors must comply with at least the minimum requirements of the RMP. Contractors are required to be familiar with the entire RMP and must also comply with applicable laws, regulation, codes, and ordinances governing the project.

Impact HZ-1: The proposed project would not create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials. (Less than Significant)

The proposed project would use common hazardous materials during both construction and operation. Impacts related to hazardous materials use are discussed below along with regulations that are in place and ensure that impacts related to the use of hazardous materials would be less than significant.

Construction

During construction of the proposed project, diesel fuel and hazardous materials such as paints, fuels, solvents, and adhesives would be used, and an inadvertent release of large quantities of these materials into the environment could adversely affect soil and Bay water quality. However, as described in Section 15, Hydrology and Water Quality, an Erosion Control Plan would be required in accordance with article 4.2 of the San Francisco Public Works Code, section 146. In accordance with this regulatory requirement, the Port would be required to obtain a Construction Site Runoff Control Permit and prepare and implement an Erosion Control Plan to minimize construction-related water quality impacts. The Erosion Control Plan would identify hazardous materials sources within the land-side portion construction area and recommend site-specific BMPs to prevent discharge of these materials into stormwater and Bay waters.

However, as discussed in Impact HY-1 of Section 15, Hydrology and Water Quality, the minimum requirements of the Erosion and Sediment Control Plan are related primarily to construction activities on land. They do not directly relate to construction activities in or over the Bay such as pile installation and construction of the pier, platform, gangways, and floats where discharges of hazardous materials could directly affect Bay water quality. Regardless, hazardous materials impacts related to construction activities in and over the Bay at the Ferry and Water Taxi Landings would be less than significant with implementation of the avoidance and minimization measures discussed in the Project Description. These measures require implementation of BMPs during construction. The BMPs related to hazardous materials include:

- No debris, rubbish, creosote-treated wood, soil, silt, sand, cement, concrete, or washings thereof, or other construction-related materials or wastes, oil, or petroleum products shall be allowed to enter into or placed where it would be subject to erosion by rain, wind, or waves and enter into jurisdictional waters.

- Protective measures shall be utilized to prevent accidental discharges to waters during fueling, cleaning, and maintenance.

- The project shall have a spill contingency plan for hazardous waste spills into the San Francisco Bay. The plan shall include floating booms and absorbent materials to recover hazardous wastes. Non-buoyant debris discharged into waters shall be recovered (by divers) as soon as possible after discharge.

Implementation of these measures would be enforced through the section 401 Water Quality Certification and/or Wastewater Discharge Requirements as discussed in Section 15, Hydrology and Water Quality, and may be modified based on regulatory agency review.

For landside, in-water, and over-water construction activities, the vendors and contractors responsible for delivery of hazardous materials would comply with the regulations of the California Highway Patrol and the California Department of Transportation related to the transportation of hazardous materials during construction.

Implementation of the legally required erosion control plan for landside construction activities and the avoidance and minimization measures discussed in the Project Description for construction activities over and in the Bay, along with legal transport of the hazardous materials, would ensure that project impacts related to the use, transport, and disposal of hazardous materials during construction are less than significant and no mitigation is necessary. Impacts related to the disposal of any hazardous wastes during project construction are addressed below in Impact HZ-2.

Operation

During operation, the project would use common types of hazardous materials such as cleaners, disinfectants, and chemical agents required to maintain the sanitation of the public facilities. These commercial products are labeled to inform users of potential risks and to instruct them in appropriate handling procedures. They would not be stored at the project site, and no hazardous wastes would be produced during operation. Further, the vendors responsible for delivery of hazardous materials would comply with the regulations of the California Highway Patrol and the California Department of Transportation related to the transportation of hazardous materials during construction (described above under “State” in Regulatory Framework). Therefore, impacts related to the routine use, transport, and disposal of hazardous materials during operation would be less than significant and no mitigation is necessary.

Impact HZ-2: The proposed project is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5, but would not 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. (Less than Significant)

The Pier 64 area, where the project site is located, is listed as a Cleanup Program site by the RWQCB.[249] However, as discussed above, the RWQCB has determined that the Pier 64 area has been adequately remediated, and any residual contamination in the Pier 64 area poses acceptable risks to human health and the environment and can be effectively managed using the Mission Bay RMP. The 1999 RMP was revised in 2006 to reflect remedial actions conducted within the Pier 64 area in 2001 and 2005.[250] The revised RMP determined that, based on completion of the necessary remedial actions, the risk management measures required prior to development no longer apply to the OAS which includes the project site. All of the RMP risk management measures required during project development and after development still apply as discussed below.

[249] San Francisco Regional Water Quality Control Board, 2017. Geotracker: https://geotracker.waterboards.ca.gov/map/?global_id=SL18397817. Accessed November 12, 2017.

[250] BBL Environmental Services, Inc., 2006. *Revised Risk Management Plan, Former Petroleum Terminals and Related Pipelines Located at Pier 64 and Vicinity, City and County of San Francisco, California*. August.

Construction

The proposed project includes the excavation of approximately 380 cubic yards of soil for installation of utilities and landside improvements. As discussed above, much of the soil in the Mission Bay plan area contains primarily petroleum products and metals at concentrations above health-based cleanup levels. Without implementation of appropriate risk management measures, the public could be exposed to this soil potentially causing adverse health effects. However, as discussed below, implementation of the risk management measures of the RMP and compliance with articles 22A and 22B of the San Francisco Health Code would ensure that public health would not be adversely affected as a result of construction activities.

Risk management measures to be implemented in accordance with the RMP during development are intended to manage risks during construction and are protective of the surrounding public and environment. They include dust control measures, soil management protocols, stormwater pollution plan requirements, contingency requirements in the event that previously unidentified underground structures or contamination are identified, protocols for dewatering activities, and a framework for complying with the requirements of article 20 of the San Francisco Health Code, commonly referred to as the Maher Ordinance (note that this ordinance was subsequently revised in 2013, and is now codified in article 22A of the San Francisco Health Code, described above).

Section 4.3.11 of the RMP requires the Port to obtain confirmation from the Department of Public Health regarding whether the site history and sampling completed for the project site under the RMP are adequate to meet the requirements of article 22A, or whether these must be supplemented for full compliance with article 22A. If they must be supplemented, additional sampling and possibly a site-specific RMP supplement (or site mitigation plan) may be required in accordance with article 22A to address proper soil handling during construction and management of risks following construction.

Section 4.3.1 of the RMP requires the Port to prepare a dust control plan and implement specific dust control measures. These RMP requirements are supplemented by the requirements of article 22B of the San Francisco Health Code, San Francisco's Dust Control Ordinance which was adopted in 2008, subsequent to approval of the RMP in 1999 and revised RMP in 2006. Because the project would involve soil disturbance of approximately 380 cubic yards, the Port would be required to implement specific dust control measures in accordance with article 22B as more specifically discussed in in Section 4, Air Quality.

In addition, the RMP specifies the process to ensure regulatory oversight of development activities within the Mission Bay plan area. Owners must specifically notify the RWQCB in advance of initiating construction and must also submit a dust monitoring notification to the RWQCB and the Department of Public Health. The owner must document compliance with specified measures to the RWQCB and must also notify the RWQCB of any unanticipated structures or contamination encountered during construction, as well as any unanticipated environmental conditions not covered by the RMP. The owner must also submit quarterly reports to the RWQCB during construction and a completion letter once construction is complete.

Implementation of the risk management measures of the RMP, as supplemented by articles 22A and 22B of the San Francisco Health Code would ensure that excavated soil is appropriately managed during project construction, and that the public and environment would not be adversely exposed to hazardous materials in soil at the project site. Implementation of the RMP requirements, and the legal requirements of articles 22A and 22B of the San Francisco Health Code by the Port's construction contractors is ensured through the RMP Compliance Section of the Port's standard contract specifications, described above. Therefore, project impacts related to exposure to hazardous materials in the soil during construction would be less than significant and no mitigation is necessary.

Operation

Risk management measures of the RMP to be implemented after development are intended to manage risks to site visitors and occupants and ensure that they would have no contact with site soils and groundwater as well as risks to maintenance and utility workers that may contact soil left in place during their normal work activities. For land uses that are not residential, and do not involve the use of groundwater, post-development measures require covering of exposed areas and providing protocols for future subsurface activities.

Once constructed, the proposed project would include approximately 5,765 square feet of impervious surfaces, including the Bay Trail and asphalt block or concrete pavement in the plaza area. Approximately 256 square feet of the project site would be landscaped. These improvements would prevent contact with the site soils by future site visitors and occupants and would constitute adequate cover under the RMP. Protocols for future subsurface activities include implementation of the RMP measures required during development that are described above for construction activities. Because the project includes the construction of new impervious surfaces and landscaping that would prevent future contact with site soils, and contractors that conduct future subsurface activities would be required to implement appropriate RMP requirements, project impacts related to exposure to hazardous materials in the soil during operation would be less than significant and no mitigation is necessary.

Impact HZ-3: The proposed project would not create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of naturally-occurring asbestos and metals. (Less than Significant)

As discussed in Section 14, Geology and Soils, the Geotechnical Design Report for the proposed project identified serpentinite, a rock type known to contain naturally-occurring asbestos and associated metals, in the artificial fill materials at the project site.[251] Naturally-occurring asbestos and associated metals are not specifically addressed by the Mission Bay RMP. The Port sampled the fill materials in March 2018 to determine the content of naturally-occurring asbestos on the site. Based on samples from four locations, the concentration of chrysotile asbestos ranges from not detected (less than 0.25 percent) to 3 percent.[252]

The Asbestos ATCM, described above (under "Naturally-Occurring Asbestos"), provides a well-established regulatory framework for managing naturally-occurring asbestos during construction. The Port would be

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[251] Geotechnical Consultants, Inc., Geotechnical Design Report, Mission Bay Ferry Landing, San Francisco, California. October, 2017.

[252] Asbestos TEM Laboratories, Inc., CARB Method 435 Polarized Light Microscopy Analytical Report, Laboratory Job # 96-02554, March 28, 2018.

required to implement the requirements of the asbestos ATCM because the asbestos content of the fill is greater than 0.25 percent. The proposed project would disturb approximately 20,850 square feet of soil (less than 0.5-acre). Therefore, the Port or its construction contractor would be required to implement the following measures:

- Limit construction vehicle speed at the work site to fifteen (15) miles per hour or less;
- Prior to any ground disturbance, apply sufficient water to the area to be disturbed to prevent visible emissions from crossing the property line;
- Maintain adequate wetting of areas to be graded or excavated to prevent visible emissions from crossing the property line;
- Adequately wet or treat storage piles when material is not being added to or removed from the pile. Treatment may include application of a chemical dust suppressant or covering of the storage pile;
- Wash equipment down before moving from the property onto a paved public road; and
- Visible track-out on paved public roads must be cleaned using wet sweeping or a HEPA filter equipped vacuum device within twenty-four (24) hours.

Implementation of these requirements would ensure that no visible dust would cross the project boundaries and the public would not be exposed to naturally-occurring asbestos and associated metals. Rock containing naturally-occurring asbestos that would be disposed of off-site would not be considered a hazardous waste under California regulations.[253] Therefore, this project impact would be less than significant and no mitigation would be necessary.

Impact HZ-4: Construction of the proposed project would not create a significant hazard to the public or the environment as a result of a release from creosote-treated structures that would be removed. (Less than Significant)

As discussed in the Project Description, the permanent fill proposed for the project would be offset by removal of remnant piles and debris within the proposed dredge area that are likely creosote-treated. Workers and the public could be exposed to unsafe levels of creosote if the piles are not appropriately managed and disposed of once removed. However, the Port would be required to implement the DTSC's Alternative Management Standards for Treated Wood Waste, described above. In accordance with these standards, employees who handle the treated wood waste or would otherwise be expected to come into contact with the waste would be trained in the applicable regulations related to the handling of treated wood waste. In addition, the treated wood waste would be segregated from other wastes, appropriately stored and labeled, and transported to an authorized treated wood waste disposal facility in accordance with the alternative management standards. The treated wood waste would not be burned, scavenged, or stored in contact with the ground. Possible disposal sites for the piles and structures are the Altamont Landfill and Resource Recovery Facility, Vasco Road Sanitary Landfill, Keller Canyon Landfill, Ox Mountain Landfill, Santa Cruz Class III Landfill, Buena Vista Drive Sanitary Landfill, Newby Island

[253] Department of Toxic Substances Control, 2000. Letter to Jon A. Morgan, Director, Environmental Management Department, County of El Dorado. Naturally Occurring Asbestos. January 20.

Landfill, Guadalupe Rubbish Disposal Company, Kirby Canyon Recycling and Disposal Facility, and Hay Road Landfill.[254] Reuse of the creosote-treated structures would not be allowed unless they are reused onsite, or if the use is consistent with allowable reuses for creosote-treated wood. Compliance with these standards and implementation of the required procedures would ensure that potential hazardous materials-related impacts of removal of creosote-treated wood would be less than significant and no mitigation is necessary.

Impact HZ-5: The proposed project would not expose people or structures to a significant risk of loss, injury or death involving fires nor would it interfere with the implementation of an emergency response or evacuation plan. (Less than Significant)

San Francisco and the Port ensure fire safety primarily through provisions of the San Francisco and Port of San Francisco Building Codes. Accordingly, the proposed project would be required to comply with the applicable sections of these building codes that require several fire safety features, such as equipping the building with a fire protection system and constructing the building with noncombustible materials or with a fire-resistive design. The final building plans would be reviewed by the San Francisco Fire Department or Port Fire Marshal (as well as the Chief Harbor Engineer) to ensure conformance with these provisions.

Further, as discussed in the Project Description, the project includes Emergency Response Fire Systems to protect against fire at the project site and in the vicinity. Both a fire suction standpipe and fire hydrant would be constructed near the Ferry Landing pier entrance and the fire hydrant would be connected to the CCSF water system near Terry A. Francois Boulevard. In addition, the Port is currently working with SFPUC to design a connection to a proposed Auxiliary Water Supply System (AWSS) manifold that would be constructed above ground in Bayfront Park. The AWSS connection would allow San Francisco Fire Department fire boats to pump bay water to the AWSS as an auxiliary emergency water source. Paved areas onshore near the Ferry Landing would allow for fire trucks to access the dry stand pipe (fire hydrant) and suction stand pipes. Consequently, the proposed project would enhance fire safety and would not create a substantial fire hazard or increase the risk of fires above existing levels.

The proposed project could be subject to earthquake hazards as discussed in Section 14, Geology and Soils, and tsunami hazards as discussed in Section 15, Hydrology and Water Quality. Occupants of, and visitors to, the Ferry and Water Taxi Landings would temporarily increase the localized population along the waterfront. This increased population could contribute to congestion if an emergency evacuation were required in the event of one of these or other emergencies. Although not "adopted" by legislative action, the City has a published Emergency Response Plan, prepared by the Department of Emergency Management as part of the City's Emergency Management Program, which includes plans for hazard mitigation and disaster preparedness and recovery.[255] The Emergency Response Plan contains 16 "annexes" (similar to appendices) that cover a number of emergency topics. The Earthquake Annex, in

[254] California Department of Toxic Substances Control, 2013. List of RWQCB Approved Treated Wood Waste Landfills. July.

[255] San Francisco Department of Emergency Management, *City and County of San Francisco Emergency Response Plan*, December 2009. Available: http://www.sfdem.org/Modules/ShowDocument.aspx?documentid=1154. Accessed November 25, 2015.

particular, sets forth planning assumptions for a series of earthquakes of varying magnitudes on different faults, and sets forth procedures for assessment of damage and injuries, as well as operational response strategies in the event of a major earthquake. The Tsunami Annex specifies emergency response procedures in the event of a tsunami, as described in more detail in Section 15, Hydrology and Water Quality.

The proposed project would enhance emergency response capabilities in the project area and would not interfere with implementation of the City's Emergency Response Plan because, as discussed in the Project Description, the Ferry Landing would be designed to remain in operation after a major earthquake and could be used as a transit link allowing passengers to enter and leave the Mission Bay area. Immediately after an earthquake or other disaster, the Ferry Landing could be available 24-hours per day for transporting emergency service personnel and passengers to terminals in the East Bay and North Bay. The Ferry Landing would be available for continuous operation in a long-term recovery period if BART and/or the Bay Bridge are unavailable for several months.

Based on the above analysis, the project would enhance fire safety and emergency response capabilities in the project area and project impacts related to fire risks and interference with the implementation of an emergency response or evacuation plan would be less than significant.

Impact C-HZ-1: The proposed project would not make a considerable contribution to any cumulative significant effects related to hazardous materials. (Less than Significant)

Impacts from hazards and hazardous materials are generally site-specific and do not generally result in cumulative impacts unless the potentially cumulative projects are in proximity to one another. Accordingly, the geographic scope of potential hazards and hazardous materials is limited to the project site and immediate vicinity and the cumulative analysis uses a list-based approach to analyze the effects of the project in combination with past, present, and probable future projects in the immediate vicinity. The analysis considers whether or not there would be a significant, adverse cumulative impact associated with project implementation in combination with past, present, and probable future projects in the immediate vicinity, and if so, whether or not the proposed project's contribution to the cumulative impact would be cumulatively considerable.

As discussed above, the proposed project would not result in any significant impacts with respect to hazards or hazardous materials that could not be mitigated to a less-than-significant level. All cumulative development in San Francisco would be subject to the same regulatory framework as the project for the transport, use, and storage of hazardous materials (Impact HZ-1). Compliance with these existing regulations would serve to ensure that cumulative impacts related to these topics are less than significant.

With implementation of the RMP for the entire Mission Bay Plan area, cumulative impacts related to soil and groundwater contamination would be less than significant as discussed in Impact HZ-2. Similarly, other projects within the Plan area would be required to investigate and, as necessary, abate soil and groundwater contamination on a project-by-project basis in accordance with article 22A of the San Francisco Health Code. Therefore, cumulative impacts related to soil and groundwater contamination would be less than significant.

With implementation of the Asbestos ATCM for all projects that would involve construction in areas containing naturally-occurring asbestos, cumulative impacts related to exposure to naturally occurring asbestos during construction would be less than significant as discussed in Impact HZ-3.

Regarding creosote-treated wood, the proposed project and any cumulative project that would include the management of creosote treated wood would be required to comply with DTSC's Alternative Management Standards for Treated Wood Waste (Impact HZ-4). Compliance with this regulation would serve to ensure that cumulative impacts related to this topic are less than significant.

With implementation of the City's Emergency Response Plan, which provides a framework for Citywide emergency planning; compliance with the San Francisco and Port of San Francisco's building code by all projects; and incorporation of the fire safety and emergency response features of the proposed project, cumulative impacts related to increased fire risks and interference with or impedance of an emergency response plan would be less than significant.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
17. MINERAL AND ENERGY RESOURCES — Would the project:					
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☐	☒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☐	☒
c) Encourage activities which result in the use of large amounts of fuel, water, or energy, or use these in a wasteful manner?	☐	☐	☒	☐	☐

The San Francisco General Plan outlines in the Environmental Protection Element that mineral resources are not found in San Francisco to "any appreciable extent," and therefore are omitted from the general plan.[256] The project site is located in a region classified as a Mineral Resource Zone 1 (MRZ-1). This type of classification represents areas where, "adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence."[257] There are no mineral resources that are of value to the region and residents of the State present in the project site. Additionally, there are no mineral resource recovery sites identified within the project site or vicinity. The implementation of the proposed project would have no impact on the availability of mineral resources or

[256] San Francisco Planning Department, *Environmental Protection Element*, San Francisco General Plan. Available: http://generalplan.sfplanning.org/ Accessed October 17, 2017.

[257] California Department of Conservation, Division of Mines and Geology, 1996. Update of Mineral Land Classification: Aggregate Materials in the South San Francisco Bay Production Consumption Zone.

mineral resource recovery sites. Therefore, Initial Study topics 17a and 17 b are not applicable to the proposed project.

Impact ME-1: The proposed project would not encourage activities that would result in the use of large amounts of fuel, water, or energy, or use these resources in a wasteful manner. (Less than Significant)

Fuel

The vessels in the Golden Gate Ferry Fleet use No. 2 Diesel. The vessels used by the WETA fleet utilize a combination of Bio Diesel B5 and Ultra Low Sulfur Diesel. The proposed project would increase water transit services in the San Francisco Bay. The impacts to overall energy consumption from transportation were analyzed in the Program Environment Impact Report (PEIR) for WETA's Expansion of Ferry Transit Service in the San Francisco Bay Area.[258] Overall, an increase in water transit services would decrease the number of individual vehicles on the road and reduce overall transportation fuel consumption. As noted in Section 8, Greenhouse Gases, the creation of additional ferry service would reduce overall vehicle miles travelled in the Bay Area. While the 2003 Program EIR noted that an increase in ferry service would lead to higher energy per passenger miles, the increase was deemed not to be significant relative to overall energy consumption due to transportation in the Bay Area.[259] Additionally, while ferries are less fuel efficient than other forms of mass transportation, the energy per passenger mile for ferries can be reduced by encouraging ferry use. Ferries have around the same passenger fuel efficiency as highway vehicles. However, given the large maximum passenger capacity of ferries, if ridership on ferries is increased, they have the potential to have twice the passenger miles traveled as highway vehicles.[260]

The energy analysis performed for the 2003 PEIR determined that while an expansion of ferry service would result in a 0.41 percent increase in energy consumption per passenger mile over a no action alternative, the resultant impact from such an increase would be less than significant. Although the ferry service expansion associated with the proposed project may lead to an incremental increase in energy consumption per passenger mile traveled, the impact would also be less than significant. Additionally, WETA and the Golden Gate Bridge, Highway and Transportation District are in the process of updating their fleets and investing in more energy efficient vessels. The proposed project would not result in the consumption of large amounts of fuel in a wasteful manner and therefore would have a less-than-significant-impact on fuel resources.

Water

Potable water at the project site would be provided by San Francisco Public Utilities Commission (SFPUC). The SFPUC supplies water to over 2.6 million people in the Bay Area. The majority of the water supplied by the SFPUC originates in the Tuolumne River watershed and is collected in the Hetch Hetchy Reservoir in Yosemite National Park. Water is also drawn from local reservoirs in the Alameda and Peninsula watersheds. The 2015 SFPUC Urban Water Management Plan projects that the 265 million

258 URS Corporation, 2003. *Final Program Environmental Impact Report: Expansion of Ferry Transit Service in the San Francisco Bay Area.*

259 Ibid.

260 Cottrell, Wayne D., 2011. *Comparison of Ferry Boat and Highway Bridge Energy Use*. Energies. Accessed on: October 19, 2017.

gallons per day limit on average annual water deliveries will be lifted in 2018. By December 2018, the SFPUC will reevaluate water system demands and supply options in order to create an updated water management plan.[261]

Non-potable water would not be provided at the project site. Approximately 8,000 gallons of potable water would be used for the initial "trim" of the float ballast tanks in order to make them level. However, the water necessary to make these adjustments would place a one-time demand on local water resources and is not anticipated to have a significant impact. During operation and maintenance, approximately 100 gallons of potable water would be used periodically to wash the decks of the Ferry Landing and Water Taxi Landing. Approximately 2,500 gallons of water per year would be used for landscape irrigation in the plaza area. As discussed in the Project Description, climate appropriate plants would be used in the landscaping of the plaza area in order to ensure minimal use of water for irrigation purposes. Overall, the project would use a minimal amount of water and would not place a large demand on local water resources. During the lifetime of the project, water would not be used in an inefficient or wasteful manner; therefore, the project would have a less-than-significant impact on water resources.

Energy

While the majority of the City and County of San Francisco receives most its electricity from Pacific Gas and Electric, the San Francisco Public Utilities Commission provides electric power to the Port of San Francisco for facilities along the waterfront. Total energy usage in the County of San Francisco in 2016 was 5,759 GWh.[262] The SFPUC expects that electricity demand will grow at a rate of 1.3 percent per year, reaching approximately 8,000 GWh per year by 2030.[263] The SFPUC generates approximately 1,600 GWh of electricity per year.[264]

Electricity would be necessary to power exterior lighting, fire alarm systems, telecommunications systems, electronic security systems, and a public address system. Supplying power to these components of the project is estimated to create a normal design load of 94 kW. The energy consumed by this project throughout construction and operation is expected to be small in comparison to other developments in the Mission Bay area. In comparison to San Francisco's projected energy demand of 8,000 GWh per year, the energy demand associated with the proposed project is minimal. The project would comply with any applicable provisions of the Port of San Francisco Green Building Standards Code. The project would have a less-than-significant impact on energy resources.

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[261] San Francisco Public Utilities Commission (SFPUC), 2016. *2015 Urban Water Management Plan for the City and County of San Francisco.* Available: http://www.sfwater.org/modules/showdocument.aspx?documentid=9300 Accessed October 12, 2017.

[262] California Energy Commission (CEC), 2016. *Electricity Consumption by County.* Available: http://ecdms.energy.ca.gov/elecbycounty.aspx Accessed November 20, 2017.

[263] San Francisco Public Utilities Commission (SFPUC), 2011a. San Francisco's 2011 Updated Electricity Resource Plan. Available: http://sfwater.org/Modules/ShowDocument.aspx?documentID=40 Accessed on November 20, 2017.

[264] San Francisco Public Utilities Commission (SFPUC), 2017. *Hydroelectric Energy*. Available: http://www.sfwater.org/index.aspx?page=207 Accessed November 20, 2017.

Impact C-ME-1: The proposed project, in combination with other past, present or reasonably foreseeable projects, would not result in a cumulative impact on mineral and energy resources. (Less than Significant)

No known minerals exist in the project site or in the vicinity; therefore, the project would not contribute to any cumulative impact on mineral resources. The geographic context of potential cumulative impacts to energy resources is the city and county of San Francisco. The proposed project would require the use of fuel, water, and energy during project construction and operation. The cumulative projects listed in Table 5 would also require the use of these resources for project construction and operation. While reasonably foreseeable projects would need to comply with the San Francisco Green Building Code, the listed cumulative projects, nonetheless, have the potential to create a cumulatively considerable impact on energy resources.

The proposed project would not place a large demand on energy resources during project construction or operation. The project would provide Bay Area commuters with additional mass transportation options. This would reduce the number of individual vehicles on the road and would reduce overall vehicle miles travelled in the Bay Area. The proposed project would not encourage the use of large amounts of energy, fuel, or water in a wasteful manner and would have a less than significant impact on energy resources. Therefore, the project's contribution to adverse cumulative impacts to energy resources would not be significant.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
18. AGRICULTURE AND FOREST RESOURCES: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. — **Would the project**					
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☐	☒
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220(g)) or timberland (as defined by Public Resources Code Section 4526)?	☐	☐	☐	☐	☒
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☐	☒

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
18. AGRICULTURE AND FOREST RESOURCES:					
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or forest land to non-forest use?	☐	☐	☐	☐	☒

The project site is located within an urbanized area of San Francisco, characterized by commercial, recreational, and industrial land uses. According to the Natural Resource Conservation Service Web Soil Survey, the soil type present at the project site is classified as "urban land, Orthents, reclaimed complex, 0 to 2 percent slopes."[265] Further, the project site and surrounding area is situated atop Bay mud (fill) that does not support agricultural practices.

No land in San Francisco County has been designated by the California Department of Conservation's Farmland Mapping and Monitoring Program as agricultural land. Because the project site does not contain agricultural uses and is not zoned for such uses, the proposed project would not require the conversion of any land designated as prime farmland, unique farmland, or Farmland of Statewide Importance to non-agricultural use. The proposed project would not conflict with any existing agricultural zoning or Williamson Act contracts. No land in San Francisco is designated as forest land or timberland by the California Public Resource Code. Therefore, the proposed project would not conflict with zoning for forest land, cause a loss of forest land, or convert forest land to a different use. For these reasons, Initial Study topics 18a through 18e are not applicable to the proposed project.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
19. MANDATORY FINDINGS OF SIGNIFICANCE — Would the project:					
a) Have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐	☐
b) Have impacts that would be individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	☐	☒	☐	☐	☐

[265] United States Department of Agriculture, Natural Resource Conservation Service, Web Soil Survey, https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx. Accessed October 17, 2017.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
19. MANDATORY FINDINGS OF SIGNIFICANCE — Would the project:					
c) Have environmental effects that would cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☒	☐	☐

a) With the incorporation of mitigation measures, the proposed project would not have the potential to degrade the quality of the environment. As discussed in Section 13, Biological Resources, with the implementation of Mitigation Measures M-BI-1a through M-BI-1d and M-BI-2, the proposed project would not adversely affect biological resources. The proposed project would not substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plan or animal community, or reduce the number or restrict the range of a rare or endangered plant or animal. No special-status plant species occur within the project area. The occurrence of special-status aquatic species within the project area is very unlikely and would be temporary in nature. However, during construction, pile driving could have an impact on special-status fish species within the project area by creating underwater noise and acoustic pressure. Additionally, dredging could lead to a variety of impacts to both organisms and habitat. As such, M-BI-1a and M-BI-1b would ensure that, in the unlikely event that special-status aquatic species are present in the project area during construction, the impact on these species would be less than significant. In order to mitigate impacts to aquatic species during operation of the proposed project, the project would adopt M-BI-1d, which would require ferries to travel down existing deeper corridors in order to leave undisturbed, shallow, open-water habitat.

There is no suitable habitat for the nesting of special-status birds at the project site. However, a number of common bird species could nest near the project site. Mitigation measure M-BI-1c would ensure that the proposed project would include pre-construction nesting surveys and establish no-work buffer zones around active nests in order to prevent impacts to nesting birds.

In order to avoid substantial adverse impacts to waters of the U.S. under jurisdiction of the USACE, waters of the State under jurisdiction of the RWQCB, and waters and land under BCDC and State Lands Commission jurisdiction, the proposed project would adopt Mitigation Measure M-BI-2. The mitigation measure would prevent the spill of construction materials, fuel, and hazardous waste into Bay waters and require preparation of a clean-up plan in the event of a spill. Together, Mitigation Measures M-BI-1a through M-BI-1d and M-BI-2 would reduce impacts to the environment, wildlife, and habitats to less than significant.

The proposed project would not eliminate important examples of California history or prehistory. As discussed in Section 4, Cultural Resources, the project would not impact any historical resources. While it is unlikely that archaeological resources would be disturbed during project construction, pile-driving, dredging, and grading have the potential to disturb unknown and unrecorded archaeological or historical resources. Mitigation Measure M-CR-2 outlines a plan to mitigate damage to such resources upon accidental discovery. The project would not have an impact on tribal cultural resources, as no such resources have been identified. However, Mitigation Measure M-CR-2 applies to tribal cultural resources, and measures to prevent damage to such resources would be developed in the event of a discovery of tribal cultural resources. Mitigation Measure M-CR-4 requires that if tribal cultural resources are found, the project should be redesigned to avoid any adverse effect on the resource, if feasible. Additionally, this measure requires that an interpretive program be developed if preservation-in-place is not an option. Mitigation Measures M-CR-2 and M-CR-4 would reduce any impacts to archaeological or historical resources to less than significant. Therefore, the proposed project would not eliminate important examples of the major periods of California history or prehistory.

b) The proposed project, in combination with past, future, and foreseeable projects would not result in any cumulative impacts. As the project would not create new housing or employment, the project would not contribute to cumulative impacts related to population and housing, utilities, recreation, and public services. The project would result in less-than-significant impacts to land use, aesthetics, noise, greenhouse gas emissions, wind and shadow, air quality, geology and soils, hydrology and water quality, hazards, mineral and energy resources, and agricultural and forest resources, and would not contribute to any cumulative effects regarding these topics. Implementation of Mitigation Measures M-CR-2, M-CR-4, M-BI-1a through M-BI-1d, and M-BI-2would ensure that the proposed project would not result in cumulative impacts regarding cultural resources or biological resources.

c) As discussed in Section 16, Hazards and Hazardous Materials, naturally-occurring asbestos is present in the artificial fill materials at the project site. Implementation of Asbestos ATCM requirements would ensure that no visible dust would cross the project boundaries and the public would not be exposed to naturally-occurring asbestos and associated metals. As a result, the proposed project would not result in adverse effects to humans.

F. Mitigation Measures and Improvement Measures

The following mitigation measure has been identified to reduce potentially significant impacts resulting from the proposed project to a less-than-significant level. Improvement measures recommended to reduce or avoid less-than-significant impacts are also identified below. Accordingly, the Port has agreed to implement the mitigation measures and all improvement measures described below.

Mitigation Measures

Mitigation Measure M-CR-2: Accidental Discovery of Archeological Resources

The following mitigation measure is required to avoid any potential adverse effect from the proposed project on accidentally discovered buried or submerged historical resources as defined in CEQA Guidelines section 15064.5(a)(c). The Port shall distribute the Planning Department archeological resource "ALERT" sheet to the project prime contractor; to any project subcontractor (including demolition, excavation, grading, foundation, pile driving, etc. firms); or utilities firm involved in soils disturbing activities within the project area. Prior to any soils disturbing activities being undertaken each contractor is responsible for ensuring that the

"ALERT" sheet is circulated to all field personnel including, machine operators, field crew, pile drivers, supervisory personnel, etc. The Port shall provide the Environmental Review Officer (ERO) with a signed affidavit from the responsible parties (prime contractor, subcontractor(s), and utilities firm) to the ERO confirming that all field personnel have received copies of the Alert Sheet.

Should any indication of an archeological resource be encountered during any soils disturbing activity of the project, the project Head Foreman and/or Port shall immediately notify the ERO and shall immediately suspend any soils disturbing activities in the vicinity of the discovery until the ERO has determined what additional measures should be undertaken.

If the ERO determines that an archeological resource may be present within the project area, the Port shall retain the services of an archeological consultant from the pool of qualified archeological consultants maintained by the Planning Department archeologist. The archeological consultant shall advise the ERO as to whether the discovery is an archeological resource, retains sufficient integrity, and is of potential scientific/historical/cultural significance. If an archeological resource is present, the archeological consultant shall identify and evaluate the archeological resource. The archeological consultant shall make a recommendation as to what action, if any, is warranted. Based on this information, the ERO may require, if warranted, specific additional measures to be implemented by the Port.

Measures might include: preservation in situ of the archeological resource; an archeological monitoring program; or an archeological testing program. If an archeological monitoring program or archeological testing program is required, it shall be consistent with the Environmental Planning (EP) division guidelines for such programs. The ERO may also require that the Port immediately implement a site security program if the archeological resource is at risk from vandalism, looting, or other damaging actions.

The project archeological consultant shall submit a Final Archeological Resources Report (FARR) to the ERO that evaluates the historical significance of any discovered archeological resource and describing the archeological and historical research methods employed in the archeological monitoring/data recovery program(s) undertaken. Information that may put at risk any archeological resource shall be provided in a separate removable insert within the final report.

Copies of the Draft FARR shall be sent to the ERO for review and approval. Once approved by the ERO, copies of the FARR shall be distributed as follows: California Archaeological Site Survey Northwest Information Center (NWIC) shall receive one (1) copy and the ERO shall receive a copy of the transmittal of the FARR to the NWIC. The Environmental Planning division of the Planning Department shall receive one bound copy, one unbound copy and one unlocked, searchable PDF copy on CD three copies of the FARR along with copies of any formal site recordation forms (CA DPR 523 series) and/or documentation for nomination to the National Register of Historic Places/California Register of Historical Resources. In instances of high public interest or interpretive value, the ERO may require a different final report content, format, and distribution than that presented above.

Mitigation Measure M-CR-4: Tribal Cultural Resources Interpretive Program

If the ERO determines that a significant archeological resource is present, and if in consultation with the affiliated Native American tribal representatives, the ERO determines that the resource constitutes a tribal cultural resource (TCR) and that the resource could be adversely affected by the proposed project, the proposed project shall be redesigned so as to avoid any adverse effect on the significant tribal cultural resource, if feasible.

If the Environmental Review Officer (ERO), in consultation with the affiliated Native American tribal representatives and the Port of San Francisco, determines that preservation-in-place of the tribal cultural resources is not a sufficient or feasible option, the Port of San Francisco shall implement an interpretive program of the tribal cultural resource in consultation with affiliated tribal representatives. An interpretive plan produced in consultation with the ERO and affiliated tribal representatives, at a minimum, and approved by the ERO would be required to guide the interpretive program. The plan shall identify, as appropriate, proposed locations for installations or displays, the proposed content and materials of those displays or installation, the producers or artists of the displays or installation, and a long-term maintenance program. The interpretive program may include artist installations, preferably by local Native American artists, oral histories with local Native Americans, artifacts displays and interpretation, and educational panels or other informational displays.

Mitigation Measure M-BI-1a: Pile Driving

The avoidance and minimization measures specific to pile driving activities, below, have been developed in accordance with the majority of the measures outlined in the 2013 NLAA Programmatic criteria, in order to reduce Project effects on sensitive resources. Avoidance and minimization measures that would reduce Project noise effects include the following:

- All in-water pile driving shall be conducted within the established Bay area environmental work windows between June and November in order to avoid potential impacts to fish species for this area of San Francisco Bay. These windows were promulgated in a programmatic biological opinion (NMFS and CDFW) for the Long Term Management Strategy program for managing sediment within the San Francisco Bay.

- The Port shall develop a NMFS-approved sound monitoring plan prior to the start of pile driving. This plan shall provide detail on the methods used to monitor and verify sound levels during pile driving activities. The sound monitoring results shall be made available to NMFS.

- Vibratory pile drivers may be used for the installation of 36-inch diameter steel pilings. Vibratory pile driving shall be conducted following the USACE "Proposed Procedures for Permitting Projects that will Not Adversely Affect Selected Listed Species in California". USFWS and NMFS completed section 7 consultation on this document which establishes general procedures for minimizing impacts to natural resources associated with projects in or adjacent to jurisdictional waters.[266]

- A "soft start" technique to impact hammer pile driving shall be implemented, at the start of each work day or after a break in impact hammer driving of 30 minutes or more, to give fish and marine mammals an opportunity to vacate the area.

- During the use of an impact hammer, a bubble curtain or other sound attenuation method may be utilized to reduce sound levels. If NMFS sound level criteria are still exceeded with the use of attenuation methods, the contractor shall revise sound attenuation methods as per the approved sound monitoring plan. A NMFS-approved biological monitor shall be available to conduct surveys before and during impact pile driving as specified by NMFS. The monitor shall inspect the established work zone and adjacent Bay waters and document the following during impact pile-driving:

[266] National Oceanic and Atmospheric Administration (NOAA), 2007. Report on the Subtidal Habitats and Associated Biological Taxa in San Francisco Bay. August.

- Maintain the safety zones established in the sound monitoring plan around sound source, for the protection of marine mammals in association with sound monitoring station distances.
- Halt work activities when a marine mammal enters the Level A[267] safety zone and resume only after the animal has been gone from the area for a minimum of 15 minutes.
- Maintain sound levels below 90 dBA in air when pinnipeds (seals and sea lions) are present.[268]

Mitigation Measure M-BI-1b: Dredging

The Port shall require the selected contractor to use clamshell dredging equipment and conduct dredging between June 1 and November 30 in accordance with Long Term Management Strategy dredging windows to minimize potential adverse effects on fish and invertebrate species.

The Port shall assess the environmental risk to aquatic resources in developing sediment capping design and mitigate potential impacts based upon regulatory and resource agency review and a RWQCB approved cap design. Dredging for capping shall be conducted between June 1 and November 30 in accordance with Long Term Management Strategy dredging windows to minimize potential adverse effects on fish and invertebrate species.

Mitigation Measure M-BI-1c: Nesting Bird Protection Measures

Nesting birds and their nests shall be protected during construction by use of the following measures:

1. A qualified wildlife biologist shall conduct pre-construction nesting surveys during the avian nesting breeding season (approximately February 15 to September 15) within 7 days prior to construction. Surveys shall be performed for the project site, vehicle and equipment staging areas, and suitable habitat within 250 feet to locate any active passerine (perching bird) nests and within 500 feet to locate any active raptor (bird of prey) nests.

2. If active nests are located during the pre-construction nesting bird surveys, the qualified wildlife biologist shall evaluate if the schedule of construction activities could affect the active nests and the following measures shall be implemented based on their determination:

   a. If construction is not likely to affect the active nest, construction may proceed without restriction.

   b. If it is determined that construction may affect the active nest, the qualified biologist shall establish a no-disturbance buffer around the nest(s) and all project work would halt within the buffer until a qualified biologist determines the nest is no longer in use. Typically, these buffer distances are up to 250 feet for passerines and 500 feet for raptors; however, the buffers may be adjusted downward for some species, or if an obstruction, such as a building, is within line-of-sight between the nest and construction activities.

   c. Modifying nest buffer distances, allowing certain construction activities within the buffer, and/or modifying construction methods in proximity to active nests shall be done at the discretion of the qualified biologist and in coordination with the Port, who would

[267] Defined as any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild.

[268] NOAA, 2007. Report on the Subtidal Habitats and Associated Biological Taxa in San Francisco Bay. August.

notify CDFW. Necessary actions to remove or relocate an active nest(s) shall be coordinated with the Port and approved by CDFW.

d. Any work that must occur within established no-disturbance buffers around active nests shall be monitored by a qualified biologist. If adverse effects in response to project work within the buffer are observed and could compromise the nest, work within the no-disturbance buffer(s) shall halt until the nest occupants have fledged.

e. Any birds that begin nesting within the project site and survey buffers amid construction activities shall be assumed to be habituated to construction-related or similar noise and disturbance levels and no work exclusion zones shall be established around active nests in these cases; however, should birds nesting nearby begin to show disturbance associated with construction activities, no-disturbance buffers shall be established as determined by the qualified wildlife biologist.

Mitigation Measure M-BI-1d: Use of Designated Ferry Routes

To minimize potential direct impacts on rafting waterbirds, ferry commute routes shall occur within defined travel routes during normal service, ferries shall travel down existing deeper channel areas as much as possible, and make use of the shortest routes across shallow areas where waterbird rafting is anticipated, to leave as much undisturbed shallow open-water habitat as possible.

Mitigation Measure M-BI-2: Construction Activities

Construction activities shall avoid or minimize adverse effects on jurisdictional waters to the full extent feasible. Specifically:

- A Spill Prevention Control and Countermeasure (SPCC) Plan shall be prepared by the selected contractor to address the emergency cleanup of any hazardous material and shall be available on site. The SPCC shall be submitted to the Port and RWQCB for review and approval.

- The party undertaking construction work shall exercise every reasonable precaution to protect listed species and EFH-protected species and their habitat(s) from construction by-products and pollutants such as demolition debris, construction chemicals, fresh cement, saw-water, or other deleterious materials. Construction may be conducted from both land and water as deemed appropriate by the Port. Care shall be used by equipment operators to control debris so that it does not enter the Bay.

- A Materials Management Disposal Plan (MMDP) shall be prepared by the selected contractor to prevent any debris from falling into the Bay during construction to the maximum extent practicable. The measures identified in the MMDP shall be based on the Best Available Technology, and shall include, but not be limited to, the following measures:

  - During construction, the barges performing the work shall be moored in a position to capture and contain the debris generated during any sub-structure or in-water work. In the event that debris does reach the Bay, personnel in workboats within the work area will immediately retrieve the debris for proper handling and disposal. All debris shall be disposed of at an authorized upland disposal site;

  - Measures to ensure that fresh cement or concrete shall not be allowed to enter San Francisco Bay. Construction waste shall be collected and transported to an authorized upland disposal area, as appropriate, and per federal, state, and local laws and regulations;

- All hazardous material shall be stored upland in storage trailers and/or shipping containers designed to provide adequate containment. Short-term laydown of hazardous materials for immediate use shall be permitted with the same anti-spill precautions;
- All construction material, wastes, debris, sediment, rubbish, trash, fencing, etc., shall be removed from the site once the proposed project is completed and transported to an authorized disposal area, as appropriate, in compliance with applicable federal, state, and local laws and regulations;
- Construction material shall need to be covered every night and during any rainfall event (if there is one);
- Construction crews shall reduce the amount of disturbance within the project site to the minimum necessary to accomplish the project; and
- Measures to prevent site water from entering the Bay.

The MMDP shall be submitted to the RWQCB for review and approval.

- Vessels and equipment that rely on internal combustion engines for power and/or propulsion shall be kept in goof working condition, and compliant with California emission regulations.
- Vehicles and equipment that are used during the course of construction shall be fueled and serviced off-site, with the exception of small amounts of oil/gas for small generators, and cranes on barges, using 55 gallon drums, etc. Fueling locations shall be inspected after fueling to document that no spills have occurred. Any spills shall be cleaned up immediately. No in-water fueling shall be permitted.

Improvement Measures

Improvement Measure I-NO-2: Neighbor Notification of Vibration-Inducing Construction Activities

At least one week prior to the start of pile driving activities, the Port shall notify owners and occupants within 500 feet of the project site of the dates, hours, and expected duration of such activities.

Improvement Measure I-TR-1: Construction Management Plan and Public Updates. The Port or the Port's contractor shall comply with the following:

Construction Management Plan—The Port should develop and, upon review and approval by the SFMTA and Public Works, implement a Construction Management Plan, addressing transportation-related circulation, access, staging and hours of delivery. The Construction Management Plan shall disseminate appropriate information to contractors and affected agencies with respect to coordinating construction activities to minimize overall disruption and ensure that overall circulation in the project area is maintained to the extent possible, with particular focus on ensuring transit, pedestrian, and bicycle connectivity. The Construction Management Plan shall supplement and expand, rather than modify or supersede, any manual, regulations, or provisions set forth by the SFMTA, Public Works, or other City departments and agencies, and the California Department of Transportation. Management practices could include: best practices for accommodating pedestrians and bicyclists, and identifying routes for construction trucks to utilize.

Carpool, Bicycle, Walk, and Transit Access for Construction Workers—To minimize parking demand and vehicle trips associated with construction workers, the construction contractor should include as part of the Construction Management Plan methods to encourage carpooling, bicycle, walk and transit access to the project site by construction workers (such as providing secure bicycle parking spaces, participating in free-to-employee and employer ride matching program from www.511.org, participating in emergency ride home program through the City of San Francisco (www.sferh.org), and providing transit information to construction workers.

Construction Worker Parking Plan—As part of the Construction Management Plan that shall be developed by the construction contractor, the location of construction worker parking could be identified as well as the person(s) responsible for monitoring the implementation of the proposed parking plan. The use of on-street parking to accommodate construction worker parking should be discouraged.

Project Construction Updates for Adjacent Businesses *and Residents*—To minimize construction impacts on access to nearby residences and businesses, the Port should provide nearby residences and adjacent businesses with regularly-updated information regarding project construction, including construction activities, peak construction vehicle activities (e.g., concrete pours), travel lane closures, and parking lane and sidewalk closures. A regular email notice should be distributed by the Port that shall provide current construction information of interest to neighbors, as well as contact information for specific construction inquiries or concerns.

G. PUBLIC NOTICE AND COMMENT

On September 20, 2017, the Planning Department mailed a Notice of Project Receiving Environmental Review to property owners within 300 feet of the project site, adjacent tenants, and other potentially interested parties. No comments were received.

On May 2, 2018, the Planning Department issued a "Notice of Availability of and Intent to Adopt a Negative Declaration" in accordance with CEQA Guidelines section 15072. A request for a hardcopy was received, which was sent to the requester. A comment was received asking about the need for two separate piers, which would occur due to the size difference between the vessels used at either pier, and because of different operators for the ferry and water taxi. No other comments were received.

H. DETERMINATION

On the basis of this Initial Study:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, no further environmental documentation is required.

Lisa Gibson
Environmental Review Officer
for
John Rahaim
Director of Planning

DATE:

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APPENDIX TR

Mission Bay Ferry Landing - Travel Demand Calculations

FERRY SERVICE Weekday Service	(1) Annual Weekday Ridership	[C] # of weekdays	(1) Average Weekday Boardings	(2) # of boat trips per day	[C] Average passengers per boat	(2) Ferryboat Capacity (passengers)	[C] Proportion of MB trips on Ferryboat
2020	366,000	251	1,460	23	63	400	16%
2040	318,400	251	1,270	23	55	400	14%

Special Event Service	(1) Annual Event Ridership	(3) # of event days	[C] Average Event Day Boardings	(4) # of boat trips per day
2020	124,900	80	1,570	4
2040	118,100	80	1,480	8

(1) Benefit Cost Analysis for San Francisco Mission Bay Ferry Service, Appendix B - Tables B2 and B3
(2) Project Description
(3) Port of SF 11/9/17 meeting
(4) Only post-event service is planned in Year 2020; Port of SF (11/16/17 written communication)
[C] Calculated

WATER TAXI

Boat trips per day	15	(2)
Maximum passenger capacity of boat	45	(2)
Maximum potential daily boardings	675	[C]
Proportion of MB trips on ferryboat	16%	[Assumed similar to ferryboats]
Daily boardings to/from Mission Bay	106	[C]
Average passengers per boat	7	[C]

MODAL SPLIT FOR COMMUTERS	(5) Commuters at Ferry Building	Adjusted for Mission Bay Conditions	
Auto (incl. TNC & taxi)	0%	2%	[C]
Transit	37%	12%	[1/3 of Ferry Building]
Walk	57%	80%	[40% more than Ferry Bld]
Bike	6%	6%	[same as Ferry Building]
TOTAL	100%	100%	

(5) WETA Downtown SF Ferry Terminal Expansion Project EIS/EIR, 2014; (Table 3.2-13)

Mission Bay Ferry Landing - Travel Demand Calculations

DAILY PERSON TRIPS BY MODE

	Daily Person Trips by Ferryboat	Daily Person Trips by Water Taxi	Total Daily Person Trips	Additional Event Day Person Trips	Total Daily Person Trips on Event Days
Auto (incl. TNC & taxi)	27	2	29		29
Transit	180	13	193		193
Walk	1,165	85	1,250	1,570	2,820
Bike	88	6	94		94
TOTAL	1,460	106	1,566	1,570	3,136
	93%	*7%*	*100%*		

AM AND PM PEAK PERIOD PERSON TRIPS BY MODE (No Event Day)

	AM Peak Period		PM Peak Period	
Time	6:45-9:45 AM	(2)	5:00-7:30 PM	(2)
Duration	3 hours	(2)	2.5 hours	(2)
Total ferryboats	11	(2)	12	(2)
Ferryboats per hour	3.7	[C]	4.8	[C]
Total taxi service boats	5	(6)	5	(6)
Taxi boats per hour	1.7	[C]	2.0	[C]

(6) Assumes that one third of all the taxi service riders would travel during each commute period.

	AM Peak Period Person Trips			PM Peak Period Person Trips		
No Event Day	by Ferryboat	by Water Taxi	Total	by Ferryboat	by Water Taxi	Total
Auto (incl. TNC & taxi)	14	1	15	14	1	15
Transit	90	4	94	90	4	94
Walk	582	28	610	582	28	610
Bike	44	2	46	44	2	46
TOTAL	730	35	765	730	35	765

	AM Peak Period Person Trips			PM Peak Period Person Trips		
Additional Event Day Trips	by Ferryboat	by Water Taxi	Total	by Ferryboat	by Water Taxi	Total
Auto (incl. TNC & taxi)			0			0
Transit			0			0
Walk			0	732	53	785
Bike			0			0
TOTAL	0	0	0	732	53	785

	AM Peak Period Person Trips			PM Peak Period Person Trips		
Total Event Day	by Ferryboat	by Water Taxi	Total	by Ferryboat	by Water Taxi	Total
Auto (incl. TNC & taxi)	14	1	15	14	1	15
Transit	90	4	94	90	4	94
Walk	582	28	610	1,314	81	1,395
Bike	44	2	46	44	2	46
TOTAL	730	35	765	1,462	88	1,550

Mission Bay Ferry Landing - Travel Demand Calculations

AM AND PM PEAK PERIOD PERSON TRIPS BY MODE AND DIRECTION OF TRAVEL (7)

	AM Peak Period Person Trips			PM Peak Period Person Trips		
No Event Day	Inbound	Outbound	Total	Inbound	Outbound	Total
Auto (incl. TNC & taxi)	11	4	15	5	10	15
Transit	66	28	94	28	66	94
Walk	427	183	610	183	427	610
Bike	32	14	46	14	32	46
TOTAL	536	229	765	230	535	765

(7) Assumes that 30% of the commuter trips would be in the counter-commute direction during each period.

	AM Peak Period Person Trips			PM Peak Period Person Trips		
Event Day	Inbound	Outbound	Total	Inbound	Outbound	Total
Auto (incl. TNC & taxi)	11	4	15	5	10	15
Transit	66	28	94	28	66	94
Walk	427	183	610	968	427	1,395
Bike	32	14	46	14	32	46
TOTAL	536	229	765	1,015	535	1,550

AM AND PM PEAK HOUR PERSON TRIPS BY MODE (8)

	AM Peak Hour Person Trips			PM Peak Hour Person Trips		
No Event Day	by Ferryboat	by Water Taxi	Total	by Ferryboat	by Water Taxi	Total
Auto (incl. TNC & taxi)	5	0	5	6	0	6
Transit	35	2	37	41	2	43
Walk	223	10	233	269	13	282
Bike	17	1	18	20	1	21
TOTAL	280	13	293	336	16	352

	AM Peak Hour Person Trips			PM Peak Hour Person Trips		
Event Day	by Ferryboat	by Water Taxi	Total	by Ferryboat	by Water Taxi	Total
Auto (incl. TNC & taxi)	5	0	5	6	0	6
Transit	35	2	37	41	2	43
Walk	223	10	233	1,001	66	1,067
Bike	17	1	18	20	1	21
TOTAL	280	13	293	1,068	69	1,137

(8) Assumes that commuter travel during the peak hour is 15 percent higher than the hourly average during the peak period.

Mission Bay Ferry Landing - Travel Demand Calculations

AM AND PM PEAK HOUR PERSON TRIPS BY MODE AND DIRECTION OF TRAVEL (8)

	AM Peak Hour Person Trips			PM Peak Hour Person Trips		
No Event Day	Inbound	Outbound	Total	Inbound	Outbound	Total
Auto (incl. TNC & taxi)	4	1	5	1	5	6
Transit	25	12	37	13	30	43
Walk	164	69	233	86	196	282
Bike	12	6	18	6	15	21
TOTAL	205	88	293	106	246	352

	AM Peak Period Person Trips			PM Peak Period Person Trips		
Event Day	Inbound	Outbound	Total	Inbound	Outbound	Total
Auto (incl. TNC & taxi)	4	2	5	1	5	6
Transit	25	11	37	13	30	43
Walk	164	70	233	871	196	1,067
Bike	12	5	18	6	15	21
TOTAL	205	88	293	891	246	1,137

(8) Assumes that commuter travel during the peak hour is 15 percent higher than the hourly average during the peak period.

AM AND PM PEAK HOUR PASSENGERS PER VESSEL AND DIRECTION OF TRAVEL

	AM Peak Hour			PM Peak Hour		
No Event Day	Inbound	Outbound	Total	Inbound	Outbound	Total
Per ferryboat	53	23	76	21	49	70
Per taxi boat	6	2	8	2	6	8

	AM Peak Hour			PM Peak Hour (9)		
Event Day	Inbound	Outbound	Total	Inbound	Outbound	Total
Per ferryboat	53	23	76	174	49	223
Per taxi boat	6	2	8	12	6	18

(9) Assumes that event bound passengers would travel during the second half of the peak commute period

Table B2 Weekday Ferry Ridership

Year / Item	Scenario		Number	
	Baseline	Mission Bay Ferry	Change	Percent Change
2020				
Annual Ridership				
Mission Bay Ferry		366,000	366,000	
Oakland		245,700	245,700	
Alameda		50,100	50,100	
Vallejo		37,600	37,600	
Larkspur		32,600	32,600	
All Bay Area Ferry	**4,237,100**	**4,337,400**	**100,300**	**2.4%**
Average Weekday				
Mission Bay Ferry		1,460	1,460	
Oakland		980	980	
Alameda		200	200	
Vallejo		150	150	
Larkspur		130	130	
All Bay Area Ferry	**16,900**	**17,300**	**400**	**2.4%**
2040				
Annual Ridership				
Mission Bay Ferry		318,400	318,400	
Oakland		205,600	205,600	
Alameda		42,600	42,600	
Vallejo		30,100	30,100	
Larkspur		37,600	37,600	
All Bay Area Ferry	**5,490,600**	**5,515,700**	**25,100**	**0.5%**
Average Weekday				
Mission Bay Ferry		1,270	1,270	
Oakland		820	820	
Alameda		170	170	
Vallejo		120	120	
Larkspur		150	150	
All Bay Area Ferry	**21,900**	**22,000**	**100**	**0.5%**

Table B3 Special Event Ferry Ridership

Year / Item	Scenario		Number	
	Baseline	Mission Bay Ferry	Change	Percent Change
2020				
Annual Special Events				
Ferry	19,500	124,900	105,400	541%
All Transit	959,500	995,000	35,500	3.7%
Single Event				
Ferry	170	1,090	920	541%
All Transit	8,370	8,680	310	3.7%
2040				
Annual Special Events				
Ferry	19,500	118,100	98,600	506%
All Transit	974,400	1,016,800	42,400	4.4%
Single Event				
Ferry	170	1,030	860	506%
All Transit	8,500	8,870	370	4.4%

Table 3.2-13
Existing Conditions Plus Project Mode Split and Assignment

Mode	Mode (%)	AM Peak Hour Passengers	PM Peak Hour Passengers
Auto	0	0	0
Transit	37	1,320	1,435
Walk	57	2,052	2,274
Bike	6	205	228
Total	**100**	**3,577**	**3,937**

Sources: WETA, 2011; CSI, 2012; DKS Associates, 2012.
Note:
The WETA ridership model grouped walking and biking in one category; i.e., nonmotorized. The ratio of walkers to bicyclists was estimated at 91 percent to 9 percent, based on passenger survey data collected in 2011 for WETA water transit services into the Ferry Terminal.
The mode split percentages represent the mode split for the increment of additional water transit passengers from the proposed project (not the total mode split for water transit passengers).
WETA = Water Emergency Transportation Authority

No auto access or egress trips are expected to be generated in San Francisco by the project; however, WETA passengers may occasionally be dropped off at or picked up from the Ferry Terminal by taxis or other vehicles. There are currently no legal pick-up or drop-off zones adjacent to the Ferry Terminal along The Embarcadero. Vehicles, including taxis, would have to stop illegally or use designated taxi stands, which are located at some distance from the Ferry Terminal (e.g., on Market Street). Illegal pick-ups and drop-offs in front of the Ferry Terminal may continue in the future, but the number of vehicle trips is expected to remain small—10 to 30 trips or fewer during the AM and PM peak hours—if the curbside restrictions continue to be strictly enforced.

The WETA model and ridership surveys also provide origin and destination information within San Francisco. Refer to Table 3.2-14 for trip distribution by Superdistrict.

Table 3.2-14
Existing Conditions Plus Project – Trip Distribution

Place of Trip Origin/ Destination	Traveling to San Francisco – Transit (%)	Traveling to San Francisco – Walk/Bike (%)	Traveling from San Francisco – All Modes
San Francisco			
Superdistrict 1	82.2	96.8	—
Superdistrict 2	7.3	0.4	—
Superdistrict 3	75.8	0.6	—
Superdistrict 4	4.7	2.3	—
East Bay	—	—	36.3
North Bay	—	—	29.7
South Bay	—	—	0.6
Treasure Island	—	—	33.4
Total	**100**	**100**	**100**

Sources: CSI, 2011; Fehr & Peers, 2010; DKS Associates, 2012.
Note:
% = percent

APPENDIX AQ

Air Quality Impact Analysis Appendix

Environmental Science Associates (ESA) prepared an air quality analysis as part of the Initial Study/Mitigated Negative Declaration (IS/MND) for the Mission Bay Ferry Landing and Water Taxi Landing project (project).

The impacts associated with the Water Emergency Transportation Authority's (WETA's) planned expansion of water transit routes and services were analyzed in the Program EIR for the Implementation and Operations Plan (WETA, 2003a), and therefore were not assessed in the IS/MND. This analysis considers at a project level the site-specific impacts of improvements for the proposed project, and impacts associated with the increase in vessels while they use and/or are docked at the Ferry and Water Taxi Landings. The Program EIR analyzed the air quality impacts associated with the regional and cumulative increase in water transit by comparing regional emissions of all sources (i.e., vehicles, buses, and water transit vessels) that would result from the proposed water transit system expansion with those that would result from the no project alternative. The Program EIR air quality analysis indicated that the water transit system expansion project would result in a reduction in air emissions for most potential pollutants (NO_x, PM_{10}, $PM_{2.5}$, CO, and combined ozone precursors [ROG and NO_x]). The Program EIR concluded that the expansion of water transit service could result in a regional increase in ROG. The Program EIR also suggested that the proposed expansion of the water transit system could result in site-specific air quality impacts related to NO_2 and PM at the project site. The project-level analysis for the proposed project provides an additional site-specific analysis of potential impacts.

The methods used to evaluate criteria air pollutant emissions and health risks associated with toxic air contaminants (TACs) resulting from the proposed project were developed in concurrence with San Francisco Planning Department Environmental Planning (EP) Division's CEQA requirements. Specifically, this appendix details the methods used to evaluate criteria air pollutant, fine particulate matter ($PM_{2.5}$) emissions from vehicle and ferry exhaust, and diesel particulate matter (DPM) emissions from vehicle and vessel exhaust, as well as associated health risks from construction equipment exhaust and operational sources (both project and cumulative) on new and existing off-site sensitive receptors[1] located in the vicinity of the proposed project.

Project Description

The proposed project would be located on San Francisco Bay, near the intersection of Terry Francois Boulevard and 16th Street, adjacent to Agua Vista Park and nearby planned Bayfront Park. Another element of the project, a proposed Water Taxi Landing, would be located approximately 400 feet south of the proposed Ferry Landing location, adjacent to Agua Vista

1 The BAAQMD generally defines a sensitive receptor as a facility or land use that houses or attracts members of the population who are particularly sensitive to the effects of air pollutants, such as children, the elderly, and people with illnesses. Examples of sensitive receptors include residences, schools, and hospitals.

Park and approximately 100 feet south of the existing Agua Vista Park fishing pier. Both sites are located completely on Port of San Francisco (Port) property.

Project Characteristics

The Port is proposing to construct a single-float, two-berth Ferry Landing to provide regional ferry service, and a separate single float, two-berth Water Taxi Landing to provide local water taxi access to the Mission Bay area and surrounding neighborhoods (see **Figure 1**). The design of the proposed ferry and water taxi landings would conform to the current Americans with Disabilities Act (ADA) Standards for Accessible Design.

The purpose of the project is to provide new ferry and water taxi landing facilities to enable regional water-based public transportation and emergency response in the Mission Bay and Central Waterfront areas of the City of San Francisco; to support current and future transit demand; to reduce vehicular trips in the Mission Bay area; and to alleviate trans-bay commute traffic.

The proposed project includes direct special event service to the future Chase Center that was not considered in WETA's 2003 Program EIR. Pre-event arrival will be part of the normal commuter service for events that occur Monday through Friday. Up to 4 vessel trips would occur for special event end times, departing the Ferry Landing between approximately 9:30 p.m. and 10:00 p.m., or upon the conclusion of games or events at the Chase Center. Return service may connect first with the Ferry Building terminal before departing for locations in the North Bay and East Bay. Special event service would be provided for all Golden State Warriors' games (41 regular season games), including pre-season (3 games) and post-season (up to 16 playoff games). Service also would be provided for approximately 20 additional events per year at the Chase Center. Therefore, ferry service would be provided for 80 special events per year. Special event service would be provided for approximately 12 Warriors' games that occur on the weekend or holidays. Weekend service may also be provided for concerts and other events at the Chase Center. Other weekend events may occur at variable times but WETA has indicated that service for such events would not be provided unless attendance was anticipated to exceed 5,000. Under a maximum special event service operating scenario, up to 4 vessel trips would occur per event occurring Monday through Friday and 8 vessel trips per event on the weekend or holidays. Therefore, assuming 75 percent of non-Warriors' events occur during the work week, emissions from ferry operations for special event service is based on a total of 388 trips per year.

The proposed project also includes use of a proposed Water Taxi Landing to licensed operators, which was also not considered in WETA's 2003 Program EIR. Water taxis would be approximately 29 feet to 54 feet long and carry between 6 and a maximum of 45 passengers. Vessel trips would occur from various locations around the Bay, including from Pier 1.5, Pier 39, Fisherman's Wharf, Sausalito, Berkeley, and Richmond. It is anticipated that 10-15 trips would occur per day with more on days with Golden State Warriors' games or other events at the Chase Center.

SOURCE: ESA, 2017

Mission Bay Ferry Landing and Water Taxi Landing Project

Figure 1
Location Map

Objective and Methods

The air quality analysis evaluates criteria air pollutant emissions and health risks associated with construction and operation of the project. Criteria air pollutant estimates include reactive organic gases (ROG), particulate matter from vehicle exhaust with and aerodynamic diameter equal to or less than 10 microns (PM_{10}), and particulate matter from vehicle exhaust with an aerodynamic diameter equal to or less than 2.5 microns ($PM_{2.5}$). Fugitive emissions of PM_{10} and $PM_{2.5}$ from construction activities (e.g. dust) are not estimated in the air quality analysis, because the project would comply with the San Francisco Construction Dust Control Ordinance (176-08) (City and County of San Francisco. 2008).[2] However, fugitive emissions of PM_{10} and $PM_{2.5}$ for operational activities are estimated per BAAQMD guidance. Health risks are estimated for emissions of DPM from off-road construction equipment; idling of ferries at the landing; on-road heavy-duty diesel trucks; and marine vessels used in dredging and construction. The analysis does not include other toxic air contaminants (TACs) besides DPM, as DPM is considered the primary TAC of concern for the project.

The approach for the air quality analysis is consistent with EP requirements, using technical information from the BAAQMD, California Air Pollution Control Officer's Association (CAPCOA), California Air Resources Board (ARB), Office of Environmental Health Hazard Assessment (OEHHA), and the U.S. Environmental Protection Agency (USEPA). Consistent with guidelines and recommendations from these agencies, the screening-level health risk assessment (HRA) contained in the air quality analysis evaluates the estimated incremental increase in lifetime cancer risks from exposure to emissions of DPM and the annual average $PM_{2.5}$ concentrations associated with combustion (i.e., exhaust) that would be emitted by project-related construction and operational sources, including ferry idling and maintenance dredging.

The San Francisco Citywide HRA evaluates the cumulative lifetime cancer risks and annual average exhaust $PM_{2.5}$ concentrations from existing known sources of air pollution as part of the development of a Community Risk Reduction Plan (CRRP) (referred to as the CRRP-HRA). The modeling is documented in *The San Francisco Community Risk Reduction Plan: Technical Support Documentation* (BAAQMD, SF DPH & SF Planning, 2012). The cumulative screening-level HRA for the project estimates lifetime excess cancer risk and annual average exhaust $PM_{2.5}$ concentrations that are attributable to other mobile and stationary sources as calculated in the CRRP-HRA, in addition to affects from the project. The CRRP-HRA was completed before OEHHA updated its Air Toxics Hot Spots Program Risk Assessment Guidelines in 2015, so the CRRP-HRA results were adjusted to use the 2015 OEHHA Guidance (OEHHA 2015) by

2 The ordinance would reduce the quantity of dust generated during site preparation, demolition, and construction work to protect the health of the general public and onsite workers and minimize public nuisance complaints through measures that include dust suppression activities (e.g., watering), street sweeping, and material stockpile covers. Accordingly, PM_{10} and $PM_{2.5}$ dust are not discussed or evaluated further.

multiplying the cancer risk values by the factor 1.3744, as recommended by the BAAQMD (Lau pers. com.).[3]

Consistent with EP and BAAQMD's CEQA requirements, and the CRRP-HRA, the air quality analysis evaluates:

1. Criteria air pollutant mass emissions associated with project construction and operations.
2. Cancer risk and annual average exhaust $PM_{2.5}$ concentrations from construction emissions at off-site sensitive receptors located within 1,000 meters.
3. Cancer risk and annual average exhaust $PM_{2.5}$ concentrations from operational emissions at off-site sensitive receptors located within 1,000 meters.
4. Cumulative cancer risk and annual average exhaust $PM_{2.5}$ concentrations (at off-site sensitive receptors) resulting from other stationary, area and mobile source emissions as calculated in the CRRP-HRA in addition to health impacts from the project construction and operational emissions.

3 The scaling factor represents the average difference in residential cancer risk, as calculated using the latest 2015 OEHHA guidance, compared to the original 2003 OEHHA guidance. In other words, using the updated cancer risk calculations and age sensitivity factors from the 2015 OEHHA guidance, calculated residential lifetime excess cancer risk is 1.3744 times higher than residential cancer risk as calculated using the original 2003 OEHHA guidance, which was used in developing the CRRP-HRA.

Emission Calculation Methods

The following sections discuss methods used to calculate emissions of criteria pollutants and TACs for each source associated with the proposed project. The section is separated into construction emissions and operational emissions. The following emissions estimates are reported:

1. **Construction**: Average daily construction emissions over the entire construction period.

2. **Operation**: Average daily and annual operational emissions at project buildout.

Calculation Methods for Construction Emissions

Project construction-related emissions of criteria pollutants and DPM (e.g., off-road equipment exhaust and on-road vehicle exhaust) were estimated using a project-specific construction-phasing schedule and a project-specific equipment mix that were provided by the project sponsor. ESA calculated total construction-related criteria pollutant emissions for the entirety of all construction phases and total annual DPM and $PM_{2.5}$ emissions for the HRA. It was assumed that all off-road and on-road equipment is diesel-powered, and that all off-road equipment and on-road vehicle exhaust emissions of PM_{10} are DPM (see Section 3.0 for additional discussion of DPM and PM_{10}).

Calculation methods for each source of construction emissions are explained separately below.

Off-road Equipment

To estimate off-road construction equipment emissions, ESA used the California Emission Estimator Model (CalEEMod), version 2016.3.1. CalEEMod is a statewide land use emissions computer model designed to provide a uniform platform for government agencies, land use planners, and environmental professionals to quantify potential criteria pollutant and greenhouse gas emissions from a variety of land use projects. The model is considered to be an accurate and comprehensive tool for quantifying air quality from land use projects throughout California, and is recommended by BAAQMD for land-use CEQA analyses.[4] As much of the construction would require in-water work for dredging and installation of piles for the pier and floats, specialty equipment would be required such as a clamshell dredge, barge-mounted pile drivers and drill rigs and cranes, tugs and scows. Where specialty equipment pieces are used, emission factors from the California Air Resources Board's 2011 Off-Road Equipment Model (OFFROAD2011) emission rate program CARB's Commercial Harbor Craft Emissions Inventory and CARB's Barge and Dredge Emission Inventory were used to quantify emissions based on **Equation 1** below. Equipment horsepower assumptions were based on a data request response from the

4 See: http://www.caleemod.com.

project applicant, CalEEMod default values for off-road equipment used in construction and data contained in the Port of Oakland Emission Inventory for marine vessels.[5]

As a public project, the proposed The project would be subject to the City of San Francisco's Clean Construction Ordinance (CCO). The project site is not located within a designated Air Pollutant Exposure Zone and, consequently, would be subject to the less stringent of the two implementation paths of the CCO. For public projects located outside an Air Pollutant Exposure Zone, like the proposed project, the CCO requires equipment to utilize off-road equipment and off-road engines fueled by biodiesel fuel grade B20 and utilize only off-road equipment that either meets or exceeds Tier 2 standards for off-road engines or operates with the most effective ARB verified diesel emission control strategy (VDECS). However, biodiesel has secondary impacts with respect to increased emissions of NOx compared to standard diesel. Consequently, the Port intends to comply with the alternative fuel component of the Clean Construction Ordinance through use of renewable diesel, which reduces NOx emissions as well as DPM emissions and the use of renewable diesel in both off-road equipment and marine vessels engaged in construction was accounted for in a post-processing adjustments.[6]

Equation 1: $E_{phase} = \sum_i (Activity_i * EF_i * LF_i * HP_i) * Conv$ *RDAF

Where:

E_{phase}	=	Total exhaust emissions for the phase, tons
Activity	=	Equipment activity, hours per day
EF	=	Engine emissions factor, grams/horsepower-hour (CalEEMod/OFFROAD2011/ CARB's Commercial Harbor Craft Emissions Model)
LF	=	Engine load factor, unitless (CalEEMod/OFFROAD2011/ CARB's Commercial Harbor Craft Emissions Model)
HP	=	Engine horsepower, hp (CalEEMod/OFFROAD2011/ CARB's Commercial Harbor Craft Emissions Model)
Conv	=	Conversion factor, 907185 grams/ton
RDAF	=	Renewable Diesel Adjustment Factor
i	=	Equipment type

On-Road Mobile Sources

In addition to off-road equipment, project construction would require on-road vehicles for materials import/export (i.e., haul trucks), employee commute trips, onsite personnel movement, and vendor trips.

5 Port of Oakland 2012 Seaport Emissions Inventory, 2013.

6 SF Department of Environment, S. Tanikawa, *Greenhouse Gas Implications for Switching from Petroleum Diesel to Renewable Diesel in San Francisco's Municipal Fleet*. October 1, 2015 Page 8

On-road haul truck emissions were calculated using haul truck trip estimates and trip length provided by the project sponsor. All excavation during the utility phase was assumed to be trucked to Altamont Landfill, a 51-mile one-way trip. Haul truck trip lengths for demolition and pier construction assumed a CalEEMod default value of 20 miles for haul truck trips. Vendor truck trips were calculated by CalEEMod based on land use and building square footage and an assumed vendor truck trip length of 7.3 miles (CalEEMod default. Construction worker trips emissions were also estimated using default values from the CalEEMod model. Estimated on-road construction criteria pollutant emissions for each construction phase were then totaled over the entirety of the construction period for all phases of construction and, consistent with BAAQMD guidance, averaged over the total number of construction work days to determine average daily emissions.

Tables 1a through 1d at the end of this appendix present the calculation and assumptions for marine vessel emissions associated with the demolition, dredging, pile driving and in-water construction phases of construction, respectively. The off-road equipment emissions were calculated using CalEEMiod and the output file is presented at the end of this appendix due to its length. Table 2 presents the summarized construction-related emission from all phases of construction and the calculation of average daily emissions in pounds per day over the entirety of project construction.

Haul Truck Idling

Idling emissions associated with heavy-duty trucks (haul trucks, concrete trucks, material delivery trucks, water trucks, etc.) were estimated based on the anticipated number of truck trips as provided by the project sponsor, and idling emission factors for heavy-duty vehicles from ARB's EMission FACtor model for on-road emissions (EMFAC2014). It is assumed that idling activities would total 15 minutes per trip, representing three separate 5-minute idling occurrences: check-in to the site or queuing at the site boundary upon arrival, on-site idling during loading/unloading, and check-out of the site or queuing at the site boundary upon departure. The 5-minute limit per idling occurrence is consistent with the ARB's Air Toxics Control Measure (ATCM) to Limit Diesel-Fueled Commercial Motor Vehicle Idling. Table 3 at the end of this appendix presents the calculation and assumptions for haul truck idling emissions.

Calculation Methods for Operational Emissions

ESA estimated project operational criteria pollutant emissions from ferries and other mobile sources, area sources, and stationary sources using CARB's Commercial Harbor Craft Emissions Inventory.

Mobile Sources

The proposed project was assumed to generate a relatively small amount of local emissions from on-road motor vehicle activity from people accessing the landings. Consistent with the transportation analysis on-road motor vehicle trips associated with the proposed project were assumed to be negligible.

As stated above, emissions associated with operation of the project (both ferries and associated reductions in vehicle trips) were analyzed in the Program EIR for the WETA's Implementation and Operations Plan and therefore are not proposed to be assessed in this MND. However, the air quality analysis for this IS/MND included an estimate of emissions from direct special event service to the Chase Center that was not considered in WETA's 2003 Program EIR. Pre-event arrival will be part of the normal commuter service. Up to 4 vessel trips would occur for special event end times for events occurring Monday through Friday and 8 vessel trips for events on the weekend or holidays, departing the Ferry Landing between approximately 9:30 p.m. and 10:00 p.m., or upon the conclusion of games or events at the Chase Center. Return service may connect first with the Ferry Building terminal before departing for locations in the North Bay and East Bay. Special event service would be provided for all Golden State Warriors' games (41 regular season games), including pre-season (3 games) and post-season (up to 16 playoff games). Service also would be provided for approximately 20 additional events per year at the Chase Center. Therefore, ferry service would be provided for 80 special events per year.

Vessel types and engine size were provided by the applicant. Table 4 at the end of this appendix presents the ferry fleet assumption used in the calculation of ferry emissions, while Table 5 presents the calculation of operational emissions from ferries during special events.

To account for the reduction in vehicle trips associated with ferry ridership, ESA used data points from WETA's 2003 Program EIR. Specifically, the 2003 Program EIR estimated a reduction of 9,058 daily vehicle trips associated with an increase in 13,736 riders. This equates to 0.66 trips reduced per rider, which was used to estimate the emissions reduction associated with ridership to the special events and water taxi service. Table 6 at the end of this appendix presents the calculation of VMT reduction and associated emissions reduction resulting from ferry operations during special events.

For water taxi operations, the air quality analysis assumed that there would be 15 taxi trips per day which is the upper end of the project description for water taxis. Furthermore, an additional 8 trips per Chase Center event (81 per year) was also assumed for a total of 6,123 water taxi trips per year. While two possible vessel types were identified by the applicant, the smaller 6-passenger Kestral vessels were assumed to provide 90 percent of water taxi operations as the larger 45-passenger Osprey vessels would most likely only be used for pre-organized charter trips. Table 7 at the end of this appendix presents the calculation of operational emissions from water taxis, while Table 8 presents the calculation of VMT reduction and associated emissions reduction resulting from water taxi operations.

Ferries and water taxis also emit DPM in their exhaust and thus were evaluated in the HRA. The majority of operational vehicles will be from idling at the landings, which would be the closest ferry operational point to receptors. The calculation of ferry idling included not only the emissions from special events at Chase Center but also commuter calls throughout the year.

The equation used to estimate vessel idling emissions is as follows:

> **Daily emission rate (lbs/day) for idling small or large vessels** = emission factor (grams/horsepower-hour) * marine vessel horsepower * vessel load factor (of 0.01) *

Estimated Air Concentrations

ESA conducted a screening-level assessment of health risks and hazards (HRA) resulting from project construction and operation. Because the project is not anticipated to result in significant health risks, the screening-level approach is appropriate to estimate the worst-case health risks associated with project construction and operation. Consistent with the CRRP-HRA, ESA estimated health risks from TACs (primarily DPM) and annual average exhaust $PM_{2.5}$ concentrations at sensitive receptor locations within 1,000 meters of the proposed project's boundaries. For the proposed project, sources included in the HRA would include construction emissions ferries and water taxies idling at the landings and maintenance dredging activities. The screening HRA was conducted following methods in BAAQMD's Health Risk Screening Analysis Guidelines (BAAQMD 2012a, 2012b) and in the OEHHA Air Toxics Hot Spots Program Guidance (OEHHA 2015). Refer to Attachment C for the calculation and modeling files used in the screening HRA.

Chemical Selection

The screening HRA evaluates health risks associated with the proposed project based on exposure of sensitive receptors to TAC emissions,[6] including DPM, as well as exhaust $PM_{2.5}$. While DPM is a complex mixture of gases and fine particles that includes over 40 substances that are listed by the USEPA as hazardous air pollutants and by the ARB as toxic air contaminant (OEHHA 1998), the DPM analysis uses PM_{10} emissions as a surrogate for DPM emissions. OEHHA guidance indicates that the cancer potency factor to be used to evaluate cancer risks were developed based on whole (gas and particulate matter) diesel exhaust, and that the surrogate for whole diesel exhaust is DPM, with PM_{10} serving as the basis for the potential risk calculations (OEHHA 2003). In addition to evaluating the effects of TAC concentrations, the screening HRA also evaluated annual average exhaust $PM_{2.5}$ concentrations. This is consistent with BAAQMD's May 2012 CEQA Guidelines, *California Environmental Quality Act: Air Quality Guidelines*, which indicate that $PM_{2.5}$ be evaluated in community-scale impacts of air pollution based on scientific studies and recommendations by the Bay Area Health Directors to the BAAQMD's Advisory Council (BAAQMD 2012).

6 Toxic air contaminants to be evaluated in this analysis include 1,3-Butadiene, Acetaldehyde, Benzene, Ethylbenzene, Formaldehyde, and Naphthalene.

Sources

The USEPA's AERSCREEN is a screening dispersion model based on the AERMOD steady-state Gaussian dispersion model, and was used to evaluate DPM and annual average exhaust $PM_{2.5}$ concentrations at off-site receptor locations that would result from construction and operational activities associated with the proposed project. Construction sources include off-road construction equipment, on-road diesel trucks (including haul trucks, material delivery trucks), and idling. Operational sources include emergency ferries idling at the landings, and maintenance dredging activities.

AERSCREEN Modeling

ESA used the most recent version of the AERSCREEN air dispersion screening model to estimate concentrations of TACs and $PM_{2.5}$ at off-site sensitive receptors. The model produces estimates of "worst-case" 1-hour concentrations for a single source, without the need for hourly meteorological data, and also includes conversion factors to estimate "worst-case" 3-hour, 8-hour, 24-hour, and annual concentrations. AERSCREEN is based on the American Meteorological Society/Environmental Protection Agency regulatory air dispersion model (AERMOD version 9.3.0). AERSCREEN is intended to produce concentration estimates that are equal to or greater than the estimates produced by AERMOD with a fully developed set of meteorological and terrain data, but the degree of conservatism will vary depending on the application. For each receptor location, AERSCREEN generates worst-case air concentrations that result from emissions from a single source. The AERSCREEN model requires numerous inputs, such as general meteorological data, source parameters, topographical data, and receptor characteristics. Where project-specific information is not available, ESA used default parameter sets that are designed to produce conservative (i.e., overestimates of) air concentrations (USEPA 2016a, 2016b). The embedded **Table 12**, **Overall AERSCREEN Modeling Parameters**, summarizes the overall modeling parameters used in AERSCREEN. For values not listed, defaults were used. Refer to Attachment C for the AERSCREEN modeling outputs used in the screening HRA.

Emission Rates

Because each emission source was modeled separately within AERSCREEN (see section below), ESA used a unitized emission rate concept for each source, where each source is modeled with a unitized emission rate of 1 gram/second (g/s). The modeled concentration at each receptor (micrograms per cubic meter [μ/m^3]/[g/s]) represents a "dispersion factor," which was then multiplied by the actual emission rate of each source to determine actual concentrations, and the final result from all the sources was superimposed. This approach is called the "Summation Concept," where the concentration and deposition fluxes at each receptor are the linear addition of the resulting values from each source.

Actual emission rates from the various emission sources (e.g., construction activities, roadways, emergency generators, etc.) were based on the anticipated hours of activity for each source and other information as described in Section 2.0 above. A total emission rate in terms of grams per second was calculated for each emission source to multiply with the AERSCREEN dispersion factors to estimate actual concentrations for each source. The emission rates will vary day to day, with some days having no emissions. For simplicity, the model assumed a constant emission rate during an entire year, and is based on the total duration of construction activities (457 calendar days or 1.25 years) and 24 hours per day, consistent with AERSCREEN dispersion parameters.

Source Parameters

Source parameters are required to model the dispersion of emissions. Off-road construction equipment was modeled as an area source within AERSCREEN using the same release parameters used in the CRRP-HRA, including a release height of 5 meters and an initial vertical dimension of 1.4 meters (BAAQMD, SF DPH & SF Planning, 2012). DPM emissions for on-road construction trucks (haul trucks and vendor trucks) were added to the off-road emissions area source, since DPM emissions from on-road trucks represent a small fraction of overall DPM emissions from construction (0.2 percent of unmitigated emissions and 4 percent of mitigated emissions) and therefore modeling a separate on-road source for trucks would not produce a significant change in overall cancer risk.

TABLE 12
OVERALL AERSCREEN MODELING PARAMETERS

Pathway	Description	Parameter
Control	Rural/Urban	Urban
	Urban Population	864,816 [a]
	Model Version	AERSCREEN v 16216
Receptor	Receptor Height	1.8m [b]
Meteorology	Minimum ambient temperature	46° F
	Maximum ambient temperature	71° F
	Dominant surface profile	7 (Urban)
	Dominant climate profile	1 (Average Moisture)

NOTES:
a For July 1, 2015, City of San Francisco (US Census Bureau 2016).
b from the CRRP-HRA (BAAQMD, SF DPH & SF Planning, 2012)

ABBREVIATIONS: m = meters; F = Fahrenheit

SOURCES:
1. United States Census Bureau. 2016. QuickFacts: San Francisco city, California. Available at https://www.census.gov/quickfacts/table/PST045216/0667000,00. Accessed March 2017.
2. Bay Area Air Quality Management District, San Francisco Department of Public Health, and San Francisco Planning Department. 2012. *The San Francisco Community Risk Reduction Plan: Technical Support Documentation*. December. Available at http://www.gsweventcenter.com/Appeal_Response_References/2012_1201_BAAQMD.pdf. Accessed March 2017.

In-water construction equipment (tugboats and utility boats) were modeled as an area source with a release height of 6 meters and an initial vertical dimension of 2.37 meters, consistent with the CRRP-HRA for tugs and harbor craft (BAAQMD, SF DPH & SF Planning, 2012). Dredging equipment for both construction and operations were modeled as an area source with a release height of 10 meters and an initial vertical dimension of 2.37 meters (ARB 2004; BAAQMD, SF DPH & SF Planning, 2012). Ferry idling was modeled as an area source. The embedded

Table 13, **Source Modeling Parameters**, summarizes the source modeling parameters used in AERSCREEN. For values not listed, defaults were used.

Receptors

The closest (within 1,000 meters) sensitive receptors to the project site are inventoried in the embedded Table **14** and presented in **Figure 2, Sensitive Receptor Locations.** As shown in Table 14, sensitive receptors include residential uses south of the project site, the University Childcare to the west (daycare), the new UCSF Hospital located to the west (hospital), and the Potrero Kids preschool to the south (school). The nearest day care facility is on the UCSF Mission Bay campus 2,400 feet to the west. Other residential uses to the south are over 1,000 feet away, south of Mariposa Street. None of the receptors in Table 14 are located within the Air Pollutant Exposure Zone (APEZ), nor are there any sensitive receptors within 1,000 meters of the project site that are located within the APEZ.

The proposed project does not include any residential uses and will not include any sensitive receptors on site. Consequently, no onsite receptors were modeled. The HRA assessed receptors out to 1,000 meters from the project boundary to evaluate the effects of construction activities and ferry and water taxi operations associated with project operations. Receptors were placed at a height of 1.8 meters, which represents the default breathing height for ground floor receptors. Maximum annual average concentrations were estimated for each receptor location modeled in AERSCREEN.

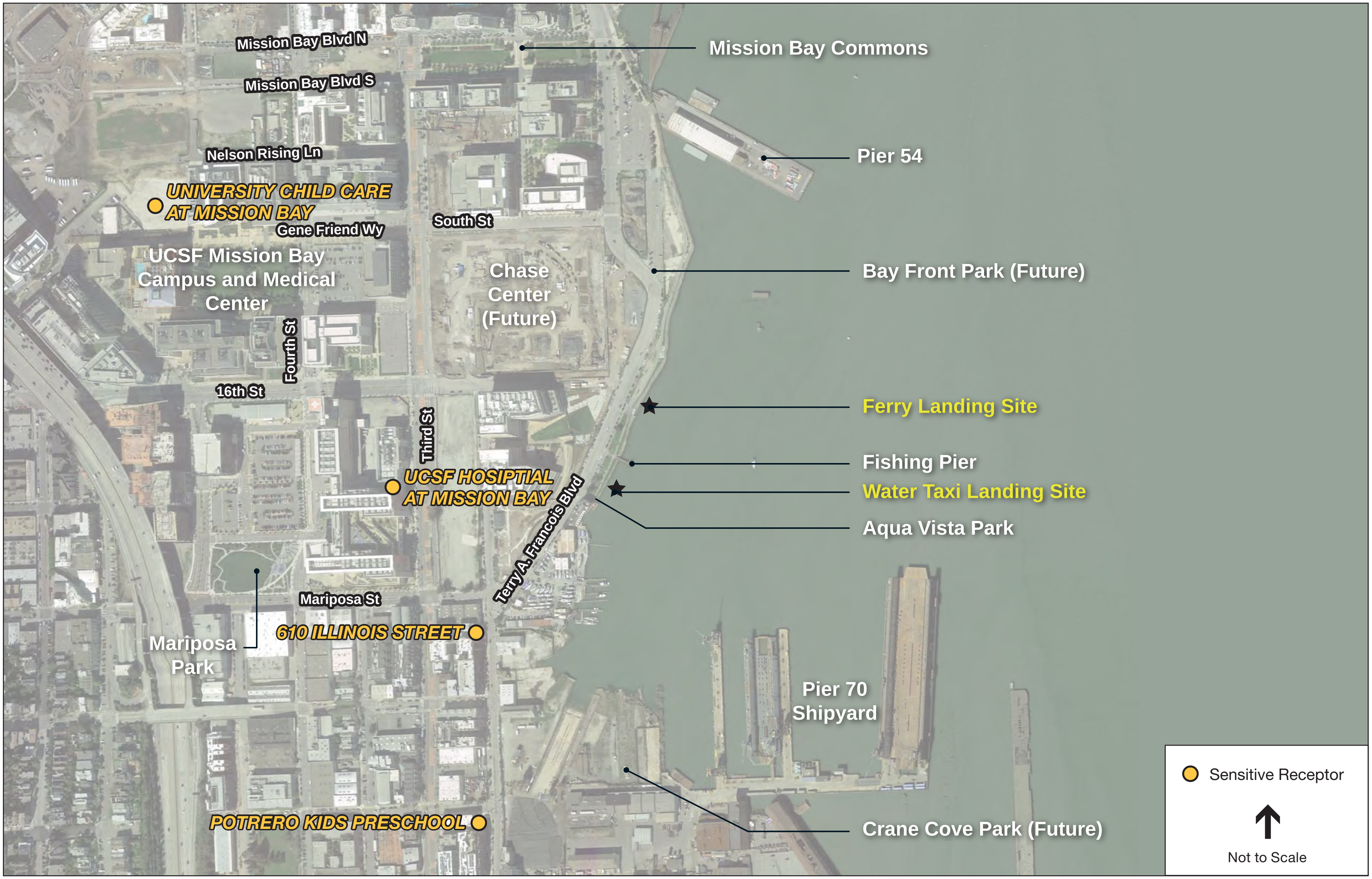
TABLE 13
SOURCE MODELING PARAMETERS

Period	Source	Source Type[a]	Source Dimension [m]	Number of Sources[b]	Release / Stack Height[c] [m]	Initial Vertical Dimension[d] [m]
Construction	Off-Road Construction Equipment	Area	62 x 20	1	5	1.4
	In-Water Equipment	Area	76 x 46	1	6.0	2.37
	Dredging	Area	287 x 156	1	6.0	2.37
Operation						
	Ferry / Water Taxi Idling	Area	38 x 13	1	10.0	2.37
	Maintenance Dredging	Area	287 x 156	1	6.0	2.37

TABLE 14
SENSITIVE RECEPTORS IN THE PROJECT SITE VICINITY

Receptor Type	Distance and Direction from the Project Site
Residential: Condos at 610 Illinois St.	820 feet south
Daycare: University Child Care at Mission Bay (Bright Horizons)	2,400 feet to the west
Hospital: UCSF Benioff Children's Hospital facility at Mission Bay, plus the UCSF Betty Irene Moore Women's Hospital and the UCSF Bakar Cancer Hospital	900 feet west
School: Potrero Kids	1,650 feet south

SOURCE: Environmental Science Associates, 2017



SOURCE: ESA, 2017

Mission Bay Ferry Landing Project . 160592

Figure 2
Sensitive Receptor Locations

Risk Characterization Methods

In March 2015, OEHHA updated the methods for estimating cancer risks to use higher estimates of cancer potency during early life exposures and uses different assumptions for breathing rates and length of residential exposures. The new guidance, *Air Toxics Hot Spots Program Guidance Manual for the Preparation of Health Risk Assessments*, incorporates advances in risk assessment with consideration of infants and children using Age Sensitivity Factors (ASF) (OEHHA 2015). These updated exposure factors can result in numeric life-time health risk values to be approximately two to three times higher than those calculated under the previous OEHHA guidelines. The BAAQMD has issued guidelines on generally adopting the 2015 OEHHA Guidance Manual (BAAQMD 2016a). Based on BAAQMD and EP guidance, the screening HRA was performed in accordance with OEHHA's 2015 guidelines to quantify potential impacts from TACs emitted during construction and operation (OEHHA 2015, BAAQMD 2016a).

ESA estimated project-specific and cumulative health risks for both construction and operational TAC emissions of DPM. ESA calculated project-level lifetime excess cancer risk and annual average exhaust $PM_{2.5}$ concentrations. These calculations were based on the emission calculation methods identified in Section 2.0 above, annual average pollutant concentrations from AERSCREEN discussed in Section 3.0, and accepted dose and risk calculations from OEHHA and BAAQMD, as discussed in this section below (OEHHA 2015, BAAQMD 2016a).

Project Sources Evaluated

As discussed above, ESA evaluate excess lifetime cancer risk and annual average exhaust $PM_{2.5}$ concentrations at off-site sensitive receptor locations associated with project construction and operational emissions. Health risks from construction activity (off-road construction equipment and heavy-duty trucks, in-water equipment, and dredging) were then calculated using the methods explained in the following sections. Health risks from operational activity (ferry/water taxi idling at the landings and maintenance dredging) were calculated using the methods discussed below.

Exposure Assessment

Cancer risk as a result of exposure to DPM occurs exclusively through the inhalation pathway (OEHHA 2015). Therefore, the screening HRA only evaluated cancer risks from inhalation and no other exposure pathways (e.g., dermal and ingestion pathways)

ESA assessed exposure using AERSCREEN for the four nearest sensitive receptor locations by type (residential, daycare, hospital, and school) as shown in Table 14. Since the proposed project will have no new sensitive receptors onsite, no onsite receptors were molded.

Potentially Exposed Populations

The HRA analysis conservatively evaluated the following receptor populations:

- Off-site residents
- Off-site daycare receptors
- Off-site school receptors
- Off-site hospital receptors

Because child resident exposure assumptions are more conservative than those for adult residents, a conservative approach of considering all off-site receptors as initially child residents was used in this screening HRA. Once residential child receptors have been exposed to operational emissions for 16 years, adult exposure parameters were then used (see embedded **Table 15**, **Exposure Parameters**).

TABLE 15
EXPOSURE PARAMETERS

Receptor Type	Exposure Scenario	Receptor Age Group	Daily Breathing Rate (DBR)[a] [L/kg-day or L/kg-8hrs]	Exposure Duration (ED)[b] [years]	Fraction of Time at Home (FAH)[c] [unitless]	Exposure Frequency (EF)[d] [days/year]	Averaging Time (AT)[e] [days]	Age Sensitivity Factor (ASF)[f] [unitless]
Off-Site Resident	Scenario 1 (construction)	3rd Trimester	361	0.25	1.0	350	25,550	10
		Age 0<2 Years	1090	1.00	1.0			10
	Scenario 2 (construction + operation)	3rd Trimester	361	0.25	1.0	350	25,550	10
		Age 0<2 Years (construction)	1090	1.00	1.0			10
		Age 0<2 Years (operation)	1090	1.00	1.0			3
		Age 2<16 Years (operation)	572	14.0	1.0			3
		Age 16<30 Years (operation)	261	14.0	0.73			1
	Scenario 3 (operation)	3rd Trimester	361	0.25	1.0	350	25,550	10
		Age 0<2 Years	1090	2.0	1.0			10
		Age 2<16 Years	572	14.0	1.0			3
		Age 16<30 Years	261	14.0	0.73			1
Off-Site Daycare	Scenario 1 (construction)	Age 0<2 Years[g]	1200	1.25	n/a	250	25,550	10
	Scenario 2 (construction + operation)	Age 0<2 Years[g] (construction)	1200	1.25	n/a	250	25,550	10
		Age 0<2 Years[g] (operation)	1200	0.75				3
		Age 2<9 Years (operation)	631	7.0				3
	Scenario 3 (operation)	Age 0<2 Years[g]	1200	2.0	n/a	250	25,550	10
		Age 2<9 Years	631	7.0				3
Off-Site School	Scenario 1 (construction)	Age 2<9 Years[g]	640	1.25	n/a	180	25,550	3
		Age 2<9 Years[g] (construction)	640	1.25	n/a	180	25,550	3

Table 15 (continued)
Exposure Parameters

Receptor Type	Exposure Scenario	Receptor Age Group	Daily Breathing Rate (DBR)[a] [L/kg-day or L/kg-8hrs]	Exposure Duration (ED)[b] [years]	Fraction of Time at Home (FAH)[c] [unitless]	Exposure Frequency (EF)[d] [days/year]	Averaging Time (AT)[e] [days]	Age Sensitivity Factor (ASF)[f] [unitless]
	Scenario 2 (construction + operation)	Age 2<9 Years (operation)	640	5.75				3
	Scenario 3 (operation)	Age 2<9 Years	640	7.0	n/a	180	25,550	3
Off-Site Hospital	Scenario 1 (construction)	3rd Trimester[h]	361	0.25	1.0	350	25,550	10
		Age 0<2 Years	1090	1.00	1.0			10
	Scenario 2 (construction + operation)	3rd Trimester[h]	361	0.25	1.0	350	25,550	10
		Age 0<2 Years (construction)	1090	1.00	1.0			10
		Age 0<2 Years (operation)	1090	1.00	1.0			3
		Age 2<16 Years (operation)	572	14.0	1.0			3
		Age 16<30 Years (operation)	261	14.0	0.73			1
	Scenario 3 (operation)	3rd Trimester[h]	361	0.25	1.0	350	25,550	10
		Age 0<2 Years	1090	2.0	1.0			10
		Age 2<16 Years	572	14.0	1.0			3
		Age 16<30 Years	261	14.0	0.73			1

Residential exposure assumptions are more conservative than those for other sensitive receptor types because residential uses have the longest exposure duration, the highest breathing rates by applicable age group, and the highest exposure frequency.

Construction Scenario

For the construction screening HRA, off-site child residents were evaluated starting with the fetus at the beginning of its third trimester when construction commences (June 2019) and exposed to all construction emissions (15 months, ending in August 2020). This is called "**Scenario 1**" in this document.

Operational Scenarios

For the operational screening HRA, two separate scenarios were evaluated as follows. These scenarios are based on the 30-year exposure requirement in the OEHHA guidelines (OEHHA 2015).

1. **Scenario 2**: off-site child residents were evaluated starting with the fetus at the beginning of its third trimester when construction commences and exposed to all construction emissions (1.25 years) and 28.75 years of operational emissions (30 years total, beginning in June 2019 with construction and ending in June 2049 with operation). This is equivalent to the Scenario 1 construction exposure plus 28.75 years of operational exposure.

2. **Scenario 3**: off-site child residents were evaluated starting with the fetus at the beginning of its third trimester when operation commences (expected to occur as soon as construction concludes in August 2020) and exposed to 30 years of operational emissions (ending in August 2050).

The first operational scenario (scenario 2) considers receptors that are exposed to *both* construction and operational emissions over a 30-year period of time, and were used to determine the maximum exposed individual when considering all sources of emissions from the project. For both scenarios, it is assumed that operations commence as soon as construction is complete in December 2020. No overlap of construction and operational emissions exposure to any sensitive receptors was assumed.

Exposure Assumptions

The exposure parameters that were used to estimate excess lifetime cancer risk for all potentially exposed populations for the screening HRA were obtained using risk assessment guidelines from OEHHA (2015) and BAAQMD (2016). **Table 15** above shows the proposed exposure parameters that were used for the screening HRA.

Calculation if Intake

The dose estimated for each exposure pathway is a function of the concentration of a chemical and the intake of that chemical. The intake factor for inhalation, IF_{inh}, was calculated as follows using **Equation 3**. The values used in this equation are presented in **Table 15** above.

Equation 3: $I_{inh} = \frac{DBR * FAH * EF * ED * ASF * CF}{AT}$

Where:

I_{inh} = Intake Factor for Inhalation (m^3/kg-day)

DBR = Daily Breathing Rate (L/kg-day)

FAH = Frequency of time at home (unitless)

EF = Exposure Frequency (days/year)

ED = Exposure Duration (years)

AT = Averaging Time (days)

ASF = Age Sensitivity Factor (unitless)

CF = Conversion Factor, 0.001 (m^3/L)

The chemical intake or dose is estimated by multiplying the intake factor for inhalation, IF_{inh}, by the chemical concentration in air, Ci. This calculation is mathematically equivalent to the dose algorithm given in the current OEHHA guidance (OEHHA 2015).

Toxicity Assessment

The assessment of toxicity determines the relationship between the magnitude of chemical exposure and the nature and magnitude of adverse health effects resulting from this exposure. Adverse health effects were calculated for both cancer and non-cancer endpoints. Toxicity values that are used to estimate the likelihood of adverse health effects occurring in humans at different exposure levels are identified as part of the toxicity assessment component of a screening HRA.

The toxicity values used in the analysis for DPM are from OEHHA and ARB (ARB 2017, 2012a). These toxicity values are for carcinogenic (cancer) effects. The primary pathway for exposures is assumed to be inhalation, as discussed above. The incremental risks were determined for each TAC emission source (DPM for construction and operation) and summed to obtain an estimated total incremental cancer health risk.

Table 16, Carcinogenic Toxicity Values for Diesel Particulate Matter, shows the cancer potency factor (CPF) for DPM that was used in the screening HRA.

TABLE 16
CARCINOGENIC TOXICITY VALUES FOR DIESEL PARTICULATE MATTER

Chemical	CAS Number	Cancer Potency Factor [mg/kg-day]$^{-1}$	Unit Cancer Risk Weighted Factor [µg/m^3]$^{-1}$
Diesel Particulate Matter	9901	1.1	—

NOTES:
None

ABBREVIATIONS:
CAS = chemical abstract services

SOURCES:
1. Bay Area Air Quality Management District. 2017. *Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values*. Last Updated: February 23, 2017. Available: <http://www.arb.ca.gov/toxics/healthval/contable.pdf>. Accessed: April 2017.

Age Sensitivity Factors (ASF)

The estimated excess lifetime cancer risks for children receptors (resident, daycare, and school) were adjusted using the ASFs recommended in the California Environmental Protection Agency (Cal/EPA) OEHHA Technical Support Document (Cal/EPA 2009) and OEHHA guidance (2015). This approach accounts for an "anticipated special sensitivity to carcinogens" of infants and children. Cancer risk estimates are weighted by a factor of 10 for exposures that occur from the third trimester of pregnancy to two years of age and by a factor of three for exposures that occur from two years through 15 years of age. No weighting factor (i.e., an ASF of one, which is equivalent to no adjustment) is applied to ages 16 to 30 years. **Table 15** shows the ASFs used for all child receptors.

Cancer Risk Characterization

Excess lifetime cancer risks are estimated as the upper-bound incremental probability that an individual will develop cancer over a lifetime as a direct result of exposure to carcinogens. The risk is expressed as a unitless probability, and is calculated as the number of cancer incidences per million individuals in the screening HRA. The cancer risk for each chemical is calculated by multiplying the chemical intake or dose at the human exchange boundaries (e.g., lungs) by the chemical-specific CPF.

Excess lifetime cancer risk occurs exclusively through the inhalation pathway and was calculated according to **Equation 4**.

Equation 4: $Risk_{inh} = C_i * IF_{inh} * CPF_i * CF_1 * CF_2$

Where:

$Risk_{inh}$ = Cancer risk; the incremental probability of an individual developing cancer as a result of inhalation exposure to a particular carcinogen (per million)

C_i = Average annual air concentration of chemical, from AERSCREEN (µ/m^3)

IF_{inh} = Intake Factor for Inhalation (m^3/kg-day)

CPF_i = Cancer potency factor for chemical (mg chemical/kg body weight-day)$^{-1}$

CF_1 = Conversion factor, micrograms to milligrams (mg/μg)

CF_2 = Risk per million individuals

i = Chemical

Cumulative Analysis

ESA calculated the cumulative lifetime excess cancer risks and annual average exhaust $PM_{2.5}$ exhaust concentrations from the project and the background sources in the surrounding area at the off-site sensitive receptor locations within 1,000 meters of the project site. Cumulative health risks were estimated by combining predicted cancer risk and annual average exhaust $PM_{2.5}$ concentrations from the AERSCREEN analysis for the Maximally Exposed Individual Sensitive Receptor (MEISR), for construction and operational activities associated with the project, with the City's CRRP-HRA cancer risk and annual average exhaust $PM_{2.5}$ concentration database.

The proposed project is not located in the APEZ and there are no sensitive receptors within 1,000 meters of the project site that are located in the APEZ. As such, ESA did not directly assess project impacts on MEISR against a specific cumulative threshold. ESA instead evaluated the cumulative cancer risk and annual average exhaust $PM_{2.5}$ concentrations at all four modeled sensitive receptor locations in order to determine the project's impact on the extent of the APEZ in the surrounding area, to identify the following:

- The maximum lifetime excess cancer risks and annual average $PM_{2.5}$ exhaust concentrations contribution from the project for those off-site receptors not located in the APEZ during existing conditions, but which would be placed in the APEZ during existing plus proposed project conditions (if any).

For determining whether the project would place off-site receptors not located in the APEZ during existing conditions into the APEZ with the project's contribution to lifetime excess cancer risks and annual average $PM_{2.5}$ exhaust concentrations (# 1 above), the following health-protective criteria were used (BAAQMD 2009, SF DPH 2014):

1. Cumulative annual average $PM_{2.5}$ exhaust concentrations greater than 10 $\mu g/m^3$, and/or
2. Excess cancer risk from the contribution of emissions from all modeled sources greater than 100 per one million population.

The AERSCREEN model does not include a receptor modeling grid which can be used to match to the 20 meter CRRP-HRA modeling grid and compare risks for all receptors within 1,000 meters of the project site. Instead, AERSCREEN outputs pollutant concentrations for discrete receptor locations at specific distances from the project site (e.g. 50 meters, 100 meters, 150 meters). As such, ESA used a representative set of discrete receptor points to model in AERSCREEN. This set of receptors represents the closest residential receptors and the MEISR; the nearby schools, daycares, and medical facilities (as identified in Table 14 and in **Figure 2** above); and the receptor points within the existing APEZ areas that are closest to the project but within 1,000 meters of the project boundary. This enabled the screening-level HRA to assess the MEISR in relation to cumulative risk in order to apply the appropriate thresholds, as indicated above. The background cancer risk and $PM_{2.5}$ concentrations from the CRRP-HRA was added to the project-level cancer risk and $PM_{2.5}$ concentrations at the four modeled receptor locations to determine total cumulative cancer risk and $PM_{2.5}$ concentrations to compare to the APEZ thresholds discussed above.

ESA relied on the CRRP-HRA for background data for the year 2014, including lifetime excess cancer risk and annual average exhaust $PM_{2.5}$ concentrations, for the cumulative analysis. Because the CRRP-HRA does not include the impact of the latest OEHHA guidelines (2015) regarding the ASFs, ESA adjusted the CRRP-HRA cancer risk values by a factor 1.3744, as recommended by the BAAQMD (Lau pers. com.). A 2040 analysis of project-related emissions was not be conducted. The 2040 citywide modeling shows that excess cancer risk generally decreases for receptor points within 1,000 meters of the project site under 2040 conditions, and $PM_{2.5}$ concentrations remain relatively constant with slight increases. This decrease in cancer risk from 2014-2040 is due to a variety of reasons including stricter emission standards, cleaner engines, and more efficient vehicles. The 2014 modeling does not include these emission standards and cleaner engines, nor does it include construction-related emissions. Therefore, the cumulative analysis for 2014, which is based on existing conditions plus the proposed project, presents a worst-case cumulative assessment of health risks.

The CRRP-HRA includes the following major sources of emissions:

- On-road mobile sources—cars and trucks—on freeways and surface streets with traffic volumes of more than 1,000 vehicles per day.
- Permitted, stationary sources, including gasoline dispensing stations, prime and standby diesel generators, wastewater treatment plants, recycling facilities, dry cleaners, large boilers, and other industrial facilities.
- Caltrain passenger diesel locomotives.
- Ships and harbor craft, including cruise ships, excursion boats, and tug boats.
- The Transbay Terminal bus depot, including diesel emissions from local transit buses.

Uncertainties

Emission Calculations

There are a number of uncertainties contained within the CalEEMod model, which was used to calculate off-road construction emissions for the proposed project. The model uses equations and emission factors that approximate actual activity and emissions associated with that activity, but they are only approximations. For example, CalEEMod uses off-road emission factors from the CARB's OFFROAD2011 model. These emission factors are based on CARB off-road equipment rule compliance reporting (including equipment populations and hours of use), load factors from academic studies, growth projections based on economic forecasts and CARB bounding scenarios, fuel consumption estimates from the USEPA NONROAD model, typical engine deterioration rates and fuel correction factors, and other databases that rely on user reporting and economic forecasts (CARB, 2010). In addition, CalEEMod default assumptions were used where project-specific information was not available. These assumptions generally result in a conservative estimate of overall construction and operational emissions.

Many emission sources were estimated outside of the CalEEMod model (such as in-water construction equipment, tugs, dredges, and ferries) using calculation methods and emission factors from a wide variety of organizations and agencies (e.g. USEPA, CARB, BAAQMD, Environ). These methods and emission factors all contain some uncertainty because they are meant to approximate emissions based on typical engine operation and fuel combustion characteristics. In addition, many assumptions were used to estimate emissions for these sources. In general, similar to the CalEEMod default assumptions, these assumptions are conservative and likely result in an overestimate of actual emissions.

There are also uncertainties associated with the estimation of emissions from construction traffic, such as haul trucks and worker commutes, and operational mobile sources, such as ferry and taxi trips. Construction debris offhaul was conservatively assumed to use tugs and scows with common destination assumptions. Generally, conservative assumptions were generally used, likely resulting in an overestimate of actual emissions.

Air Concentrations and Source Representation

The source parameters used in the emissions modeling add uncertainty to the analysis. For all emission sources, ESA used source parameters that are either recommended as defaults, are consistent with the CRRP-HRA methodology, are consistent with CARB's modeling guidance for harbor craft, or are expected to produce more conservative (i.e., overestimation of) results. Although differences may exist between the actual emissions characteristics of a source and its representation in the modeling, exposure concentrations used in this screening HRA represent approximate exposure concentrations.

Exposure Concentrations

When estimating pollutant exposures using the AERSCREEN dispersion mode, there is uncertainty embodied in the modeling. AERSCREEN's limitations provide a source of uncertainty in the estimation of exposure concentrations. According to the USEPA, errors of ±10 percent to 40 percent are typical for the highest estimated concentrations due to the limitation of the AERMOD algorithms (USEPA 2005). The methods employed by ESA consistently produce conservative results, and therefore estimated exposure concentrations are likely to be at or above actual exposure concentrations.

Exposure Assumptions

A number of assumptions must be made in order to estimate human exposure to chemicals. These assumptions include parameters such as breathing rates, exposure time and frequency, exposure duration, and human activity patterns (see Table 15 for these parameters). Although the best way to estimate central tendency is to use average values derived from scientifically defensible studies, many of the exposure variables used in this screening HRA per 2015 OEHHA guidelines are high-end estimates. For example, although the OEHHA guidance recommends assuming a period of time spent out of the home each day for residential sensitive receptors, this analysis conservatively assumes that children are exposed 24 hours per day, and assumes adult residents are home 73 percent of the time. Additionally, it is assumed that residential receptors are exposed 350 days per year to project construction emissions for the entire construction duration, with the emissions occurring over 260 workdays each year. These assumptions are highly conservative, since most residents do not remain in their homes for these periods of time throughout the year. This analysis follows OEHHA guidance in evaluating outdoor air; however, indoor air concentrations may be different due to filtration or other reductions resulting from the building shell or HVAC systems. The combination of several high-end and conservative estimates used as exposure parameters may substantially overestimate chemical intake. The excess lifetime cancer risks calculated in this screening HRA are therefore likely to be overestimated.

Toxicity Assessment

The standard CPF established by Cal/EPA for DPM was used to estimate potential carcinogenic health effects from exposures to DPM emitted from project construction and operation. The CPF for DPM is derived by applying conservative assumptions which are intended to protect the most sensitive individuals in the potentially exposed populations.

To derive the CPF toxicity value for DPM, Cal/EPA makes several assumptions that tend to overestimate the actual hazard or risk to human health. CPFs used to estimate carcinogenic risk are also typically derived based on data from animal studies. These studies often administer high doses of a test chemical to laboratory animals, and the reported response is extrapolated to the much lower doses typical of human exposure. Very little experimental data are available on the nature of the dose-response relationship at low doses (e.g. whether a threshold exists or if the dose-response curve passes through the origin). Because of this uncertainty, a conservative model is used to estimate the low-dose relationship, and uses an upper bound estimate (the 95 upper confidence limit of the slope predicted by the extrapolation model) as the CPF. With this factor, an upper-bound estimate of potential cancer risks is calculated.

The Cal/EPA CPF for DPM (1.1 mg/kg-day) is used to estimate cancer risks associated with exposure to DPM from project construction and operation. However, the CPF is highly uncertain in both the estimation of response and dose. Due to inadequate animal test data and epidemiology data on diesel exhaust, the International Agency for Research on Cancer (IARC), a branch of the World Health Organization (WHO), had previously classified DPM as Probably Carcinogenic to Humans (Group 2). The USEPA had also previously concluded that the existing data did not provide an adequate basis for quantitative risk assessment (USEPA 2002). However, based on two recent scientific studies (Attfield 2012, Benbrahim-Tallaa 2012, Silverman 2012), IARC has re-classified DPM as Carcinogenic to Humans to Group 1 (IARC 2012). This means that the IARC has determined that there is "sufficient evidence of carcinogenicity" of a substance in humans and represents the strongest weight-of-evidence rating in IARC's carcinogen classification scheme. This determination by the IARC may provide additional impetus for the USEPA to identify a quantitative dose-response relationship between exposure to DPM and cancer.

Risk Calculations

The USEPA states that the conservative assumptions used in a risk assessment, such as this screening HRA, are intended to assure that the estimated risks do not underestimate the actual risks posed by a source. Further, that the estimated risks do not necessarily represent actual risks experienced by populations at or near a site (USEPA 1989).

As noted above, the estimated risks in this screening HRA are based primarily on a series of conservative assumptions related to predicted environmental concentrations, exposure, and chemical toxicity. The use of conservative assumptions tends to produce upper-bound estimates of risk. The use of conservative assumptions is likely to result in overestimates of exposure and therefore risk, although it is difficult to quantify the uncertainties associated with all the assumptions made in this screening HRA. BAAQMD acknowledges this uncertainty by stating, "the methods used [to estimate risk] are conservative, meaning that the real risks from the source may be lower than the calculations, but it is unlikely that they will be higher" (BAAQMD 2016b).

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Attachment A: Non-Embedded Air Quality Calculation Tables

Table 1a

Construction Marine Emissions

Phase 1 Demolition

Year = 2019

Durataiion = 20 days

Source **Tug Boat to maneuver barge for pile removal Main Engine**

Use during Demo = 2 hours/day 19 days
(assume 19 days)
Use During Offhaul = 8 hour/ day 1 day
(assume 1 day)

Total Useage during demo phase = 46 hours

hp = 2460 Source: Environ, Port of Oakland Emission Inventory, 2013

Emission Factors
Aveage Engine Year: 2009
Horsepower range: 1901 - 3300

Running	ROG	NOx	PM10	PM2.5	CO2
gm/hp-hr	3.73	5.529	0.2	0.2	328.69

Source: CARB's Commercial Harbor Craft Estimation Data Base

Load Factor = 0.5 Source: CARB's Commercial Harbor Craft Estimation Data Base

Emissions Calculation

Annual emission rate (tons/year) for idling small or large vessels = emission factor (grams/horsepower-hour) * marine vessel horsepower * vessel load factor * conversion factor (1 ton/907185 grams) * annual hours vessels operations

Running Emissions =	ROG	NOx	PM10	PM2.5	CO2
Ton/year	0.23	0.34	0.01	0.01	20.50

Source **Tug Boat to maneuver barge for pile removal Auxillery Engine**

hp = 282 Source: Environ, Port of Oakland Emission Inventory, 2013

Emission Factors
Aveage Engine Year: 2009
Horsepower range: 251 - 500

Running	ROG	NOx	PM10	PM2.5	CO2
gm/hp-hr	0.8092	5.1015	0.15	0.15	303.28

Source: CARB's Commercial Harbor Craft Estimation Data Base

Load Factor = 0.31 Source: CARB's Commercial Harbor Craft Estimation Data Base

Emissions Calculation

Annual emission rate (tons/year) for idling small or large vessels = emission factor (grams/horsepower-hour) * marine vessel horsepower * vessel load factor * conversion factor (1 ton/907185 grams) * annual hours vessels operations

Running Emissions =	ROG	NOx	PM10	PM2.5	CO2
Ton/year	3.59E-03	2.26E-02	6.65E-04	6.65E-04	1.34

Construction Marine Emissions

Phase 2 Dredging

Year = 2019

Duration = 65 days

Source **Berth Dredge**

Use = 8 hours/day

Total Useage during phase = 520 hours

hp = 425 Source: Environ, Port of Oakland Emission Inventory, 2013

Emission Factors

Engine Year: 2010

Horsepower range: 250 - 500

Running	ROG	NOx	PM10	PM2.5	CO2	Source: CARB's Barge and Drege Emission Inventory
gm/hp-hr	0.12	2.45	0.11	0.1	568.00	

Load Factor = 0.5 Source: Environ, Port of Oakland Emission Inventory, 2013

Emissions Calculation

Annual emission rate (tons/year) for idling small or large vessels = emission factor (grams/horsepower-hour) * horsepower * load factor * conversion factor (1 ton/907185 grams) * annual hours vessels operations

Running Emissions =	ROG	NOx	PM10	PM2.5	CO2
Ton/year	0.01	0.30	0.01	0.01	69.19

Source **Survey Boat**

Use = 8 hours/day

Total Useage during phase = 520 hours

hp = 300 Source: Environ, Port of Oakland Emission Inventory, 2013

Emission Factors

Aveage Engine Year: 2009

Horsepower range: 250 - 500

Running	ROG	NOx	PM10	PM2.5	CO2	Source: CARB's Commercial Harbor Craft Estimation Data Base
gm/hp-hr	0.68	5.1	0.11	0.1	303.19	

Load Factor = 0.5 Source: Environ, Port of Oakland Emission Inventory, 2013

Emissions Calculation

Annual emission rate (tons/year) for idling small or large vessels = emission factor (grams/horsepower-hour) * marine vessel horsepower * vessel load factor * conversion factor (1 ton/907185 grams) * annual hours vessels operations

Running Emissions =	ROG	NOx	PM10	PM2.5	CO2
Ton/year	0.06	0.44	0.01	0.01	26.07

Table 1b

Source **Tug Boat to pull scow for dredge export Main Engine**

Year = 2019

Duration = 65 days

Use During Offhaul = 4.17 hour/ day Source: Environ, Port of Oakland Emission Inventory, 2013
(Averge of Montezuma and DOO locations)

Total Useage phase = 271.05 hours

hp = 2460 Source: Environ, Port of Oakland Emission Inventory, 2013

Emission Factors
Aveage Engine Year: 2009
Horsepower range: 1901 - 3300

Running	ROG	NOx	PM10	PM2.5	CO2	Source: CARB's Commercial Harbor Craft Estimation Data Base
gm/hp-hr	3.73	5.529	0.2	0.2	328.69	

Load Factor = 0.5 Source: CARB's Commercial Harbor Craft Estimation Data Base

Emissions Calculation

Annual emission rate (tons/year) for idling small or large vessels = emission factor (grams/horsepower-hour) * marine vessel horsepower * vessel load factor * conversion factor (1 ton/907185 grams) * annual hours vessels operations

Running Emissions =	ROG	NOx	PM10	PM2.5	CO2
Ton	1.37	2.03	0.07	0.07	120.80

Source **Tug Boat to pull scow for dredge export Auxillary Engine**

hp = 282 Source: Environ, Port of Oakland Emission Inventory, 2013

Emission Factors
Aveage Engine Year: 2009
Horsepower range: 251 - 500

Running	ROG	NOx	PM10	PM2.5	CO2	Source: CARB's Commercial Harbor Craft Estimation Data Base
gm/hp-hr	0.8092	5.1015	0.15	0.15	303.28	

Load Factor = 0.31 Source: CARB's Commercial Harbor Craft Estimation Data Base

Emissions Calculation

Annual emission rate (tons/year) for idling small or large vessels = emission factor (grams/horsepower-hour) * marine vessel horsepower * vessel load factor * conversion factor (1 ton/907185 grams) * annual hours vessels operations

Running Emissions =	ROG	NOx	PM10	PM2.5	CO2
Ton/year	2.11E-02	1.33E-01	3.92E-03	3.92E-03	7.92

Table 1b

On-site Tug Emissions

Assume 5% of Tug Transport emissions occur on site to maneuver barge

	ROG	NOx	PM10	PM2.5	CO2
Main Engine ton/year =	0.068539	0.101596	0.003675	0.003675	6.039762
Auxillary Engine ton/year =	1.06E-03	6.66E-03	1.96E-04	1.96E-04	3.96E-01
Total =	**0.069596**	**0.108258**	**0.003871**	**0.003871**	**6.435836**

	ROG	**NOx**	**PM10**	**PM2.5**	**CO2**
Total On-Site Emissions =	**0.14**	**0.85**	**0.03**	**0.03**	**101.69**

Construction Marine Emissions

Phase 3 Pile Driving
Year = 2019

Duration = 44 days

Source **Utility Boat**

Use = 4 hours/day

Total Useage during phase = 176 hours

hp = 300 Source: Environ, Port of Oakland Emission Inventory, 2013

Emission Factors
Aveage Engine Year: 2009
Horsepower range: 250 - 500

Running	ROG	NOx	PM10	PM2.5	CO2
gm/hp-hr	0.68	5.1	0.11	0.1	303.19

Source: CARB's Commercial Harbor Craft Estimation Data Base

Load Factor = 0.5 Source: Environ, Port of Oakland Emission Inventory, 2013

Emissions Calculation

Annual emission rate (tons/year) for idling small or large vessels = emission factor (grams/horsepower-hour) * marine vessel horsepower * vessel load factor * conversion factor (1 ton/907185 grams) * annual hours vessels operations

Running Emissions =	ROG	NOx	PM10	PM2.5	CO2
Ton/year	0.02	0.15	0.00	0.00	8.82

Table 1c

Source **Tug Boat to manuever barge with pile driver - Main Engine**

Year = 2019

Duration = 44 days

Use between piles = 2 hour/ day

Total Useage phase = 88 hours

hp = 2460 Source: Environ, Port of Oakland Emission Inventory, 2013

Emission Factors

Aveage Engine Year: 2009

Horsepower range: 1901 - 3300

Running	ROG	NOx	PM10	PM2.5	CO2
gm/hp-hr	3.73	5.529	0.2	0.2	328.69

Source: CARB's Commercial Harbor Craft Estimation Data Base

Load Factor = 0.5 Source: CARB's Commercial Harbor Craft Estimation Data Base

Emissions Calculation

Annual emission rate (tons/year) for idling small or large vessels = emission factor (grams/horsepower-hour) * marine vessel horsepower * vessel load factor * conversion factor (1 ton/907185 grams) * annual hours vessels operations

Running Emissions =	ROG	NOx	PM10	PM2.5	CO2
Ton	0.45	0.66	0.02	0.02	39.22

Table 1c

Source **Tug Boat to manuever barge with pile driver - Auxillery Engine**

hp = 282 Source: Environ, Port of Oakland Emission Inventory, 2013

Emission Factors
Aveage Engine Year: 2009
Horsepower range: 251 - 500

Running	ROG	NOx	PM10	PM2.5	CO2
gm/hp-hr	0.8092	5.1015	0.15	0.15	303.28

Source: CARB's Commercial Harbor Craft Estimation Data Base

Load Factor = 0.31 Source: CARB's Commercial Harbor Craft Estimation Data Base

Emissions Calculation

Annual emission rate (tons/year) for idling small or large vessels = emission factor (grams/horsepower-hour) * marine vessel horsepower * vessel load factor * conversion factor (1 ton/907185 grams) * annual hours vessels operations

Running Emissions =	ROG	NOx	PM10	PM2.5	CO2
Ton/year	6.86E-03	4.33E-02	1.27E-03	1.27E-03	2.57

Construction Marine Emissions

Phase 4 Float Installation

Source **Tug Boat Main Engine to manuever barge for guide pile installation and derrick crane**

Year = 2020

Duration = 66 days

Use between piles = 2 hour/ day

Total Useage phase = 132 hours

hp = 2460 Source: Environ, Port of Oakland Emission Inventory, 2013

Emission Factors
Aveage Engine Year: 2009
Horsepower range: 1901 - 3300

Running	ROG	NOx	PM10	PM2.5	CO2
gm/hp-hr	3.73	5.529	0.2	0.2	328.69

Source: CARB's Commercial Harbor Craft Estimation Data Base

Load Factor = 0.5 Source: CARB's Commercial Harbor Craft Estimation Data Base

Emissions Calculation

Annual emission rate (tons/year) for idling small or large vessels = emission factor (grams/horsepower-hour) * marine vessel horsepower * vessel load factor * conversion factor (1 ton/907185 grams) * annual hours vessels operations

Running Emissions =	ROG	NOx	PM10	PM2.5	CO2
Ton	0.67	0.99	0.04	0.04	58.83

Source **Tug Boat Auxillary Engine to manuever barge for guide pile installation and derrick crane**

hp = 282 Source: Environ, Port of Oakland Emission Inventory, 2013

Emission Factors
Aveage Engine Year: 2009
Horsepower range: 251 - 500

Running	ROG	NOx	PM10	PM2.5	CO2
gm/hp-hr	0.8092	5.1015	0.15	0.15	303.28

Source: CARB's Commercial Harbor Craft Estimation Data Base

Load Factor = 0.31 Source: CARB's Commercial Harbor Craft Estimation Data Base

Emissions Calculation

Annual emission rate (tons/year) for idling small or large vessels = emission factor (grams/horsepower-hour) * marine vessel horsepower * vessel load factor * conversion factor (1 ton/907185 grams) * annual hours vessels operations

Running Emissions =	ROG	NOx	PM10	PM2.5	CO2
Ton/year	1.03E-02	6.49E-02	1.91E-03	1.91E-03	3.86

Table 2
Emissions Summary for Construction

Source	Emissions in Tons				
	ROG	NOx	PM10	PM2.5	CO2
Off-Road Equipment =	0.3853	4.9913	0.18	0.17	910.9
(from CalEEMod)					
In-Water Demo	0.24	0.37	0.01	0.01	21.84
In-Water Dredging	0.85	1.95	0.07	0.07	167.10
In-water pile driving	0.47	0.85	0.03	0.03	50.61
In-WaterFloats	0.68	1.05	0.04	0.04	62.68
Total Emissions =	**2.62**	**9.21**	**0.32**	**0.31**	**1213.14**

	Average Daily (pounds per day)			
	ROG	NOx	PM10	PM2.5
Off-Road Equipment =	2.129448	21.39877	0.54908	0.853988
On Road	0.234356	9.222699	0.534969	0.174233
In-Water Demo	1.449217	2.254298	0.080605	0.080605
In-Water Dredging	5.214682	11.93514	0.405325	0.405325
In-water pile driving	2.893819	5.223092	0.17384	0.17384
In-WaterFloats	4.158624	6.468854	0.231302	0.231302
Total Emissions =	16.08015	56.50285	1.975122	1.919294

Avergage Daily with Renewable Diesel			
ROG	NOx	PM10	PM2.5
2.057	**19.280**	**0.361**	**0.562**
0.234	9.223	0.535	0.174
1.400	**2.031**	**0.053**	**0.053**
5.037	**10.754**	**0.267**	**0.267**
2.795	**4.706**	**0.114**	**0.114**
4.017	**5.828**	**0.152**	**0.152**
15.54139	51.82212	1.48259	1.322483

Renewable Diesel Correction (%)			
-0.034	**-0.099**	**-0.342**	**-0.342**

Table 3

Truck Idling Emissions

Pier Construction Phase : Concrete Trucks	30		Source: applicant RFI Response
2019			
Utitlity Trenching			
	100	CY Export	Source: applicant RFI Response
	100	CY Import	Source: applicant RFI Response
Total	200	CY Transport	
Truck Capacity	15	CY	Source: applicant RFI Response
Trenching Truck loads (2020) =	13	Truck Loads	
Vendor Trips (2020) =	8	Source; CalEEMod	
Total Haul Truck/Vendor Truck (2020)	21		
Idle time per truck =	0.25	hour	

Emission Factors

EMFAC2014 analysis Year = 2019

Emission Factors from EMFAC2014

Idle 2019	ROG	NOx	PM10	PM2.5	CO2	CH4
gm/hr	1.396413	55.36484	0.11175	0.106916	6644.15	0.06486

Idle Emissions in 2019=	ROG	NOx	PM10	PM2.5	CO2
Ton	1.15E-05	4.58E-04	9.24E-07	8.84E-07	5.49E-02

Emission Factors

EMFAC2014 analysis Year = 2020

Emission Factors from EMFAC2014

Idle 2020	ROG	NOx	PM10	PM2.5	CO2	CH4
gm/hr	1.200916	51.24094	0.080889	0.07739	6581.33	0.055779

Idle Emissions in 2020=	ROG	NOx	PM10	PM2.5	CO2	
Ton	7.06E-06	3.01E-04	4.76E-07	4.55E-07	3.87E-02	3.28E-07

Table 4

Ferry Engine Specifications and Calculation of Composite Engine Size

SF BAY Ferry Fleet

Ferry name	**Peralta**	**Intintoli**	**Mare Island**	**Solano**	**Gemini Class**	**Hydrus**	**Cetus**	**Vessls 3 &4**	**North Bay/Richmond**	Total
# of vessels	1	1	1	1	4	1	1	2	3	15
# of Engines	2	2	2	2	2	2	2	2	2	
Engine	Cummins QSK50	MTU 16V4000M73	MTU 16V4000M73	MTU 16V4000M71	MTU 16V2000	MTU 12V4000	MTU 12V4000	MTU 12V4000	MTU 16V4000	
Engine hp	2200	2575	2575	3305	2400	2360	2360	2360	NA -Applicant provided hp	
Engine year	2002	1997	1997	2004	2008	2017	2017	2018	2019	
Total hp =	4400	5150	5150	6610	4800	4720	4720	4720	7657	

Golden Gate Ferry Fleet

Ferry name	**MV Del Norte**	**MV Golden Gate**	**MV Napa**	**MV Medocino**	**MS Marin**	**MS San Francisco**	**MS Somoma**			
# of vessels	1	1	1	1	1	1	1			7
# of Engines	NA -Applicant provided hp									
Engine										
Engine hp										
Engine year	2010	Assume same	Assume same	2008	2002	2002	2002			
Total hp	7880	7880	7880	7880	3600	3600	3600			
Average engine Year =		**2009.2**								
Average hp =	5667.32									

Table 5

Special Event Ferry Operations

Trips/year =	388		Source: Project Description
Larkspur to SF Time =	0.5	hour	Source: http://goldengateferry.org/schedules/Larkspur.php
Alameda to SF Time =	0.33	hour	Source: http://sanfranciscobayferry.com/route/alameda/sffb
Vallejo to SF Time =	1.1	hour	Source: http://sanfranciscobayferry.com/route/vallejo/pier41

Average Ferry trip length = 0.64 Hour

Annual Special Event Ferry Operation = 249.6 hours

Average hp = 5667 Source: Separate fleet calculation sheet

Emission Factors

Aveage Engine Year: 2009

Running	ROG	NOx	PM10	PM2.5	CO2
gm/hp-hr	0.68	5.529	0.2	0.2	328.69

Source: CARB's Commercial Harbor Craft Estimation Data Base

Load Factor = 0.42 Source: CARB's Commercial Harbor Craft Estimation Data Base

Emissions Calculation

Annual emission rate (tons/year) for ferry vessels = emission factor (grams/horsepower-hour) * marine vessel horsepower * vessel load factor * conversion factor (1 ton/907185 grams) * annual hours vessels operations

Running Emissions =	ROG	NOx	PM10	PM2.5	CO2
Ton/year	0.45	3.62	0.13	0.13	215.26

Table 6

Special Event Vehicle Emissions Reduction

Events/year =	80		Source: Project Description
Trips/ event =	4		Source: Project Description
Trips/year =	320		

Annual passengers (2040) =	118000	passengers	(LCW Consulting)
Trip reduction rate=	0.66	trips reduced per rider	Source: WETA 2003
Trips reduced =	77880	trips/year	
Trip Length =	14	miles	Source: Google driving distance between Chase Center and Alameda ferry terminal (Closest)
Reduced VMT =	1090320	VMT/year	

Emission Factors
Buildout Year: 2021
Composite factors assume 75% LDA and 25%LDT1

Running	ROG	NOx	PM10	PM2.5	CO2	Source: EMFAC2014
gm/mile	0.408817	0.071442	0.046636	0.019484	282.75	

Annual Emissions Reduction Calculation

Annual emission rate (tons/year) for vehuicles = emission factor (grams/mile) * conversion factor (1 ton/907185 grams) * annual VMT

Annual Emissions Reduction =
Tons/year

	ROG	NOx	PM10	PM2.5	CO2
Tons/year =	0.491346	0.085864	0.05605	0.023417	339.8306
Pounds/day =	2.692307	0.47049	0.307123	0.128313	

Table 7

Water Taxi Operations

Daily Operations	15	Trips/day	Source: Project Description
Special Events/year =	81		Source: Project Description
Trips/ event =	8		ESA estimate. Equal to the number of ferry trips per event. Also more than half the daily total assumption in the PD
Trips/year =	6123		

Larkspur to SF Time = 0.5 hour Source: http://goldengateferry.org/schedules/Larkspur.php
(conservative assummtion. Per PD destinations could be Pier 1.5, Pier 39, Fisherman's Wharf, Sausalito, Berkeley, and Richmond)

Annual Water Taxi Operation = 3061.5 hours

Average hp = 425 Source: Applicant RFI Response. Assume 90 % 6-passenger Kestral and 10% 45-passenger Opsrey

Emission Factors
Engine Year: 2014-2020

Running	ROG	NOx	PM10	PM2.5	CO2	Source: CARB's Commercial Harbor Craft Estimation Data Base
gm/hp-hr	0.68	3.99	0.08	0.08	237.20	

Load Factor = 0.42 Source: CARB's Commercial Harbor Craft Estimation Data Base

Emissions Calculation

Annual emission rate (tons/year) for idling small or large vessels = emission factor (grams/horsepower-hour) * marine vessel horsepower * vessel load factor * conversion factor (1 ton/907185 grams) * annual hours vessels operations

Running Emissions =	ROG	NOx	PM10	PM2.5	CO2
Ton/year	0.41	2.40	0.05	0.05	142.89

Table 8

Water Taxi Vehicle Emissions Reduction

Daily Operations	15	Trips/day	Source: Project Description
Trips/year =	3765		

Water Taxis have a capacity of 6 to 45

Assume = 7 passengers/trip (LCW Consulting)

Annual passengers = 26355 passengers

Trip reduction rate= 0.66 trips reduced per rider Source: WETA 2003

Trips reduced = 17394.3 trips/year

Trip Length = 14 miles Source: Google driving distance between Chase Center and Alameda ferry terminal (Closest)

Reduced VMT = 243520.2 VMT/year

Emission Factors
Buildout Year: 2021
Composite factors assume 75% LDA and 25%LDT1

Running	ROG	NOx	PM10	PM2.5	CO2	Source: EMFAC2014
gm/mile	0.408817	0.071442	0.046636	0.019484	282.75	

Annual Emissions Reduction Calculation

Annual emission rate (tons/year) for vehuicles = emission factor (grams/mile) * conversion factor (1 ton/907185 grams) * annual VMT

Annual Emissions Reduction =
Tons/year

	ROG	NOx	PM10	PM2.5	CO2
Tons/year =	0.109741	0.019178	0.012519	0.00523	75.90031
Pounds/day =	0.60132	0.105083	0.068595	0.028658	

Table 9

Annual Idling Operations - Commute Service and Special Event

Trip Frequency

Weekdays
Per Project Description:

Morning commute:	11	landing calls
Evening Commute:	12	landing calls
Daily Commute =	23	landing calls

Assume :	5	days/week
	52	week/year
	260	days/year

Annual commute Calls =	5980
Special Event Calls =	388
Total Ferry calls =	6368

Daily emission rate (tons/year) for idling small or large vessels = emission factor (grams/horsepower-hour) * marine vessel horsepower * vessel load factor (of 0.01) * conversion factor (1 ton/907185 grams) * number of total vessels/year * 20 idling minutes/vessel * 1 hour/60 min

Average idling time = 0.33 Hour

Annual ferry idling = 2101.4 hours

Average hp = 5667 Source: Separate fleet calculation sheet

Emission Factors
Aveage Engine Year: 2009

Running	ROG	NOx	PM10	PM2.5	CO2
gm/hp-hr	0.68	5.529	0.2	0.2	328.69

Source: CARB's Commercial Harbor Craft Estimation Data Base

Idle Load Factor = 0.01 Source: WETA 2014 and SOW

Running Emissions =	ROG	NOx	PM10	PM2.5	CO2
Ton/year	0.09	0.73	0.03	0.03	43.15

Table 10

Annual Idling Operations - Water Taxi

Daily Operations	15	Trips/day	Source: Project Description
Special Events/year =	81		Source: Project Description
Trips/ event =	8		ESA estimate. Equal to the number of ferry trips per event. Also more than half the daily total assumtion in the PD
Trips/year =	6123		

Total Taxi calls = 6123

Daily emission rate (tons/year) for idling small or large vessels = emission factor (grams/horsepower-hour) * marine vessel horsepower * vessel load factor (of 0.01) * conversion factor (1 ton/907185 grams) * number of total vessels/year * 20 idling minutes/vessel * 1 hour/60 min

Average idling time = 0.33 Hour

Annual ferry idling = 2020.6 hours

Average hp = 425 Source: Applicant RFI Response. Assume 90 % 6-passenger Kestral and 10% 45-passenger Opsrey

Emission Factors
Engine Year: 2012-2016

	ROG	NOx	PM10	PM2.5	CO2	Source: CARB's Commercial Harbor Craft Estimation Data Base
gm/hp-hr	0.68	3.99	0.08	0.08	237.20	

Idle Load Factor = 0.01 Source: WETA 2014 and SOW

Running Emissions =	ROG	NOx	PM10	PM2.5	CO2
Ton/year	0.01	0.04	7.57E-04	7.57E-04	2.25

Table 11

Maintenance Dredging

Year = 2027

Duration = 41 days

Source **Berth Dredge**

Use = 8 hours/day

Total Useage during phase = 328 hours

hp = 425 Source: Environ, Port of Oakland Emission Inventory, 2013

Emission Factors
Engine Year: 2017 (assume 10 years Old)
Horsepower range: 250 - 500

Running	ROG	NOx	PM10	PM2.5	CO2	Source: CARB's Barge and Dredge Emission Inventory
gm/hp-hr	0.08	1.36	0.01	0.01	568.00	

Load Factor = 0.5 Source: Environ, Port of Oakland Emission Inventory, 2013

Emissions Calculation

Daily emission rate (lbs/day) for idling small or large vessels = emission factor (grams/horsepower-hour) * horsepower * load factor * conversion factor (1 ton/907185 grams) * annual hours vessels operations

Running Emissions =	ROG	NOx	PM10	PM2.5	CO2
Ton/year	0.01	0.10	7.68E-04	7.68E-04	43.64

Source **Survey Boat**

Use = 8 hours/day

Total Useage during phase = 328 hours

hp = 300 Source: Environ, Port of Oakland Emission Inventory, 2013

Emission Factors
Aveage Engine Year: 2017 (assume 10 years old)
Horsepower range: 250 - 500

Running	ROG	NOx	PM10	PM2.5	CO2	Source: CARB's Commercial Harbor Craft Estimation Data Base
gm/hp-hr	0.68	3.99	0.08	0.08	237.20	

Load Factor = 0.5 Source: Environ, Port of Oakland Emission Inventory, 2013

Emissions Calculation

Daily emission rate (lbs/day) for idling small or large vessels = emission factor (grams/horsepower-hour) * marine vessel horsepower * vessel load factor * conversion factor (1 ton/907185 grams) * annual hours vessels operations

Running Emissions =	ROG	NOx	PM10	PM2.5	CO2
Ton/year	0.04	0.22	4.34E-03	4.34E-03	12.86

Table 11

Source **Tug Boat to pull scow for dredge export Main Engine**

Year = 2027

Duration = 41 days

Use During Offhaul = 4.17 hour/ day Source: Environ, Port of Oakland Emission Inventory, 2013
(Average of Montezuma and DOO locations)

Total Useage phase = 170.97 hours

hp = 2460 Source: Environ, Port of Oakland Emission Inventory, 2013

Emission Factors
Aveage Engine Year: 2017 (assume 10 years old)
Horsepower range: 1901 - 3300

Running	ROG	NOx	PM10	PM2.5	CO2
gm/hp-hr	0.18	1.3	0.03	0.03	77.28

Source: CARB's Commercial Harbor Craft Estimation Data Base

Load Factor = 0.5 Source: CARB's Commercial Harbor Craft Estimation Data Base

Emissions Calculation

Daily emission rate (lbs/day) for idling small or large vessels = emission factor (grams/horsepower-hour) * marine vessel horsepower * vessel load factor * conversion factor (1 ton/907185 grams) * annual hours vessels operations

Running Emissions =	ROG	NOx	PM10	PM2.5	CO2
Ton	0.04	0.30	0.01	0.01	17.92

Source **Tug Boat to pull scow for dredge export Auxillary Engine**

hp = 282 Source: Environ, Port of Oakland Emission Inventory, 2013

Emission Factors
Aveage Engine Year: 2017 (assume 10 years old)
Horsepower range: 251 - 500

Running	ROG	NOx	PM10	PM2.5	CO2
gm/hp-hr	0.8092	3.99	0.08	0.08	237.20

Source: CARB's Commercial Harbor Craft Estimation Data Base

Load Factor = 0.31 Source: CARB's Commercial Harbor Craft Estimation Data Base

Emissions Calculation

Daily emission rate (lbs/day) for idling small or large vessels = emission factor (grams/horsepower-hour) * marine vessel horsepower * vessel load factor * conversion factor (1 ton/907185 grams) * annual hours vessels operations

Running Emissions =	ROG	NOx	PM10	PM2.5	CO2
Ton/year	1.33E-02	6.57E-02	1.32E-03	1.32E-03	3.91

Table 11

On-site Tug Emissions

Assume 5% of Tug Transport emissions occur on site to maneuver barge as needed

	ROG	NOx	PM10	PM2.5	CO2
Main Engine ton/year =	0.002086	0.015068	0.000348	0.000348	0.895751
Auxillary Engine ton/year =	6.67E-04	3.29E-03	6.59E-05	6.59E-05	1.95E-01
Total =	**0.002753**	**0.018354**	**0.000414**	**0.000414**	**1.09115**

	ROG	**NOx**	**PM10**	**PM2.5**	**CO2**
Total On-Site Emissions =	**0.05**	**0.34**	**0.01**	**0.01**	**57.60**

Mission Bay Ferry Construction v.3

San Francisco County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Industrial	1.00	User Defined Unit	0.50	20,000.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	4.6	**Precipitation Freq (Days)**	64
Climate Zone	5			**Operational Year**	2021
Utility Company	City and County of San Francisco				
CO2 Intensity (lb/MWhr)	76.28	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Site less than 0.5 acre

Construction Phase - Construction Schedule per Applicant data request response.

Off-road Equipment -

Off-road Equipment - Other Construcion equipment is vibratory hammer.

Off-road Equipment - Other construction equipment is a dredge

Off-road Equipment - General Industrial Equipment is a pile driver. Other material handling equipment is vibratory hammer.

Off-road Equipment - Equipment list per applicant

Off-road Equipment - Other construction equipment is a pile driver. Other material handling is a vibratory hammer

Off-road Equipment - Equipment from applicantOthr construction equipment is impact hammer.

Trips and VMT - Assume 30 vendortrips/day for concrete delivery for pier. Changes per applicant data request response. Haul trips for 28 kcy of dredge spoils to Altamont

Demolition -

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	10.00	20.00
tblConstructionPhase	NumDays	1.00	65.00
tblConstructionPhase	NumDays	100.00	44.00
tblConstructionPhase	NumDays	100.00	173.00
tblConstructionPhase	NumDays	100.00	66.00
tblGrading	AcresOfGrading	0.00	0.50
tblLandUse	LandUseSquareFeet	0.00	20,000.00
tblLandUse	LotAcreage	0.00	0.50
tblOffRoadEquipment	HorsePower	231.00	399.00
tblOffRoadEquipment	HorsePower	231.00	399.00
tblOffRoadEquipment	HorsePower	172.00	75.00
tblOffRoadEquipment	HorsePower	172.00	399.00
tblOffRoadEquipment	HorsePower	172.00	1,100.00
tblOffRoadEquipment	HorsePower	168.00	75.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	UsageHours	8.00	7.00

tblTripsAndVMT	HaulingTripLength	20.00	55.00
tblTripsAndVMT	HaulingTripLength	20.00	51.00
tblTripsAndVMT	HaulingTripNumber	0.00	5.00
tblTripsAndVMT	HaulingTripNumber	0.00	3,504.00
tblTripsAndVMT	HaulingTripNumber	0.00	14.00
tblTripsAndVMT	HaulingTripNumber	0.00	30.00
tblTripsAndVMT	VendorTripNumber	3.00	5.00
tblTripsAndVMT	VendorTripNumber	3.00	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2019	0.1368	2.5480	1.1550	5.4800e-003	0.0873	0.0539	0.1411	0.0239	0.0511	0.0749	0.0000	553.5255	553.5255	0.1018	0.0000	556.0694
2020	0.2485	2.4433	2.0122	4.0300e-003	0.0201	0.1228	0.1429	5.3900e-003	0.1165	0.1219	0.0000	352.8993	352.8993	0.0771	0.0000	354.8271
Maximum	**0.2485**	**2.5480**	**2.0122**	**5.4800e-003**	**0.0873**	**0.1228**	**0.1429**	**0.0239**	**0.1165**	**0.1219**	**0.0000**	**553.5255**	**553.5255**	**0.1018**	**0.0000**	**556.0694**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					

2019	0.1368	2.5480	1.1550	5.4800e-003	0.0873	0.0539	0.1411	0.0239	0.0511	0.0749	0.0000	553.5253	553.5253	0.1018	0.0000	556.0693
2020	0.2485	2.4433	2.0122	4.0300e-003	0.0201	0.1228	0.1429	5.3900e-003	0.1165	0.1219	0.0000	352.8989	352.8989	0.0771	0.0000	354.8268
Maximum	**0.2485**	**2.5480**	**2.0122**	**5.4800e-003**	**0.0873**	**0.1228**	**0.1429**	**0.0239**	**0.1165**	**0.1219**	**0.0000**	**553.5253**	**553.5253**	**0.1018**	**0.0000**	**556.0693**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
7	**4-11-2019**	**7-10-2019**	1.0602	1.0602
8	**7-11-2019**	**10-10-2019**	1.3171	1.3171
9	**10-11-2019**	**1-10-2020**	0.3197	0.3197
10	**1-11-2020**	**4-10-2020**	0.2700	0.2700
11	**4-11-2020**	**7-10-2020**	1.1712	1.1712
12	**7-11-2020**	**9-30-2020**	1.2107	1.2107
		Highest	1.3171	1.3171

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0885	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Total	0.0885	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0885	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0885**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	6/1/2019	6/30/2019	5	20	
2	Dredging	Site Preparation	6/1/2019	8/31/2019	5	65	
3	Pile Driving	Building Construction	9/1/2019	10/31/2019	5	44	
4	Pier Construction	Building Construction	11/1/2019	6/30/2020	5	173	
5	Utilities and Paving	Trenching	6/1/2020	8/31/2020	5	66	

6	Float Installation	Building Construction	6/1/2020	8/31/2020	5	66	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition	Concrete/Industrial Saws	0	8.00	81	0.73
Demolition	Cranes	1	8.00	231	0.29
Demolition	Excavators	1	8.00	158	0.38
Demolition	Generator Sets	1	8.00	84	0.74
Demolition	Other Construction Equipment	1	8.00	75	0.42
Demolition	Rubber Tired Dozers	0	1.00	247	0.40
Demolition	Tractors/Loaders/Backhoes	0	6.00	97	0.37
Dredging	Cranes	1	8.00	231	0.29
Dredging	Graders	0	8.00	187	0.41
Dredging	Other Construction Equipment	1	8.00	399	0.42
Dredging	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Utilities and Paving	Aerial Lifts	1	8.00	63	0.31
Utilities and Paving	Air Compressors	1	8.00	78	0.48
Utilities and Paving	Bore/Drill Rigs	1	8.00	221	0.50
Utilities and Paving	Concrete/Industrial Saws	1	8.00	81	0.73
Utilities and Paving	Cranes	1	8.00	231	0.29
Utilities and Paving	Excavators	1	8.00	158	0.38
Utilities and Paving	Forklifts	1	8.00	89	0.20
Utilities and Paving	Generator Sets	1	8.00	84	0.74
Utilities and Paving	Graders	1	8.00	187	0.41
Utilities and Paving	Other Construction Equipment	1	8.00	172	0.42

Utilities and Paving	Paving Equipment	1	8.00	132	0.36
Utilities and Paving	Plate Compactors	1	8.00	8	0.43
Utilities and Paving	Pumps	1	8.00	84	0.74
Utilities and Paving	Rollers	1	8.00	80	0.38
Utilities and Paving	Surfacing Equipment	1	8.00	263	0.30
Utilities and Paving	Sweepers/Scrubbers	1	8.00	64	0.46
Utilities and Paving	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Utilities and Paving	Trenchers	1	8.00	78	0.50
Pile Driving	Air Compressors	1	8.00	78	0.48
Pile Driving	Cranes	1	4.00	399	0.29
Pile Driving	Forklifts	0	6.00	89	0.20
Pile Driving	Generator Sets	1	8.00	84	0.74
Pile Driving	Other Construction Equipment	1	8.00	1100	0.42
Pile Driving	Other Material Handling Equipment	1		75	0.40
Pile Driving	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Pier Construction	Aerial Lifts	1	8.00	63	0.31
Pier Construction	Concrete/Industrial Saws	0	8.00	81	0.73
Pier Construction	Cranes	1	4.00	231	0.29
Pier Construction	Forklifts	0	6.00	89	0.20
Pier Construction	Generator Sets	1		84	0.74
Pier Construction	Pumps	1	8.00	84	0.74
Pier Construction	Rubber Tired Dozers	0	1.00	247	0.40
Pier Construction	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Float Installation	Air Compressors	1	8.00	78	0.48
Float Installation	Cement and Mortar Mixers	0	6.00	9	0.56
Float Installation	Cranes	1	4.00	399	0.29
Float Installation	Forklifts	0	6.00	89	0.20
Float Installation	Other General Industrial Equipment	1	8.00	88	0.34
Float Installation	Other Material Handling Equipment	0		168	0.40
Float Installation	Pavers	0	7.00	130	0.42

Float Installation	Rollers	0	7.00	80	0.38
Float Installation	Tractors/Loaders/Backhoes	0	7.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	4	10.00	0.00	5.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Dredging	2	5.00	0.00	3,504.00	10.80	7.30	55.00	LD_Mix	HDT_Mix	HHDT
Utilities and Paving	17	43.00	0.00	14.00	10.80	7.30	51.00	LD_Mix	HDT_Mix	HHDT
Pile Driving	5	8.00	3.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Pier Construction	4	8.00	5.00	30.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Float Installation	3	8.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Demolition - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					6.0000e-005	0.0000	6.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0152	0.1527	0.1137	2.0000e-004		8.2000e-003	8.2000e-003		7.7300e-003	7.7300e-003	0.0000	17.9012	17.9012	4.2300e-003	0.0000	18.0071
Total	**0.0152**	**0.1527**	**0.1137**	**2.0000e-004**	**6.0000e-005**	**8.2000e-003**	**8.2600e-003**	**1.0000e-005**	**7.7300e-003**	**7.7400e-003**	**0.0000**	**17.9012**	**17.9012**	**4.2300e-003**	**0.0000**	**18.0071**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.0000e-005	9.4000e-004	2.6000e-004	0.0000	4.0000e-005	0.0000	5.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.2268	0.2268	4.0000e-005	0.0000	0.2278
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.3000e-004	2.3000e-004	2.4600e-003	1.0000e-005	7.9000e-004	1.0000e-005	8.0000e-004	2.1000e-004	1.0000e-005	2.2000e-004	0.0000	0.7759	0.7759	2.0000e-005	0.0000	0.7763
Total	**3.5000e-004**	**1.1700e-003**	**2.7200e-003**	**1.0000e-005**	**8.3000e-004**	**1.0000e-005**	**8.5000e-004**	**2.2000e-004**	**1.0000e-005**	**2.3000e-004**	**0.0000**	**1.0027**	**1.0027**	**6.0000e-005**	**0.0000**	**1.0042**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					6.0000e-005	0.0000	6.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0152	0.1527	0.1137	2.0000e-004		8.2000e-003	8.2000e-003		7.7300e-003	7.7300e-003	0.0000	17.9012	17.9012	4.2300e-003	0.0000	18.0071
Total	**0.0152**	**0.1527**	**0.1137**	**2.0000e-004**	**6.0000e-005**	**8.2000e-003**	**8.2600e-003**	**1.0000e-005**	**7.7300e-003**	**7.7400e-003**	**0.0000**	**17.9012**	**17.9012**	**4.2300e-003**	**0.0000**	**18.0071**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Hauling	2.0000e-005	9.4000e-004	2.6000e-004	0.0000	4.0000e-005	0.0000	5.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.2268	0.2268	4.0000e-005	0.0000	0.2278
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.3000e-004	2.3000e-004	2.4600e-003	1.0000e-005	7.9000e-004	1.0000e-005	8.0000e-004	2.1000e-004	1.0000e-005	2.2000e-004	0.0000	0.7759	0.7759	2.0000e-005	0.0000	0.7763
Total	**3.5000e-004**	**1.1700e-003**	**2.7200e-003**	**1.0000e-005**	**8.3000e-004**	**1.0000e-005**	**8.5000e-004**	**2.2000e-004**	**1.0000e-005**	**2.3000e-004**	**0.0000**	**1.0027**	**1.0027**	**6.0000e-005**	**0.0000**	**1.0042**

3.3 Dredging - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.7000e-004	0.0000	2.7000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0388	0.4695	0.2347	6.6000e-004		0.0181	0.0181		0.0167	0.0167	0.0000	59.1409	59.1409	0.0187	0.0000	59.6087
Total	**0.0388**	**0.4695**	**0.2347**	**6.6000e-004**	**2.7000e-004**	**0.0181**	**0.0184**	**3.0000e-005**	**0.0167**	**0.0167**	**0.0000**	**59.1409**	**59.1409**	**0.0187**	**0.0000**	**59.6087**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0382	1.5033	0.4519	3.9300e-003	0.0808	6.4800e-003	0.0872	0.0222	6.2000e-003	0.0284	0.0000	415.6026	415.6026	0.0698	0.0000	417.3479
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.3000e-004	3.7000e-004	4.0000e-003	1.0000e-005	1.2800e-003	1.0000e-005	1.2900e-003	3.4000e-004	1.0000e-005	3.5000e-004	0.0000	1.2608	1.2608	3.0000e-005	0.0000	1.2615
Total	**0.0387**	**1.5037**	**0.4559**	**3.9400e-003**	**0.0820**	**6.4900e-003**	**0.0885**	**0.0225**	**6.2100e-003**	**0.0287**	**0.0000**	**416.8633**	**416.8633**	**0.0698**	**0.0000**	**418.6094**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.7000e-004	0.0000	2.7000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0388	0.4695	0.2347	6.6000e-004		0.0181	0.0181		0.0167	0.0167	0.0000	59.1409	59.1409	0.0187	0.0000	59.6086
Total	**0.0388**	**0.4695**	**0.2347**	**6.6000e-004**	**2.7000e-004**	**0.0181**	**0.0184**	**3.0000e-005**	**0.0167**	**0.0167**	**0.0000**	**59.1409**	**59.1409**	**0.0187**	**0.0000**	**59.6086**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0382	1.5033	0.4519	3.9300e-003	0.0808	6.4800e-003	0.0872	0.0222	6.2000e-003	0.0284	0.0000	415.6026	415.6026	0.0698	0.0000	417.3479
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.3000e-004	3.7000e-004	4.0000e-003	1.0000e-005	1.2800e-003	1.0000e-005	1.2900e-003	3.4000e-004	1.0000e-005	3.5000e-004	0.0000	1.2608	1.2608	3.0000e-005	0.0000	1.2615
Total	**0.0387**	**1.5037**	**0.4559**	**3.9400e-003**	**0.0820**	**6.4900e-003**	**0.0885**	**0.0225**	**6.2100e-003**	**0.0287**	**0.0000**	**416.8633**	**416.8633**	**0.0698**	**0.0000**	**418.6094**

3.4 Pile Driving - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0254	0.2334	0.2026	3.4000e-004		0.0126	0.0126		0.0123	0.0123	0.0000	29.7633	29.7633	4.5300e-003	0.0000	29.8766
Total	**0.0254**	**0.2334**	**0.2026**	**3.4000e-004**		**0.0126**	**0.0126**		**0.0123**	**0.0123**	**0.0000**	**29.7633**	**29.7633**	**4.5300e-003**	**0.0000**	**29.8766**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	3.0000e-004	9.0000e-003	2.6700e-003	2.0000e-005	4.3000e-004	6.0000e-005	4.9000e-004	1.2000e-004	5.0000e-005	1.8000e-004	0.0000	1.8453	1.8453	2.5000e-004	0.0000	1.8515
Worker	5.8000e-004	4.0000e-004	4.3400e-003	2.0000e-005	1.3900e-003	1.0000e-005	1.4000e-003	3.7000e-004	1.0000e-005	3.8000e-004	0.0000	1.3655	1.3655	3.0000e-005	0.0000	1.3664
Total	**8.8000e-004**	**9.4000e-003**	**7.0100e-003**	**4.0000e-005**	**1.8200e-003**	**7.0000e-005**	**1.8900e-003**	**4.9000e-004**	**6.0000e-005**	**5.6000e-004**	**0.0000**	**3.2108**	**3.2108**	**2.8000e-004**	**0.0000**	**3.2178**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0254	0.2334	0.2026	3.4000e-004		0.0126	0.0126		0.0123	0.0123	0.0000	29.7632	29.7632	4.5300e-003	0.0000	29.8766

Total	**0.0254**	**0.2334**	**0.2026**	**3.4000e-004**		**0.0126**	**0.0126**		**0.0123**	**0.0123**	**0.0000**	**29.7632**	**29.7632**	**4.5300e-003**	**0.0000**	**29.8766**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	3.0000e-004	9.0000e-003	2.6700e-003	2.0000e-005	4.3000e-004	6.0000e-005	4.9000e-004	1.2000e-004	5.0000e-005	1.8000e-004	0.0000	1.8453	1.8453	2.5000e-004	0.0000	1.8515
Worker	5.8000e-004	4.0000e-004	4.3400e-003	2.0000e-005	1.3900e-003	1.0000e-005	1.4000e-003	3.7000e-004	1.0000e-005	3.8000e-004	0.0000	1.3655	1.3655	3.0000e-005	0.0000	1.3664
Total	**8.8000e-004**	**9.4000e-003**	**7.0100e-003**	**4.0000e-005**	**1.8200e-003**	**7.0000e-005**	**1.8900e-003**	**4.9000e-004**	**6.0000e-005**	**5.6000e-004**	**0.0000**	**3.2108**	**3.2108**	**2.8000e-004**	**0.0000**	**3.2178**

3.5 Pier Construction - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0164	0.1616	0.1294	2.4000e-004		8.2100e-003	8.2100e-003		7.9600e-003	7.9600e-003	0.0000	20.9648	20.9648	3.6000e-003	0.0000	21.0549
Total	**0.0164**	**0.1616**	**0.1294**	**2.4000e-004**		**8.2100e-003**	**8.2100e-003**		**7.9600e-003**	**7.9600e-003**	**0.0000**	**20.9648**	**20.9648**	**3.6000e-003**	**0.0000**	**21.0549**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.0000e-005	1.4100e-003	3.9000e-004	0.0000	2.1000e-004	1.0000e-005	2.1000e-004	5.0000e-005	1.0000e-005	6.0000e-005	0.0000	0.3383	0.3383	6.0000e-005	0.0000	0.3398
Vendor	4.9000e-004	0.0147	4.3500e-003	3.0000e-005	7.0000e-004	9.0000e-005	7.9000e-004	2.0000e-004	9.0000e-005	2.9000e-004	0.0000	3.0055	3.0055	4.1000e-004	0.0000	3.0157
Worker	5.6000e-004	3.9000e-004	4.2400e-003	1.0000e-005	1.3600e-003	1.0000e-005	1.3700e-003	3.6000e-004	1.0000e-005	3.7000e-004	0.0000	1.3345	1.3345	3.0000e-005	0.0000	1.3353
Total	**1.0800e-003**	**0.0165**	**8.9800e-003**	**4.0000e-005**	**2.2700e-003**	**1.1000e-004**	**2.3700e-003**	**6.1000e-004**	**1.1000e-004**	**7.2000e-004**	**0.0000**	**4.6783**	**4.6783**	**5.0000e-004**	**0.0000**	**4.6907**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0164	0.1616	0.1294	2.4000e-004		8.2100e-003	8.2100e-003		7.9600e-003	7.9600e-003	0.0000	20.9648	20.9648	3.6000e-003	0.0000	21.0548
Total	**0.0164**	**0.1616**	**0.1294**	**2.4000e-004**		**8.2100e-003**	**8.2100e-003**		**7.9600e-003**	**7.9600e-003**	**0.0000**	**20.9648**	**20.9648**	**3.6000e-003**	**0.0000**	**21.0548**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Hauling	3.0000e-005	1.4100e-003	3.9000e-004	0.0000	2.1000e-004	1.0000e-005	2.1000e-004	5.0000e-005	1.0000e-005	6.0000e-005	0.0000	0.3383	0.3383	6.0000e-005	0.0000	0.3398
Vendor	4.9000e-004	0.0147	4.3500e-003	3.0000e-005	7.0000e-004	9.0000e-005	7.9000e-004	2.0000e-004	9.0000e-005	2.9000e-004	0.0000	3.0055	3.0055	4.1000e-004	0.0000	3.0157
Worker	5.6000e-004	3.9000e-004	4.2400e-003	1.0000e-005	1.3600e-003	1.0000e-005	1.3700e-003	3.6000e-004	1.0000e-005	3.7000e-004	0.0000	1.3345	1.3345	3.0000e-005	0.0000	1.3353
Total	**1.0800e-003**	**0.0165**	**8.9800e-003**	**4.0000e-005**	**2.2700e-003**	**1.1000e-004**	**2.3700e-003**	**6.1000e-004**	**1.1000e-004**	**7.2000e-004**	**0.0000**	**4.6783**	**4.6783**	**5.0000e-004**	**0.0000**	**4.6907**

3.5 Pier Construction - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0448	0.4465	0.3844	7.2000e-004		0.0216	0.0216		0.0210	0.0210	0.0000	62.8028	62.8028	0.0106	0.0000	63.0685
Total	**0.0448**	**0.4465**	**0.3844**	**7.2000e-004**		**0.0216**	**0.0216**		**0.0210**	**0.0210**	**0.0000**	**62.8028**	**62.8028**	**0.0106**	**0.0000**	**63.0685**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	9.0000e-005	3.9300e-003	1.1600e-003	1.0000e-005	2.4000e-004	1.0000e-005	2.5000e-004	6.0000e-005	1.0000e-005	7.0000e-005	0.0000	1.0070	1.0070	1.8000e-004	0.0000	1.0115
Vendor	1.2000e-003	0.0407	0.0120	9.0000e-005	2.1200e-003	1.8000e-004	2.3000e-003	6.1000e-004	1.7000e-004	7.9000e-004	0.0000	8.9963	8.9963	1.2000e-003	0.0000	9.0264
Worker	1.5800e-003	1.0500e-003	0.0117	4.0000e-005	4.1100e-003	3.0000e-005	4.1400e-003	1.0900e-003	3.0000e-005	1.1200e-003	0.0000	3.9052	3.9052	9.0000e-005	0.0000	3.9073
Total	**2.8700e-003**	**0.0457**	**0.0249**	**1.4000e-004**	**6.4700e-003**	**2.2000e-004**	**6.6900e-003**	**1.7600e-003**	**2.1000e-004**	**1.9800e-003**	**0.0000**	**13.9085**	**13.9085**	**1.4700e-003**	**0.0000**	**13.9451**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0448	0.4465	0.3844	7.2000e-004		0.0216	0.0216		0.0210	0.0210	0.0000	62.8027	62.8027	0.0106	0.0000	63.0684
Total	**0.0448**	**0.4465**	**0.3844**	**7.2000e-004**		**0.0216**	**0.0216**		**0.0210**	**0.0210**	**0.0000**	**62.8027**	**62.8027**	**0.0106**	**0.0000**	**63.0684**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	9.0000e-005	3.9300e-003	1.1600e-003	1.0000e-005	2.4000e-004	1.0000e-005	2.5000e-004	6.0000e-005	1.0000e-005	7.0000e-005	0.0000	1.0070	1.0070	1.8000e-004	0.0000	1.0115
Vendor	1.2000e-003	0.0407	0.0120	9.0000e-005	2.1200e-003	1.8000e-004	2.3000e-003	6.1000e-004	1.7000e-004	7.9000e-004	0.0000	8.9963	8.9963	1.2000e-003	0.0000	9.0264
Worker	1.5800e-003	1.0500e-003	0.0117	4.0000e-005	4.1100e-003	3.0000e-005	4.1400e-003	1.0900e-003	3.0000e-005	1.1200e-003	0.0000	3.9052	3.9052	9.0000e-005	0.0000	3.9073
Total	**2.8700e-003**	**0.0457**	**0.0249**	**1.4000e-004**	**6.4700e-003**	**2.2000e-004**	**6.6900e-003**	**1.7600e-003**	**2.1000e-004**	**1.9800e-003**	**0.0000**	**13.9085**	**13.9085**	**1.4700e-003**	**0.0000**	**13.9451**

3.6 Utilities and Paving - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1663	1.6678	1.3276	2.6300e-003		0.0856	0.0856		0.0808	0.0808	0.0000	228.9366	228.9366	0.0565	0.0000	230.3501
Total	**0.1663**	**1.6678**	**1.3276**	**2.6300e-003**		**0.0856**	**0.0856**		**0.0808**	**0.0808**	**0.0000**	**228.9366**	**228.9366**	**0.0565**	**0.0000**	**230.3501**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.3000e-004	5.1500e-003	1.6700e-003	1.0000e-005	3.0000e-004	2.0000e-005	3.2000e-004	8.0000e-005	2.0000e-005	1.0000e-004	0.0000	1.5176	1.5176	2.6000e-004	0.0000	1.5242
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.3100e-003	2.8700e-003	0.0319	1.2000e-004	0.0112	9.0000e-005	0.0113	2.9800e-003	8.0000e-005	3.0600e-003	0.0000	10.6566	10.6566	2.3000e-004	0.0000	10.6625
Total	**4.4400e-003**	**8.0200e-003**	**0.0336**	**1.3000e-004**	**0.0115**	**1.1000e-004**	**0.0116**	**3.0600e-003**	**1.0000e-004**	**3.1600e-003**	**0.0000**	**12.1742**	**12.1742**	**4.9000e-004**	**0.0000**	**12.1866**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1663	1.6678	1.3276	2.6300e-003		0.0856	0.0856		0.0808	0.0808	0.0000	228.9363	228.9363	0.0565	0.0000	230.3498

Total	**0.1663**	**1.6678**	**1.3276**	**2.6300e-003**		**0.0856**	**0.0856**		**0.0808**	**0.0808**	**0.0000**	**228.9363**	**228.9363**	**0.0565**	**0.0000**	**230.3498**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.3000e-004	5.1500e-003	1.6700e-003	1.0000e-005	3.0000e-004	2.0000e-005	3.2000e-004	8.0000e-005	2.0000e-005	1.0000e-004	0.0000	1.5176	1.5176	2.6000e-004	0.0000	1.5242
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.3100e-003	2.8700e-003	0.0319	1.2000e-004	0.0112	9.0000e-005	0.0113	2.9800e-003	8.0000e-005	3.0600e-003	0.0000	10.6566	10.6566	2.3000e-004	0.0000	10.6625
Total	**4.4400e-003**	**8.0200e-003**	**0.0336**	**1.3000e-004**	**0.0115**	**1.1000e-004**	**0.0116**	**3.0600e-003**	**1.0000e-004**	**3.1600e-003**	**0.0000**	**12.1742**	**12.1742**	**4.9000e-004**	**0.0000**	**12.1866**

3.7 Float Installation - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0292	0.2749	0.2358	3.8000e-004		0.0153	0.0153		0.0144	0.0144	0.0000	33.0947	33.0947	7.9400e-003	0.0000	33.2932
Total	**0.0292**	**0.2749**	**0.2358**	**3.8000e-004**		**0.0153**	**0.0153**		**0.0144**	**0.0144**	**0.0000**	**33.0947**	**33.0947**	**7.9400e-003**	**0.0000**	**33.2932**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	8.0000e-004	5.3000e-004	5.9300e-003	2.0000e-005	2.0900e-003	2.0000e-005	2.1000e-003	5.5000e-004	1.0000e-005	5.7000e-004	0.0000	1.9826	1.9826	4.0000e-005	0.0000	1.9837
Total	**8.0000e-004**	**5.3000e-004**	**5.9300e-003**	**2.0000e-005**	**2.0900e-003**	**2.0000e-005**	**2.1000e-003**	**5.5000e-004**	**1.0000e-005**	**5.7000e-004**	**0.0000**	**1.9826**	**1.9826**	**4.0000e-005**	**0.0000**	**1.9837**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0292	0.2749	0.2358	3.8000e-004		0.0153	0.0153		0.0144	0.0144	0.0000	33.0947	33.0947	7.9400e-003	0.0000	33.2932
Total	**0.0292**	**0.2749**	**0.2358**	**3.8000e-004**		**0.0153**	**0.0153**		**0.0144**	**0.0144**	**0.0000**	**33.0947**	**33.0947**	**7.9400e-003**	**0.0000**	**33.2932**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	8.0000e-004	5.3000e-004	5.9300e-003	2.0000e-005	2.0900e-003	2.0000e-005	2.1000e-003	5.5000e-004	1.0000e-005	5.7000e-004	0.0000	1.9826	1.9826	4.0000e-005	0.0000	1.9837
Total	**8.0000e-004**	**5.3000e-004**	**5.9300e-003**	**2.0000e-005**	**2.0900e-003**	**2.0000e-005**	**2.1000e-003**	**5.5000e-004**	**1.0000e-005**	**5.7000e-004**	**0.0000**	**1.9826**	**1.9826**	**4.0000e-005**	**0.0000**	**1.9837**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Industrial	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by

ATTACHMENT C

Attachment C: Health Risk Assessment Calculations

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Attachment C
Health Risk Assessment Calculations

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C-1 Summary Tables

Tables for ISMND

Updated: 3/23/2018

Green = used in ISMND

Table 21: Lifetime Cancer Risk and PM2.5 Concentration Contributions at Off-Site Receptors

Source	Lifetime Excess Cancer Risk (in one million)	PM2.5 Concentration ($\mu g/m^3$)
Residential Receptor		
Background	42.3	8.47
Construction – Off-road Emissions	26.0	0.18
Operation – Vessel Idling and Dredging	20.3	0.03
Cumulative Totala	**83.8**	**8.68**
APEZ	100	10.00
Significant?	No	No
Hospital Receptor		
Background	58.5	8.58
Construction – Off-road Emissions	2.4	0.02
Operation – Vessel Idling and Dredging	1.9	0.00
Cumulative Totala	**62.4**	**8.60**
APEZ Criteria	100.0	10.00
Significant?	No	No
Daycare Receptor		
Background	49.6	8.58
Construction – Off-road Emissions	5.4	0.04
Operation – Vessel Idling and Dredging	2.6	0.01
Cumulative Totala	**56.6**	**8.63**
APEZ Criteria	100.0	10.00
Significant?	No	No
School Receptor		
Background	38.4	8.46
Construction – Off-road Emissions	1.0	0.07
Operation – Vessel Idling and Dredging	1.1	0.01
Cumulative Totala	**40.4**	**8.54**
APEZ Criteria	100.0	10.00
Significant?	No	No

83.8 <- Maximum Cancer

8.7 <- Maximum PM2.5

Cancer Risk

UNMITIGATED

Receptor Type	Cancer Risk by Scenario: Construction	Construction + Operation	Operation
Project Risk			
Residential	26.0	41.5	20.3
Hospital	2.4	3.8	1.9
Daycare	5.4	7.0	2.6
School	1.0	2.0	1.1
Maximum Cancer Risk	26.0	41.5	20.3
Background Risk			
Residential	42.3	42.3	42.3
Hospital	58.5	58.5	58.5
Daycare	49.6	49.6	49.6
School	38.4	38.4	38.4
Project + Background Risk			
Residential	68.3	83.8	62.6
Hospital	60.9	62.4	60.5
Daycare	55.1	56.6	52.2
School	39.5	40.4	39.6
Maximum Cancer Risk	68.3	83.8	62.6
APEZ Cancer Threshold	100.0	100.0	100.0
In APEZ?	No	No	No
Cancer Threshold for Project	**10**	**10**	**10**
Exceeds Threshold?	No	No	No

Actual Data

Risk Scenario: Construction	Construction + Operation	Operation
25.99	41.47	20.34
2.37	3.83	1.90
5.43	6.98	2.58
1.04	1.95	1.11
25.99	41.47	20.34

MITIGATED

Receptor Type	Cancer Risk by Scenario: Construction	Construction + Operation	Operation
Project Risk			
Residential	17.7	33.1	20.3

Actual Data

Risk Scenario: Construction	Construction + Operation	Operation
17.66	33.14	20.34

Hospital	1.6	3.1	1.9	1.61	3.07	1.90
Daycare	3.7	5.2	2.6	3.69	5.24	2.58
School	0.7	1.6	1.1	0.71	1.62	1.11
Maximum Cancer Risk	17.7	33.1	20.3	17.66	33.14	20.34
Background Risk						
Residential	42.3	42.3	42.3			
Hospital	58.5	58.5	58.5			
Daycare	49.6	49.6	49.6			
School	38.4	38.4	38.4			
Project + Background Risk						
Residential	60.0	75.4	62.6			
Hospital	60.2	61.6	60.5			
Daycare	53.3	54.9	52.2			
School	39.2	40.1	39.6			
Maximum Cancer Risk	60.2	75.4	62.6			
APEZ Cancer Threshold	100.0	100.0	100.0			
In APEZ?	No	No	No			
Cancer Threshold for Project	**10**	**10**	**10**			
Exceeds Threshold?	No	No	No			

PM2.5 Annual Average Concentrations

UNMITIGATED

Receptor Type	Average Annual PM2.5 Concentration by Scenario			Actual Data: Risk Scenario		
	Construction	Construction + Operation	Operation	Construction	Construction + Operation	Operation
Project Risk						
Residential	0.2	0.2	<0.1	0.18	0.21	0.03
Hospital	<0.1	<0.1	<0.1	0.02	0.02	0.00
Daycare	<0.1	<0.1	<0.1	0.04	0.05	0.01
School	<0.1	<0.1	<0.1	0.07	0.08	0.01
Maximum PM2.5 Concentration	0.2	0.2	<0.1	0.18	0.21	0.03
Background Risk						
Residential	8.5	8.5	8.5			
Hospital	8.6	8.6	8.6			
Daycare	8.6	8.6	8.6			
School	8.5	8.5	8.5			
Project + Background Risk						
Residential	8.7	8.7	8.5			
Hospital	8.6	8.6	8.6			
Daycare	8.6	8.6	8.6			
School	8.5	8.5	8.5			
Maximum Cancer Risk	8.7	8.7	8.6			
APEZ PM2.5 Threshold	**10.0**	**10.0**	**10.0**			
In APEZ?	No	No	No			
PM2.5 Threshold for Project	**0.3**	**0.3**	**0.3**			
Exceeds Threshold?	No	No	No			

MITIGATED

Receptor Type	Average Annual PM2.5 Concentration by Scenario			Actual Data: Risk Scenario		
	Construction	Construction + Operation	Operation	Construction	Construction + Operation	Operation
Project Risk						
Residential	0.1	0.2	<0.1	0.12	0.15	0.03
Hospital	<0.1	<0.1	<0.1	0.01	0.01	0.00
Daycare	<0.1	<0.1	<0.1	0.03	0.04	0.01
School	<0.1	<0.1	<0.1	0.05	0.06	0.01
Maximum PM2.5 Concentration	0.1	0.2	<0.1	0.12	0.15	0.03
Background Risk						
Residential	8.5	8.5	8.5			
Hospital	8.6	8.6	8.6			
Daycare	8.6	8.6	8.6			
School	8.5	8.5	8.5			
Project + Background Risk						
Residential	8.6	8.6	8.5			
Hospital	8.6	8.6	8.6			
Daycare	8.6	8.6	8.6			
School	8.5	8.5	8.5			
Maximum Cancer Risk	8.6	8.6	8.6			
APEZ PM2.5 Threshold	**10.0**	**10.0**	**10.0**			
In APEZ?	No	No	No			
PM2.5 Threshold for Project	**0.3**	**0.3**	**0.3**			
Exceeds Threshold?	No	No	No			

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C-2 Construction Data

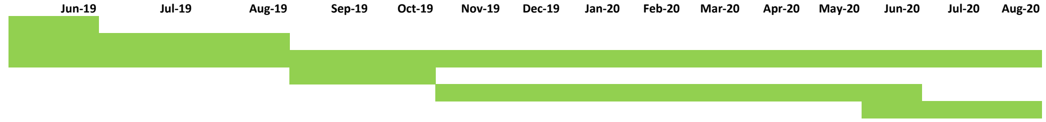
Construction Data

Updated: 2/1/2018

Construction Schedule

Phase	Start Date	End Date	Workdays	Total Days
Demolition	6/1/2019	6/30/2019	20	29
Dredging	6/1/2019	8/31/2019	65	91
Utilities and Paving	6/1/2020	8/31/2020	66	91
Pile Driving	9/1/2019	10/31/2019	44	60
Pier Construction	11/1/2019	6/30/2020	173	242
Float Installation	6/1/2020	8/31/2020	66	91
All Construction	*6/1/2019*	*8/31/2020*	*326*	*457*
			Years:	**1.25**

2019							2020							
3rd Tri	3rd Tri	3rd Tri	3rd Tri	0<2 Yrs	0<2 Yrs	0<2 Yrs	0<2 Yrs	0<2 Yrs	0<2 Yrs	0<2 Yrs	0<2 Yrs	0<2 Yrs	0<2 Yrs	0<2 Yrs
Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20



Exhaust Emissions Data (tons) - SUMMARY

Source	Unmitigated PM10	Unmitigated PM2.5	Mitigated PM10	Mitigated PM2.5
Off-Road Equipment (CalEEMod)	0.170	0.161	0.009	0.009
On-Road truck idling	1.40E-06	1.34E-06	1.40E-06	1.34E-06
In-Water Demo	0.013	0.013	0.013	0.013
In-Water Dredging				
Berth dredge = Survey boat	*0.023*	*0.023*	*0.023*	*0.023*
Tugboat, portion at site	*0.004*	*0.004*	*0.004*	*0.004*
In-water pile driving	0.028	0.028	0.027	0.027
In-WaterFloats	0.038	0.038	0.036	0.036
Total	**0.276**	**0.267**	**0.111**	**0.111**

Source: Constructiion Marine emissions_v2_BS

Summary for Emission Rates Tab

Pollutant / Mit	Construction Off-Road Equip	Construction In-Water Equip	Construction Dredging	Total
PM10				
Unmitigated	0.170	0.079	0.027	**0.276**
Mitigated	0.009	0.076	0.027	**0.111**
PM2.5				
Unmitigated	0.161	0.079	0.027	**0.267**
Mitigated	0.009	0.076	0.027	**0.111**

C-3 Operational Data

Operational Data

Updated: 2/1/2018

Exhaust Emissions Data (tons) - SUMMARY

	Unmitigated		Mitigated		
Source	**PM10**	**PM2.5**	**PM10**	**PM2.5**	
Special Event Ferry Trips	0.131	0.131	0.131	0.131	not used in HRA; emissions not near site
Ferry Idling	2.63E-02	2.63E-02	2.63E-02	2.63E-02	
Water Taxi Trips	0.048	0.048	0.048	0.048	not used in HRA; emissions not near site
Water Taxi idling	0.000757288	0.000757288	0.00075729	0.00075729	
In-Water Dredging					
Berth dredge = Survey boat	*0.005*	*0.005*	*0.005*	*0.005*	
Tugboat, portion at site	*0.0004*	*0.0004*	*0.0004*	*0.0004*	
Ferry Trip Reduction	-0.056	-0.023	-0.056	-0.023	not used in HRA; emissions not near site
Water Taxi Trip reduction	-0.013	-0.005	-0.013	-0.005	not used in HRA; emissions not near site
Total	**0.143**	**0.183**	**0.143**	**0.183**	

Source: Ferry Operations 013118_BS

Summary for Emission Rates Tab

Pollutant / Mit	Operation Dredging	Operation In-Water Equip (idling)	Total
PM10			
Unmitigated	0.006	0.027	**0.033**
Mitigated	0.006	0.027	**0.033**
PM2.5			
Unmitigated	0.006	0.027	**0.033**
Mitigated	0.006	0.027	**0.033**

C-4 CRRP Background Risk

CRRP Background Risk
Updated: 10/23/2017

Receptor

	X	Y	2014 Cancer	SCALED Cancer	2014 PM2.5	Receptor Location
Residential	553880	4179800	30.780881	*42.30524285*	8.470791	Condos at 610 Illinois St., 250m south (820 feet)
Hospital	553780	4180060	42.600263	*58.54980147*	8.57923	UCSF Benioff Children's Hospital, 275m west (900 feet)
Daycare	553380	4180320	36.121487	*49.64537173*	8.577442	University Child Care at Mission Bay (Bright Horizons), 725 meters west (2,400 feet)
School	553920	4179520	27.973545	*38.44684025*	8.460822	Potrero Kids, 500m south (1,650 feet)

Other locations

Residential	553900	4179800	28.305132	*38.90257342*	8.451409	Condos at 610 Illinois St., 250m south (820 feet)

C-5 HRA Calculations

HRA - Screening

Updated: 10/20/2017

HRA Notes:

XXX

Emission Rates - Scaling Factors

	Construction Off-Road Equip	Construction In-Water Equip	Construction Dredging	Operation Dredging	Operation In-Water Equip (idling)	NOTES
DPM g/s						
Unmitigated	0.0021	0.0018	0.0006	1.59E-04	7.77E-04	
Mitigated	0.0014	0.0013	0.0004	1.59E-04	7.77E-04	
PM2.5 g/s						
Unmitigated	0.0032	0.0018	0.0006	1.59E-04	7.77E-04	
Mitigated	0.0021	0.0013	0.0004	1.59E-04	7.77E-04	
MERV Filtration Reduction Factors						
Residential						
Hospital	90%	90%	90%	90%	90%	MERV 14 at UCSF, according to this: http://designandconstruction.ucsfmedicalcenter.org/ref-material/hvac guide.pdf
Daycare						
School						

4.12.2.1 Non-Continuous Sources

When modeling a non-continuously emitting source (e.g., operating for eight hours per day and five days per week), the modeled long-term average concentrations are based on 24 hours a day and seven days per week for the period of the meteorological data set. Even though the emitting source is modeled using a non-continuous emissions schedule, the long-term concentration is still based on 24 hours a day and seven days per week. Thus, this concentration includes the zero hours when the source was not operating. For the offsite worker inhalation risk, we want to determine the long-term concentration the worker is breathing during their work shift. Therefore, the long-term concentration needs to be adjusted so it is based only on the hours when the worker is present. For example, assuming the emitting source and worker's schedules are the same, the adjustment factor is 4.2 = (24 hours per day/8 hours per shift)x(7 days in a week/5 days in a work week). In this example, the long term residential exposure is adjusted upward to represent the exposure to a worker. Additional concentration adjustments may be appropriate depending on the work shift overlap. These adjustments are discussed below.

4.12.2.2 Continuous Sources

If the source is continuously emitting, then the worker is assumed to breathe the long-term annual average concentration during their work shift. Equation 4.1 becomes one and no concentration adjustments are necessary in this situation when estimating the inhalation cancer risk. Note however, if an assessor does not wish to apply the assumption the worker breathes the long-term annual average concentration during the work shift, then a refined concentration can be post-processed as described in Appendix M. All alternative assumptions should be approved by the reviewing authority and supported in the presentation of results.

2.1.3.2 Short Term Projects

In the 2015 HRA Guidelines, OEHHA recommends using actual project duration for short term projects, but cautions that the risk manager should consider a lower cancer risk threshold for very short term projects, because a higher exposure over a short period of time may pose a greater risk than the same total exposure spread over a much longer period of time. To ensure that short-term projects do not result in unanticipated higher cancer impacts due to short-duration high-exposure rates, the Air District recommends that the cancer risk be evaluated assuming that the average daily dose for short-term exposure lasts a minimum of three years for projects lasting three years or less. For residential exposures, the cancer risk calculations should include the most sensitive age groups (beginning with the third trimester of pregnancy) and should use the 95th percentile breathing rates. The Air District recommends following OEHHA guidelines for other aspects of short term projects. In summary, the Air District recommends:

- use of actual emission rates over a minimum 3-year duration for cancer risk assessments involving projects lasting 3 years or less, and
- use of actual project duration for cancer risk assessments on projects lasting longer than 3 years.

Cancer Risk Calculations

	Construction Off-Road Equip	Construction In-Water Equip	Construction Dredging	Operation Dredging	Operation In-Water Equip (idling)	NOTES
Average Annual Scaler Concentrations (ug/m3)						
Residential	34.05	31.91	30.98	*30.98*	28.85	
Hospital	29.80	27.97	27.20	*27.20*	25.34	
Daycare	7.80	7.36	7.25	*7.25*	6.76	
School	13.01	12.27	12.01	*12.01*	11.22	
Average Annual SCALED Concentrations (ug/m3)						
Unmitigated						
Residential	0.070022545	0.058052072	0.017808943	0.004920556	0.022413683	
Hospital	0.006128721	0.00508847	0.001563226	0.000431914	0.001968628	
Daycare	0.01603782	0.013391524	0.004165076	0.001150798	0.005250218	
School	0.026746835	0.022328	0.006903667	0.001907462	0.008720706	
Mitigated						
Residential	0.046075209	0.04132609	0.011718285	0.004920556	0.022413683	
Hospital	0.004032731	0.003622378	0.001028602	0.000431914	0.001968628	
Daycare	0.010552971	0.009533154	0.00274062	0.001150798	0.005250218	
School	0.017599561	0.015894849	0.004542613	0.001907462	0.008720706	
Risk Factors						
Construction						
Residential	178.18	178.18	178.18			Sum of all age groups; same for all scenarios
Hospital	185.82	185.82	185.82			""
Daycare	161.71	161.71	161.71			""
School	18.63	18.63	18.63			""
Construction + Operation						
Residential	178.18	178.18	178.18	566.11	566.11	Sum of all age groups; separate for cons/ops
Hospital	185.82	185.82	185.82	605.87	605.87	""
Daycare	161.71	161.71	161.71	241.26	241.26	""
School	18.63	18.63	18.63	85.52	85.52	""
Operation						
Residential				744.29	744.29	""
Hospital				791.69	791.69	""
Daycare				402.97	402.97	""
School				104.15	104.15	""

	Construction Off-Road Equip	Construction In-Water Equip	Construction Dredging	Operation Dredging	Operation In-Water Equip (idling)	
Cancer Risk - Unmitigated						
Construction						
Residential	12.48	10.34	3.17	0.00	0.00	
Hospital	1.14	0.95	0.29	0.00	0.00	
Daycare	2.59	2.17	0.67	0.00	0.00	
School	0.50	0.42	0.13	0.00	0.00	
Construction + Operation						
Residential	12.48	10.34	3.17	2.79	12.69	
Hospital	1.14	0.95	0.29	0.26	1.19	
Daycare	2.59	2.17	0.67	0.28	1.27	
School	0.50	0.42	0.13	0.16	0.75	
Operation						
Residential	0.00	0.00	0.00	3.66	16.68	
Hospital	0.00	0.00	0.00	0.34	1.56	
Daycare	0.00	0.00	0.00	0.46	2.12	
School	0.00	0.00	0.00	0.20	0.91	
Cancer Risk - Mitigated						
Construction	46%	42%	12%			
Residential	8.21	7.36	2.09	0.00	0.00	17.66
Hospital	0.75	0.67	0.19	0.00	0.00	1.61
Daycare	1.71	1.54	0.44	0.00	0.00	3.69
School	0.33	0.30	0.08	0.00	0.00	0.71
Construction + Operation						
Residential	8.21	7.36	2.09	2.79	12.69	33.14
Hospital	0.75	0.67	0.19	0.26	1.19	3.07
Daycare	1.71	1.54	0.44	0.28	1.27	5.24
School	0.33	0.30	0.08	0.16	0.75	1.62
Operation						
Residential	0.00	0.00	0.00	3.66	16.68	20.34
Hospital	0.00	0.00	0.00	0.34	1.56	1.90
Daycare	0.00	0.00	0.00	0.46	2.12	2.58
School	0.00	0.00	0.00	0.20	0.91	1.11

ESTIMATED PM2.5 Concentrations - Average Annual (ug/m3)

	Construction Off-Road Equip	Construction In-Water Equip	Construction Dredging	Operation Dredging	Operation In-Water Equip (idling)	NOTES
Average Annual Concentrations (ug/m3)						
Unmitigated						
Residential	0.108905917	0.058052072	0.017808943	0.004920556	0.022413683	
Hospital	0.009531986	0.00508847	0.001563226	0.000431914	0.001968628	
Daycare	0.024943587	0.013391524	0.004165076	0.001150798	0.005250218	
School	0.041599297	0.022328	0.006903667	0.001907462	0.008720706	
Mitigated						
Residential	0.071660452	0.04132609	0.011718285	0.004920556	0.022413683	
Hospital	0.006272078	0.003622378	0.001028602	0.000431914	0.001968628	
Daycare	0.016412962	0.009533154	0.00274062	0.001150798	0.005250218	
School	0.027372474	0.015894849	0.004542613	0.001907462	0.008720706	

8.3.1 *Calculation of Noncancer Inhalation Hazard Quotient and Hazard Index*

To calculate the acute HQ, the maximum 1-hour ground level concentration (in $\mu g/m^3$) of a substance at a receptor is divided by the acute 1-hour REL (in $\mu g/m^3$) for the substance:

$$\text{Acute Hazard Quotient} = \frac{\text{1-Hour Max Concentration } (\mu g/m^3)}{\text{Acute REL } (\mu g/m^3)}$$

To calculate the chronic HQ, the annual average ground level concentration of a substance is divided by the chronic REL for the substance:

$$\text{Chronic Hazard Quotient} = \frac{\text{Annual Average Concentration } (\mu g/m^3)}{\text{Chronic REL } (\mu g/m^3)}$$

To calculate the 8-hour HQ, the adjusted annual average ground level concentration of a substance (represented as "Adjusted C_{av}" in EQ 5.4.1.4 A) is divided by the 8-hour REL for the substance:

Test: risk by distance, cons+ops, residential

						Total Risk	APEZ min
1	119.22	56.12	3.36	10.80	0.00	189.50	-89.50
25	154.58	74.51	3.61	28.44	0.00	261.14	-161.14
29	161.30	79.99	3.83	28.78	0.00	273.90	-173.90
50	90.54	70.63	4.02	20.33	0.00	185.52	-85.52
75	47.24	40.38	4.23	12.76	0.00	104.61	-4.61
100	30.54	26.69	4.38	8.84	0.00	70.46	29.54
125	22.01	19.42	4.46	6.59	0.00	52.48	47.52
150	16.92	15.02	4.45	5.17	0.00	41.56	58.44
175	13.58	12.10	3.73	4.21	0.00	33.61	66.39
200	11.24	10.04	2.91	3.51	0.00	27.70	72.30
225	9.52	8.52	2.42	2.99	0.00	23.45	76.55
250	**8.21**	**7.36**	**2.09**	**2.59**	**0.00**	**20.25**	79.75
275	7.19	6.45	1.83	2.28	0.00	17.75	82.25
300	6.36	5.72	1.63	2.02	0.00	15.74	84.26
325	5.69	5.12	1.46	1.81	0.00	14.09	85.91
350	5.14	4.62	1.32	1.64	0.00	12.72	87.28
375	4.67	4.21	1.20	1.49	0.00	11.57	88.43
400	4.27	3.85	1.10	1.37	0.00	10.58	89.42
425	3.92	3.54	1.01	1.26	0.00	9.74	90.26
450	3.63	3.27	0.93	1.16	0.00	9.00	91.00
475	3.37	3.04	0.87	1.08	0.00	8.36	91.64
500	3.14	2.83	0.81	1.01	0.00	7.79	92.21
525	2.93	2.65	0.76	0.94	0.00	7.28	92.72
550	2.75	2.48	0.71	0.89	0.00	6.83	93.17
575	2.59	2.34	0.67	0.83	0.00	6.43	93.57
600	2.44	2.20	0.63	0.79	0.00	6.06	93.94
625	2.31	2.08	0.60	0.74	0.00	5.73	94.27
650	2.19	1.97	0.57	0.71	0.00	5.43	94.57
675	2.07	1.87	0.54	0.67	0.00	5.16	94.84
700	1.97	1.78	0.51	0.64	0.00	4.91	95.09
725	1.88	1.70	0.49	0.61	0.00	4.67	95.33
750	1.79	1.62	0.47	0.58	0.00	4.46	95.54
775	1.72	1.55	0.45	0.55	0.00	4.27	95.73
800	1.64	1.48	0.43	0.53	0.00	4.08	95.92
825	1.57	1.42	0.41	0.51	0.00	3.92	96.08
850	1.51	1.37	0.39	0.49	0.00	3.76	96.24
875	1.45	1.32	0.38	0.47	0.00	3.62	96.38
900	1.40	1.27	0.36	0.45	0.00	3.48	96.52
925	1.35	1.22	0.35	0.44	0.00	3.35	96.65
950	1.30	1.18	0.34	0.42	0.00	3.23	96.77
975	1.25	1.13	0.33	0.41	0.00	3.12	96.88
1000	1.21	1.10	0.32	0.39	0.00	3.01	96.99

C-6 Risk Factors

Risk Factors

Updated: 10/19/2017

Notes

Normally, we use a worker adjustment factor to estimate risk for school and daycare receptors, but this is used if AERMOD models sources using a non-continuous emissions schedule (e.g. work hours). However, because we use AERSCREEN, which assumes a continuous emission rate based on t schedule of 5 days per week and 8 hrs/day (and estimates maximum 1-hr concentrations), concentrations are based on continuous emissions, and we don't need the adjustment factor.

Dose Calculation

Dose Factors	3rd Trimester	Age 0<2 Years	Age 2<9 Years	Age 2<16 Years	Age 16<30 Years	Age 16<70 Years	Notes / Source
Daily Breathing Rate (DBR) [L/kg-day or L/kg-8hrs]							
Residential	361	1090	631	572	261		95th percentile 24-hour breathing rates (OEHHA Table 5.6) for 3rd trimester and age 0<2 years and 80th percentile 24-ho
Hospital	361	1090	631	572	261		Same as residential
Daycare		1200	640	520	240		95th percentile 8-hour moderate intensity breathing rates (OEHHA Table 5.8) for 3rd trimester, age 0<2 years, and age 2<
School			640	520		230	95th percentile 8-hour moderate intensity breathing rates (OEHHA Table 5.8) for age 2<16 years.
Inhalation Absorption Factor (A)	1	1	1	1	1		
Exposure Frequency (EF) [days/365 days]							
Residential	0.96	0.96	0.96	0.96	0.96	0.96	
Hospital	1.00	1.00	1.00	1.00	1.00	1.00	assume 100% in hospital
Daycare	0.68	0.68	0.68	0.68	0.68	0.68	250 days/yr
School	0.49	0.49	0.49	0.49	0.49	0.49	180 days/yr
Conversion	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	

Dose Factor (no concentration)	3rd Trimester	Age 0<2 Years	Age 2<9 Years	Age 2<16 Years	Age 16<30 Years	Age 16<70 Years
Residential	0.000346164	0.001045205	0.000605068	0.000548493	0.000250274	0
Hospital	0.000361	0.00109	0.000631	0.000572	0.000261	0
Daycare	0	0.000821918	0.000438356	0.000356164	0.000164384	0
School	0	0	0.000315616	0.000256438	0	0

Risk Calculation

Risk Factors	3rd Trimester	Age 0<2 Years	Age 2<9 Years	Age 2<16 Years	Age 16<30 Years	Age 16<70 Years	Notes	Total yrs exposure	
Inhalation Cancer Potency Factor (CPF)	1.1	1.1	1.1	1.1	1.1	1.1			
Age Sensitivity Factor (ASF) [unitless]	10	10	3	3	1	1			
Exposure Duration (ED) [years]									
Construction									
Residential	0.25	1.00						1.25	
Hospital	0.25	1.00						1.25	
Daycare		1.25						1.25	
School			1.25					1.25	
Construction + Operation									
Construction Phase									
Residential	0.25	1.00						1.25	
Hospital	0.25	1.00						1.25	
Daycare		1.25						1.25	
School			1.25					1.25	
Operation Phase									
Residential		1.00		14	14			29.00	30.25
Hospital		1.00		14	14			29.00	30.25
Daycare		0.75	7.00				Only assume 9 years of exposure (probably actually less b/c only goes to kindergarden prep)	7.75	9.00
School			5.75				Only assume 7 years of exposure (2-9; it is actually only probably to age 5)	5.75	7.00
Operation									
Residential	0.25	2		14	14			30.25	
Hospital	0.25	2		14	14			30.25	
Daycare		2	7				Only assume 9 years of exposure (probably actually less b/c only goes to kindergarden prep)	9.00	
School			7				Only assume 7 years of exposure (2-9; it is actually only probably to age 5)	7.00	
Averaging Time (AT) [years]	70	70	70	70	70	70			
Fraction of Time at Home (FAH) [unitless]	1	1	1	1	0.73	0.73			

Fraction of time at home are set to 1.0 for all age groups less than 16 years, since there are potentially schools within cancer risk isopleths of one in a million or greater, per BAAQMD guidance (2016). For age groups greater than 16 years, values from OEHHA (2015) Table 8.4 were used

Chances per Million	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
	need MAF??					

Risk Factor (no concentration)	3rd Trimester	Age 0<2 Years	Age 2<9 Years	Age 2<16 Years	Age 16<30 Years	Age 16<70 Years
Construction						
Residential	13.60	164.58	0.00	0.00	0.00	0.00
Hospital	14.18	171.64	0.00	0.00	0.00	0.00
Daycare	0.00	161.71	0.00	0.00	0.00	0.00
School	0.00	0.00	18.63	0.00	0.00	0.00
Construction + Operation						
Construction Phase						
Residential	13.60	164.58	0.00	0.00	0.00	0.00
Hospital	14.18	171.64	0.00	0.00	0.00	0.00
Daycare	0.00	161.71	0.00	0.00	0.00	0.00
School	0.00	0.00	18.63	0.00	0.00	0.00
Operation Phase						
Residential	0.00	163.91	0.00	362.01	40.19	0.00
Hospital	0.00	170.93	0.00	377.52	57.42	0.00
Daycare	0.00	96.60	144.66	0.00	0.00	0.00
School	0.00	0.00	85.52	0.00	0.00	0.00
Operation						
Residential	13.60	328.49	0.00	362.01	40.19	0.00
Hospital	14.18	342.57	0.00	377.52	57.42	0.00
Daycare	0.00	258.32	144.66	0.00	0.00	0.00
School	0.00	0.00	104.15	0.00	0.00	0.00

Multiply risk factors by concentration to determine risk

test calc, construction res

1g/s conc						
Off-Road Equip	34.052					
In-Water Equip	31.912					
Dredging	30.984					
Emission rate mit g/s						
Off-Road Equip	0.000201528					
In-Water Equip	0.001746067					
Dredging	0.000614074					
Scaled conc						
Off-Road Equip	0.006862415					
In-Water Equip	0.055720503					
Dredging	0.019026479					
Dose by Age Group						
Off-Road Equip	2.37552E-06	7.17263E-06	4.15223E-06	3.76399E-06	1.71748E-06	0
In-Water Equip	1.92885E-05	5.82394E-05	3.37147E-05	3.05623E-05	1.39454E-05	0
Dredging	6.58629E-06	1.98866E-05	1.15123E-05	1.04359E-05	4.76183E-06	0
Cancer risk by Age Group						
Off-Road Equip	0.093324138	1.129444111	0	0	0	0
In-Water Equip	0.757760673	9.170707041	0	0	0	0
Dredging	0.258747084	3.131455339	0	0	0	0
Cancer risk total						
Off-Road Equip	1.222768249					
In-Water Equip	9.928467714					
Dredging	3.390202423					
total	**14.54143839**					
	14.54143839 <-table					

Table 5.6 Point Estimates of Residential Daily Breathing Rates for 3rd trimester, 0<2, 2<9, 2<16, 16<30 and 16-70 years (L/kg BW-day)

	3rd Trimester[a]	0<2 years	2<9 years	2<16 years	16<30 years	16<70 years
	L/kg-day					
Mean	225	658	535	452	210	185
95th Percentile	361	1090	861	745	335	290

Table 5.7 Daily Breathing Rate Distributions by Age Group for Residential Stochastic Analysis (L/kg BW-day)

	3rd Trimester	0<2 years	2<9 years	2<16 years	16<30 years	16-70 years
Distribution	Max extreme	Max extreme	Max extreme	Log-normal	Logistic	Logistic
Minimum	78	196	156	57	40	13
Maximum	491	2,584	1,713	1,692	630	850
Scale	59.31	568.09	125.59		40.92	36.19
Likeliest	191.80	152.12	462.61			
Location				-144.06		
Mean	225	658	535	452	210	185
Std Dev	72	217	158	172	75	67
Skewness	2.83	2.01	1.64	1.11	0.83	1.32
Kurtosis	3.68	10.61	7.68	6.02	5.17	10.83
Percentiles						
5%	127	415	328	216	96	86
10%	142	454	367	259	118	104
25%	179	525	427	331	161	141
50%	212	618	594	432	207	161
75%	260	723	602	545	252	222
80%	273	758	631	572	261	233
90%	333	934	732	659	307	262
95%	361	1090	861	745	335	290
99%	412	1430	1140	896	432	361

5-25

Table 5.8. Eight-Hour Breathing Rate (L/kg per 8 Hrs) Point Estimates for Males and Females Combined[a,b]

	0<2 years	2<9 years	2<16 years	16<30 years	16-70 years
	Sedentary & Passive Activities (METS ≤ 1.5)				
Mean	200	100	80	30	30
95th Percentile	250	140	120	40	40
	Light Intensity Activities (1.5 < METs ≤ 3.0)				
Mean	430	250	200	80	60
95th Percentile	600	340	270	100	100
	Moderate Intensity Activities (3.0 < METs ≤ 6.0)				
Mean	890	470	380	170	170
95th Percentile	1200	640	520	240	230

5-30

Table 8.4 Recommendations for Fraction of Time at Home (FAH) for Evaluating Residential Cancer Risk

Age Range	Fraction of Time at Residence
3rd Trimester, and 0<2 years	0.85[1]
2<16 years[2]	0.72[1]
16-70 years[3]	0.73

[1] Use FAH = 1 if a school is within the 1×10^{-6} (or greater) cancer risk isopleth

pathway in order to avoid underestimating cancer risk to the public, including children. A possible exception for using high-end breathing rates are when there is exposure to multipathway substances and two of the non-inhalation pathways drive the risk, rather than the inhalation pathway (see Chapter 8).

A. Equation 5.4.1.1: Dose-air = C_{air} × (BR/BW) × A × EF × 10^{-6}

1. Dose-air = Dose through inhalation (mg/kg/d)
2. C_{air} = Concentration in air (µg/m³)
3. (BR/BW) = Daily Breathing rate normalized to body weight (L/kg body weight - day)
4. A = Inhalation absorption factor (unitless)
5. EF = Exposure frequency (unitless), days/365 days
6. 10^{-6} = Micrograms to milligrams conversion, liters to cubic meters conversion

a. Recommended default values for EQ 5.4.1.1:

1. (BR/BW) = Daily breathing rates by age groupings, see As supplemental information, the assessor may wish to evaluate the inhalation dose by using the mean point estimates in Table 5.6 to provide a range of breathing rates for cancer risk assessment to the risk manager.
2. Table (point estimates) and Table 5.7 (parametric model distributions for Tier III stochastic risk assessment). For Tier 1 residential estimates, use 95th percentile breathing rates in Table 5.6.

Table 8.3 Age Sensitivity Factors by Age Group for Cancer Risk Assessment

Age Group	Age Sensitivity Factor (unitless)
3rd Trimester	10
0<2 years	10
2<9 years	3
2<16 years	3
16<30 years	1
16-70 years	1

8.2.4 Calculating Residential and Offsite Worker Inhalation Cancer Risk

Residential Receptors

For residential inhalation exposure, cancer risk must be separately calculated for specified age groups (Eq. 8.2.4A, see Section 8.2.1), because of age differences in sensitivity to carcinogens and age differences in intake rates (per kg body weight). Separate risk estimates for these age groups provide a health-protective estimate of cancer risk by accounting for greater susceptibility in early life, including both age-related sensitivity and amount of exposure. The following equation illustrates the formula for calculating residential inhalation cancer risk. See Appendix I for a detailed example calculation.

A. Equation 8.2.4 A: $RISK_{inh-res}$ = $DOSE_{air}$ × CPF × ASF × ED/AT × FAH

7. $RISK_{inh-res}$ = Residential inhalation cancer risk
8. $DOSE_{air}$ = Daily inhalation dose (mg/kg-day)
9. CPF = Inhalation cancer potency factor (mg/kg-day)$^{-1}$
10. ASF = Age sensitivity factor for a specified age group (unitless)
11. ED = Exposure duration (in years) for a specified age group
12. AT = Averaging time for lifetime cancer risk (years)
13. FAH = Fraction of time spent at home (unitless)

a. Recommended default values for EQ 8.2.4 A:

5. $DOSE_{air}$ = Calculated for each age group from Eq. 5.4.1
6. CPF = Substance-specific (see Table 7.1)
7. ASF = See Section 8.2.1
8. ED = 0.25 years for 3rd trimester, 2 years for 0<2, 7 years for 2<9, 14 years for 2<16, 14 years for 16<30, 54 years for 16-70
9. AT = 70 years[1]
10. FAH = See Table 8.4

[1] Although AT actually sums to 70.25 years when the 3rd trimester (0.25 years) is included, OEHHA recommends rounding AT = 70 years (and rounding residential exposure durations at 9- and 30-years rather than 9.25- and 30.25-years) to simplify the calculation without causing a significant adjustment. Note that the dose for the 3rd trimester is based on the breathing rate of pregnant women using the assumption that the dose to the fetus during the 3rd trimester is the same as that to the mother.

B. Equation 8.2.4 B: $RISK_{inh-work}$ = $DOSE_{air}$ × CPF × ASF × ED/AT

1. $RISK_{inh-work}$ = Worker inhalation cancer risk

a. Recommended default values for EQ 8.2.4 B:

1. $DOSE_{air}$ = Calculated for workers in Eq. 5.4.1.2
2. CPF = Substance specific (see Table 7.1)
3. ASF = 1 for working age 16-70 yrs (See Section 8.2.1)
4. ED = 25 years
5. AT = 70 yrs for lifetime cancer risk

C-7 Emission Rates

DPM and PM2.5 Emission Rates

Updated: 10/24/2017

HRA Notes:

BAAQMD recommends short-term projects "use of actual emission rates over a minimum 3-year duration for cancer risk assessments involving projects lasting 3 years or less." This was not done to be conservative.

Since AERSCREEN calculates maximum 1-hr concentration based on continuous emissions (which is then converted to annual), the 1-hr emission rate should be based on the emission rate during the entire construction period (24 hrs/day, 7 days per week).

DPM Emission Rates

	Construction Off-Road Equip	Construction In-Water Equip	Construction Dredging	Operation Dredging	Operation In-Water Equip (idling)	NOTES
DPM Emissions (lbs)						
Unmitigated	179.0027988	158.3537162	50.03400013	11.04124173	54.02364801	
Mitigated	117.7847988	112.7287911	32.92237208	11.04124173	54.02364801	
	45%	43%	12%			
Time Values for Emission Rates						
Total Days	457	457	457	365	365	Cons: total calendar days (7 days/week); Ops: 365
Hours per day	24	24	24	24	24	24 hrs/day; see note above
Emission Rates - Scaling Factors						Cons: total work days (5 days/week); Ops: 365 days/year
Unmitigated						Cons: 8 work hrs/day; Ops: 24 hrs/day; see note above
DPM lbs/hr	0.0163	0.0144	0.0046	0.0013	0.0062	
DPM g/s	0.0021	0.0018	0.0006	0.0002	0.0008	
Mitigated						
DPM lbs/hr	0.0107	0.0103	0.0030	0.0013	0.0062	
DPM g/s	0.0014	0.0013	0.0004	0.0002	0.0008	

PM2.5 Exhaust Emission Rates

	Construction Off-Road Equip	Construction In-Water Equip	Construction Dredging	Operation Dredging	Operation In-Water Equip (idling)	NOTES
PM2.5 Exhaust Emissions (lbs)						
Unmitigated	278.4026778	158.3537162	50.03400013	11.04124173	54.02364801	
Mitigated	183.1898778	112.7287911	32.92237208	11.04124173	54.02364801	
Time Values for Emission Rates						
Total Days	*457*	*457*	*457*	*365*	*365*	*Same as above*
Hours per day	*24*	*24*	*24*	*24*	*24*	*Same as above*
Emission Rates - Scaling Factors						
Unmitigated						
PM2.5 lbs/hr	0.0254	0.0144	0.0046	0.0013	0.0062	
PM2.5 g/s	0.0032	0.0018	0.0006	0.0002	0.0008	
Mitigated						
PM2.5 lbs/hr	0.0167	0.0103	0.0030	0.0013	0.0062	
PM2.5 g/s	0.0021	0.0013	0.0004	0.0002	0.0008	

4.12.2.1 Non-Continuous Sources

When modeling a non-continuously emitting source (e.g., operating for eight hours per day and five days per week), the modeled long-term average concentrations are based on 24 hours a day and seven days per week for the period of the meteorological data set. Even though the emitting source is modeled using a non-continuous emissions schedule, the long-term concentration is still based on 24 hours a day and seven days per week. Thus, this concentration includes the zero hours when the source was not operating. For the offsite worker inhalation risk, we want to determine the long-term concentration the worker is breathing during their work shift. Therefore, the long-term concentration needs to be adjusted so it is based only on the hours when the worker is present. For example, assuming the emitting source and worker's schedules are the same, the adjustment factor is 4.2 = (24 hours per day/8 hours per shift)x(7 days in a week/5 days in a work week). In this example, the long term residential exposure is adjusted upward to represent the exposure to a worker. Additional concentration adjustments may be appropriate depending on the work shift overlap. These adjustments are discussed below.

If the source is continuously emitting, then the worker is assumed to breathe the long-term annual average concentration during their work shift. Equation 4.1 becomes one and no concentration adjustments are necessary in this situation when estimating the inhalation cancer risk. Note however, if an assessor does not wish to apply the assumption the worker breathes the long-term annual average concentration during the work shift, then a refined concentration can be post-processed as described in Appendix M. All alternative assumptions should be approved by the reviewing authority and supported in the presentation of results.

2.1.3.2 Short Term Projects

In the 2015 HRA Guidelines, OEHHA recommends using actual project duration for short term projects, but cautions that the risk manager should consider a lower cancer risk threshold for very short term projects, because a higher exposure over a short period of time may pose a greater risk than the same total exposure spread over a much longer period of time. To ensure that short-term projects do not result in unanticipated higher cancer impacts due to short-duration high-exposure rates, the Air District recommends that the cancer risk be evaluated assuming that the average daily dose for short-term exposure lasts a minimum of three years for projects lasting three years or less. For residential exposures, the cancer risk calculations should include the most sensitive age groups (beginning with the third trimester of pregnancy) and should use the 95th percentile breathing rates. The Air District recommends following OEHHA guidelines for other aspects of short term projects. In summary, the Air District recommends:

- use of actual emission rates over a minimum 3-year duration for cancer risk assessments involving projects lasting 3 years or less, and
- use of actual project duration for cancer risk assessments on projects lasting longer than 3 years.

C-8 AERSCREEN Inputs and Outputs

AERSCREEN Inputs and Outputs

Updated: 10/25/2017

ferry separate from water taxi?
ferry/taxi travel fraction?
off-road truck idling?

Notes

Concentrations modeled using AERSCREEN worst-case 1-hr, scaled to annual

Input

	Construction	Construction	Construction/Operation	Operation					
	Off-Road Equip	**In-Water Equip**	**Dredging**	**In-Water Equip (idling)**	**Notes**	241	end of pier from shore (ft)	42	landing width (ft) - project design, page 31/32
Title	Offroad	InWater	Dredge	InWaterIdle		221	estimate end of pier from stack	126	ferry width (ft) - project design, page 31/32
Units	M	M	M	M		67	meters	42	ferry stack length area (ft) - estimate
Source Type	A	A	A	A			could use if we are sig		
DPM emission rate (g/s)	1	1	1	1	Unit emission rate for scaling				
Release Height above ground (meters)	5	6	6	10	AQTR SOW Table 2. Ferries based ARB 2004; off-road and tugs and other boats based on CRRP				
Maximum horizontal dimension of area source (feet)	*203*	*250*	*940*	*126*	Off-road and dredging dimensions from Priya Finnemore, 10/20/17. Combined landside areas for both sites; used ferry dredging as dredging site. Assumed area surrounding ferry for in-water construction; estiamted values				
Minimum horizontal dimension of area source (feet)	*64*	*150*	*511*	*42*	Note: dredging area is not a rectangle				
Maximum horizontal dimension of area source (meters)	62	76	287	38					
Minimum horizontal dimension of area source (meters)	20	46	156	13					
Initial Vertical Dimension (meters)	1.4	2.37	2.37	2.37	AQTR SOW, Table 2; assumed same for all sources				
rural/urban	urban	urban	urban	urban	Although CRRP uses rural (page 31), AERSCREEN is already exceedingly conservative, so per the AQTR SOW used urban instead.				
population of urban area	*864,816*	*864,817*	*864,817*	*864,818*					
min distance to ambient air (meters)	default	default	default	default					
NO2 chemistry	1	1	1	1					
max distance to probe	default	default	default	default					
include discrete receptors	no	no	no	no		dss			
use flagpole receptors	yes	yes	yes	yes					
flagpole receptor height (meters)	1.8	1.8	1.8	1.8	AQTR SOW, CRRP modeling				
source elevation	default	default	default	default	for in-water, source elevation is -5m				
min ambient temperature (F)	*46*	*46*	*46*	*46*					
max ambient temperature (F)	*71*	*71*	*71*	*71*					
min ambient temperature (K)	281	281	281	281					
max ambient temperature (K)	295	295	295	295					
min wind speed (m/s)	default	default	default	default					
anemometer height (m)	default	default	default	default					
surface characteristics	2	2	2	2					
Dominant surface profile	7	7	7	7					
dominant climate profile	1	1	1	1					
adjust	no	no	no	no					
debug	no	no	no	no					
Output file name	Offroad.out	InWater.out	Dredge.out	InWaterIdle.out					

Outputs

	Construction	Construction	Construction/Operation	Operation		
	Off-Road Equip	**In-Water Equip**	**Dredging**	**In-Water Equip (idling)**		
Closest Receptors						
Concentrations - Maximum 1-hr (ug/m3)					**Distance (m)**	**Receptor Location**
Residential	340.52	319.12	309.84	288.45	250	Condos at 610 Illinois St., 250m south (820 feet)
Hospital	298.04	279.72	271.97	253.35	275	UCSF Benioff Children's Hospital, 275m west (900 feet)
Daycare	77.992	73.615	72.464	67.567	725	University Child Care at Mission Bay (Bright Horizons), 725 meters west (2,400 feet)
School	130.07	122.74	120.11	112.23	500	Potrero Kids, 500m south (1,650 feet)
Concentrations - Average Annual (ug/m3)						
Residential	34.052	31.912	30.984	28.845		
Hospital	29.804	27.972	27.197	25.335		
Daycare	7.7992	7.3615	7.2464	6.7567		
School	13.007	12.274	12.011	11.223		

All Receptors	Paste from AERMOD Output			
Distance (m)	**Concentrations - Maximum 1-hr (ug/m3)**			
1	4944.9	2432.10	497.91	1201.70
25	6411.4	3229.20	535.29	**3163.30**
29	**6690.2**	**3466.50**	568.37	3201.30
50	3755.5	3061.10	596.59	2260.90
75	1959.5	1749.90	627.37	1419.40
100	1266.9	1156.80	650.52	983.60
125	912.84	841.66	661.16	733.49
150	701.93	650.97	**660.11**	575.30
175	563.41	524.24	552.79	467.75
200	466.13	435.17	431.96	390.53
225	394.79	369.38	358.63	332.86
250	340.52	319.12	309.84	288.45
275	298.04	279.72	271.97	253.35
300	263.99	247.93	241.32	225.09
325	236.18	221.97	216.24	201.88
350	213.1	200.41	195.42	182.51
375	193.68	182.27	177.82	166.14
400	177.11	166.82	162.76	152.16
425	162.78	153.52	149.89	140.09
450	150.41	141.92	138.67	129.58
475	139.6	131.75	128.77	120.37
500	130.07	122.74	120.11	112.23
525	121.61	114.75	112.37	105.00
550	114.07	107.63	105.46	98.54
575	107.29	101.24	99.30	92.73
600	101.19	95.48	93.77	87.50
625	95.658	90.27	88.71	82.75
650	90.632	85.53	84.07	78.44
675	86.046	81.21	79.85	74.50
700	81.847	77.25	75.99	70.89
725	77.992	73.62	72.46	67.57
750	74.441	70.27	69.22	64.51
775	71.16	67.18	66.22	61.68
800	68.121	64.31	63.42	59.06
825	65.301	61.66	60.82	56.63
850	62.677	59.35	58.41	54.37
875	60.23	57.04	56.15	52.26
900	57.944	54.87	54.04	50.29
925	55.804	52.85	52.06	48.44
950	53.798	50.95	50.21	46.70
975	51.913	49.17	48.47	45.08
1000	50.14	47.49	46.84	43.54

C-9 Constants

Constants

Updated:	10/18/2017	
grams per ton	907185	
grams per MT	1000000	
grams per kg	1000	
lbs per ton	2000	
hrs/day	24	
work hrs/day	8	CalEEMod output
seconds/hr	3600	
grams per lb	453.592	
1hr to annual concentration	0.1	https://www3.epa.gov/ttn/scram/models/screen/aerscreen_userguide.pdf
Operational hrs/day		
feet per meter	3.28084	
Cancer Scaling		
OEHHA Scaling	1.3744	Email from Jessica Range on May 10, 2016
APEZ Thresholds		
Cancer	100	
PM2.5	10	

C-10 AERSCREEN Inputs – Construction Off-road

```
Start date and time  10/25/17 15:17:57
                               AERSCREEN 16216

OffRoad

            OffRoad


         -----------------  DATA ENTRY VALIDATION  -----------------
                        METRIC              ENGLISH
 ** AREADATA **  ---------------     ----------------

 Emission Rate:       1.0000 g/s            7.937 lb/hr
 Area Height:           5.00 meters         16.40 feet
 Area Source Length:   62.00 meters        203.41 feet
 Area Source Width:    20.00 meters         65.62 feet
 Vertical Dimension:    1.40 meters          4.59 feet
 Model Mode:           URBAN
 Population:          864816
 Dist to Ambient Air:           1.0 meters            3. feet


 ** BUILDING DATA **

 No Building Downwash Parameters


 ** TERRAIN DATA **

 No Terrain Elevations
 Source Base Elevation:   0.0 meters        0.0  feet

 Probe distance:   5000. meters       16404. feet
 Flagpole Receptor Height:      1.8 meters            6. feet

 No discrete receptors used


 ** FUMIGATION DATA **

 No fumigation requested


 ** METEOROLOGY DATA **

 Min/Max Temperature:  281.0 / 295.0 K   46.1 /  71.3 Deg F

 Minimum Wind Speed:     0.5 m/s

 Anemometer Height:   10.000 meters

 Dominant Surface Profile: Urban
 Dominant Climate Type:    Average Moisture

 Surface friction velocity (u*): not adjusted

DEBUG OPTION OFF


 AERSCREEN output file:
 OffRoad.out


 *** AERSCREEN Run is Ready to Begin



 No terrain used, AERMAP will not be run
```

```
**************************************************

SURFACE CHARACTERISTICS & MAKEMET
Obtaining surface characteristics...

Using AERMET seasonal surface characteristics for Urban with Average Moisture
Season            Albedo     Bo       zo
Winter             0.35     1.50     1.000
Spring             0.14     1.00     1.000
Summer             0.16     2.00     1.000
Autumn             0.18     2.00     1.000

Creating met files aerscreen_01_01.sfc & aerscreen_01_01.pfl

Creating met files aerscreen_02_01.sfc & aerscreen_02_01.pfl

Creating met files aerscreen_03_01.sfc & aerscreen_03_01.pfl

Creating met files aerscreen_04_01.sfc & aerscreen_04_01.pfl

Buildings and/or terrain present or rectangular area source, skipping probe

FLOWSECTOR   started 10/25/17 15:18:56
 ********************************************

  Running AERMOD
 Processing Winter

Processing surface roughness sector  1

*****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
 ********************************************
```

```
  Running AERMOD
 Processing Spring

Processing surface roughness sector  1

*****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
 ********************************************

  Running AERMOD
 Processing Summer

Processing surface roughness sector  1

*****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   3
```

```
 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
 ********************************************

  Running AERMOD
 Processing Autumn

Processing surface roughness sector  1

*****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

FLOWSECTOR   ended 10/25/17 15:19:05
```

```
REFINE       started 10/25/17 15:19:05

 AERMOD Finishes Successfully for REFINE stage 3 Winter sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

REFINE       ended 10/25/17 15:19:07

 **********************************************
 AERSCREEN Finished Successfully
 With no errors or warnings
 Check log file for details
 ***********************************************

 Ending date and time  10/25/17 15:19:07
```

C-11 AERSCREEN Inputs – Construction In-water

```
Start date and time  10/25/17 15:20:28
                             AERSCREEN 16216

InWater

            InWater


         -----------------  DATA ENTRY VALIDATION  -----------------
                       METRIC              ENGLISH
 ** AREADATA **  ---------------     ----------------

 Emission Rate:       1.0000 g/s             7.937 lb/hr
 Area Height:           6.00 meters          19.69 feet
 Area Source Length:   76.00 meters         249.34 feet
 Area Source Width:    46.00 meters         150.92 feet
 Vertical Dimension:    2.37 meters           7.78 feet
 Model Mode:           URBAN
 Population:          864817
 Dist to Ambient Air:           1.0 meters             3. feet


 ** BUILDING DATA **

 No Building Downwash Parameters


 ** TERRAIN DATA **

 No Terrain Elevations
 Source Base Elevation:   0.0 meters        0.0  feet

 Probe distance:   5000. meters       16404. feet
 Flagpole Receptor Height:      1.8 meters             6. feet

 No discrete receptors used


 ** FUMIGATION DATA **

 No fumigation requested


 ** METEOROLOGY DATA **

 Min/Max Temperature:  281.0 / 295.0 K   46.1 /  71.3 Deg F

 Minimum Wind Speed:     0.5 m/s

 Anemometer Height:   10.000 meters

 Dominant Surface Profile: Urban
 Dominant Climate Type:    Average Moisture

 Surface friction velocity (u*): not adjusted

DEBUG OPTION OFF


 AERSCREEN output file:
 InWater.out


 *** AERSCREEN Run is Ready to Begin



 No terrain used, AERMAP will not be run
```

****

SURFACE CHARACTERISTICS & MAKEMET
Obtaining surface characteristics...

Using AERMET seasonal surface characteristics for Urban with Average Moisture

Season	Albedo	Bo	zo
Winter	0.35	1.50	1.000
Spring	0.14	1.00	1.000
Summer	0.16	2.00	1.000
Autumn	0.18	2.00	1.000

Creating met files aerscreen_01_01.sfc & aerscreen_01_01.pfl

Creating met files aerscreen_02_01.sfc & aerscreen_02_01.pfl

Creating met files aerscreen_03_01.sfc & aerscreen_03_01.pfl

Creating met files aerscreen_04_01.sfc & aerscreen_04_01.pfl

Buildings and/or terrain present or rectangular area source, skipping probe

FLOWSECTOR started 10/25/17 15:21:08
****

Running AERMOD
Processing Winter

Processing surface roughness sector 1

****
Processing wind flow sector 1

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 0

******** WARNING MESSAGES ********
*** NONE ***

****
Processing wind flow sector 2

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 5

******** WARNING MESSAGES ********
*** NONE ***

****
Processing wind flow sector 3

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 10

******** WARNING MESSAGES ********
*** NONE ***

****
Processing wind flow sector 4

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 15

******** WARNING MESSAGES ********
*** NONE ***

****
Processing wind flow sector 5

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 20

******** WARNING MESSAGES ********
*** NONE ***

```
****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  25

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  30

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   8

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  35

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
 ********************************************

  Running AERMOD
 Processing Spring

Processing surface roughness sector  1

****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
```

```
****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  25

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  30

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   8

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  35

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
 ********************************************

  Running AERMOD
 Processing Summer

Processing surface roughness sector  1

****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
```

```
****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  25

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  30

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   8

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  35

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
 ********************************************

  Running AERMOD
 Processing Autumn

Processing surface roughness sector  1

****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
```

```
****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  25

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  30

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   8

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  35

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

FLOWSECTOR   ended 10/25/17 15:21:26

REFINE       started 10/25/17 15:21:26

 AERMOD Finishes Successfully for REFINE stage 3 Winter sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

REFINE       ended 10/25/17 15:21:27

 **********************************************
 AERSCREEN Finished Successfully
 With no errors or warnings
 Check log file for details
 ***********************************************

 Ending date and time  10/25/17 15:21:28
```

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C-12 AERSCREEN Inputs – Operational Dredging

Start date and time 10/25/17 15:22:55
AERSCREEN 16216

Dredge

Dredge

```
         -----------------  DATA ENTRY VALIDATION  -----------------
                       METRIC              ENGLISH
 ** AREADATA **  ---------------     ----------------

 Emission Rate:       1.0000 g/s            7.937 lb/hr
 Area Height:           6.00 meters         19.69 feet
 Area Source Length:  287.00 meters        941.60 feet
 Area Source Width:   156.00 meters        511.81 feet
 Vertical Dimension:    2.37 meters          7.78 feet
 Model Mode:           URBAN
 Population:          864817
 Dist to Ambient Air:           1.0 meters             3. feet


 ** BUILDING DATA **

 No Building Downwash Parameters


 ** TERRAIN DATA **

 No Terrain Elevations
 Source Base Elevation:   0.0 meters        0.0  feet

 Probe distance:   5000. meters       16404. feet
 Flagpole Receptor Height:      1.8 meters             6. feet

 No discrete receptors used


 ** FUMIGATION DATA **

 No fumigation requested


 ** METEOROLOGY DATA **

 Min/Max Temperature:  281.0 / 295.0 K   46.1 /  71.3 Deg F

 Minimum Wind Speed:     0.5 m/s

 Anemometer Height:   10.000 meters

 Dominant Surface Profile: Urban
 Dominant Climate Type:    Average Moisture

 Surface friction velocity (u*): not adjusted

DEBUG OPTION OFF


 AERSCREEN output file:
 Dredge.out


 *** AERSCREEN Run is Ready to Begin


 No terrain used, AERMAP will not be run
```

```
**************************************************

SURFACE CHARACTERISTICS & MAKEMET
Obtaining surface characteristics...

Using AERMET seasonal surface characteristics for Urban with Average Moisture
Season            Albedo     Bo       zo
Winter             0.35     1.50     1.000
Spring             0.14     1.00     1.000
Summer             0.16     2.00     1.000
Autumn             0.18     2.00     1.000

Creating met files aerscreen_01_01.sfc & aerscreen_01_01.pfl

Creating met files aerscreen_02_01.sfc & aerscreen_02_01.pfl

Creating met files aerscreen_03_01.sfc & aerscreen_03_01.pfl

Creating met files aerscreen_04_01.sfc & aerscreen_04_01.pfl

Buildings and/or terrain present or rectangular area source, skipping probe

FLOWSECTOR   started 10/25/17 15:23:36
 ********************************************

  Running AERMOD
 Processing Winter

Processing surface roughness sector  1

*****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
```

```
*****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  25

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  30

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
 *********************************************

  Running AERMOD
 Processing Spring

Processing surface roughness sector  1

*****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  25

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
```

```
****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  30

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
 *******************************************

  Running AERMOD
 Processing Summer

Processing surface roughness sector  1

****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  25

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  30

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
 *******************************************
```

```
  Running AERMOD
 Processing Autumn

Processing surface roughness sector  1

*****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  25

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  30

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

FLOWSECTOR   ended 10/25/17 15:24:04

REFINE       started 10/25/17 15:24:04

 AERMOD Finishes Successfully for REFINE stage 3 Winter sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
```

```
REFINE       ended 10/25/17 15:24:06

 *********************************************
 AERSCREEN Finished Successfully
 With no errors or warnings
 Check log file for details
 **********************************************

 Ending date and time  10/25/17 15:24:07
```

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C-13 AERSCREEN Inputs – Operational Idling

```
Start date and time  10/25/17 15:30:32
                            AERSCREEN 16216

InWaterIdle

            InWaterIdle


         -----------------  DATA ENTRY VALIDATION  -----------------
                        METRIC              ENGLISH
 ** AREADATA **  ---------------     ----------------

 Emission Rate:       1.0000 g/s            7.937 lb/hr
 Area Height:          10.00 meters         32.81 feet
 Area Source Length:   38.00 meters        124.67 feet
 Area Source Width:    13.00 meters         42.65 feet
 Vertical Dimension:    2.37 meters          7.78 feet
 Model Mode:           URBAN
 Population:          864818
 Dist to Ambient Air:           1.0 meters             3. feet


 ** BUILDING DATA **

 No Building Downwash Parameters


 ** TERRAIN DATA **

 No Terrain Elevations
 Source Base Elevation:   0.0 meters        0.0  feet

 Probe distance:   5000. meters       16404. feet
 Flagpole Receptor Height:      1.8 meters             6. feet

 No discrete receptors used


 ** FUMIGATION DATA **

 No fumigation requested


 ** METEOROLOGY DATA **

 Min/Max Temperature:  281.0 / 295.0 K   46.1 /  71.3 Deg F

 Minimum Wind Speed:     0.5 m/s

 Anemometer Height:   10.000 meters

 Dominant Surface Profile: Urban
 Dominant Climate Type:    Average Moisture

 Surface friction velocity (u*): not adjusted

DEBUG OPTION OFF


 AERSCREEN output file:
 InWaterIdle.out


 *** AERSCREEN Run is Ready to Begin


 No terrain used, AERMAP will not be run
```

****

SURFACE CHARACTERISTICS & MAKEMET
Obtaining surface characteristics...

Using AERMET seasonal surface characteristics for Urban with Average Moisture

Season	Albedo	Bo	zo
Winter	0.35	1.50	1.000
Spring	0.14	1.00	1.000
Summer	0.16	2.00	1.000
Autumn	0.18	2.00	1.000

Creating met files aerscreen_01_01.sfc & aerscreen_01_01.pfl

Creating met files aerscreen_02_01.sfc & aerscreen_02_01.pfl

Creating met files aerscreen_03_01.sfc & aerscreen_03_01.pfl

Creating met files aerscreen_04_01.sfc & aerscreen_04_01.pfl

Buildings and/or terrain present or rectangular area source, skipping probe

FLOWSECTOR started 10/25/17 15:31:25
****

Running AERMOD
Processing Winter

Processing surface roughness sector 1

****
Processing wind flow sector 1

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 0

******** WARNING MESSAGES ********
*** NONE ***

****
Processing wind flow sector 2

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 5

******** WARNING MESSAGES ********
*** NONE ***

****
Processing wind flow sector 3

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 10

******** WARNING MESSAGES ********
*** NONE ***

****
Processing wind flow sector 4

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 15

******** WARNING MESSAGES ********
*** NONE ***

****
Processing wind flow sector 5

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 20

******** WARNING MESSAGES ********
*** NONE ***
****

```
  Running AERMOD
 Processing Spring

Processing surface roughness sector  1

*****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
 ********************************************

  Running AERMOD
 Processing Summer

Processing surface roughness sector  1

*****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   3
```

```
 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
 ********************************************

  Running AERMOD
 Processing Autumn

Processing surface roughness sector  1

*****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

FLOWSECTOR   ended 10/25/17 15:31:34
```

```
REFINE       started 10/25/17 15:31:34

 AERMOD Finishes Successfully for REFINE stage 3 Winter sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

REFINE       ended 10/25/17 15:31:35

 **********************************************
 AERSCREEN Finished Successfully
 With no errors or warnings
 Check log file for details
 ***********************************************

 Ending date and time  10/25/17 15:31:35
```

C-14 AERSCREEN Outputs – Construction Off-road

	Concentrat	Distance	Elevation	Diag	Season/Mc	Zo	sector	Date	H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O	LEN	Z0	BOWEN	ALBEDO	REF	WS	HT	REF	TA	HT
	4.94E+03	1	0	0	Winter	0-360	10013101	-0.82	0.043	-9	0.02	-999	21	9	1	1.5	0.35	0.5	10	295	2				
	6.41E+03	25	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
*	6.69E+03	32	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	3.76E+03	50	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.96E+03	75	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.27E+03	100	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	9.13E+02	125	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	7.02E+02	150	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	5.63E+02	175	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	4.66E+02	200	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	3.95E+02	225	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	3.41E+02	250	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.98E+02	275	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.64E+02	300	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.36E+02	325	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.13E+02	350	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.94E+02	375	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.77E+02	400	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.63E+02	425	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.50E+02	450	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.40E+02	475	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.30E+02	500	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.22E+02	525	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.14E+02	550	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.07E+02	575	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.01E+02	600	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	9.57E+01	625	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	9.06E+01	649.99	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	8.60E+01	675	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	8.18E+01	700	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	7.80E+01	725	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	7.44E+01	749.99	0	15	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	7.12E+01	775	0	15	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	6.81E+01	800	0	20	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	6.53E+01	825	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	6.27E+01	850	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	6.02E+01	875	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	5.79E+01	900	0	15	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	5.58E+01	925	0	15	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	5.38E+01	950	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	5.19E+01	975	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	5.01E+01	1000	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	4.85E+01	1025	0	20	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	4.69E+01	1050	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	4.54E+01	1075	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	4.40E+01	1100	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	4.27E+01	1125	0	20	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	4.14E+01	1150	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	4.02E+01	1175	0	15	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	3.90E+01	1200	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	3.80E+01	1225	0	20	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	3.69E+01	1250	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	3.59E+01	1275	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	3.50E+01	1300	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	3.41E+01	1325	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	3.32E+01	1350	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	3.24E+01	1375	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	3.16E+01	1400	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	3.09E+01	1425	0	15	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	3.01E+01	1450	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.94E+01	1475	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.88E+01	1500	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.81E+01	1525	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.75E+01	1550	0	20	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.69E+01	1575	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.63E+01	1600	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.58E+01	1625	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.52E+01	1650	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.47E+01	1675	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.42E+01	1700	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.37E+01	1725	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.33E+01	1750	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.28E+01	1775	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.24E+01	1800	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.20E+01	1825	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.16E+01	1850	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.12E+01	1875	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.08E+01	1900	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.04E+01	1924.99	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	2.01E+01	1950	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.97E+01	1975	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.94E+01	2000	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.91E+01	2025	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.87E+01	2050	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.84E+01	2075	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.81E+01	2100	0	15	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.78E+01	2125	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.76E+01	2150	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.73E+01	2175	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.70E+01	2200	0	20	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.68E+01	2225	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.65E+01	2250	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.63E+01	2275	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.60E+01	2300	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.58E+01	2325	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.55E+01	2350	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.53E+01	2375	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.51E+01	2400	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.49E+01	2425	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.47E+01	2450	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.45E+01	2475	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.43E+01	2500	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.41E+01	2525	0	15	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.39E+01	2550	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.37E+01	2575	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.35E+01	2600	0	20	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.34E+01	2625	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.32E+01	2650	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.30E+01	2675	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.29E+01	2700	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.27E+01	2725	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.25E+01	2750	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.24E+01	2775	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.22E+01	2800	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.21E+01	2825	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.19E+01	2850	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.18E+01	2875	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.17E+01	2900	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.15E+01	2925	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.14E+01	2950	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.13E+01	2975	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				
	1.11E+01	3000	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2				

1.10E+01	3025	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
1.09E+01	3050	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
1.08E+01	3075	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
1.06E+01	3100	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
1.05E+01	3125	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
1.04E+01	3150	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
1.03E+01	3175	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
1.02E+01	3200	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
1.01E+01	3225	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
9.98E+00	3250	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
9.87E+00	3275	0	20	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
9.77E+00	3300	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
9.67E+00	3325	0	15	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
9.57E+00	3350	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
9.47E+00	3375	0	15	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
9.38E+00	3400	0	20	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
9.28E+00	3425	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
9.19E+00	3450	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
9.10E+00	3475	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
9.01E+00	3500	0	20	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
8.93E+00	3525	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
8.84E+00	3550	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
8.76E+00	3575	0	15	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
8.67E+00	3600	0	20	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
8.59E+00	3625	0	15	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
8.51E+00	3650	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
8.43E+00	3675	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
8.35E+00	3700	0	20	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
8.28E+00	3724.99	0	20	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
8.20E+00	3750	0	15	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
8.13E+00	3775	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
8.05E+00	3800	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
7.98E+00	3825	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
7.91E+00	3849.99	0	15	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
7.84E+00	3875	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
7.77E+00	3900	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
7.71E+00	3925	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
7.64E+00	3950	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
7.57E+00	3975	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
7.51E+00	4000	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
7.44E+00	4025	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
7.38E+00	4050	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
7.32E+00	4075	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
7.26E+00	4100	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
7.20E+00	4125	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
7.14E+00	4149.99	0	20	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
7.08E+00	4175	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
7.02E+00	4200	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.97E+00	4225	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.91E+00	4250	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.86E+00	4275	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.80E+00	4300	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.75E+00	4325	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.69E+00	4350	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.64E+00	4375	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.59E+00	4400	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.54E+00	4425	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.49E+00	4449.99	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.44E+00	4475	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.39E+00	4500	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.34E+00	4525	0	10	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.30E+00	4550	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.25E+00	4575	0	20	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.20E+00	4600	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.16E+00	4625	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.11E+00	4650	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.07E+00	4675	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.02E+00	4700	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
5.98E+00	4725	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
5.94E+00	4750	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
5.89E+00	4775	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
5.85E+00	4800	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
5.81E+00	4825	0	15	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
5.77E+00	4850	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
5.73E+00	4875	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
5.69E+00	4900	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
5.65E+00	4924.99	0	15	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
5.61E+00	4950	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
5.57E+00	4975	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
5.53E+00	5000	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2

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C-15 AERSCREEN Outputs – Construction In-water

	Concentrat	Distance	Elevation	Diag	Season/Mc	Zo sector	Date	H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS	HT	REF TA	HT
	2.43E+03	1	0		5 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	3.23E+03	25	0		30 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
*	3.47E+03	38	0		30 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	3.06E+03	50	0		25 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	1.75E+03	75	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	1.16E+03	100	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	8.42E+02	125	0		5 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	6.51E+02	150	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	5.24E+02	175	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	4.35E+02	200	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	3.69E+02	225	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	3.19E+02	250	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	2.80E+02	275	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	2.48E+02	300	0		5 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	2.22E+02	325	0		10 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	2.00E+02	350	0		5 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	1.82E+02	375	0		5 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	1.67E+02	400	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	1.54E+02	425	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	1.42E+02	450	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	1.32E+02	475	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	1.23E+02	500	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	1.15E+02	525	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	1.08E+02	550	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	1.01E+02	575	0		10 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	9.55E+01	600	0		10 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	9.03E+01	625	0		15 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	8.55E+01	650	0		15 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	8.12E+01	675	0		15 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	7.72E+01	700	0		15 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	7.36E+01	725	0		15 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	7.03E+01	749.99	0		15 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	6.72E+01	775	0		10 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	6.43E+01	800	0		10 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	6.17E+01	825	0		10 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	5.94E+01	850	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	5.70E+01	875	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	5.49E+01	900	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	5.28E+01	925	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	5.09E+01	950	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	4.92E+01	975	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	4.75E+01	1000	0		5 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	4.59E+01	1025	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	4.44E+01	1050	0		5 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	4.30E+01	1075	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	4.17E+01	1100	0		5 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	4.04E+01	1125	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	3.92E+01	1149.99	0		15 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	3.81E+01	1175	0		15 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	3.70E+01	1200	0		5 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	3.60E+01	1225	0		20 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	3.50E+01	1250	0		5 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	3.40E+01	1275	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	3.31E+01	1300	0		5 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	3.23E+01	1325	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	3.15E+01	1350	0		5 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	3.07E+01	1375	0		30 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	2.99E+01	1400	0		5 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	2.92E+01	1425	0		15 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	2.85E+01	1450	0		5 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	2.79E+01	1475	0		10 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	2.72E+01	1500	0		5 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	2.66E+01	1525	0		10 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	2.61E+01	1550	0		5 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	2.55E+01	1575	0		15 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	2.49E+01	1600	0		5 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	2.44E+01	1625	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	2.39E+01	1650	0		5 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	2.34E+01	1675	0		0 Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
	2.30E+01	1700	0		5 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	2.25E+01	1725	0		10 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	2.21E+01	1750	0		10 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	2.17E+01	1775	0		10 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	2.12E+01	1800	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	2.08E+01	1825	0		10 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	2.05E+01	1850	0		10 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	2.01E+01	1875	0		10 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.97E+01	1900	0		10 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.94E+01	1924.99	0		5 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.90E+01	1950	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.87E+01	1975	0		5 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.84E+01	2000	0		35 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.81E+01	2025	0		5 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.78E+01	2050	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.75E+01	2075	0		5 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.72E+01	2100	0		15 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.69E+01	2125	0		5 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.67E+01	2150	0		25 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.64E+01	2175	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.61E+01	2200	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.59E+01	2224.99	0		15 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.57E+01	2250	0		15 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.54E+01	2275	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.52E+01	2300	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.50E+01	2325	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.47E+01	2350	0		25 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.45E+01	2375	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.43E+01	2399.99	0		35 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.41E+01	2425	0		5 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.39E+01	2450	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.37E+01	2475	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.36E+01	2500	0		15 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.34E+01	2525	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.32E+01	2550	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.30E+01	2575	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.28E+01	2600	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.27E+01	2625	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.25E+01	2650	0		15 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.24E+01	2675	0		25 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.22E+01	2700	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.20E+01	2725	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.19E+01	2750	0		10 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.17E+01	2775	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.16E+01	2800	0		15 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.15E+01	2825	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.13E+01	2850	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.12E+01	2875	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.11E+01	2900	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.09E+01	2925	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.08E+01	2950	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.07E+01	2975	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
	1.06E+01	3000	0		0 Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2

1.04E+01	3025	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.03E+01	3050	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.02E+01	3075	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.01E+01	3100	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.99E+00	3125	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.88E+00	3150	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.77E+00	3174.99	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.67E+00	3199.99	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.57E+00	3225	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.46E+00	3250	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.37E+00	3275	0	35	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.27E+00	3300	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.17E+00	3325	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.08E+00	3350	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.99E+00	3375	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.90E+00	3400	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.81E+00	3425	0	25	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.72E+00	3450	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.64E+00	3475	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.55E+00	3500	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.47E+00	3525	0	25	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.39E+00	3550	0	25	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.31E+00	3575	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.23E+00	3600	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.15E+00	3625	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.08E+00	3650	0	30	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.00E+00	3675	0	30	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.93E+00	3700	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.85E+00	3724.99	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.78E+00	3750	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.71E+00	3775	0	25	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.64E+00	3800	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.57E+00	3825	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.51E+00	3849.99	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.44E+00	3875	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.38E+00	3900	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.31E+00	3925	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.25E+00	3950	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.19E+00	3975	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.13E+00	4000	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.06E+00	4025	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.01E+00	4050	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.95E+00	4075	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.89E+00	4100	0	25	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.83E+00	4125	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.78E+00	4150	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.72E+00	4175	0	25	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.67E+00	4200	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.61E+00	4225	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.56E+00	4250	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.51E+00	4275	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.45E+00	4300	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.40E+00	4325	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.35E+00	4350	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.30E+00	4375	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.25E+00	4400	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.21E+00	4425	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.16E+00	4449.99	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.11E+00	4475	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.07E+00	4500	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.02E+00	4525	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.97E+00	4550	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.93E+00	4575	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.89E+00	4600	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.84E+00	4625	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.80E+00	4650	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.76E+00	4675	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.72E+00	4700	0	35	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.67E+00	4725	0	25	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.63E+00	4750	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.59E+00	4775	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.55E+00	4800	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.51E+00	4825	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.48E+00	4850	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.44E+00	4875	0	25	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.40E+00	4899.99	0	35	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.36E+00	4924.99	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.32E+00	4950	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.29E+00	4975	0	35	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.25E+00	5000	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2

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C-16 AERSCREEN Outputs – Operational Dredging

Concentrat	Distance	Elevation	Diag	Season/Mc	Zo sector	Date	H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS	HT	REF TA	HT
4.98E+02	1	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
5.35E+02	25	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
5.68E+02	50	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
5.97E+02	75	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.27E+02	100	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.51E+02	125	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
* 6.61E+02	149	0	15	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.60E+02	150	0	15	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
5.53E+02	175	0	20	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
4.32E+02	200	0	20	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
3.59E+02	225	0	20	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
3.10E+02	250	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
2.72E+02	275	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
2.41E+02	300	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
2.16E+02	325	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
1.95E+02	350	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
1.78E+02	375	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
1.63E+02	400	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
1.50E+02	425	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
1.39E+02	450	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
1.29E+02	475	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
1.20E+02	500	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
1.12E+02	525	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
1.05E+02	550	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
9.93E+01	575	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
9.38E+01	600	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
8.87E+01	625	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
8.41E+01	650	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
7.98E+01	675	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
7.60E+01	700	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
7.25E+01	725	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.92E+01	750	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.62E+01	775	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.34E+01	800	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
6.08E+01	825	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
5.84E+01	850	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
5.62E+01	875	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
5.40E+01	900	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
5.21E+01	925	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
5.02E+01	950	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
4.85E+01	975	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
4.68E+01	1000	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
4.53E+01	1025	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
4.38E+01	1050	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
4.24E+01	1075	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
4.11E+01	1100	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
3.99E+01	1125	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
3.87E+01	1150	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
3.76E+01	1175	0	5	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
3.65E+01	1200	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
3.55E+01	1225	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
3.46E+01	1250	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
3.37E+01	1275	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
3.28E+01	1300	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
3.19E+01	1325	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
3.11E+01	1350	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
3.04E+01	1375	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
2.96E+01	1400	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
2.89E+01	1425	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
2.83E+01	1450	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
2.76E+01	1475	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
2.70E+01	1500	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
2.64E+01	1525	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
2.58E+01	1550	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
2.53E+01	1575	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
2.47E+01	1600	0	0	Winter	0-360	10011001	-1.27	0.043	-9	0.02	-999	21	5.9	1	1.5	0.35	0.5	10	295	2
2.42E+01	1625	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
2.37E+01	1650	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
2.32E+01	1675	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
2.28E+01	1700	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
2.23E+01	1725	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
2.19E+01	1750	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
2.15E+01	1775	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
2.11E+01	1800	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
2.07E+01	1825	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
2.03E+01	1850	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.99E+01	1875	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.96E+01	1900	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.92E+01	1924.99	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.89E+01	1950	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.86E+01	1975	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.83E+01	2000	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.80E+01	2025	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.77E+01	2050	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.74E+01	2075	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.71E+01	2100	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.68E+01	2125	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.66E+01	2150	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.63E+01	2175	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.60E+01	2200	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.58E+01	2225	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.56E+01	2250	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.53E+01	2275	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.51E+01	2300	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.49E+01	2325	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.47E+01	2350	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.45E+01	2375	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.43E+01	2400	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.41E+01	2425	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.39E+01	2450	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.37E+01	2475	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.35E+01	2500	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.33E+01	2525	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.31E+01	2550	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.30E+01	2575	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.28E+01	2600	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.26E+01	2625	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.25E+01	2650	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.23E+01	2675	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.21E+01	2700	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.20E+01	2725	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.18E+01	2750	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.17E+01	2775	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.16E+01	2800	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.14E+01	2825	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.13E+01	2850	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.12E+01	2875	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.11E+01	2900	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.09E+01	2925	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.08E+01	2950	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.07E+01	2975	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.06E+01	3000	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2

1.04E+01	3025	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.03E+01	3050	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.02E+01	3075	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
1.01E+01	3100	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.99E+00	3125	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.88E+00	3150	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.78E+00	3175	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.67E+00	3200	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.57E+00	3225	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.47E+00	3250	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.37E+00	3275	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.27E+00	3300	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.18E+00	3325	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.08E+00	3350	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.99E+00	3375	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.90E+00	3400	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.81E+00	3425	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.73E+00	3450	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.64E+00	3475	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.56E+00	3500	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.47E+00	3525	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.39E+00	3550	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.31E+00	3575	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.23E+00	3600	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.15E+00	3625	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.08E+00	3650	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.00E+00	3675	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.93E+00	3700	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.86E+00	3725	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.79E+00	3750	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.71E+00	3775	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.65E+00	3800	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.58E+00	3825	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.51E+00	3850	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.44E+00	3875	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.38E+00	3900	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.31E+00	3925	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.25E+00	3950	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.19E+00	3975	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.13E+00	4000	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.07E+00	4025	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.01E+00	4050	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.95E+00	4075	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.89E+00	4100	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.83E+00	4125	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.78E+00	4150	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.72E+00	4175	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.67E+00	4200	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.61E+00	4225	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.56E+00	4250	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.51E+00	4275	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.46E+00	4300	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.41E+00	4325	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.36E+00	4350	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.31E+00	4375	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.26E+00	4400	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.21E+00	4425	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.16E+00	4449.99	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.11E+00	4475	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.07E+00	4500	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.02E+00	4525	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.98E+00	4550	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.93E+00	4575	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.89E+00	4600	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.84E+00	4625	0	25	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.80E+00	4650	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.76E+00	4675	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.72E+00	4700	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.68E+00	4725	0	25	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.64E+00	4750	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.59E+00	4775	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.56E+00	4800	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.52E+00	4825	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.48E+00	4850	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.44E+00	4875	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.40E+00	4900	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.36E+00	4925	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.33E+00	4950	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.29E+00	4975	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.25E+00	5000	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2

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C-17 AERSCREEN Outputs – Operational Idling

	Concentrat	Distance	Elevation	Diag	Season/Mc	Zo	sector	Date	H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O	LEN	Z0	BOWEN	ALBEDO	REF	WS	HT	REF	TA	HT
	1.20E+03	1	0	5	Summer	0-360	10010412	11.04	0.124	0.3	0.02	89	101	-15.8	1	2	0.16	0.5	10	295	2				
	3.16E+03	25	0	15	Winter	0-360	10011901	-0.88	0.043	-9	0.02	-999	21	8.1	1	1.5	0.35	0.5	10	281	2				
*	3.20E+03	27	0	15	Winter	0-360	10012801	-0.9	0.043	-9	0.02	-999	21	8.3	1	1.5	0.35	0.5	10	295	2				
	2.26E+03	50	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.42E+03	75	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	9.84E+02	100	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	7.33E+02	125	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	5.75E+02	150	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	4.68E+02	175	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	3.91E+02	200	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	3.33E+02	225	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	2.88E+02	250	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	2.53E+02	275	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	2.25E+02	300	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	2.02E+02	325	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.83E+02	350	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.66E+02	375	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.52E+02	400	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.40E+02	425	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.30E+02	450	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.20E+02	475	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.12E+02	500	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.05E+02	525	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	9.85E+01	550	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	9.27E+01	575	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	8.75E+01	600	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	8.28E+01	625	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	7.84E+01	649.99	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	7.45E+01	675	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	7.09E+01	699.99	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	6.76E+01	725	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	6.45E+01	749.99	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	6.17E+01	775	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	5.91E+01	800	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	5.66E+01	825	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	5.44E+01	850	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	5.23E+01	875	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	5.03E+01	900	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	4.84E+01	925	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	4.67E+01	950	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	4.51E+01	975	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	4.35E+01	1000	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	4.21E+01	1025	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	4.07E+01	1050	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	3.94E+01	1075	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	3.82E+01	1100	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	3.71E+01	1125	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	3.60E+01	1149.99	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	3.49E+01	1175	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	3.39E+01	1200	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	3.30E+01	1225	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	3.21E+01	1250	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	3.12E+01	1275	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	3.04E+01	1300	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	2.96E+01	1325	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	2.89E+01	1350	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	2.82E+01	1375	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	2.75E+01	1400	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	2.68E+01	1425	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	2.62E+01	1450	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	2.56E+01	1475	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	2.50E+01	1500	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	2.45E+01	1525	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	2.39E+01	1550	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	2.34E+01	1575	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	2.29E+01	1600	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	2.24E+01	1625	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	2.20E+01	1650	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	2.15E+01	1675	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	2.11E+01	1700	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	2.07E+01	1725	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	2.03E+01	1750	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.99E+01	1775	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.95E+01	1800	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.91E+01	1824.99	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.88E+01	1850	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.85E+01	1875	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.81E+01	1900	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.78E+01	1924.99	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.75E+01	1950	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.72E+01	1975	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.69E+01	2000	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.66E+01	2025	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.64E+01	2050	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.61E+01	2075	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.58E+01	2100	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.56E+01	2125	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.53E+01	2150	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.51E+01	2175	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.49E+01	2200	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.46E+01	2224.99	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.44E+01	2250	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.42E+01	2275	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.40E+01	2300	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.38E+01	2325	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.36E+01	2350	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.34E+01	2375	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.32E+01	2400	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.31E+01	2425	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.29E+01	2450	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.27E+01	2475	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.26E+01	2500	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.24E+01	2525	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.22E+01	2550	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.21E+01	2575	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.19E+01	2600	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.18E+01	2625	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.16E+01	2650	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.15E+01	2675	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.14E+01	2700	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.12E+01	2725	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.11E+01	2750	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.10E+01	2775	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.09E+01	2800	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.07E+01	2825	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.06E+01	2850	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.05E+01	2875	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.04E+01	2900	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.03E+01	2925	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.02E+01	2950	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	1.01E+01	2975	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				
	9.97E+00	3000	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2				

9.87E+00	3025	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.77E+00	3050	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.67E+00	3075	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.58E+00	3100	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.49E+00	3125	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.40E+00	3150	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.31E+00	3174.99	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.23E+00	3199.99	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.14E+00	3225	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
9.04E+00	3250	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.95E+00	3275	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.86E+00	3300	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.77E+00	3325	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.68E+00	3350	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.59E+00	3375	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.50E+00	3400	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.42E+00	3425	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.34E+00	3450	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.25E+00	3475	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.17E+00	3500	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.10E+00	3525	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
8.02E+00	3550	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.94E+00	3575	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.87E+00	3600	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.79E+00	3625	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.72E+00	3650	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.65E+00	3675	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.58E+00	3700	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.51E+00	3724.99	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.44E+00	3750	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.38E+00	3775	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.31E+00	3800	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.24E+00	3825	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.18E+00	3849.99	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.12E+00	3875	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
7.06E+00	3900	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.99E+00	3925	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.93E+00	3950	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.88E+00	3975	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.82E+00	4000	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.76E+00	4025	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.70E+00	4050	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.65E+00	4075	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.59E+00	4100	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.54E+00	4125	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.48E+00	4149.99	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.43E+00	4175	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.38E+00	4200	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.33E+00	4225	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.28E+00	4250	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.23E+00	4275	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.18E+00	4300	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.13E+00	4325	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.08E+00	4350	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
6.03E+00	4375	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.99E+00	4400	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.94E+00	4425	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.90E+00	4450	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.85E+00	4475	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.81E+00	4500	0	10	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.76E+00	4525	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.72E+00	4550	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.68E+00	4575	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.64E+00	4600	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.60E+00	4625	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.55E+00	4650	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.51E+00	4675	0	20	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.47E+00	4700	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.43E+00	4725	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.40E+00	4750	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.36E+00	4775	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.32E+00	4800	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.28E+00	4825	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.25E+00	4850	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.21E+00	4875	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.17E+00	4900	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.14E+00	4924.99	0	15	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.10E+00	4950	0	5	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.07E+00	4975	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2
5.03E+00	5000	0	0	Winter	0-360	10011601	-0.4	0.043	-9	0.02	-999	21	18.8	1	1.5	0.35	0.5	10	295	2

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