Appendix A
Chapter 2 Project Description

2.1 Introduction

The Humboldt Bay Harbor, Recreation and Conservation District (Harbor District) is proposing the Humboldt Bay Offshore Wind Heavy Lift Marine Terminal Project (Project) which will redevelop a marine terminal on an approximately 180-acre site at the Port of Humboldt Bay, California. The Project will provide a new multipurpose, heavy-lift marine terminal facility to support the offshore wind energy industry and, potentially in the future, other coastal-dependent industries.

The Project includes both landside and waterside components. The Project will primarily serve as a facility for the vertical integration, launching, and long-term maintenance of fully assembled wind turbine generators (WTG). The terminal will also serve as a facility for the manufacturing, importing, staging, and preassembly of various WTG components, including assembly of WTG floating foundations.

Construction of the Project will include marine infrastructure and upland improvements, demolition of all existing structures on the Project site, and relocation of three existing uses (mariculture, commercial fishing equipment storage and a commercial fish landing/live-holding facility) to offsite locations. Additionally, the Project includes habitat restoration to mitigate for impacts on (1) freshwater wetlands, environmentally sensitive habitat areas (ESHA), eelgrass (*Zostera marina*), Osprey (*Pandion haliaetus*) nests, and fish and marine mammal species; (2) conversion of intertidal to subtidal habitat; and (3) increased benthic cover. Construction will be completed in phases; Phase I is anticipated to begin in 2026 and be completed in 2030, based on a 3.5 month in-water work window each year. A lengthened in-water work window is being considered and will allow construction to be completed in fewer years.

2.2 Project Background

The federal government has established a goal of deploying 30 gigawatts (GW) of offshore wind energy by the year 2030 and 110 GW by the year 2050. The State of California has established goals of deploying 5 GW of offshore wind energy by 2030 and 25 GW by 2045. Studies by the Federal Bureau of Ocean Energy Management (BOEM), the National Renewable Energy Laboratory (NREL), and the California Energy Commission (CEC) have indicated that major port development will be required throughout California for the federal and State goals to be realized.

BOEM has leased three sites near Morro Bay, California, and two sites near Humboldt Bay to private offshore wind energy (OSW) developers. The Harbor District is designing the Project to support OSW development for these leases and potentially other future leases where OSW will be developed on the U.S. West Coast. As necessary, the development and operations of offshore wind farms are expected to be analyzed in a separate California Environmental Quality Act (CEQA) document prepared by the California State Lands Commission and a National Environmental Policy Act (NEPA) document prepared by BOEM. Offshore wind farms and associated energy transmission are not included in the Project.

Unlike the U.S. East Coast, where fixed foundations are used for turbine installation, the West Coast ocean floor is much deeper, and floating platforms are necessary. It is anticipated that turbines installed off California's coast will have a capacity of 15 megawatts (MW) or greater. For the purposes of this analysis, 20 MW turbines were assumed for terminal design. Components for a 15+ MW turbine are so large that the only feasible way to transport them from one location to another is by waterborne transit. Road and rail transit will not be possible. Therefore, port infrastructure is an essential part of achieving the OSW goals. Additionally, open water construction is not practical; therefore, platforms, towers, and blades must be constructed within ports and towed out to wind farms fully assembled.

The terminal will primarily serve as a facility for the manufacturing, import, staging, preassembly, and loadout of large OSW components. The marine infrastructure and upland improvements are required to prepare the Project site for use by offshore wind developers. While the OSW industry is the proposed anchor tenant of the modernized port facilities, in the future, the multipurpose facilities could accommodate other uses.

2.3 Project Objectives

The objectives of the Project are as follows.

- Redevelop and repurpose a blighted and largely unutilized industrial site that formerly operated for decades as a major regional employment center.
- Create a diversity of new jobs and stimulate regional economic development.
- Develop a project that establishes Humboldt Bay as a global leader in addressing climate change and energy decarbonization by serving a critical role in offshore wind renewable energy development.
- Develop a facility that can contribute to the federal goal of deploying 30 GW of offshore wind energy by the year 2030 and the State goals of deploying 5 GW of offshore wind energy by 2030 and 25 GW of offshore wind energy by 2045.
- Provide the facilities and infrastructure required for Humboldt Bay to serve as the first floating offshore wind staging and integration port in California.
- Design and construct the site in such a way that it can serve multiple purposes, either simultaneously with the OSW functions or after. Additional purposes could include breakbulk, dry bulk, wood product manufacturing/shipping, cargo laydown/storage/transport, and/or other related maritime transport uses that require heavy-lift wharfs and large laydown yards.
- Develop a marine terminal site with modern environmental standards related to minimization of greenhouse gas emissions, onsite renewable energy generation, green building materials, the electrification of terminal operations, and the facilities needed to accommodate vessel shore power.
- Prepare the site for sea level rise.
- Address and manage residual soil contamination if encountered at the site.

- Generate revenue that can be used for general Harbor District purposes throughout the rest of Humboldt Bay, including year-round maintenance of channel and marina depths, conservation, ecological restoration, and recreation programs.

2.4 Project Location and Setting

2.4.1 Project Location

The Project is located on the Samoa Peninsula in Humboldt Bay (**Figure 1**). Humboldt Bay is California's second largest bay, located in Humboldt County, about 270 miles north of San Francisco and 100 miles south of the Oregon border. Humboldt Bay is 14 miles long and 4.5 miles wide at its broadest point, with a 48-foot-deep entrance, and federal navigation channels between 26 and 48-feet deep.

The Samoa Peninsula is an approximately 8.2-mile-long sand spit separating Humboldt Bay and the Pacific Ocean. The peninsula hosts an assortment of coastal habitats, including beaches and dunes, coastal coniferous and deciduous forests, and freshwater and brackish wetlands. The eastern edge of the peninsula contains mud flats, eelgrass, and salt marshes.

The Port of Humboldt Bay is accessible by air, sea, and road, with U.S. Route 101 being the region's primary coastal transportation corridor, and State Route (SR) 299, a transportation corridor that provides the Port of Humboldt Bay with direct access to Interstate 5 and the rest of the nation's federal surface and maritime transportation networks. Locally, the Samoa Peninsula is served by SR 255.

Shipping, commercial, and recreational fisheries, boating, and mariculture are important parts of the economy and culture in Humboldt Bay. Petroleum and forest wood products are important types of cargo arriving (petroleum) or leaving (forest wood products) the Port of Humboldt Bay.

2.4.2 Project Site and Environs

2.4.2.1 Project Site and Existing Conditions

The Project site is approximately 180 acres situated in a developed industrial area of the Samoa Peninsula where timber processing, pulp mills, and other timber-related industrial operations historically occurred. A site figure showing the location of former operations and structures is provided in **Figure 2**. Louisiana Pacific historically occupied the site as part of the Louisiana Pacific Kraft Pulp and Lumber Mill operations. Much of the large-scale industrial activity occurred between the period of 1920 to 2005, with current site operations limited to log storage and fishing related activities including: storage of commercial fishing equipment, commercial fish landing and holding, limited forest product storage, and mariculture. Much of the site is currently vacant. There are remnants from past forest product industry uses at the site, including utilities, buildings, docks, and other structures. This infrastructure is generally failing and in need of repair, replacement, or demolition. Existing railroad tracks and cars, coastal rip rap, roadways, asphalt work areas, industrial stormwater management infrastructure, and degraded industrial foundations and buildings cover the majority of the site; however, portions of the site are densely covered in shrub, bramble, or young tree growth, reflecting the time that has elapsed since the site was last used for industrial purposes.

2.4.2.2 Areas of Potential Concern

Known releases of hazardous substances have occurred at the site that have undergone investigation and cleanup under the oversight of the North Coast Regional Water Quality Control Board (RWQCB). Areas previously investigated for release and cleanup include fuel storage facilities and wood treatment with fungicide application (**Figure 2**). The primary constituents of concern in these areas are petroleum hydrocarbon and their associated constituents (for example, diesel, motor oil, gasoline and benzene) and pentachlorophenol, a polycyclic aromatic hydrocarbon (PAH). There are currently no active cases under regulatory oversight requiring investigation and cleanup at the Project site.

Additional areas of the site with the potential for contaminants include the former refuse burners in the northern portion of the site (dioxin/furans and PAHs), former structures with industrial use (fuels and lubricants), and existing structures that may contain asbestos and lead-based paint. General areas of lesser concern include the use of dredge material as fill on the site, utility/conveyance lines that may act as a preferential pathway for released materials, and the potential of elevated metals in soils where storage of materials from salvage operations may have occurred.

The EPA is currently implementing a Phase I Environmental Site Assessment (ESA) which will be followed by a Phase II assessment. The objective of the Phase II ESA will be to assess any potential localized areas of contaminants prior to site development. Cleanup, as required, will follow.

2.4.2.3 Project Site Land Use Designations

The Project is located entirely in the California Coastal Zone, within the jurisdiction of the County of Humboldt and the California Coastal Commission (CCC), and is subject to the Humboldt Bay Area Plan (HBAP), a component of the Humboldt County Local Coastal Program (LCP). The western portion of the Project site (referred to as the inland or backlands in this document) is within the jurisdiction of the County of Humboldt and in an area appealable to the CCC. In contrast, the eastern portion of the project site, along Humboldt Bay, is within the area of retained jurisdiction of the CCC (**Figure 3**).

The Project site has four Humboldt County land use designations, Industrial (MC and MG), Natural Resource (NR), and Commercial (CR). The majority of the upland development is within the combining zone of Industrial, Coastal Dependent (MC/A) (**Figure 4**). The zone "A" refers to an Archaeological Resource Area Outside Shelter Cove combining zone overlay that designates the Project site as within an area potentially containing archaeological resources and provides for "reasonable mitigation measures where development would have an adverse impact upon archaeological and paleontological resources" (Humboldt County 2017). Additional zoning designations in areas along the western periphery of the Project site include: MG (Industrial General); NR/W (Natural Resources/Coastal Wetland Areas); NR/W,B (Natural Resources/Coastal Wetland Areas/Beach and Dune Areas); and PF/D (Public Facility/Design Review). The portion of the Project within the bay is zoned NR/W and there is an area of apparent mapping error where NR/W zoned parcel extends onto developed uplands (**Figure 4**). The Project site includes parcels identified by assessor parcel numbers (APN) 401-031-040, -054, -055, -061, -070, -071, -077, -078; and 401-112-011, -012, -013, -024, -029, -030.

2.4.2.4 Existing Tenants

There are existing tenants in the Project area that will be relocated as part of the proposed Project. The existing tenant's uses that will be relocated include shellfish and seaweed mariculture, commercial fishing equipment storage and hagfish (*Eptatretus stouti*) landing / live holding. (**Figure 7**).

2.4.2.5 Neighboring Land Uses

To the south of the Project site is Redwood Marine Terminal II, the historic site of the Samoa Pulp Mill (constructed in 1965) and the current site of an in-bay oyster and clam nursery, various upland tenants, and the proposed 660,000 square foot Nordic Aquafarms Land-Based Aquaculture Project. To the north and west of the Project site is the town of Samoa (Samoa), which includes planned and existing residential development, and to the east is Humboldt Bay.

2.5 Project Components

The Project includes both landside and waterside components as part of the redevelopment of the Project site into a multipurpose, heavy-lift marine terminal facility (**Figure 5**).

2.5.1 Overview of Operations

2.5.1.1 Permitted Operations

The Project site will primarily serve as a facility for the staging, vertical integration, launching, and long-term maintenance of fully assembled WTGs. Additionally, WTG foundations will be assembled at the site. These are referred to as permitted operations because these will be included in permit applications submitted in 2024. Permitted operations comprise the project analyzed in this EIR.

Based on the size of the terminal and number of WTG vertical integration sites required to meet the state's renewable energy goals, two WTG staging and vertical integration sites will be constructed at the Project site to allow for the simultaneous construction of two OSW projects out of the terminal. Each contains 60 acres of upland space and a heavy lift wharf for delivery vessels (one 1,100-foot and one 1,600-foot), as well as other component infrastructure (**Table 1**).

In addition to the two Staging and Integration Sites, a Floating Foundation Assembly Site is included in the remaining 60 acres (**Figure 5**). This will provide significant economic benefits and job creation as well as operational efficiencies. The Floating Foundation Assembly Site will have 400 feet of dedicated berth space for foundation launching and access to a shared berth for delivery of subcomponents.

These project components are described in detail in this section and shown in **Figure 6**. As described in Chapter 1, *Introduction*, the Harbor District is proposing to approve and implement specific activities (structure demolition, construction and Project operations) related to OSW development, and this environmental impact report (EIR) evaluates these specific activities at a project level.

2.5.1.2 Future Operations

Other projects may occur at the terminal site in the future but are not yet designed or proposed to be constructed or operated. These are referred to as Future Operations. Future Operations could include the terminal also serving as a facility for the manufacturing, import, staging, and preassembly of various WTG components.

Future Operations will occur later than Permitted Operations and are not a part of the proposed project. Not enough detail regarding the Future Operations is currently known to include them in the initial permit applications or project level CEQA documentation.

Because details regarding these future projects are not available to facilitate impact analysis and no approvals will be provided for these future projects at this time, the effects of these future projects would be speculative. Therefore, this EIR does not evaluate the potential physical changes to the environment associated with these future projects.

2.5.2 Proposed Uses in Development Subareas

Four subareas are delineated within the Project site according to the type of construction and operational activity that will occur within them (**Figure 6**). These include the Upland Development Subarea, The Marine Development Subarea, the Wet Storage Subarea, and the Habitat Mitigation Subarea.

2.5.2.1 Upland Development Subarea

The Upland Development Subarea is landward (west) of Humboldt Bay. All nonmarine development will occur in this area (**Figure 6**).

Offshore Wind Terminal Operations

Offshore wind terminal operations will include general WTG staging and integration operations. This includes the use of crawler cranes and two fixed position quayside ring cranes[1]; loading and unloading of turbine components via ships; marine terminal import of WTG components, such as blades, towers, floating foundations, and other turbine components; as well as turbine device mooring equipment, such as anchors, mooring lines, and chains. **Table 1** summarizes staging and integration site component infrastructure.

Staging and Integration Operations

Table 1. Staging and Integration Site Component Infrastructure

Staging and Integration Site 1—Infrastructure	Staging and Integration Site 2—Infrastructure
1,600-ft Heavy Lift Wharf:	1,100-ft Heavy Lift Wharf:
(1) 400-ft integration berth	(1) 400-ft integration berth
(1) 400-ft pre-commissioning berth	(1) 700-ft delivery berth (shared with adjacent Foundation Assembly site)
(1) 800-ft delivery berth	(1) quayside ring crane

[1] Anticipated design is similar to that of a Mammoet PTC200-DS ring crane. Approximate height of the boom tip will be 800-feet to accommodate a working point of approximately 600-feet while assembling large size WTGs.

Staging and Integration Site 1—Infrastructure	Staging and Integration Site 2—Infrastructure
(1) quayside ring crane Load rating = 6,000 psf	Load rating = 6,000 psf
60-Acre Uplands: (1) 20,000 sq ft office building (1) 50,000 sq ft storage / assembly building (1) 90,000 sq ft parking area Laydown area for WTG components Load rating = 3,000 psf	60-Acre Uplands: (1) 20,000 sq ft office building (1) 50,000 sq ft storage / assembly building (1) 90,000 sq ft parking area Laydown area for WTG components Load rating = 3,000 psf

ft = feet; psf = pounds per square foot; sq ft = square feet; WTG = wind turbine generators.

Wind Turbine Generator Components Delivery and Storage

WTG components will be delivered at the delivery berth (Staging and Integration Site 2 shares delivery berth with the Foundation Assembly Site). WTG components will be temporarily stored in upland areas as shown on **Figure 5.** Blades will be stacked in sets of three, and towers will be stored horizontally or vertically. Nacelles will also be stored prior to vertical integration of the WTGs.

Foundation Delivery and Storage

Two potential scenarios may be utilized for foundations. The goal is to manufacture the foundations on site. The Project is being designed for onsite foundation manufacturing, but initially some foundations may be built at another location.

- Scenario 1: Foundations will be sourced from the onsite Foundation Assembly Site and launched with a semi-submersible barge. A sinking basin, approximately 60 feet deep, will be constructed for this purpose. The foundations will be assembled in the upland areas, moved across the quay onto a semi-submersible barge with self-propelled modular transporters (SPMT). Then the barge will be moved to the sinking basin using tugs and submerged. The foundation will then float off the barge and be towed to wet storage with tugs or vertically assembled into a WTG and towed to sea.
- Scenario 2: Foundations will be fabricated at a separate location in the U.S. and towed to Humboldt Bay using tugs and then placed in wet storage. Alternatively, foundations will be fabricated in Europe or Asia and delivered to a separate location in the U.S. via a semi-submersible vessel, floated off the heavy lift vessel, and then towed to Humboldt Bay by tugs and placed in wet storage.

Vertical Integration

- WTG foundations, from wet storage, will be brought to the integration berth by tugs.
- WTG components will be moved from uplands storage to the quayside pre-assembly area by SPMTs and integrated onto the foundation by a quayside crane.
- Once fully assembled, the integrated WTG will be moved to the pre-commissioning berth for pre-commissioning activities.
- After pre-commissioning is completed, depending on weather and towing conditions, the WTG will be towed directly to the offshore installation site (good weather window) or towed to the

southern WTG wet storage area (impermissible weather window) until a good weather window is available for tow-out to offshore installation site.

Floating Foundation Assembly Site Infrastructure and Operations

As described in Scenario 1, ultimately, WTG foundations will be assembled on site. Following is the process for delivery of foundation subcomponents, subcomponent storage, foundation assembly, and foundation loadout. **Table 2** summarizes Floating Foundation Assembly Site infrastructure.

- Completed foundations will be moved to either wet storage area by tugs.
- Foundation subcomponents will be delivered at a 700-foot delivery berth, shared with adjacent Staging and Integration Site 2 (**Figure 5**).
- Foundation subcomponents will be temporarily stored in upland areas. The quantity, storage configuration, and storage location will differ depending on the foundation technology being utilized. Foundations may be semi-submersible (made of steel or concrete) or tension leg platform foundations.
- Foundations will load-out at the 500-foot load-out berth (**Figure 5**) using one of the following options.

  Option 1—Semi-Submersible Barge: SPMTs will load the WTG foundation onto a semi-submersible barge at the quay. The barge will move to the sinking basin, ballast down until the foundation is floated off, and then the foundation will be towed by tugs to the integration berth or to foundation wet storage. A sinking basin approximately 60 feet deep will be constructed for this purpose.

  Option 2—Direct Transfer with Crane: A quayside crane will lift the assembled foundation from the quayside into the water. Tugs will attach to the foundation in the water and tow it to the integration berth or to foundation wet storage. Due to the significant size and weight of the foundations, this option will be infeasible for the majority of foundation designs.

Table 2. Floating Foundation Assembly Site Infrastructure

500-Ft Heavy Lift Wharf: (1) 500-ft load-out berth (1) 700-ft delivery berth (shared with adjacent Staging and Integration Site 2) Load rating = 6,000 psf
60-Acre Uplands: (1) 20,000 sq ft office building (1) 50,000 sq ft parking area Laydown area for foundation subcomponents (2) assembly lines – moving from the back of the site towards the wharf – for WTG foundation assembly (exact method of assembly, quantity, and orientation of production lines will differ depending on foundation technology being utilized). Load rating = 3,000 psf

psf = pounds per square foot; sq ft = square feet.

Tenant Relocation

Commercial Fishermen Storage Area

Commercial fishermen currently store equipment within the Upland Development Subarea (**Figure 6**). Existing commercial fishing storage will be relocated to Woodley Island (**Figure 7**). This area on Woodley Island will be graveled and fenced. Additionally, the Woodley Island Marina work dock (**Figure 8**) will be expanded to accommodate the increased need for moving equipment between the new storage area and vessels.

Hagfish Landing and Holding Facility

A permitted facility that unloads hagfish from a fishing vessel and temporarily holds them prior to shipping is located within the Upland Development Subarea (**Figure 7**). The facility includes a bay water intake and discharge. This facility will be relocated to an offsite location that has not yet been identified.

2.5.2.2 Marine Development Subarea

The Marine Development Subarea extends from the top of the bank into the bay to the federal navigation channel. Assembly and launching of the floating foundations will occur in this area, as will the final vertical integration of the various offshore wind components into deployment-ready fully-constructed floating WTGs. Most of the marine development will occur in this area, except for off-terminal wet storage that will occur in the Wet Storage Subarea (**Figure 6**).

Proposed Uses

Tenant Relocation: Mariculture Operations

There are current shellfish and seaweed farms within the Marine Development Subarea (**Figure 7**). These farms are operated by private, non-profit, and academic entities with state, local and federal regulatory approvals that are held by the Harbor District through a program known as the Humboldt Bay Mariculture Pre-Permitting Project. The shellfish and seaweed farms will be relocated to an area that has not yet been identified.

Dredge Material Dewatering Area (Samoa Lagoons)

The Project includes berth areas and wet storage areas, all of which will need to be initially dredged and then periodically re-dredged in the future (known as *maintenance dredging*). Each maintenance dredging event will generate substantial amounts of dredge material (See Section 2.6.7, *Dredging*) that will be beneficially used or disposed.

As shown in **Figure 9**, an existing dredge material dewatering area is located just north of the Upland Development Subarea. Known as the *Samoa Lagoons*, this site has a capacity to hold approximately 65,000 cubic yards of dredge material. It was designed and constructed to receive dredge materials, drain residual water back to the bay, and then temporarily store the dried sediment. The de-watered dredge material can then be hauled off site for beneficial use or disposal. The site was originally used as a dewatering and storage site for the dredging of a berth to the east of the Samoa dock that is scheduled to be demolished as a part of the Project (**Figure 2**). The Project will re-open the Samoa Lagoons Dredge Materials Dewatering Area to be used for either the initial dredging and/or the maintenance dredging of the proposed berths and wet storage areas. The project will also either amend existing permits associated with the Samoa Lagoons site or acquire new required permits. The Habor District has a County Coastal Development Permit (CDP) / Conditional Use Permit (CUP) (CDP-10-12/CUP-10-09) for the 21-acre site that allows up to 65,000 cubic yards of dredge material to be dewatered and temporarily stored at this site. The site was originally permitted and was used in the 1980’s and 1990’s. It is anticipated that the dewatering area will required improvements including: regrading, lining as necessary, and a decant system may be overhauled or replaced.

2.5.2.3 Wet Storage Subarea

Within the Wet Storage Subarea, areas for short-term temporary mooring (staging) of WTGs (referred to as *wet storage sites*) will be developed (**Figure 6**).

Proposed Uses

Wet storage areas will be used for floating foundations storage prior to vertical integration into assembled WTGs and temporary staging of the assembled WTGs (floating foundation, tower, nacelle, and blades) prior to towing them to sea. Wet storage allows production to continue until an adequate towing weather window is available. Two potential wet storage areas have been identified: North Wet Storage and South Wet Storage (**Figure 6**). Due to proximity to the bridge, the northern area can be used for wet storage of foundations only, not turbines. The southern area will be used for wet storage of foundations and assembled WTGs.

Based on limited available space, a fixed mooring system will be utilized. This will limit the travel of foundations when at anchorage. Ballasting with supply water will be required to level and stabilize WTGs during offloading of the WTG floating foundations and during vertical integration. Bay water will be used for ballasting, which can be done by flooding foundation compartments or using pumps. Foundation ballasting may be required in the following circumstances:

- WTG Vertical Integration: flooding floating foundation compartments while tower sections, nacelle, and blades are installed.
- WTG Tow-Out Preparation: flooding floating foundation compartments as preparation for tow out.
- WTG Tow-In Operations: for future maintenance of the WTGs, which requires towing them back to port for heavy lift service or tow-in delivery from another port, reversed ballasting operations may be needed depending on navigation requirements and what work is done on the WTG.

2.5.2.4 Habitat Restoration Subarea

In the Habitat Restoration Subarea, wetlands and environmentally sensitive habitat areas (ESHA) will be created and restored as mitigation for biological impacts in the Upland Development Subarea (**Figure 6**).

Proposed Uses

The Habitat Restoration Subarea includes areas that are ruderal and dominated by nonnative invasive plant species. Habitat restoration, including estuarine and freshwater wetland establishment, will provide onsite mitigation for some of the project impacts on wetlands and ESHAs and accommodate some relocated osprey nests (**Figure 10**). Habitat restoration will develop a mosaic of habitat types that is significantly higher quality than what will be affected by the Project's upland development. This is because wetlands within the mitigation area have developed for a longer period of time due to earlier abandonment of activities in that subarea. However, the existing wetlands in the Habitat Restoration Subarea are characterized by fill substrates, nonnative and invasive species in the understory, and in many cases are artificially induced as a result of past industrial development. Estuarine wetlands along Humboldt Bay in the mitigation area are high quality and support special-status salt marsh species and sensitive salt marsh habitat.

Based on the conceptual mitigation plan developed for the onsite mitigation area, nearly all of the remnant sensitive natural communities in the mitigation area will be avoided during the implementation of this plan, however some minor impacts are unavoidable during the creation of new depressions and restoration activities. Estuarine and freshwater channels will be excavated to meet design specifications for tidal influence and to be adaptable to anticipated sea level rise. The freshwater wetlands will be hydrologically connected to the estuarine wetland via a tide gate and culvert under the Project access road. Freshwater wetland creation will consist of excavating an area that is currently upland fill to suitable depths to allow for the development of freshwater wetland hydrology and establishment of native hydrophytes. Additional areas will be planted with a diverse pallet of native wetland plants which will provide higher quality habitat and substantial functional lift.

2.6 Construction and Demolition

The Project includes demolition of existing structures, site preparation, marine terminal construction, dredging, establishment of wet storage sites, habitat restoration, and relocation of existing tenants currently on the Project site.

2.6.1 Project Phasing and Schedule

2.6.1.1 Phasing

Overall site development will occur in multiple phases as shown on **Figure 11** and will follow the schedule shown in **Table 3**.

- Phase 0 will consist of developing access corridors and performing onsite mitigation/habitat restoration.
- Phase 1 will consist of developing the northern portion of the site and creating a wet storage area. Phase I construction is anticipated to start in 2026 and be completed by the end of 2030.
- Phases 2 and 3 will consist of developing the southern portion of the site and creating an additional wet storage area. The Foundation Assembly Site will likely follow at a later date.

2.6.1.2 Construction Schedule and Hours

Table 3. Construction Schedule

Milestones	Duration	Completion
All permits in hand		July 1, 2026

Milestones	Duration	Completion
Constraints		
In-Water Work Window	July 1–October 15 each year	July 1, 2030
Assumptions		
Marine Construction Work Hours	12 hours per day	
Marine Construction Workdays	6 days per week	
Dredging Work Hours	24 hours per day	
Dredging Workdays	7 days per week	
Upland Work Hours	12 hours per day	
Upland Workdays	7 days per week	

2.6.2 Construction Access and Material Delivery

2.6.2.1 Construction Access

Construction access will be from both the land and water to the Project site. Two access points will be constructed during Phase 0 and used during Phase 1 and 2 (**Figure 11**). The North Entrance will be at the north end of the site and accessed off of Vance Avenue. The West Entrance will be at the south end of the site and accessed via the West Access Road that connects to New Navy Base Road.

It is expected that any large deliveries, such as crane components and piles will be delivered through the West Access Road or from barge. A construction road on site will need to be maintained at all times to allow for unobstructed movement on site. The Contractor will be responsible for this and will need to coordinate with all subcontractors to avoid blocking access to work. Smaller deliveries and construction workforce will likely use the North Entrance to gain access to the site but may use the West Access Road if certain work makes this access impractical or unsafe.

The waterfront construction will be accessed directly from Humboldt Bay via tugs and barges. Due to the shallow depths near shore, the Contractor will likely need to perform some amount of the planned dredging to gain closer access to the construction site. Crew boats will be utilized to transport the workforce to the floating equipment.

The Contractor will be required to liaise directly with the appropriate local authorities, such as the police, California Department of Transportation (Caltrans), and local road departments regarding the use of public roads, particularly with respect to wide, long, or heavy loads. Similarly, the Contractor will be required to liaise with the appropriate local authorities such as the U.S. Coast Guard and the Humboldt Bay Harbor District with respect to marine access and mobilization of floating equipment (i.e. derrick barges, flat barges, hydraulic dredges, and tugs) to the site.

2.6.2.2 Material Delivery

Dense grade aggregate will be transported to the Project site via barge and truck. Larger quantities used for the wharf and backlands will likely be supplied via barges, while smaller quantities will be delivered via truck. The material will be offloaded from the barge into the backlands either via a derrick barge and bucket, or a barge that has an integrated conveyor system that can offload material directly.

The steel piling can either be brought to the Project site in full lengths via a material barge or in smaller sections by truck and spliced together on site. Once spliced, the piles will need to be rehandled onto a material barge for use by the pile driving derrick barges, or for landside operations. The piles can be stockpiled directly behind the landside crane within its swing radius. If the piles come in full lengths, there may be a need to rehandle the piles into the backlands and stockpile to ensure the material barge can be used to receive the next load of piles.

2.6.2.3 Equipment Delivery

Water based equipment will be tied down and brought to the site. Once on site, the equipment will be unlashed and made ready for service. Land-based equipment will be brought onto the site via trucks. Some larger equipment such as crawler cranes will require multiple truck loads and multiple days to assemble on site. Some of these large loads will require special permits and coordination with local authorities if the load is too wide, too long, or too heavy per regulations.

2.6.3 Soil Improvements

The backlands are required to be consolidated via preloading the site with a surcharge of soil to reduce the amount of remaining settlement expected from the future loading when the site is operational. To accelerate the required time the preload surcharge must remain in place wick drains (or prefabricated vertical drains, PVD) will be installed to facilitate the movement of pore water out of the soil. See 2.6.7.1, *Soil Preloading Surcharge*.

2.6.4 Staging

The Project will require onsite staging areas for the Contractor and subcontractors to accommodate Contractor temporary offices, material storage and stockpile areas, maintenance equipment and supplies, and parking for the construction management and construction workforce. This area will typically be given a designated area in the backlands, however due to the site improvements it is anticipated the staging area will need to relocate multiple times throughout the Project as the preload surcharge area moves. Schedule permitting, materials could wait to be stockpiled until after the first surcharge area is completed to avoid rehandling.

Additionally, the Contractor will require designated water access staging, and water laydown areas for derrick barges, dredges, material barges, tugs, and crew boats. The Contractor may request to install multiple mooring points in the Project water work limits to attach vessels, barges, or floating equipment via temporary anchored buoy locations. The water access staging can either be a gangway and float which connects to shore on site, or the Contractor may make use of the existing marinas in the area in which case the floating equipment's crew will park off site.

2.6.5 Temporary Construction Facilities

Temporary or permanent perimeter fencing and guard access checkpoints/gates will be installed prior to the start of construction to secure the area. Rerouting of existing utilities while new infrastructure is constructed will be necessary prior to the start of construction. In addition, installation of a temporary mooring system to allow for offloading of dense grade aggregate via barge may be necessary if the schedule does not permit use of the newly constructed wharf.

2.6.5.1 Concrete Batch Plant and Material Storage

A concrete batching plant is used to manufacture concrete from its ingredients, including cement, crushed stone, sand, water and admixture chemicals. Concrete mixtures are manufactured based on engineering project specifications. Concrete mixture specifications vary by altering the proportion of various raw materials. Concrete work will use a combination of offsite batch plant and onsite batch plants. Up to two concrete batch plants will be installed onsite. Stockpiles will be located immediately adjacent to the batch plant, allowing for easy access to materials. Water provided by the Humboldt Bay Marine Water District (HBMWD) will also be used for batch plant operation.

2.6.6 Demolition

The Project will require demolition of various structures in the backlands as well as the existing onsite timber wharf structure and remaining pilings. All existing facilities on the Project site will be demolished (**Figure 13**). The demolition phase will include the following.

- Demolition of backlands structures, utilities, foundations, etc.
- Demolition of existing wharf structures and removal of piling, and bulkheads (275,000 square feet of deck removal and approximately 3,800 piles).
- Disposal of treated wood waste.
- Removal of debris along rock slope, and regrading of slope as required.

The backland structures will be removed using excavators and other equipment (graders, loaders, backhoes, etc.) to demolish and process the structures. The processed materials will be sent via truck to various landfills depending on the material type and their hazardous classification. Concrete demolition will consist of a combination of onsite reuse, offsite recycling, and offsite disposal.

The timber wharf deck will be demolished by either a backhoe or excavator by driving onto the deck and peeling the deck from the outer edge back to the shore. If the wharf is not strong enough to support this then it will be demolished from the water using a floating crane. In this scenario, a floating crane and a water side crew using a combination of work boats (or skiffs) and work floats for access underneath the wharf will work in tandem to rig the crane into sections of the wharf, then the water side crew will use a saw to disconnect the rigged up section from the remaining structure. The removed section will be placed onto a material barge next to the floating crane. Removed sections will then be rehandled into either the backlands or another laydown area to be processed and sent to a landfill or other appropriate site for disposal.

The remaining piles will be removed either by dry-pulling or by vibratory hammer. Dry pulling is performed by wrapping a pile with a chain sling to choke it. The chain is attached to rigging and back to a crane, the crane will pull on the pile to remove it. If the piles do not come out, or break during removal, the Contractor may use a vibratory hammer. The vibratory hammer hangs from the crane and uses a hydraulic clamp to attach to the head of the pile. The hammer has an internal mechanism which will oscillate and cause the pile to vibrate and liquefy the soil surrounding the pile allowing the pile to be extracted with less force. The removed piles will be rehandled to the backlands or another laydown area to be processed then sent to a landfill.

The existing grade near the timber wharf is too shallow for a floating barge or material barge to gain access after approximately the first 60 feet are removed (measuring from the face of the wharf towards the backlands). Therefore, the Contractor will remove the deck and piles where it can reach, then dredge the exposed area enough to allow barge access (approximately 6 feet). The Contractor can then move the barges over the newly dredged areas to reach more deck and repeat the process until complete. The area of demolition is large enough that a demolition focused crew and a dredge crew can work simultaneously for efficiency.

2.6.7 Site Grading

Roughly 170 acres of backland will be graded to provide protection against future sea level rise, provide laydown area for the windfarm components, be compacted to sustain the loads of the equipment that will move the components around, and provide positive drainage to the proposed stormwater collection facilities (**Figure 14a**).

The Project site will be raised to an elevation of at least 16 feet to accommodate sea level rise for the design life of the project components. In addition, to avoid collection of drainage within the interior of the site, a high point ridgeline will run in the north-south direction. The ridgeline elevation will vary from an elevation of 18 feet at the north end of the site to an elevation of 20.5 feet at the south end of the site (**Figure 14b**). This will promote stormwater runoff at an approximately 0.5% slope in the east-west direction along the perimeter of the site (**Table 4**). A gentle slope is required to provide laydown area for the windfarm components.

Table 4. Summary of Grading Design Criteria

Minimum Grade	0.5%*
Maximum Grade	1.5%*

* Excluding access ramps, driveways, and perimeter cut/fill slopes.

The proposed elevations will generate a net cut of roughly 300,000 cubic yards within the entire Project site, excluding the North Access Road (**Figure 14a**). The net number does not account for shrinkage or bulking of material based on excavation, compaction, or surcharge. There could be a need to import fill from dredged material or other sources depending on the amount of usable material onsite and the timing of construction phases. Some export of excavated material may also needed. The grading surface will be the subbase for approximately 3 feet of dense graded aggregate (DGA) that will create the top surface.

Since the north half of the site has lower existing elevations, it will mainly consist of fill with a minor amount of cut along the west boundary of the site. The south half of the site had higher existing elevations and will mainly consist of cut with a minor amount of fill in the middle of the site and near the shoreline (**Figure 14a**).

2.6.7.1 Soil Preloading Surcharge and Wick Drains

The backlands are required to be consolidated via preloading with a surcharge of soil to reduce the amount of remaining settlement expected from the future loading when the site is operational. To accelerate the required time the preload surcharge must remain in place for 6 months. Wick drains (or prefabricated vertical drains) will be installed to facilitate the movement of pore water out of the soil. Surcharge soil could be comprised of reused soils from onsite, dredged sediment from the adjacent marine subarea if suitable, or imported material.

It is anticipated the Contractor will perform demolition, installation of any temporary utilities, and some amount of site regrading prior to beginning the wick drain operation. Wick drains are expected to be installed approximately 95 feet deep and placed in a 3.5-foot triangular pattern. As many as four wick drain installation machines will be needed to meet schedule demands early in the Project and can be scaled back once the surcharge operation becomes the critical path.

The wick drain installation operation initially requires laying out, or flagging, the wick drain locations. A wick drain installation machine will push or vibrate the wick drain into the ground. An assisting worker will then cut the wick drain and set up the machine to install the next wick drain.

Depending on the conditions of the soil on site, the wick drain machine may experience conditions that are too hard to reach the design tip location. If this happens a pre-drilling operation will need to occur. Pre-drilling involves using a drill mounted on an excavator or specialty drilling rig to drill or auger the location of the wick drains to loosen the soil. If required, this operation will start prior to wicking in a given area and enough drill rigs will be required to not interfere with the required production rate of the wick drain installation. Drilling is slower than wick drain installation, so more drill rigs will be required than wick drain installation machines.

It is assumed that approximately 700,000 cubic yards surcharge will be built. Surcharge material is sandy fill that will ideally be placed into the backlands as a byproduct of the dredging operation. However, if adjacent dredge material is deemed not suitable, then this material will need to be brought in by truck or barge. Once built, the surcharge will remain in place for 6 months. Once the required settlement is observed, the surcharge will be moved to an adjacent footprint where it will sit for another 6-months. This process will be repeated until the needed areas are consolidated.

Once all of the preload operations are completed, excess material will be removed from the site or could potentially be left in a stockpile to supply the Phase 2 work. This decision will be influenced by permit requirements, the availability to leave the material stockpiles in the Phase 2 area, and how long it must remain in place before Phase 2 work begins.

2.6.7.2 Cement Deep Soil Mixing

To strengthen the near-shore soil properties adjacent to the Samoa Channel and reduce lateral spreading, cement deep soil mixing (CDSM) will be performed along the slope. The work will be performed by a specialty drilling rig that has soil mixing attachments. The auger will simultaneously drill, inject cementitious grout, and mix the soil as it gets to the required depth as well as inject cementitious grout and mix the soil as it is extracted. The drilling rig will be supplied by a small batch plant of water and grout in the immediate vicinity of the work. During this process, cement replaces as much as 40% of the native material and this residual spoil of cementitious soil becomes available for use onsite. This residual material may be used as backfill, surcharge, or berm material. This will be used as the first source of fill in the backlands after the soil preload surcharge operation is complete.

2.6.7.3 Dense Grade Aggregate (DGA)

The components and equipment that are anticipated to be used at this site will necessitate that the wharf can handle a 6,000 pound per square foot (PSF) loading and the backlands can handle a 3,000 PSF loading. This is a cost-effective solution compared to the likely alternative of some form of roller compacted concrete or reinforced-steel concrete. Typically, a 3-foot section of DGA is required for the soil to accept a 3,000 PSF loading. However, it is likely this can be reduced to less than 3 feet depending on comprehensive geotechnical data collection and detailed analysis. Any reduced amount of DGA in the backlands would be replaced with surcharge material in order to meet final grade elevations (**Figure 14b**).

DGA material may be delivered by truck or by barge. Barge delivery would likely include offloading with a conveyor system that may be more efficient than trucking. Especially if the material can be loaded onto the barge directly from a waterfront quarry.

Based on a 3-foot section of DGA, up to approximately 48,300 cubic yards of DGA will be needed during Phase 0 of the project to build access roads to the site. It will not be needed on site again until after site preparation of the backlands for Phase 1 which could be multiple years after Phase 0 concludes. Due to the gap in time, it is most likely that the Phase 0 DGA will be brought to the site via trucking from a local source. The larger quantity of DGA used for the wharf and backlands would likely be supplied via a waterfront quarry and barges. This volume is estimated to be approximately 222,600 cubic yards in Phase 1 and 545,400 cubic yards in Phase 2, for a total of 816,300 cubic yards of DGA in Phases 0, 1, and 2.

Additionally, as seen in other wind terminals where DGA is used as a base, there will be some amount of localized settling in areas of long-term storage and along the routes where components are moved. These localized areas will require to be filled with additional DGA as a maintenance action during Phase 1 and 2 of construction. This volume would most likely be supplied via truck from a local source and could total up to approximately 128,000 cubic yards if the entire backlands experiences 6 inches of settling. Therefore, the approximate maximum amount of imported DGA materials used in the backlands could reach 944,300 cubic yards during construction.

2.6.8 Dredging

2.6.8.1 Dredging Activities

Dredging activities will include the following.

- Dredge new berth pocket and wet storage footprints.
- Rehandle dredge spoils suitable for beneficial use into backlands for use as surcharge.
- Construct surcharge in backlands for use in pre-loading of soil.
- Perform CDSM soil improvement along shoreline.

It is expected the Contractor will need multiple pieces of equipment to increase the production rate; the waterfront site for Phase 1 and Phase 2 is only large enough to efficiently accommodate two to three pieces of floating equipment along with the support barges. It is expected the Contractor will have a combination of two to three dredges or derrick barges at a time during the construction phase. Additionally, the Wet Storage Subarea is far enough away from the wharf work areas that additional dredge work can occur simultaneously.

Multiple types of dredging are required to meet Project needs. Portions of the material may be used for surcharge and construction fill at the Project site. The Harbor District is also pursuing opportunities to beneficially use the dredged material for beach nourishment, habitat restoration, dike construction or other projects. The material must have the appropriate gain size and be tested for contaminants for these uses to occur. A large portion of the dredge material will likely be disposed of at the Humboldt Open Ocean Disposal Site (HOODS).

Hydraulic dredging will be employed for bulk dredging where possible. Hydraulic dredging will not be used in areas where obstructions are expected such as large rocks, or timber pile remnants. Clamshell dredging is ideal for more precise work, or if obstructions are expected. It is assumed clamshell dredging will be used for initial passes where there could be debris or timber pile remnants, final grade cleanup work, and cutting slopes.

To make full use of the in-water work window, dredging operations will work continuously 24 hours a day 7 days a week. The dredges will be crewed by either 2 crews working 12 hours, or 3 crews working 8 hours per day. The wharf areas and wet storage areas are far enough away from each other that dredging operations can be run independently of each other.

As discussed in Section 2.6.5, *Demolition*, the timber wharf demolition will happen simultaneously with dredging to gain access. For this reason, it is anticipated there will be slow production for initial dredging operations near the existing timber wharf until all piles are removed. Conceivably, the Contractor will use two pieces of floating equipment to dredge and demolish the wharf. A third piece of floating equipment could simultaneously work on the remaining dredge footprint between the demolition front and the navigation channel. A fourth piece of floating equipment could work in the Wet Storage Subarea.

Clamshell Dredging

A pre-dredge survey will be taken of the Project site to determine how much material needs to be removed across the entire dredge limit. This information will be available to the clamshell dredge operator as a guide for how much material will be excavated within the Project area. The dredge along with a scow will be located into position via tug. The dredge will use a bucket to excavate material and place it into a scow. Once the scow is full, a tug will bring an empty scow and swap it with the full scow. The tug will tow the full barge from the dredge location out to the offshore disposal area, HOODS, where the barge will bottom dump the material. Periodic surveys will be taken to check dredging progress.

The clamshell method will be used for the initial pass of the dredge areas to remove newer fill that may contain contaminants that will exclude the material's use as fill. Remaining material may also be used for meeting final grades of the berth pocket and the slope since hydraulic dredges are not precise enough.

Rock quarry will be placed to stabilize and prevent scouring on the dredge slope (See 2.6.11, *Rock Revetment*, and **Figure 15a**). If turbidity is a concern a silt curtain may be deployed around the area of work to prevent the spread of turbid water from the dredging area.

Cutter Suction Dredging

A pre-dredge survey will be taken of the Project site to determine how much material needs to be removed across the entire dredge limit. This information will be available to the cutter suction dredge operator as a guide for how much material will be excavated within the Project area. Cutter-suction dredges are positioned by a tugboat and then an anchor spread is laid out. The dredge will be able to move itself around a certain area based on the anchor spread. A separate crew will layout an assortment of flexible, submerged, and floating pipeline that attach to the dredge and continue to the disposal area. The dredge will use a cutter head that is lowered to the excavation depth, then the dredge will move in a sweeping motion to remove material. The dredge pump the material through the pipeline where it is handled by an earthwork crew who manage the material. Periodic surveys will be taken to check progress of both the dredging area and the disposal site fill. In general, this method of dredging does not produce as much turbidity as a clamshell operation.

Hopper Dredging

A pre-dredge survey will be taken of the Project site to determine how much material needs to be removed across the entire dredge limit. This information will be available to the hopper dredge operators as a guide for how much material will be excavated in the Project area. Hopper dredges are self-propelled and can locate themselves to and within the site. The hopper dredge will use cutter heads that are located on the sides of the vessel and are lowered to the excavation depth. The hopper dredge will make passes over the areas to be dredged to remove material. The material will be transferred to a hopper located within the vessel itself. Once the hopper is full the dredge will move to the disposal location (HOODS) and open the hopper to dump the material. Periodic surveys will be taken to check dredging progress.

This method of dredging does not produce as much turbidity as a clamshell operation, and the area the hopper dredge works in is also too large to practically surround with a silt curtain. Thus, a silt curtain is not normally used with this type of operation. If turbidity does become an issue, it will be more practical to place a silt curtain around any sensitive area (e.g., eelgrass habitat) that is being affected rather than the entire dredging operation itself.

2.6.8.2 Dredging Equipment

The following describes derrick barges and types of dredges that are expected to be used for the Project.

Derrick Barge

Derrick barges are floating platforms that require tugboats to mobilize or demobilize. The barge is modified or designed to support crawler or pedestal mounted cranes. Derrick barges are secured into position through the use of spuds, which are usually pipe piles that can be raised and lowered into the sea floor, or through the use of anchors. Typically, a derrick barge will require a minimum of 5 to 12 feet of draft.

Derrick barges are typically configured to have longer booms for more head room (distance from working surface to the boom tip), and have additional winches compared to similar floating cranes like clamshell dredges. Derrick barges will be used for demolition, pile driving, heavy lifts, and wharf construction support.

Clamshell Dredge

A clamshell dredge is similar to a derrick barge. However, the crane will be configured to be better at cyclic work. Clamshell dredges have winches and lines set up to allow for the operation of a mechanical bucket and aren’t necessarily well set up to perform other types of operations like a derrick barge. Clamshell dredges may also be configured with a walking spud, which pivots and can be used for small movements without use of a tugboat.

Clamshell dredges will use a bucket to remove material from the sea floor, then transfer it to a scow. The scow will be taken by a tugboat to HOODS where the scow will open, and the material will fall out of the bottom of the scow.

Clamshell dredges are more precise than hydraulic dredges but have lower production rates. Clamshell dredges will likely be required for any side slopes, toes, or in areas where obstructions are expected to be encountered.

Hydraulic Dredge

There are two types of hydraulic dredges that could be used on the project: cutter-suction and hopper, as discussed in Section 2.6.7.1, *Dredging Activities*.

2.6.9 Shoreline Protection

A stone revetment will be constructed to provide protection from erosion. Revetment is the simplest, most cost-effective solution, is currently used at the site, is easy to maintain and adapt to SLR, and is the most common shoreline treatment for working ports. Replacing the existing scattered rock and debris shore protection with clean rock in a more compact footprint will also provide a benefit to the bay ecosystem.

The stone revetment will require a four-foot-thick section with a 2.5-foot layer of 14-inch D50 riprap underlain by a 1.5-foot layer of 5-inch cobble, with a 2H:1V slope. The stone revetment is the simplest structure to construct for slope protection. The sloped nature of the revetment requires placing rock below the High Tide Line (HTL) (**Figure 15**).

2.6.10 Marine Berths and Wharf Construction

Berth construction will include construction of the following structures.

- North and South Marginal wharves.
- Near shore berthing dolphins.
- Near shore mooring dolphins.
- Wet storage berthing dolphins.
- Wet storage mooring dolphins.

The structures will be comprised of concrete decks supported by pile supported dolphin structures with fendering. The wharves will be located above a slope in the dredged berth area. The slopes under the wharves will require rock revetment for slope stabilization and to prevent scouring. The near shore dolphins will be located on either end of the wharves and may or may not be located within a slope or dredge berth area. The wet storage dolphins will be located in the wet storage areas which do not require rock revetment.

2.6.11 Rock Revetment

Rock revetment will be placed along dredged slopes to stabilize them (**Figure 15a**) and under the wharves and along shorelines once dredging is complete (**Figure 15b**). Additionally, revetment will be placed to stabilize the dredge slope. Rock revetment will be brought to site via a material barge loaded at an offsite quarry and tended by a tugboat. The material barge will be moored to a floating crane which will be positioned such that revetment stone can be pushed off the side of the material barge using a loader at the desired location. More precise placement of rock to either fill low points, or when getting close to design thickness, will be placed by the floating crane using a rock tub. The rock tub is loaded by the loader on the material barge, the crane will hold the rock tub over the location it intends to dump the rock and will tilt the bucket to dump the rock. Periodic survey will be performed to confirm grades are met.

2.6.12 Pile Driving

Pile driving will occur once all rock revetment is in place to avoid any damage to the piles during rock placement. Additionally, access to the slope to place rock and to perform quality control surveys will be hindered if the piles were already in place.

The ten pile rows furthest from the water will be installed by a derrick barge to construct wharfs and the remaining landward piles will be installed by a land-based crane (**Figure 16**). Piles will be installed in a type-writer order in which about five rows will be driven out further than the succeeding five rows, and this will continue until all rows are completed for a given length of the wharf. It is anticipated that all piles will be open ended steel pipe piles. The piles will be installed using a vibratory hammer for initial positioning and driving and then with an impact hammer.

Pile Installation Phasing

- North wharf – Phase 1: Installation of approximately 1,260, 175-foot-long, 36-inch diameter steel pipe piles (600 in water, 660 on land). The berthing and mooring dolphins will require approximately 24, 200-foot-long, 36-inch steel pipe piles and concrete deck and fenders.
- North wharf – Phase 2: Installation of approximately 780, 175-foot-long, 36-inch diameter steel pipe piles (600 in water, 180 on land). The berthing and mooring dolphins will require approximately 24, 200-foot-long, 36-inch steel pipe piles and concrete deck and fenders.
- South wharf – Phase 3: Installation of approximately 1,712, 175-foot-long 36-inch diameter steel pipe piles (1,200 in water and 512 on land). The berthing and mooring dolphins will require approximately 48, 200-foot-long, 36-inch steel pipe piles and concrete deck and fenders.
- Wet storage pier: Installation of approximately 24, 200-foot-long, 36-inch diameter steel pipe piles. The berthing and mooring dolphins will require two, 200-foot-long, 72-inch diameter piles and concrete deck and fenders.
- Wet storage site 1 including sinking basin: Installation of approximately 192, 200-foot-long, 36-inch diameter berthing dolphin piles and approximately 16, 200-foot-long, 72-inch diameter mooring dolphin piles.
- Wet storage site 2: Installation of approximately 168, 200-foot-long, 36-inch berthing dolphin piles and approximately 14, 200-foot-long, 72-inch diameter mooring dolphin piles.
- In total, there will be approximately 2,912 piles installed in the water and 1,352 installed on land.

2.6.13 Wharf Deck Construction

Once piles are driven for the full width of the wharf for a given length of wharf falsework will be installed on the piles by a water-based crew using work boats and work floats to gain access to the piles. The falsework is a supporting structure that attaches to the piles which is designed to hold the weight of forms, rebar, concrete, and other construction live loads. It is typically made up of friction collars, which are beams that are squeezed onto the piles with enough force to support a vertical load. Steel beams are then placed from collar to collar. Alternatively, a hanging support could be attached to the pile on which a steel beam will rest.

A crane will assist by holding the falsework in position while the crew erects the falsework. The crane can be either land or water-based but will likely be land based. Formwork is then placed on top of the falsework by the same assist crane to create the form of the concrete pour. Formwork is typically made of wood beams that span between the falsework steel beams and is topped with specialty plywood that has a smooth surface and is less likely to bond to concrete so it can be used multiple times. The Contractor may also choose to use reusable forms, which are modular and made of steel.

Once the formwork is installed, rebar will be installed, as well as any embedded items such as utility conduits (water, electrical) and vaults, bolts, and anchors. Once all embedded items are installed, concrete for the main deck will be poured. Concrete pour lengths are limited by the amount of concrete that can be poured, finished, and curing methods implemented in a work shift. The main wharf is 150 feet wide and 3 feet deep, so the length of pours will likely span four to six bents for an approximate pour length of 50 to 80 feet per pour. The concrete will be placed using a concrete pump truck that can reach all areas of the concrete pour. The pump truck will be positioned on the landside of the wharf and supplied by a continuous supply of concrete from concrete trucks.

Once the concrete reaches sufficient strength and curing is complete, the falsework and formwork will be removed by a water-based crew in work boats and work floats with the assistance of a crane. Once the falsework and formwork are dropped, they will be rehandled into the backlands to be reused or demobilized once all pours are complete.

The main deck will be poured separate from deeper sections of the wharf (such as where the fenders will attach or breast), where the concrete is above the elevation of the main deck pour (such as any curbs), or any embeds which have critical elevation requirements such as vaults. These areas will be poured separately for ease of construction and will happen after the main deck pour has cured and falsework and formwork has been removed. Concrete trucks will be able to drive directly onto the new wharf deck for access to pour the concrete.

Once the secondary pours are completed the bollards and fenders will be installed with either a small mobile crane or forklift that can drive directly on the new wharf deck.

2.6.14 Site Drainage and Utilities

Utilities in the backlands will be installed after the pre-loading operation is completed in a given area and the surcharge has been removed. Installation will include trenching to place buried conduits, pipes, and structures (such as utility vaults), installation of utility pipes, conduit, and vaults, backfilling, and compacting, or slurry will be poured to fill the remaining void. Once the water, sewer, and storm drain utilities are installed, they will be tested for pressure and water quality prior to commissioning.

2.6.15 Habitat Area Construction

Habitat Restoration Subarea construction will create and enhance onsite wetland and ESHA habitats. Areas will be lowered in elevation to introduce tidal influence and develop salt marsh habitat. Freshwater wetlands will be created at the margins of salt marsh to mimic natural salt marsh to freshwater marsh ecotones in Humboldt Bay (**Figure 10**).

Freshwater wetland will be developed by excavating geomorphic low points to intercept groundwater; placing clay soils in the bottom of geomorphic low points to intercept groundwater; and/or placing clay soils in the bottom of geomorphic low points to capture and retain rainwater.

Other construction activities will include the following.

- Salt marsh, freshwater wetlands, and ESHA will be planted with suitable native plant species.
- Construction of structures that will support osprey nests.

2.6.16 Building Construction

Building construction will follow site preparation and grading. Building construction will include the construction of administrative and storage buildings such as those shown in **Figure 5**; the type, placement, and number of buildings is subject to change.

2.6.17 Site Finalization

At the conclusion of building construction, the areas surrounding the buildings will be finished to grade with DGA and geogrid. The final stage will include construction of permanent site fencing, barriers, access gates, and security check points.

2.6.18 Demobilization

This activity consists of demobilizing the Contractor's workforce and equipment from the worksite and staging areas. This includes all activities for transportation of Contractor's personnel, equipment, and operating supplies off of the site, including temporary offices and other general facilities the Contractor may have installed. The Contractor is responsible for cleaning up and restoring all work areas prior to demobilizing. The staging areas will be restored to their original condition unless required otherwise. All waste, contaminants, temporary works and facilities will be removed.

Land-based equipment will be demobilized by trucks. Some larger equipment, such as crawler cranes, will require multiple truck loads and multiple days to disassemble. Some of these large loads will require special permits and coordination with local authorities if the load is too wide, too long, or too heavy per regulations.

2.6.19 Construction Staffing

The construction workforce will fluctuate throughout the project but will be made up of, on average, 90 personnel and up to 165 personnel during the peak for Phases 1 and 2. Phase 3 will have, on average, 45 personnel and up to 115 personnel when the buildings and utilities are being installed.

This number will include the Contractor team, Construction Management Team (CMT), highly skilled trades, journeymen, and laborers.

The labor demand will initially be focused on water-based demolition, backlands demolition, and dredging. The labor will increase to include earthwork and wick drain operations. This will remain constant for the first 18 to 24 months, at which point additional labor will be required to construct the wharf, utilities, and buildings.

The construction workforce will primarily be resourced from the local labor market, except for specialized individuals furnished directly by the Contractor(s). It is anticipated that these specialized individuals will find local housing for the duration of their part of construction. Therefore, there will be no requirement for a labor camp to be set up for the construction.

2.7 Operational Project Access

2.7.1 Vehicle Access

There will be four access points into the Project site during operation: two primary access points and two secondary access points (**Figure 12**). The two primary access points for vehicular traffic will be the North and West Access Roads. The North Access Road will accommodate a combination of worker vehicles and standard highway trucks for deliveries. Large overlength lowboy-type trucks are not anticipated to utilize the North Access Road. The West Access Road will accommodate a combination of worker vehicles, standard highway trucks, and heavy haul overlength lowboy type trucks for delivery of equipment. The two secondary access points will be for limited special and emergency type access. The secondary access points are located across from LP Drive on the west property boundary and along the southeast side of the Project site (shown as driveways on **Figure 12**).

2.7.1.1 North Access Road

The North Access Road will follow a similar alignment to that of the existing access road, although the new access road will be higher in elevation than the existing access road. The new road will tie in to Vance Avenue at an approximate elevation of 16.5 feet, and it will maintain a minimum road surface elevation of 16.1 feet until it ends at the Project site. The North Access Road will be a private road, so it will be constructed with two 12-foot gravel lanes and 4-foot gravel shoulders.

2.7.1.2 West Access Road

The West Access Road will follow an existing (paved) segment of Vance Avenue between LP Drive and the recently constructed Phyllis Rex Townhomes in Samoa, until Vance Avenue turns to the north as it approaches the townhomes. After Vance Avenue turns to the north, the West Access Road will continue running parallel to the Great Redwood Trail Agency (GRTA) corridor until it reaches the Project site. This segment of land between Vance Avenue and the Project site does not contain an existing access road, is vegetated, and the existing ground surface is sloped.

The West Access Road will be designed to meet County standards between LP Drive and the driveway to the Recology™ Samoa Resource Recovery Center site. East of the Recology driveway, the West Access Road will be designed as a private road.

2.7.1.3 Offsite Roadway Improvements

A minimum 40-foot width is planned for all public roadway access points to the Project in order to accommodate standard semi-trucks. The 40-foot road widths will consist of two 12-foot paved travel lanes, and two 8-foot paved shoulders. Depending on the configuration of the road, 2-foot gravel shoulders may also be needed along the sides of the roads. The current width of Cookhouse Road is approximately 30 feet. The current width of Vance Avenue near the project site is approximately 22 feet. The current width of LP Drive is approximately 28 feet. The intersection of Vance Avenue and Cookhouse Road will be expanded to accommodate the turning radius of semitrucks (**Figure 17**). In addition, all-way stop controls are warranted as the adjacent Town of Samoa develops. This modification would require an additional stop sign on Cookhouse Road eastbound, and on Vance Avenue northbound..

2.7.2 Bicycle Access

A new Class I Bike Path trail within the GRTA right-of-way will be constructed and will extend the approximate length of the proposed marine terminal (approximately 1 mile in length) adjacent to the West Access Road (**Figure 18**).

2.8 Operational Site Drainage and Utilities

2.8.1 Existing Utilities

The utilities on the Project site consist of electrical, natural gas, fire protection water, future bay water, storm drain, and sanitary sewer. These utilities will be re-routed outside of the project area or demolished and removed from the site.

2.8.2 Proposed Utilities

The utilities that are proposed to serve the Project site are domestic potable water, untreated industrial water, fire protection water, storm drain, sanitary sewer, electrical, roof mounted solar, and telecommunications. All the new utilities, existing site utilities that must be re-routed, and the planned utilities for adjacent projects are included in the offsite utility corridor and shown in **Figure 19**.

Buildings onsite will require domestic water, industrial/fire water, sanitary sewer, telecommunication, and power. The wharves will require domestic water, industrial/fire water, and power. The onsite utility corridor has reserved space for a joint trench that is anticipated to include telecommunications and electrical. The onsite utilities are proposed to be routed along the perimeter of the Project site to minimize impact on the utilities from the industry vehicle and equipment traffic. It is expected that there will be two sanitary sewer lift stations that will be connected to the buildings on site and routed to the Samoa Waste Water Treatment Facility (WWTF). The site's fire water system and source are not defined because the fire water demand is unknown. A water storage tank and emergency fire pump may be needed to obtain the required fire flow for the Project, so space is reserved for these features as shown in **Figure 20**.

2.8.2.1 Industrial Water Supply

The industrial water system of the HBMWD was designed and constructed to provide approximately 60 million gallons per day of raw water to the peninsula to serve the former pump mills. This system does not have any treatment, so turbidity in the water source (the Mad River) is reflected in the industrial water. It may be necessary to modify the existing system to reduce the turbidity of the water supply. The system was sized for a larger capacity than what will likely be required to support the Project and the surrounding developments on the peninsula. Once the Project's industrial, domestic, and fire water demands are confirmed, coordination with the HBMWD will be necessary to determine if modifications to the system will be needed.

2.8.2.2 Domestic Water Supply

HBMWD will supply domestic water from the Mad River for the Project. The domestic water point of connection is at LP Drive on the western boundary of the Project site and connects to the existing 15 inch HBMWD domestic water main. Domestic water is anticipated to provide water for restrooms, sinks, kitchens, drinking fountains, and other similar uses at all site buildings and each wharf.

2.8.2.3 Wastewater Treatment

Wastewater treatment will be provided by the Samoa WWTF. The facility treats wastewater using primary settling tanks, pre-anoxic tanks, recirculating biological filtration units, and ultraviolet (UV) light disinfection. The disinfected and treated effluent will be pumped from WWTF to an intertie with the ocean outfall pipe at Redwood Marine Terminal II. The force main that conveys the treated effluent from WWTF to the ocean outfall is approximately 0.75 mile long, 4-inches in diameter, and follows the proposed alignment for Vance Avenue included in the Samoa Improvement Plans from the Samoa Pacific Group (**Figure 19**).

2.8.2.4 Storm Drainage

All existing storm drain systems identified within the Project site will be removed or abandoned in place with slurry fill based on geotechnical recommendations. The new site drainage proposes to take advantage of the proposed east-west crowned grading to allow surface flow collection around the perimeter of the site (**Figure 14b**). Bio-filtration planters with 10-year and 100-year overflow risers will be installed not only for stormwater collection, but also for Low Impact Development (LID) treatment. Backlands adjacent to the wharfs will collect stormwater in trench drains along the wharf, which will connect to trash capture devices, LID mechanical treatment, and then outfall to the Bay (**Figure 14b**). Reconstructed storm drain systems from Samoa will pass through the site to maintain existing drainage patterns.

Bio-Filtration Planters

Bio-filtration planters are proposed to collect and pre-treat site runoff (**Figure 14b**) prior to sending the flow to StormPods (infiltration vaults) (**Figures 21, 22**), which will allow the runoff to infiltrate into the ground, and any excess to discharge to the bay.

Bio-filtration planters consist of four distinct components.

- Surface Ponding Zone —Provides temporary surface storage of precipitation and runoff which promotes infiltration into the lower components.
- Soil Media Layer (typically consisting of a sand/compost mix)—Allows for storage of runoff in the void spaces of the media, supports plant growth, and provides treatment via filtration, volatilization, biological uptake, media adsorption, and vegetative transpiration.
- Gravel Storage Layer—Allows for storage of runoff in the void spaces between the rock and promotes infiltration into the native soils below. The gravel layer may or may not include an underdrain, which allows discharge in the occasional case that the storage and volumetric losses (infiltration and evapotranspiration) are insufficient to retain all precipitation and runoff.
- Underlying Native Soil—Infiltration into the native soil is dependent on the characteristics of the native soil. Infiltration into the native soils is promoted by ensuring that the native soil beneath the bioretention basin is uncompacted. Liners or other barriers are not typically allowed in order to promote infiltration into the native soils.

As the Project will consist of complete redevelopment of the site and because the site will consist primarily of impervious surfaces, preliminary sizing of the bioretention vaults is 4% of the entire drainage management area.

BioPod and DVS Trash Capture

BioPods (bio-filtration vaults) and dual vortex separator devices will be installed to remove trash and treat stormwater before discharging to the bay (**Figure 14b**). Trench drains will collect stormwater and discharge to trash capture devices and then a BioPod.

Offsite Drainage

Due to the proposed grading of the backland, offsite runoff is anticipated to collect and pool along low points of the Project site boundary where it previously flowed across the site, either ponding or discharging to the bay. To relieve drainage collection at certain points along the raised Project boundary, the Project will install 10-year and 100-year overflow pipes throughout the site (**Figure 14**).

2.8.3 Electrical Infrastructure

2.8.3.1 Existing Utility Infrastructure

The Project site is currently fed from Pacific Gas and Electric's (PG&E) 1103 circuit, a 12kV distribution line on wood poles, which currently transverses the Project site from the Fairhaven substation 12kV switchyard enroute to feeding Samoa. At this time, the load hosting capacity of the Fairhaven 1103 circuit is 7.27MW, which may be adequate to feed Phase 1 of the Project; however, with the planned buildout of this Project, as well as buildout of Samoa and with the development of the Nordic Aquafarms project, an alternate design is being proposed. A PG&E Service Application will be necessary to confirm load serving and photovoltaic (PV) generation capacity.

2.8.3.2 Proposed Electrical Infrastructure

The project will include overhead and underground utility relocations, construction of transmission lines, and installation of electrical substations and microgrids. The maximum combined Phase 1 and 2 load is estimated at 28.265 megavolt amperes (MVA). The proposed electrical infrastructure will serve the site with redundant 60 kilovolt (kV) lines from the Fairhaven substation.

While the Phase 1 load is estimated to be between 6.821 and 8.185MVA, the combined electrical load for Phase 1 and 2 of the project development is estimated to be between 22.267 and 28.265MVA. Individual phase loads could be independently fed by a single 12kV line, but this will require an upgrade of the Fairhaven Substation transformer bank and 12kV yard and will not provide redundancy in the power supply to the site. Therefore, for planning purposes, redundant 60kV lines from the Fairhaven Substation will ultimately feed the site, each independently capable of supplying power to the full site once built out. However, the proposed infrastructure could easily support a 12kV service for Phase 1 and an upgrade to 70kV for Phase 2 if needed.

An overhead double-circuit 60kV transmission line on about 60-foot-tall steel poles will be constructed from an upgraded 60kV switchyard at the Fairhaven substation to the Project site. A 15-foot expansion of the existing Fairhaven-Evergreen Pulp-Fairhaven Power Plant 60kV PG&E easement will be required to accommodate this new transmission pole line. Once at the project southern boundary, the lines will transition underground and be routed to their prospective substation. Optionally, one of these lines could be fed from the Fairhaven Energy Storage Project, once built, for back-up islanded project operations when the utility is unavailable.

Two new approximately 100-foot x 60-foot substations will be constructed at the terminus of the new transmission lines for transformation from 60kV to 34.5kV for distribution throughout the Project site. One substation will be constructed during Phase 1 (Substation North) and the other substation during Phase 2 (Substation South) (**Figure 23**).

Power distribution throughout the site will be through a 34.5kV underground ring with 38kV outdoor switchgear located at each substation. This switchgear will be equipped with a main circuit breaker and two feeder circuit breakers, one to feed the loads associated with each phase and a normally open tie breaker to feed the other substation in the case that one of the two redundant 60kV electrical services is down. Each building will be fed at 34.5kV via outdoor 38kV switchgear. Power will be stepped down to 480V for interconnection of a roof-mount photovoltaic system, a grid-interactive battery energy storage system, a back-up generator, and building 480V loads. All pad-mount transformers associated with the Project will utilize natural ester insulating fluid for reduced flammability and biodegradability.

For Phase 2 of the project, PG&E circuit 1103, which currently traverses the Phase 2 Project site, will be rerouted around the Project site overhead or underground to Samoa. A new or expanded utility easement will be required around the south and west boundaries of the site to accommodate rerouting of this circuit.

The Pulp Mill 60kV substation and 12kV switchyard is expected to be upgraded and sized to provide an additional 5MW of capacity dedicated to the Project site. Given the additional 5MW of capacity, it is proposed that the Phase 1 2.5-MW landfill PV system connect to the Pulp Mill substation via a new overhead or underground interconnection 12kV distribution line. Interconnection at this location will require a new 12 kV switchyard that is anticipated to comprise a 15 kV switchgear line-up, including PG&E metering, a main circuit breaker, and a feeder circuit breaker collecting power from step-up transformers located throughout the array.

Phase I Building Substation and Microgrid

A Phase 1 microgrid electrical substation is proposed to be sited adjacent to the Storage and Assembly Building and provide power to the facility, as well as serve critical loads in the north end of the terminal (**Figure 5**). A 480V microgrid is proposed for the Storage and Assembly Building in Phase 1 of the Project.

Photovoltaic System

The proposed PV system is based on a 50,000-square-foot Storage and Assembly Building. The PV system will include a roof-mounted PV array with an approximate system size of 300-kilowatt direct current (kWDC). The system will utilize rows of 420W high efficiency, monocrystalline modules flush-mounted in rows in landscape orientation at a tilt of 14 degrees. The modules will have a flush-mount attachment to a standing seam metal roof. The design includes IBC access pathways and smoke ventilation setbacks.

Power generated by the arrays will utilize AC conversion through three 100kW, 480V inverters adjacent to the building for 480V three phase interconnection into a building’s 480V switchgear. These inverters are UL 1741-SA listed and can be frequency controlled by the battery energy storage system to ramp PV output to balance generation with the load. The direct current (DC)/alternating current (AC) ratio is 1.01 for minimization of equipment variation on the overall site; however, inverter capacity could be downsized to a DC/AC ratio of up to 1.25 with minimal clipping with further inverter optimization. The inverters are anticipated to be connected to the building's 480V switchboard through a solar subpanel and a visible, lockable disconnect to be located next to the inverters for ease of shutdown in the case of a fire.

Battery Energy Storage System

The Project includes a 1.9-MW battery energy storage system with a 3-hour duration of energy storage. The duration is based on a battery load estimate of 1.3MVA for the Phase 1 critical loads. Load shedding of noncritical loads during grid outages can be implemented to extend the hours of resiliency.

38 kV Switchgear

The substation includes a new 34.5 kV, raintight main switchgear lineup containing a controllable main breaker to be supervised by a Schweitzer Engineering Laboratories 700GT+ Intertie and Generation Relay Islanding Controller, which interfaces with the integrated site controller to provide seamless transitions to an islanded battery-powered state and retransfers back to the local utility grid. The main switchgear contains all the metering, control, and Uninterruptible Power Supplies (UPS) equipment required for operation and for PV, Battery Energy Storage System (BESS), and load control and monitoring to ensure safe stable grid-connected and microgrid operation. The switchgear feeds a loop-feed, pad-mount 34.5kV step-down transformer and secondary 480V switchgear for interconnection of the battery, generator, and to feed the building and wharf loads.

Emergency Generator

There will be a 2-MW generator for emergency back-up operations to serve the Phase 1 critical load of 1.3MVA. The expected runtime of the emergency generator is based on the reliability of the grid serving the Project site. For short term grid outages, the microgrid battery system will provide backup power. With the ability of the Humboldt Bay Generating Station to island during state-wide Public Safety Power Shutoff (PSPS) events, the number of long-term transmission-level outages due to out-of-county safety issues are expected to be infrequent. Generator runtime could range from 12 hours to 500 hours per year. Generator operation of 1 hour per month is required for maintenance purposes to ensure proper lubrication of the generator and verify system functionality and load transfer capability. Generator operation may be required during future electrical infrastructure work as the Project phases are implemented. These planned utility grid outages could require up to 500 hours of operation during these construction activities.

Phase 2 Building Substation and Microgrid

The preliminary design for a Phase 2 substation and microgrid is similar to that of Phase 1 with the primary differences being the increased number of buildings available for solar generation and the higher estimated load and projected battery (critical) load in Phase 2 (**Figure 5**).

Photovoltaic System

The combined available rooftop space of 560,000 square feet for Phase 2 buildings was used to model system performance and estimate the annual production of solar energy. The general equipment specifications and design are similar to the Phase 1 design.

Battery Energy Storage System

The project includes a 1.9-MW/2-hour battery energy storage system with a 1.5-hour duration of energy storage. The duration is based on a battery load estimate of 2.3MVA for the Phase 2 critical loads. Load shedding of noncritical loads during grid outages can be implemented to extend the hours of resiliency.

38 kV Switchgear

In general, the 38 kV switchgear will be similar to Phase 1 equipment but will be sized and specified for individual or groups of buildings and their associated solar generation capacities.

Emergency Generator

There will be a 2-MW generator for emergency back-up operations to serve the Phase 2 critical load of 2.3MVA for the Phase 2 critical loads. The expected runtime of the emergency generator is based on the reliability of the grid serving the Project site. For short term grid outages, the microgrid battery system will provide backup power. With the ability of the Humboldt Bay Generating Station to island during state-wide PSPS events, the number of long-term transmission-level outages due to these out of county safety issues are expected to be infrequent. Generator runtime could range from 12 hours to 500 hours per year. Generator operation of 1 hour per month is required for maintenance purposes to ensure proper lubrication of the generator and verify system functionality and load transfer capability. Generator operation may be required during future electrical infrastructure work as the project phases are implemented. These planned utility grid outages could require up to 500 hours of operation during these construction activities.

Offsite Landfill Solar Panel Installation

For additional solar generation, the nearby Harbor District-owned solid waste landfill has been identified as a site for local offsite generation from a large, ground-mounted solar PV system (**Figure 9**). Solar energy generated from the system will be used to offset energy use at the terminal.

The total landfill area is 36 acres with four capped waste management units (WMUs) comprising 15 acres. The WMUs are 20 to 25-foot-high, capped mounds containing approximately 98% wood ash from a former pulp mill. The landfill cap consists of a two-foot-thick ash foundation layer, overlain by a 1-foot minimum thickness barrier layer, overlain by a 2-foot minimum thickness vegetation layer and 6 inches of mulch. The final cap surface is sloped no steeper than 3:1 nor flatter than 3%.

A 2.5MWDC, ballasted PV system will be installed on the east-west facing planes of the waste management units utilizing generic PV modules and string inverters. The PV system will connect to the upgraded Harbor District substation via an underground 12kV line during Phase 1 of the Project. Interconnection at this location will require a new 12kV switchgear line-up comprised of PG&E metering, a main and a feeder circuit breaker collecting power from step-up pad-mount transformers distributed throughout the array, control power, and a back-up battery system to ensure safe and reliable interconnection.

Phase 2 Terminal-Wide Microgrid Option

For Phase 2 of Project buildout, the Fairhaven Energy Storage Project and the landfill PV system could be integrated into a terminal-wide microgrid that could provide a significant amount of solar energy and site resiliency. This size of a microgrid has the potential to serve a large portion, if not all, of the Project site’s loads during grid outages.

2.9 Humboldt Bay Area Plan Amendments

The proposed project will require amendments to the Humboldt Bay Area Plan (HBAP). The following amendment to the HBAP are proposed.

- Recognizing the Project as a Priority 1 Site for the proposed coastal-dependent industrial use. Resolve conflicting language in relationship to other coastal act policies addressed in the HBAP and with other current uses including policies regarding natural resources, viewsheds, and recreation.
- An area designated NR-W by Humboldt County is within the Harbor District’s primary regulatory jurisdiction and is contrary to the purposes of the tidelands granted in 1970 to the Harbor District by the California State Lands Commission. This inconsistency will need to be resolved (**Figure 4**).
- Differentiate between buildings and nonbuilding structures (e.g., cranes, high mast lighting and assembly of wind turbines) and increase maximum building and structure height allowances to accommodate the Project.
- Modify limitations of industrial performance standards, including, noise, lighting, vibrations, dust control, and enclosed manufacturing to meet the needs of this Project and surrounding land uses.

2.10 Required Permits and Major Approvals

The project will be subject to numerous federal, state, and local regulations that protect various aspects of environmental quality. More detailed information on regulatory requirements is provided in Chapter 3, *Environmental Setting and Effects of the Alternatives.* Table 5 presents a summary of related environmental laws, approvals, permits, and/or consultations potentially required for project implementation.

Table 5. Permit Requirements Potentially Applicable to the Project

Agency with Jurisdiction	Regulation(s)	Required Authorization
North Coast Regional Water Quality Control Board (RWQCB)	Federal Clean Water Act, Sections 401	401 Water Quality Certification
U.S. Army Corps of Engineers (USACE)	Federal Clean Water Act, Section 404, 33 U.S.C 408, and RHA Section 10 Individual Permit	Permits for dredge and fill activities in waters of the United States; Federal action requires NEPA compliance.
State Historic Preservation Office (SHPO)	National Historic Preservation Act (NHPA), Section 106	Section 106 Consultation. Submission of Historic Properties/Cultural Resources Report, effects determination, and evidence of tribal coordination by federal lead to SHPO.
U.S. Fish and Wildlife Service (USFWS)	Federal Endangered Species Act (ESA) Section 7 Formal Consultation	Potential need for take authorization under ESA Section 7 will be determined through USACE consultation with USFWS.
National Marine Fisheries Service (NMFS)	ESA Section 7 Formal Consultation	Potential need for take authorization under ESA Section 7 will be determined through USACE consultation with NMFS.
NMFS	Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat (EFH) Consultation	Potential need for EFH consultation will be determined through consultation with NMFS
NMFS	Incidental Harassment Authorization (IHA)	Potential need for IHA will be determined through consultation with NMFS
California Department of Fish and Wildlife (CDFW)	California Endangered Species Act (CESA) Incidental Take Permit with CDFW as CEQA responsible agency Section 2081 ITP California Endangered Species Act (CESA) Incidental Take Permit with CDFW as CEQA lead agency Section 2081 ITP	Potential need for incidental take authorization under Section 2081 of the California Fish and Game Code will be determined through consultation with CDFW; Federal ESA Biological Opinion (BO) and request for consistency determination.

Agency with Jurisdiction	Regulation(s)	Required Authorization
	Consistency Determination California Fish and Game Code Section 2080.1	
California Coastal Commission (CCC) and County of Humboldt	Consolidated Coastal Development Permit Coastal Zone Management Act Consistency Determination (CZMA Consistency)	Consolidated Coastal Development Permit from CCC and County Coastal Zone Management Act Consistency Determination
Harbor District	Development Permit	Development Permit
City of Eureka		Conditional Use Permit
City of Arcata		Conditional Use Permit

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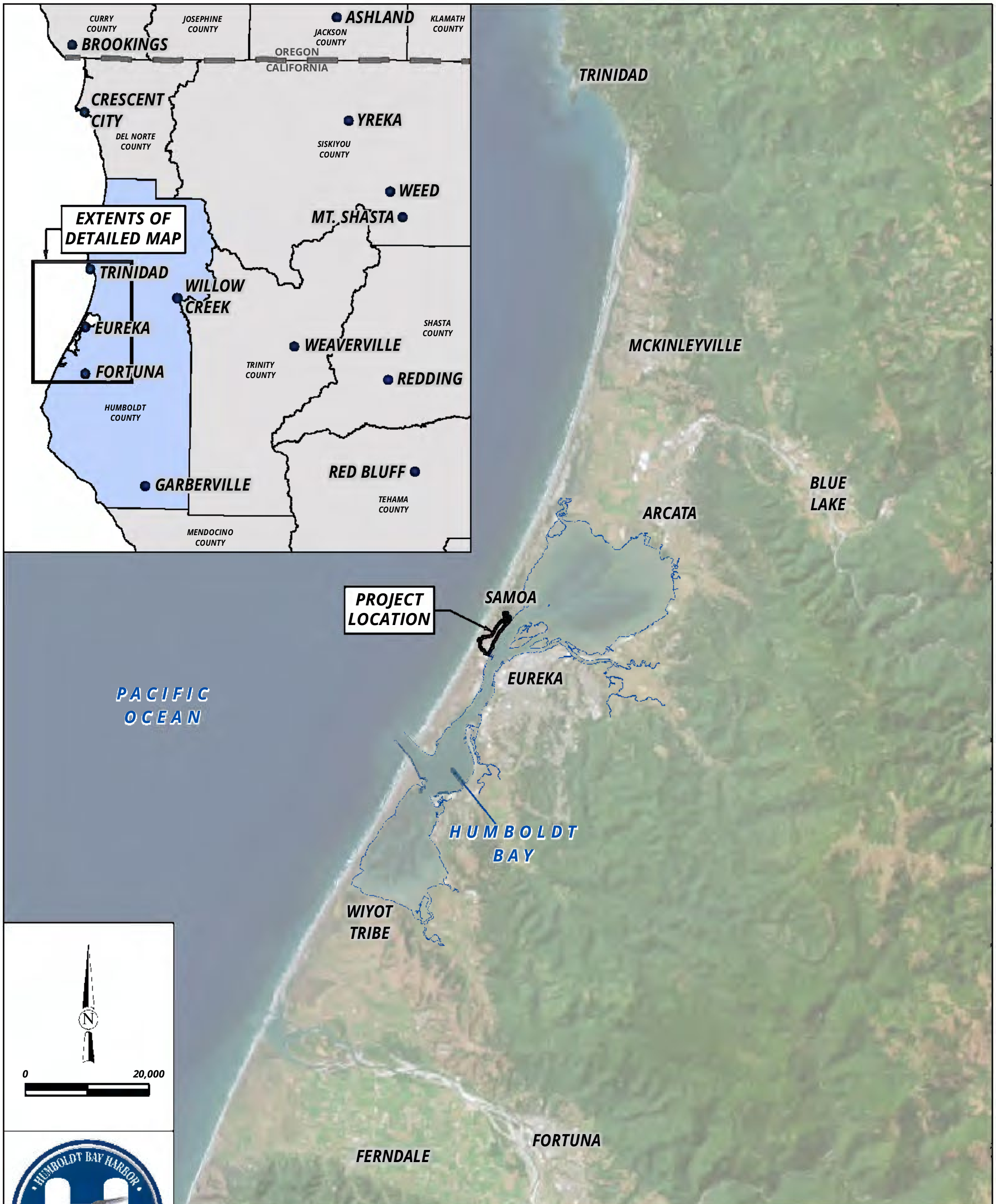


moffatt & nichol

Humboldt Offshore Wind Heavy Lift Marine Terminal Project

March 2023

Figure 1
Vicinity Map

Graphics ... Humboldt Bay Harbor RMMT 104500 (4/25/2024)

\\eureka\projects\2022\022054-Humboldt-RMMT\GIS\ENVCON_FIg1_EnvironmentalConditions.mxd USER: pix4d DATE: 10/9/23, 2:19PM

Graphics . . . Humboldt Bay Harbor RMMT 104500 (4/25/2024)

Humboldt Bay Offshore Wind Heavy Lift Marine Terminal

October 2023 - 022054.400

Figure 2
Environmental Conditions

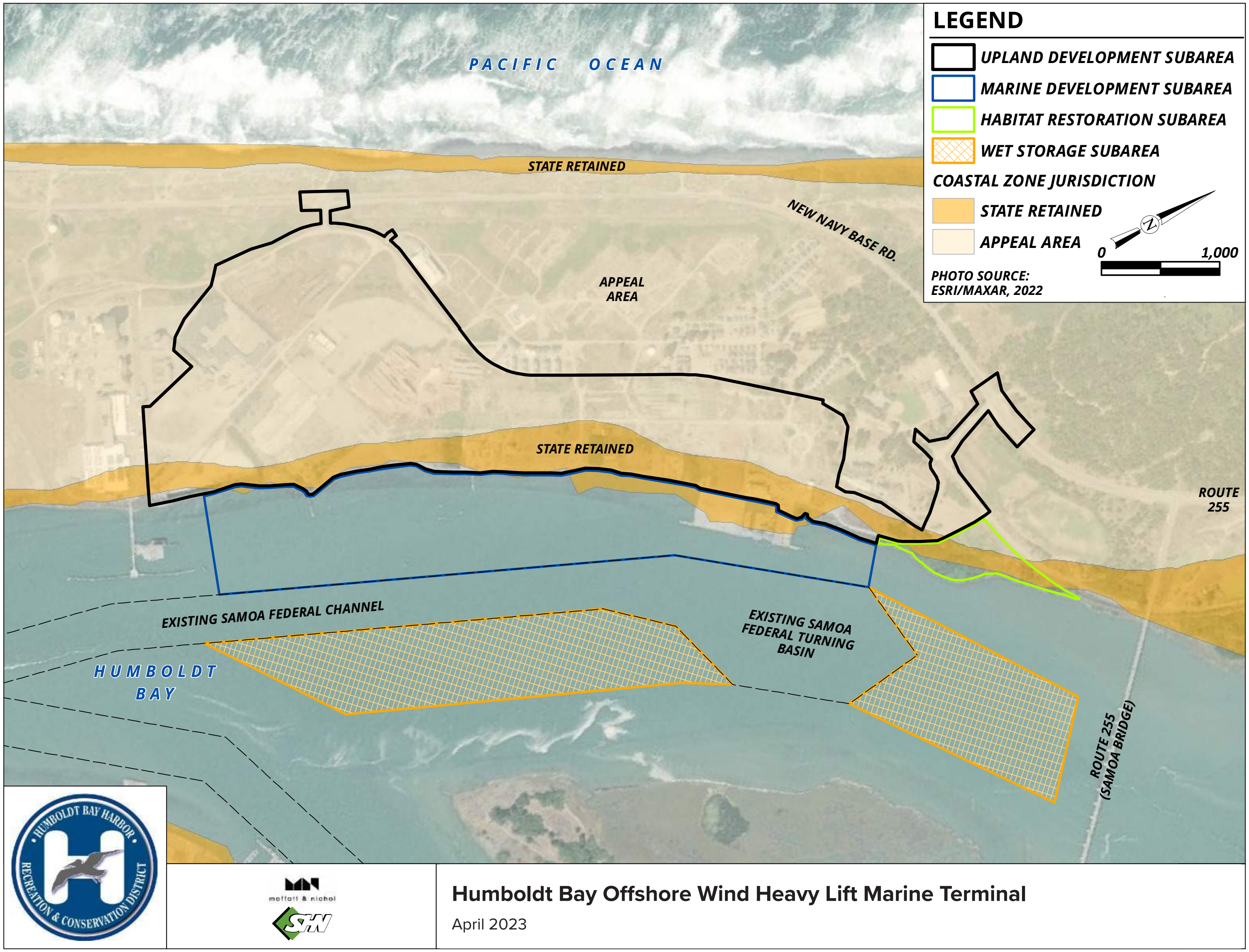
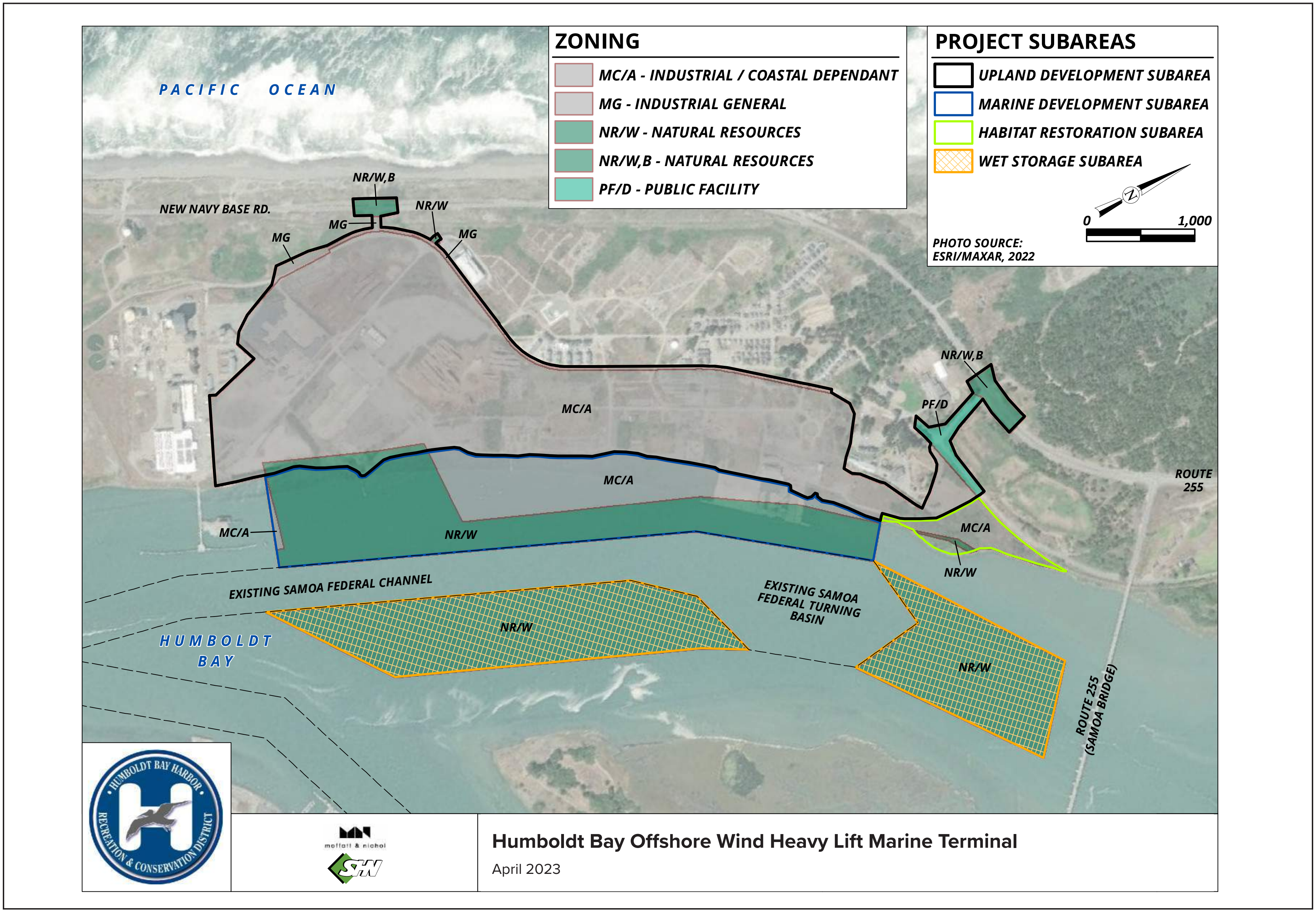
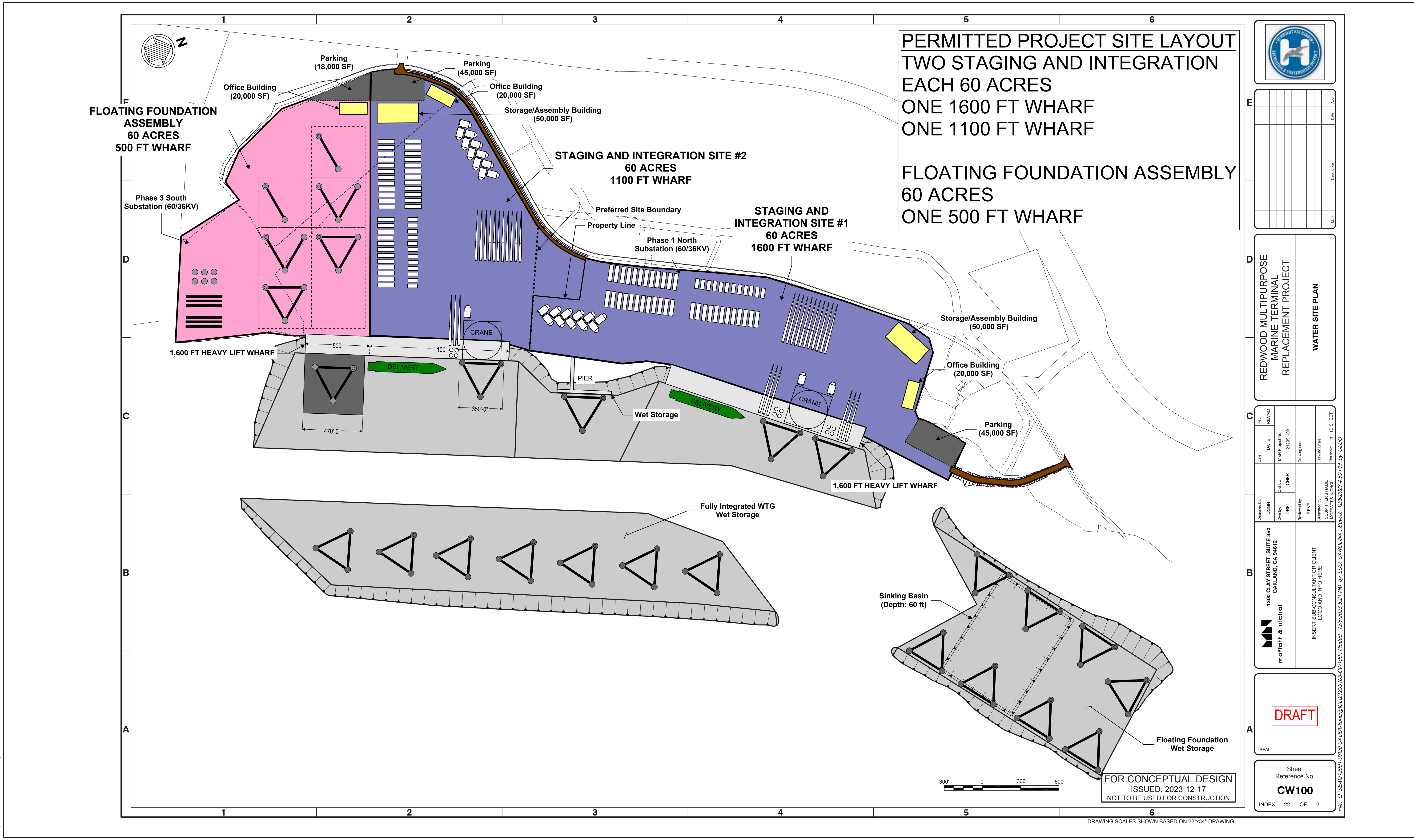


Figure 3
Project Subareas and Coastal Zone Jurisdictions



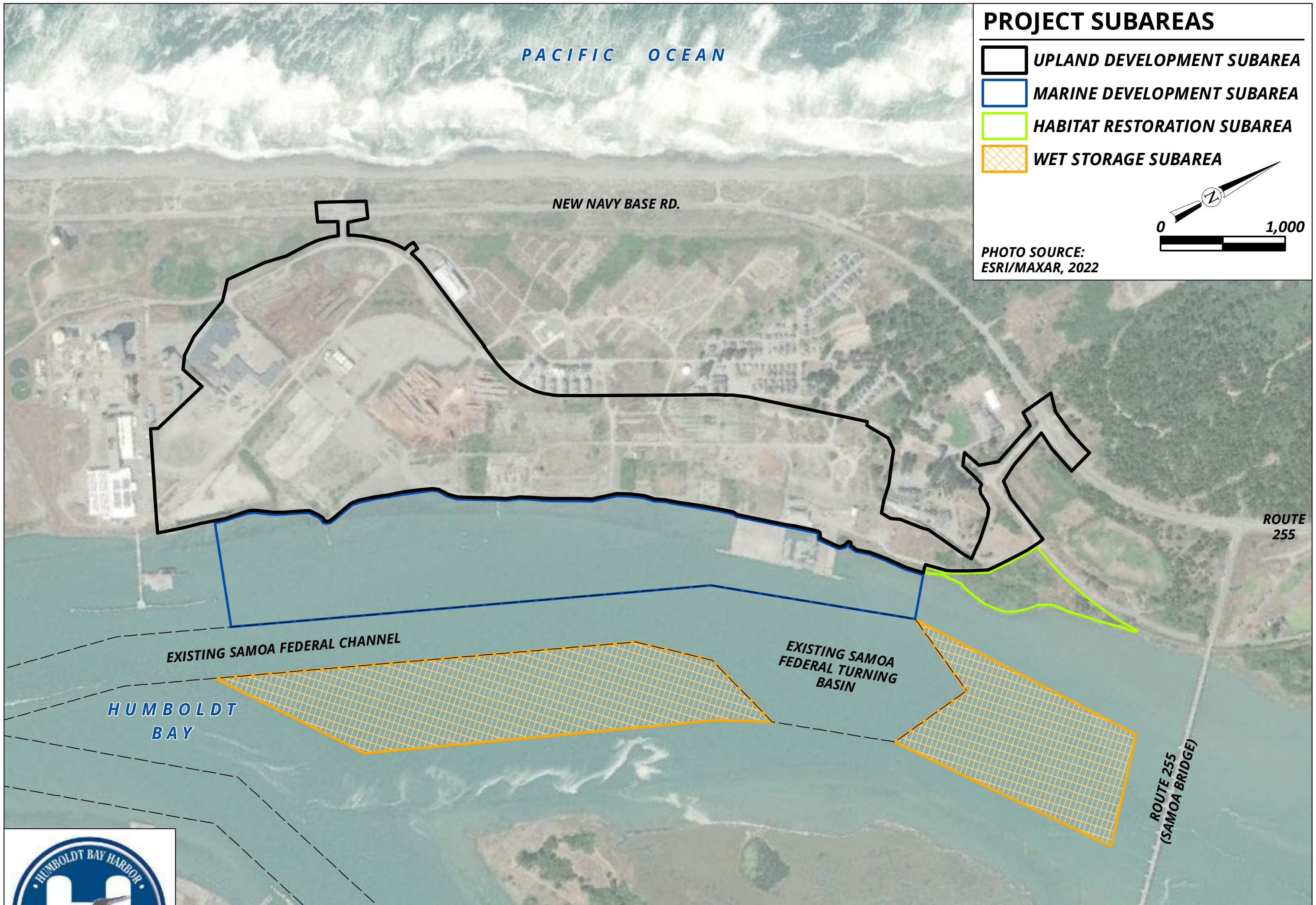
Graphics ... Humboldt Bay Harbor RMMT 104500 (4/25/2024)

Figure 4
Project Subareas and Zoning



Graphics ... Humboldt Bay Harbor RMMT 104500 (4/25/2024)

Figure 5
Site Plan



Humboldt Offshore Wind Heavy Lift Marine Terminal Project

April 2023

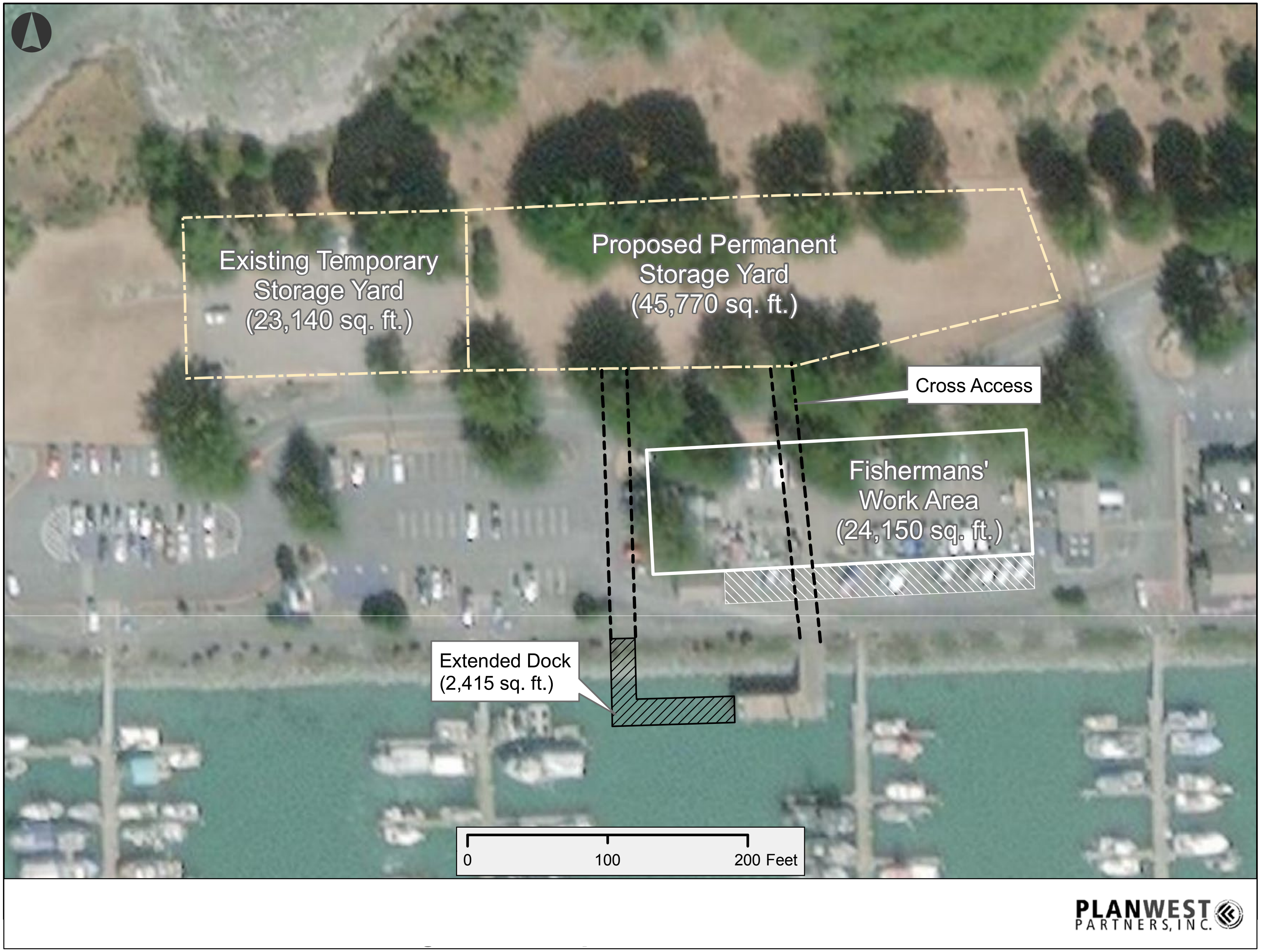
Graphics … Humboldt Bay Harbor RMMT 104500 (4/25/2024)

Figure 6
Project Subareas

Humboldt Offshore Wind Heavy Lift Marine Terminal Project

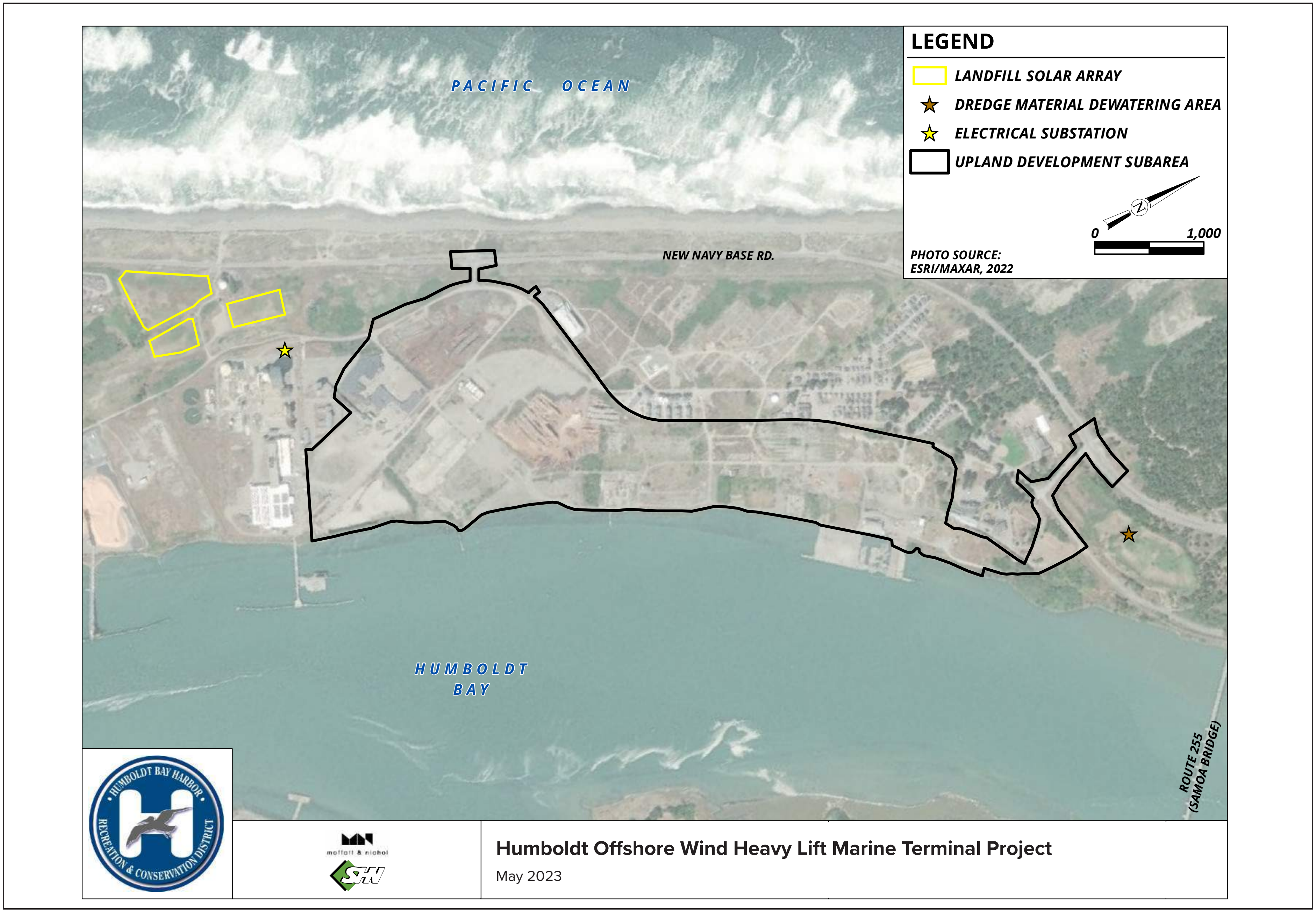
June 2023

Figure 7
Existing Tenant Locations and Proposed Tenant Relocation Sites



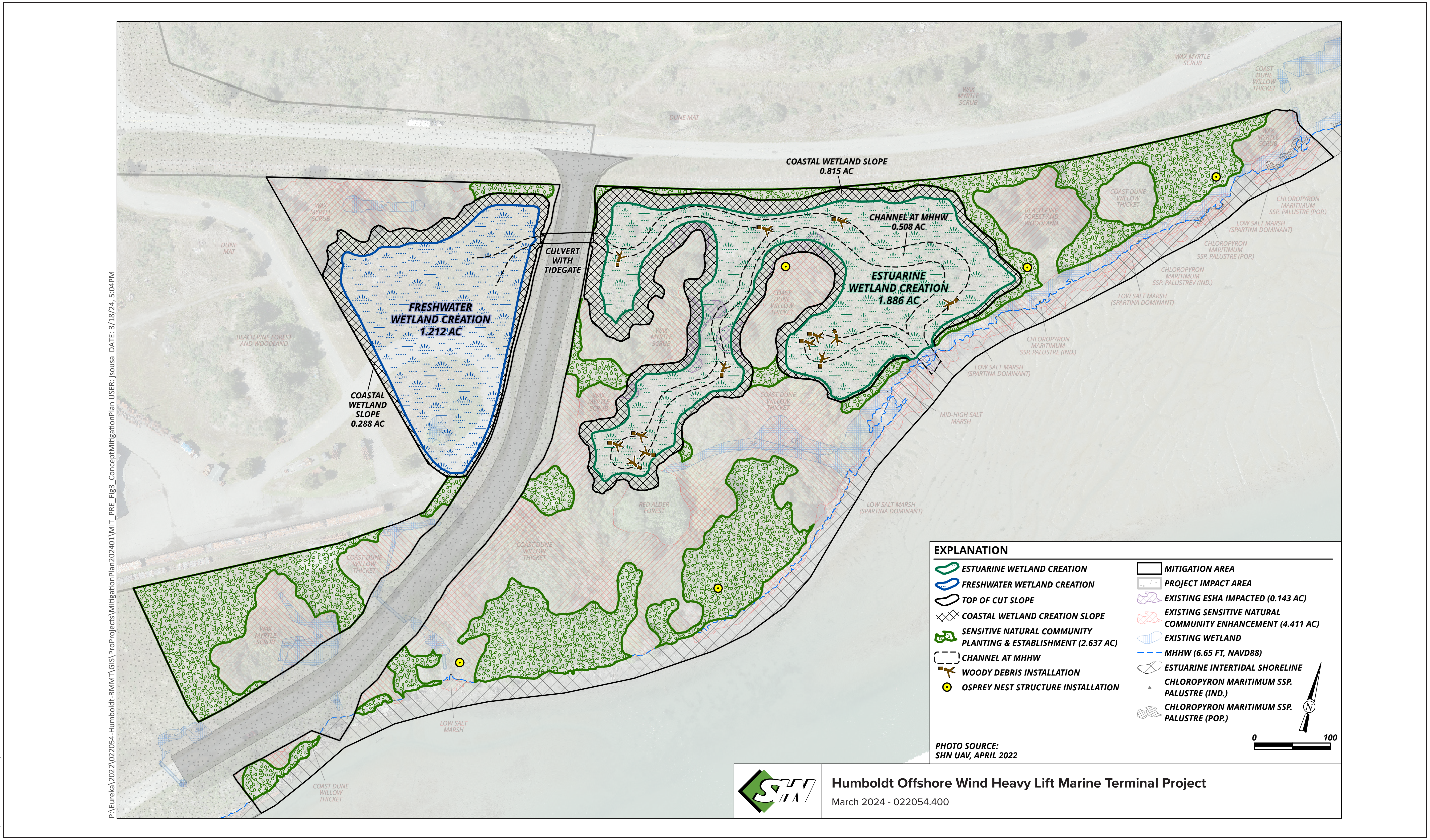
Graphics ... Humboldt Bay Harbor RMMT 104500 (4/25/2024)

Figure 8
Preliminary Conceptual Woodley Island Marina Fisherman Work and Storage Area Improvements



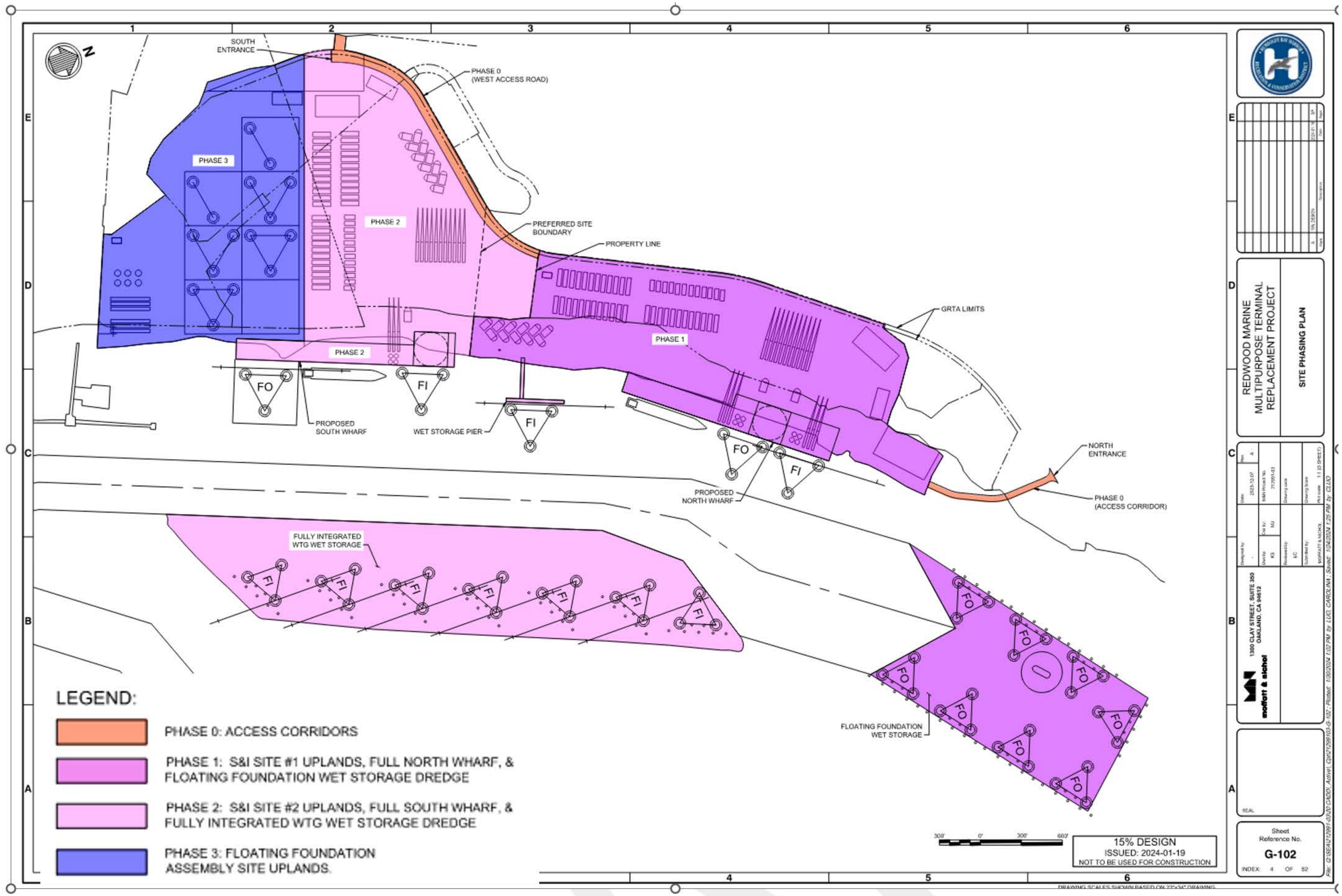
Graphics … Humboldt Bay Harbor RMMT 104500 (4/25/2024)

Figure 9
Potential Landfill Solar Array, Potential Dredge Material Dewatering Area, and Existing Electrical Substation



Graphics ... Humboldt Bay Harbor RMMT 104500 (4/25/2024)

Figure 10
Conceptual Mitigation Plan



Source: Moffatt & Nichol, 15% Design Plans, Sheet No. G-102

Figure 11
Site Phasing Plan

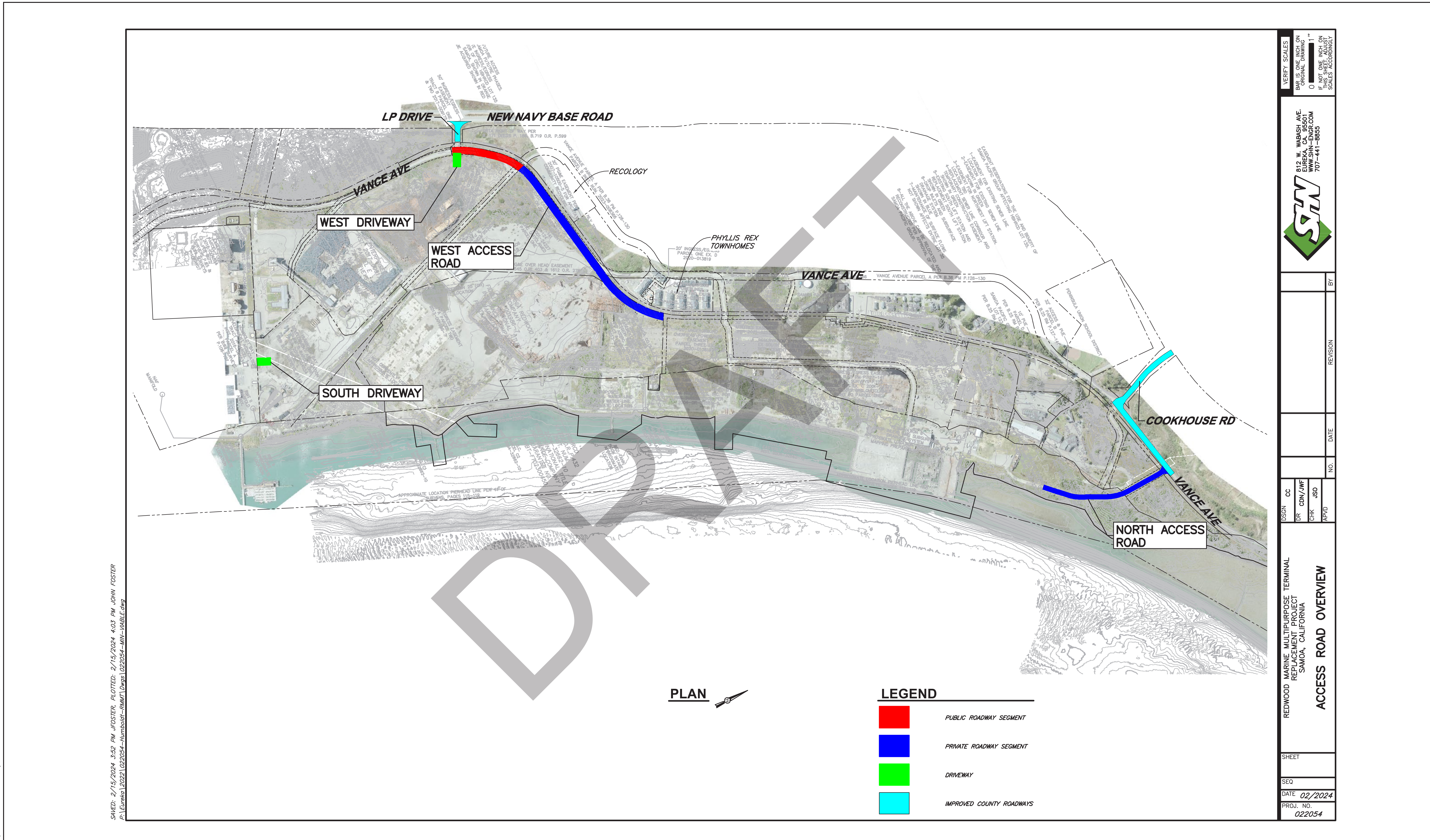
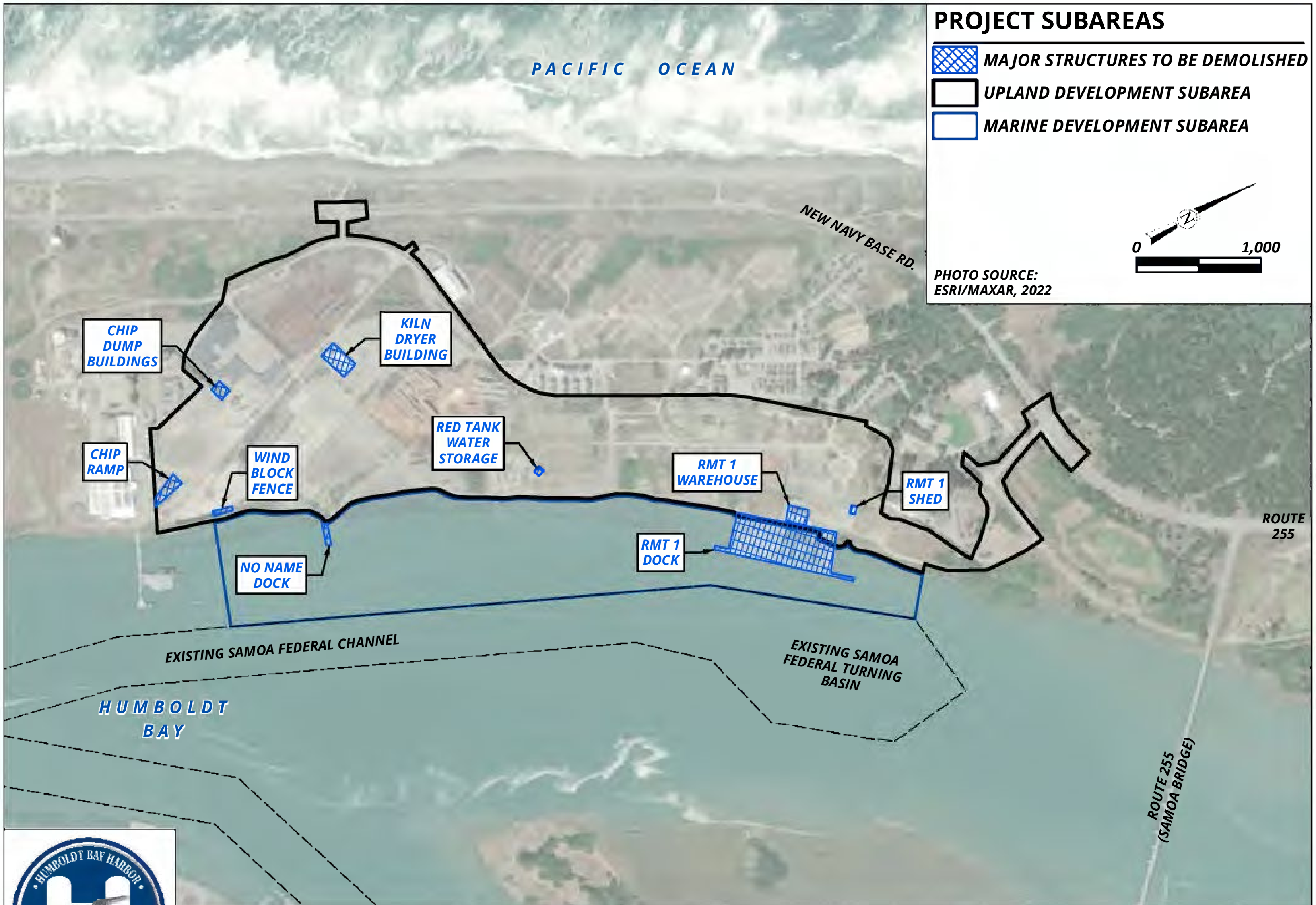


Figure 12
Access Road Overview

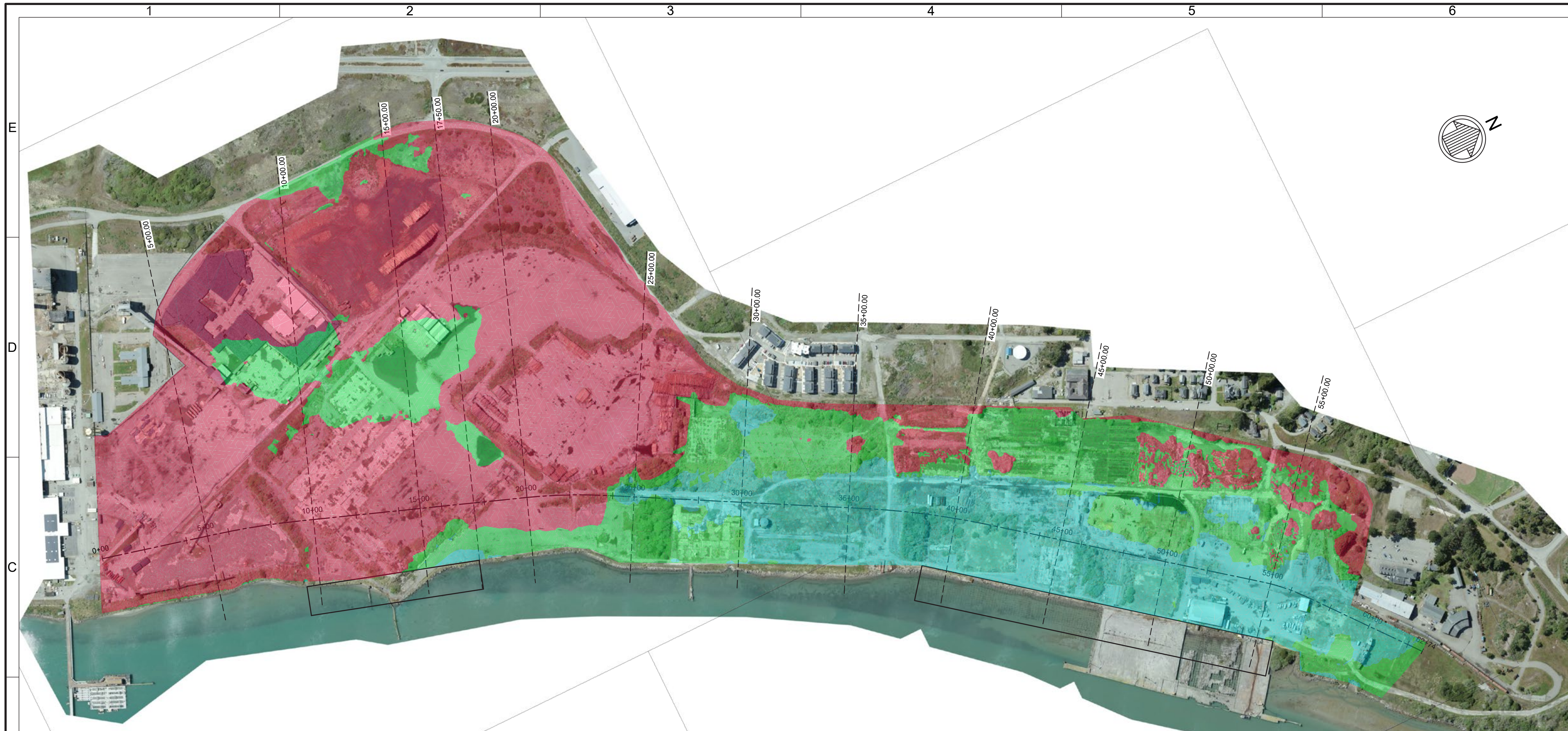


Humboldt Offshore Wind Heavy Lift Marine Terminal Project

May 2023

Graphics ... Humboldt Bay Harbor RMMT 104500 (4/25/2024)

Figure 13
Major Structures to Be Demolished



MPDG HUMBOLDT WIND PORT

CUT/FILL FROM SUBGRADE

ELEVATIONS TABLE				
NUMBER	MIN. ELEVATION	MAX. ELEVATION	AREA	COLOR
1	-25.17	0.00	4238830.82	CUT
2	0.00	3.00	1719878.11	FILL
3	3.00	7.24	1419187.41	FILL

Cut/Fill Summary -3 ft

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
VOL_PLATFORM- 3 ft	1.000	1.000	7381777.06 Sq. Ft.	582166.19 Cu. Yd.	299131.45 Cu. Yd.	283034.75 Cu. Yd.<Cut>

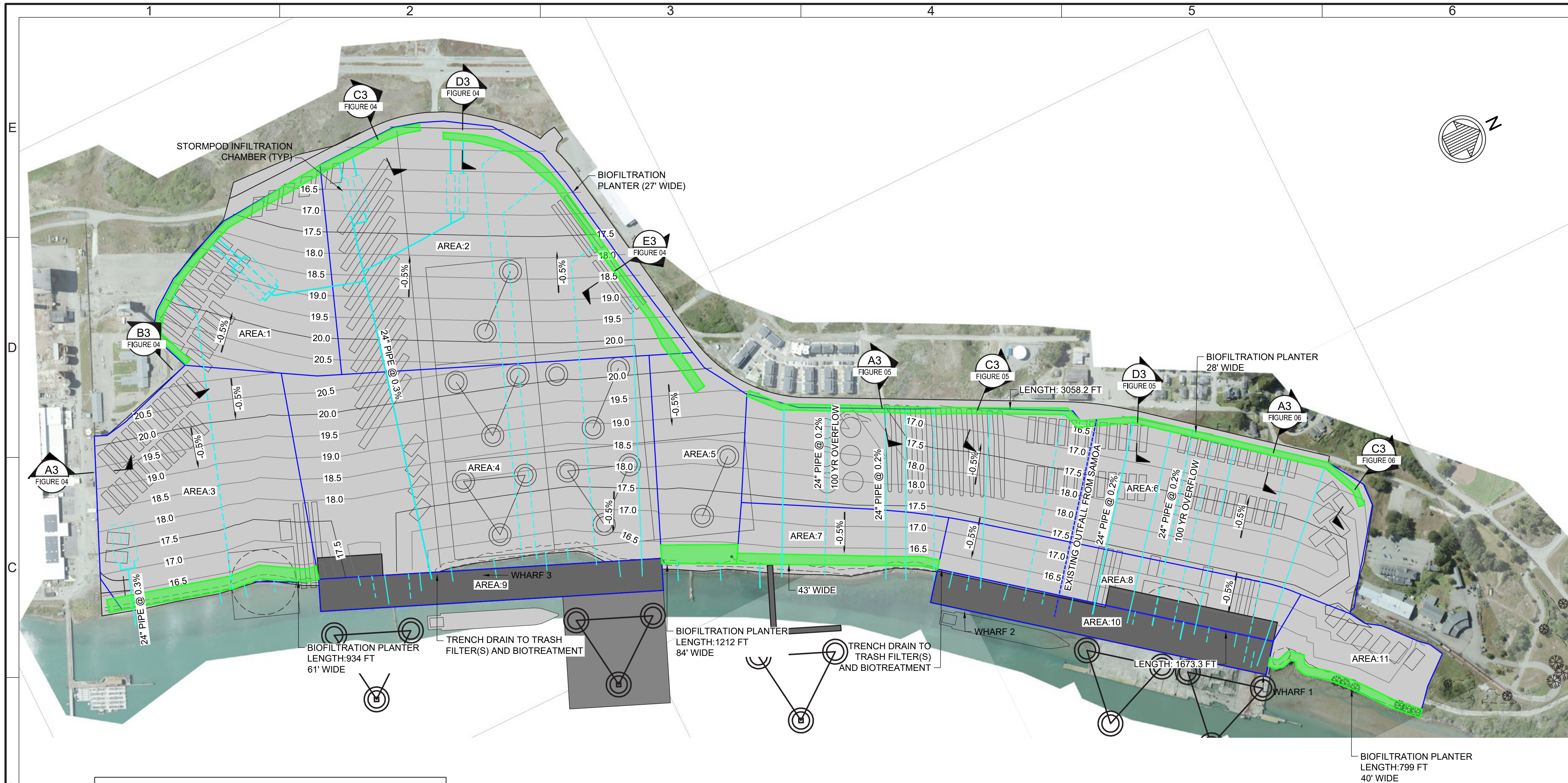
FOR CONCEPTUAL DESIGN
ISSUED: 2023-08-21
NOT TO BE USED FOR CONSTRUCTION

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

moffatt & nichol

INDEX: 01 OF ####

Figure 14a
Cut/Fill from Subgrade



PARCEL AREA TABLE

PARCEL #	AREA (Sq. ft)	AREA (Acres)	Q10 (cfs)	Q100 (cfs)
1	571578.18	13.12	17.3	30.12
2	1419799.14	32.59	40.24	68.68
3	914227.65	20.99	26.67	45.95
4	1568142.74	36.00	47.18	82.14
5	372498.88	8.55	11.21	18.72
6	1636522.69	37.57	54.78	94.31
7	253011.64	5.81	10.96	17.68
8	416685.85	9.57	18.05	31.76
9	240000.00	5.51	12.19	18.28
10	253572.42	5.82	12.88	19.31
11	242970.69	5.58	9.88	16.98

LEGEND:

24" PIPE

24" PIPE 100YR OVERFLOW

250' 0' 250' 500'

FOR CONCEPTUAL DESIGN
ISSUED: 2023-08-21
NOT TO BE USED FOR CONSTRUCTION

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

MPDG HUMBOLDT WIND PORT

GRADING AND DRAINAGE PLAN

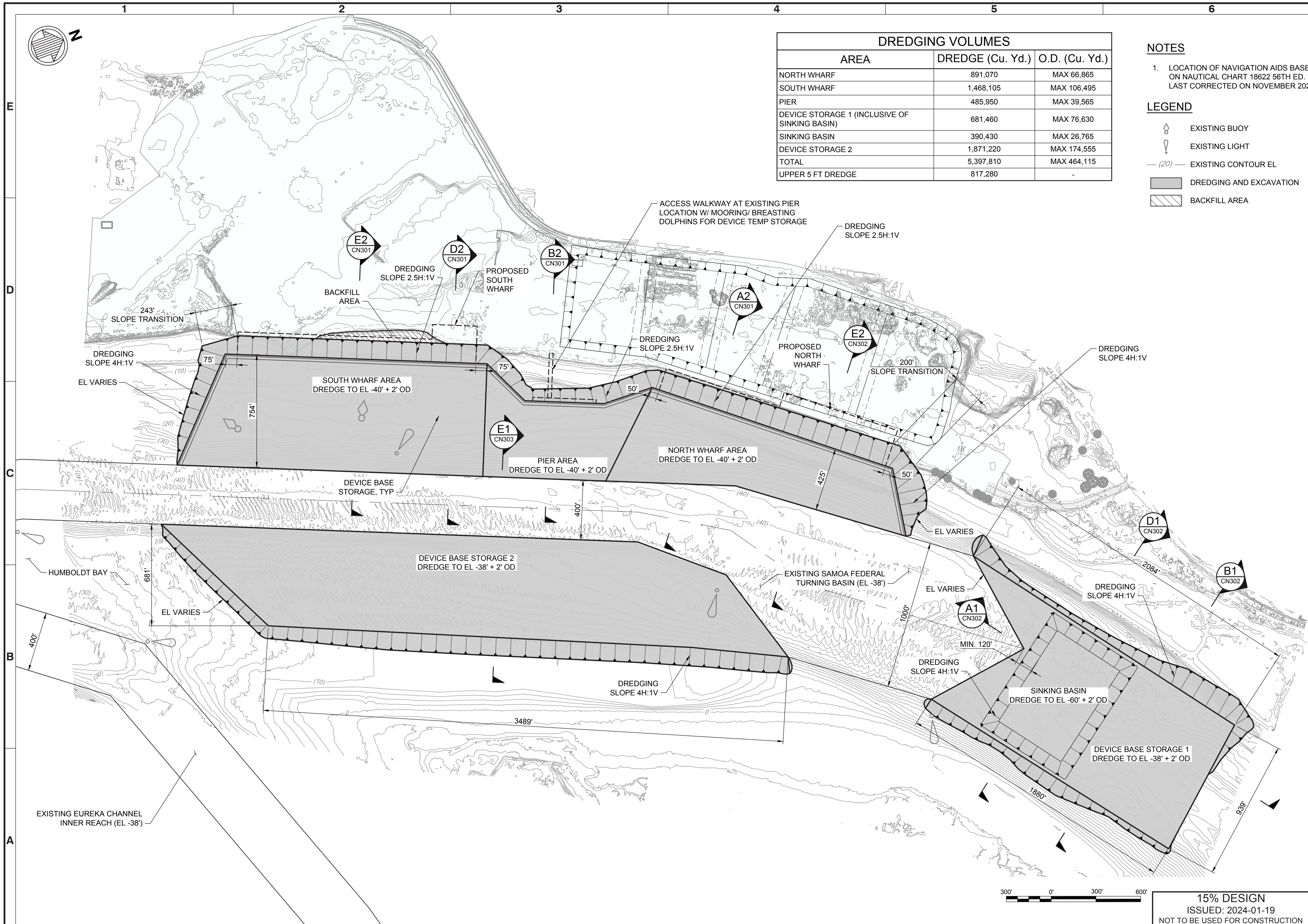
moffatt & nichol
1300 CLAY STREET, SUITE 350
OAKLAND, CA 94612

INSERT SUB-CONSULTANT OR CLIENT LOGO AND INFO HERE

SEAL

INDEX: 03 OF ####

Figure 14b
Grading and Drainage Plan



DREDGING VOLUMES		
AREA	DREDGE (Cu. Yd.)	O.D. (Cu. Yd.)
NORTH WHARF	891,070	MAX 66,865
SOUTH WHARF	1,468,105	MAX 106,495
PIER	485,950	MAX 39,565
DEVICE STORAGE 1 (INCLUSIVE OF SINKING BASIN)	681,460	MAX 76,630
SINKING BASIN	390,430	MAX 26,765
DEVICE STORAGE 2	1,871,220	MAX 174,555
TOTAL	5,397,810	MAX 464,115
UPPER 5 FT DREDGE	817,280	-

NOTES

1. LOCATION OF NAVIGATION AIDS BASED ON NAUTICAL CHART 18622 56TH ED. LAST CORRECTED ON NOVEMBER 2021.

LEGEND

- EXISTING BUOY
- EXISTING LIGHT
- — (20) — EXISTING CONTOUR EL
- DREDGING AND EXCAVATION
- BACKFILL AREA

15% DESIGN
ISSUED: 2024-01-19
NOT TO BE USED FOR CONSTRUCTION

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

REDWOOD MARINE MULTIPURPOSE TERMINAL REPLACEMENT PROJECT

DREDGE PLAN

moffatt & nichol
1300 CLAY STREET, SUITE 350
OAKLAND, CA 94612

Sheet Reference No. CN101
INDEX: 18 OF 52

Graphics … Humboldt Bay Harbor RMMT 104500 (4/25/2024)

Figure 15a
Dredge Plan

ROCK REVETMENT VOLUMES

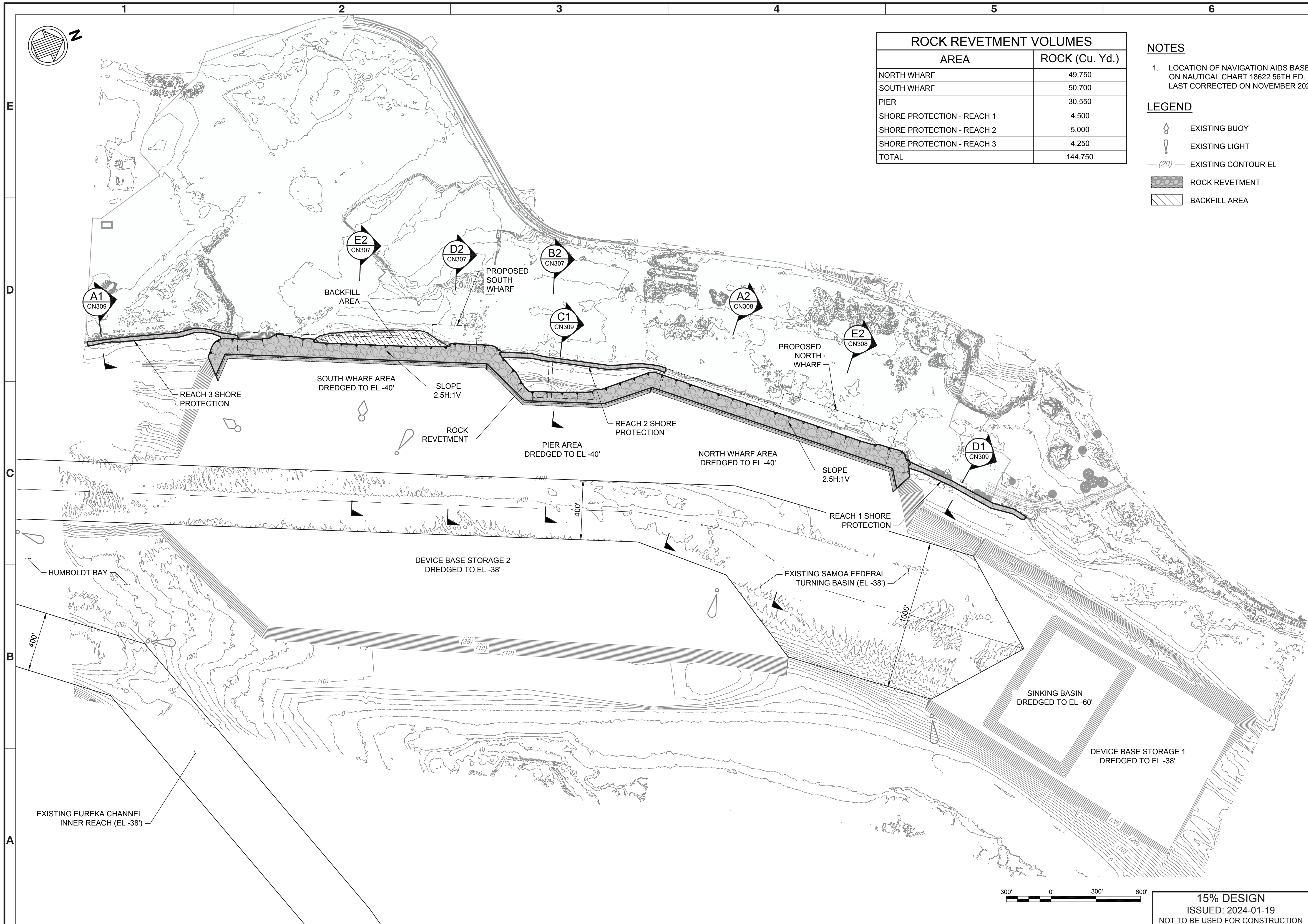
AREA	ROCK (Cu. Yd.)
NORTH WHARF	49,750
SOUTH WHARF	50,700
PIER	30,550
SHORE PROTECTION - REACH 1	4,500
SHORE PROTECTION - REACH 2	5,000
SHORE PROTECTION - REACH 3	4,250
TOTAL	144,750

NOTES

1. LOCATION OF NAVIGATION AIDS BASED ON NAUTICAL CHART 18622 56TH ED. LAST CORRECTED ON NOVEMBER 2021.

LEGEND

- EXISTING BUOY
- EXISTING LIGHT
- (20) EXISTING CONTOUR EL
- ROCK REVETMENT
- BACKFILL AREA



15% DESIGN
ISSUED: 2024-01-19
NOT TO BE USED FOR CONSTRUCTION

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

HUMBOLDT BAY HARBOR RECREATION & CONSERVATION DISTRICT

Mark	Description	Date	App
A	15% DESIGN	2024-01-19	SP

REDWOOD MARINE MULTIPURPOSE TERMINAL REPLACEMENT PROJECT

ROCK REVETMENT PLAN

moffatt & nichol
1300 CLAY STREET, SUITE 350
OAKLAND, CA 94612

Designed by: YN | Date: 2023-12-07 | Rev: A
Dwn by: RG | Ckd by: MJ | M&N Project No.: 212991-03
Reviewed by: EC | Drawing code:
Submitted by: MOFFATT & NICHOL | Drawing Scale: 1:1 (D SHEET) | Plot scale:

SEAL

Sheet Reference No.
CN102
INDEX: 19 OF 52

Figure 15b
Rock Revetment Plan

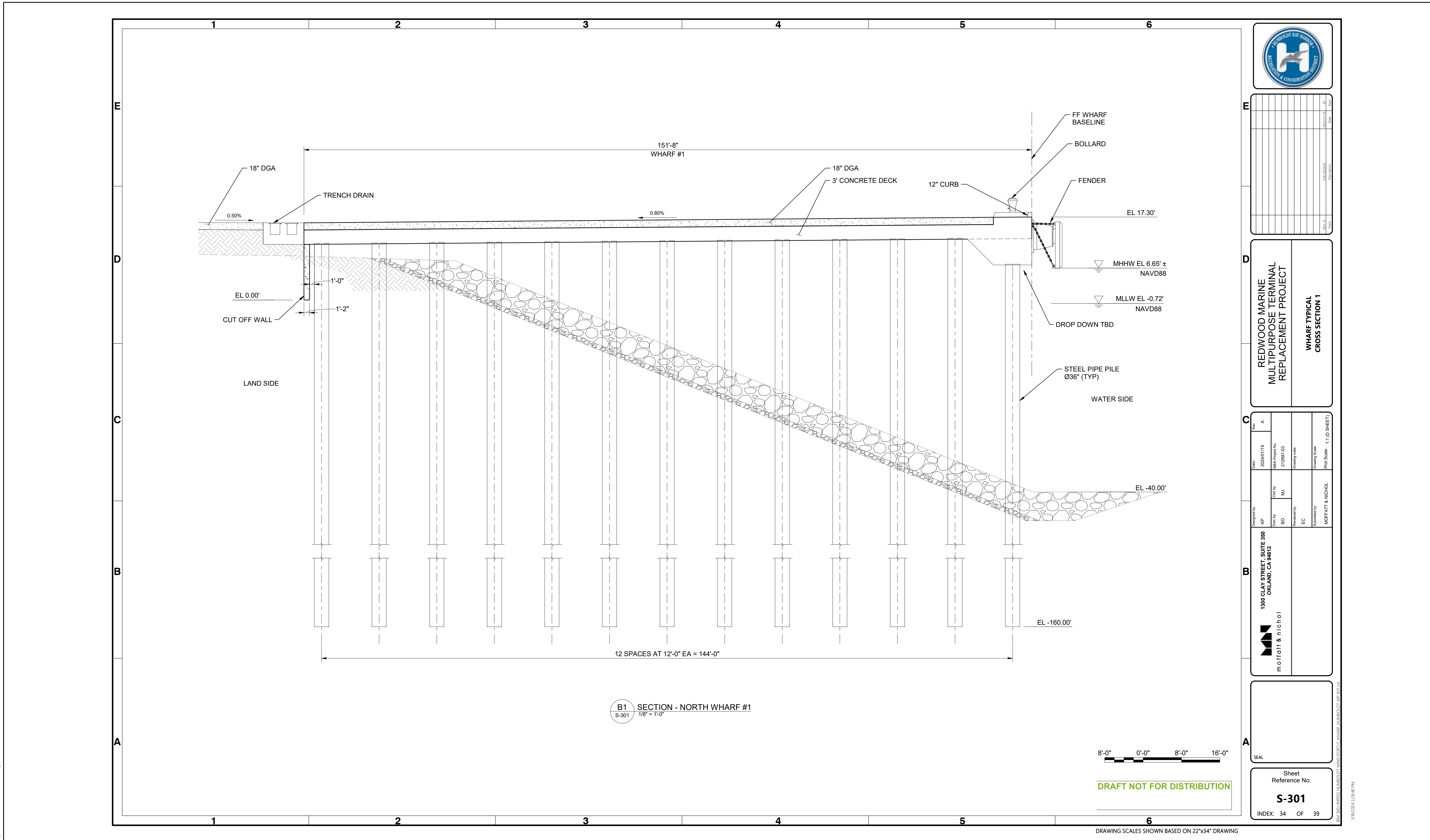


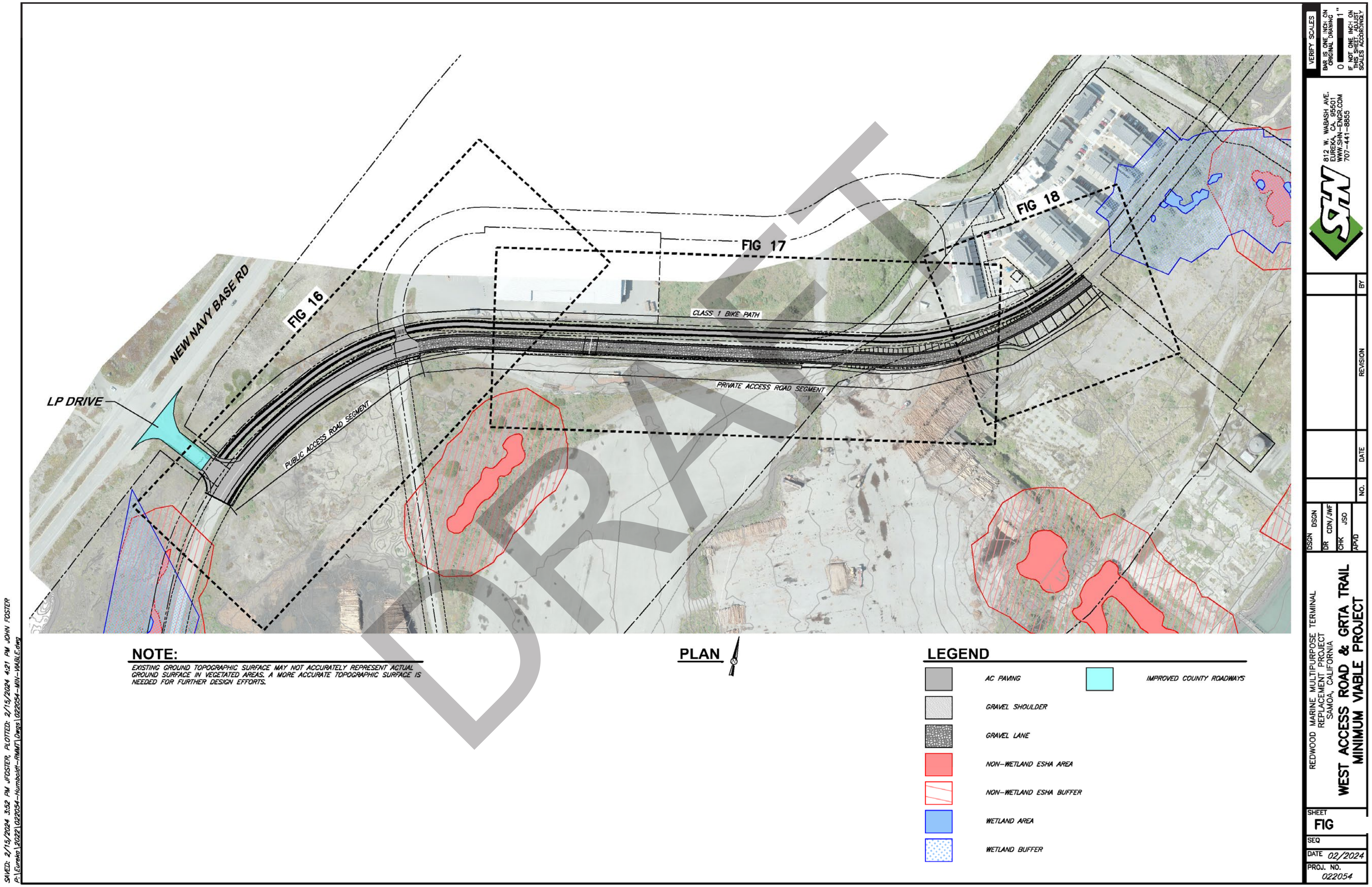
Figure 16
Wharf Typical Cross Section 1

Humboldt Offshore Wind Heavy Lift Marine Terminal Project

May 2023

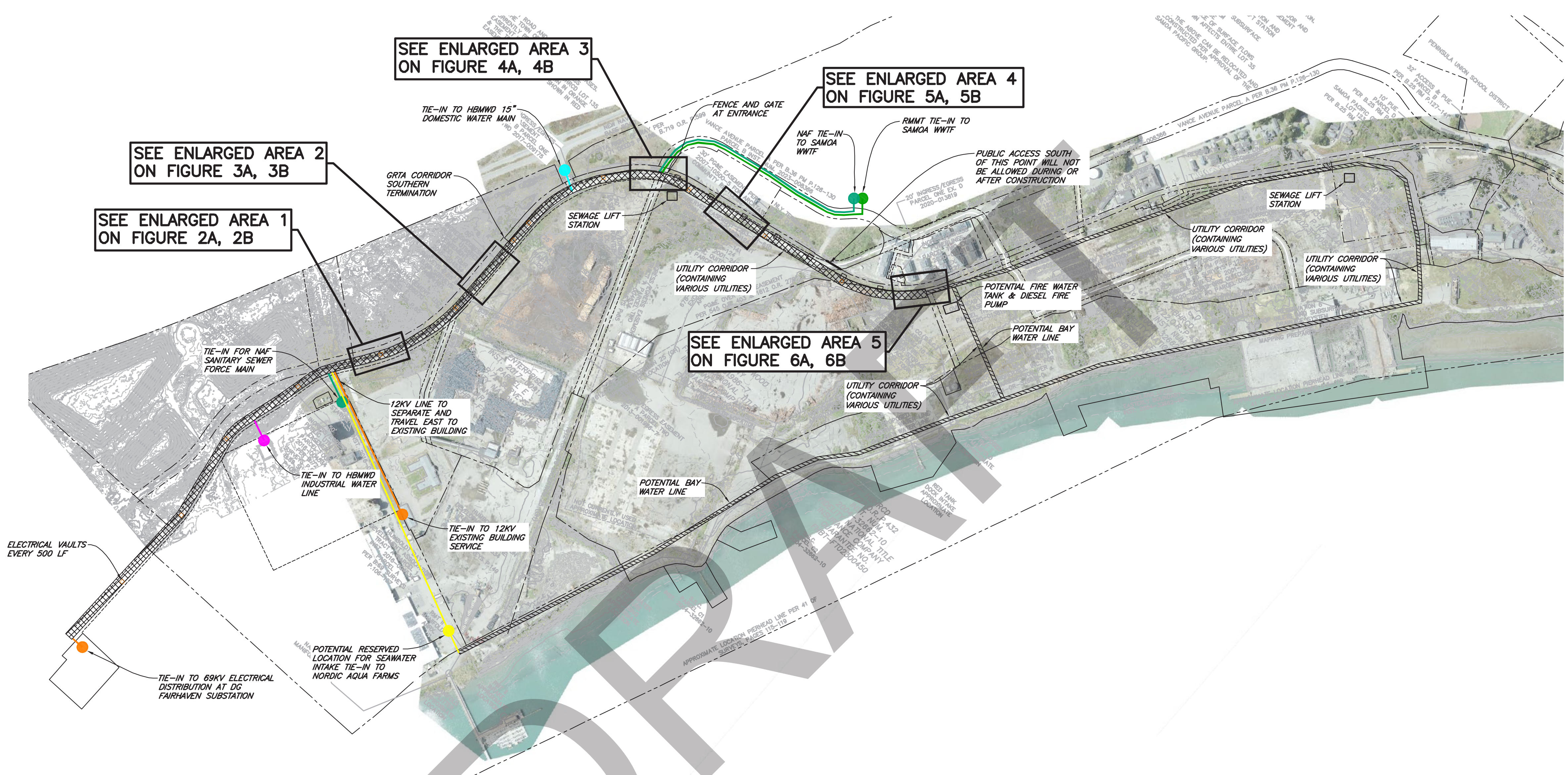
Graphics ... Humboldt Bay Harbor RMMT 104500 (4/25/2024)

Figure 17
Potential Intersection Improvements



Graphics ... Humboldt Bay Harbor RMMT 104500 (4/25/2024)

Figure 18
West Access Road & GRTA Trail



SAVED: 1/10/2024 8:12 AM JFOSTER, PLOTTED: 1/10/2024 8:13 AM JOHN FOSTER
P:\Eureka\2022\022054-Humboldt-RMMT\Dwgs\022054-UTIL-FIG-ALT.dwg

FIGURE TITLE DESCRIPTIONS

#A – UTILITIES SHIFTED WEST WITHIN RAILROAD/GRTA CORRIDOR.
NOTE: THE GRTA/RAILROAD CORRIDOR TEMINATES SOUTH OF LP DRIVE. THE UTILITY ALIGNMENT CONTINUES ON THE SAME PATH SOUTH OF THE GRTA CORRIDOR TERMINATION.

#B – UTILITIES SHIFTED TO THE EAST OUTSIDE OF THE RAILROAD/GRTA CORRIDOR.

LEGEND

- ELECTRICAL DISTRIBUTION TIE-IN
- 12" INDUSTRIAL WATER TIE-IN
- 12" DOMESTIC WATER TIE-IN
- 6" SANITARY SEWER TIE-IN
- 6" NAF SANITARY SEWER TIE-IN
- UTILITY RESERVED SPACE
- ELECTRICAL VAULT
- OFF-SITE UTILITY CORRIDOR
- ON-SITE UTILITY CORRIDOR
- FENCE

PLAN

0 300

UTILITY PLAN ASSUMPTIONS:

1. PUBLIC ROAD SECTION 12' PAVED ROAD, 8' PAVED SHOULDER, 2' GRAVEL SHOULDER, AND 10' VEGETATED STRIP.
2. IT WILL BE ACCEPTABLE TO PLACE UTILITIES WITHIN THE RAILROAD CORRIDOR.
3. GAS WILL BE REQUIRED FOR RELOCATED UTILITIES ON-SITE, AND WOULD BE PLACED IN JOINT TRENCH BY OTHERS.
4. JOINT TRENCH WILL NOT CROSS BIO-SWALE.
5. JOINT TRENCH WILL REQUIRE 3' SET-BACK ON EITHER SIDE TO ACCOMMODATE WET UTILITIES AND STORMWATER FEATURES.
6. JOINT TRENCH IS 3' WIDE, BUT IS TO BE DESIGNED BY OTHERS.
7. SEAWATER INTAKE OR STORM DRAIN SPACE IS RESERVED.
8. 4' DRAIN INLETS WILL BE REQUIRED ALONG THE STORM DRAIN LINE.
9. THE LOCATIONS OF THE EXISTING SAMOA UTILITIES ARE NOT BASED ON SURVEY INFORMATION.
10. THE EXISTING SAMOA UTILITIES MEET CODE REQUIRED SEPARATION REQUIREMENTS.
11. WE HAVE ASSUMED A CLASS 1 BIKE TRAIL WILL BE CONSTRUCTED ON THE CENTERLINE OF THE RAILROAD/GRTA TRAIL CORRIDOR.
12. ASSUMED SIZES FOR UTILITIES ARE AS FOLLOWS, LOADS ARE REQUIRED TO COMPLETE SIZING:
    - 12" INDUSTRIAL WATER
    - 12" DOMESTIC WATER
    - 6" SANITARY SEWER
    - UTILITY RESERVED SPACE
13. THE UTILITY CORRIDOR INCLUDES ELECTRICAL AND GAS THAT WILL BE RE-ROUTED FROM THE PROJECT SITE AND PLANNED NORDIC AQUA FARMS DOMESTIC WATER LINE.

PRELIMINARY

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SHN
812 W. WABASH AVE.
EUREKA, CA 95501
WWW.SHN-ENGR.COM
707-441-8855

NO.	DATE	REVISION	BY

DSGN CC
DR CDN/JWF
CHK JSO
APVD

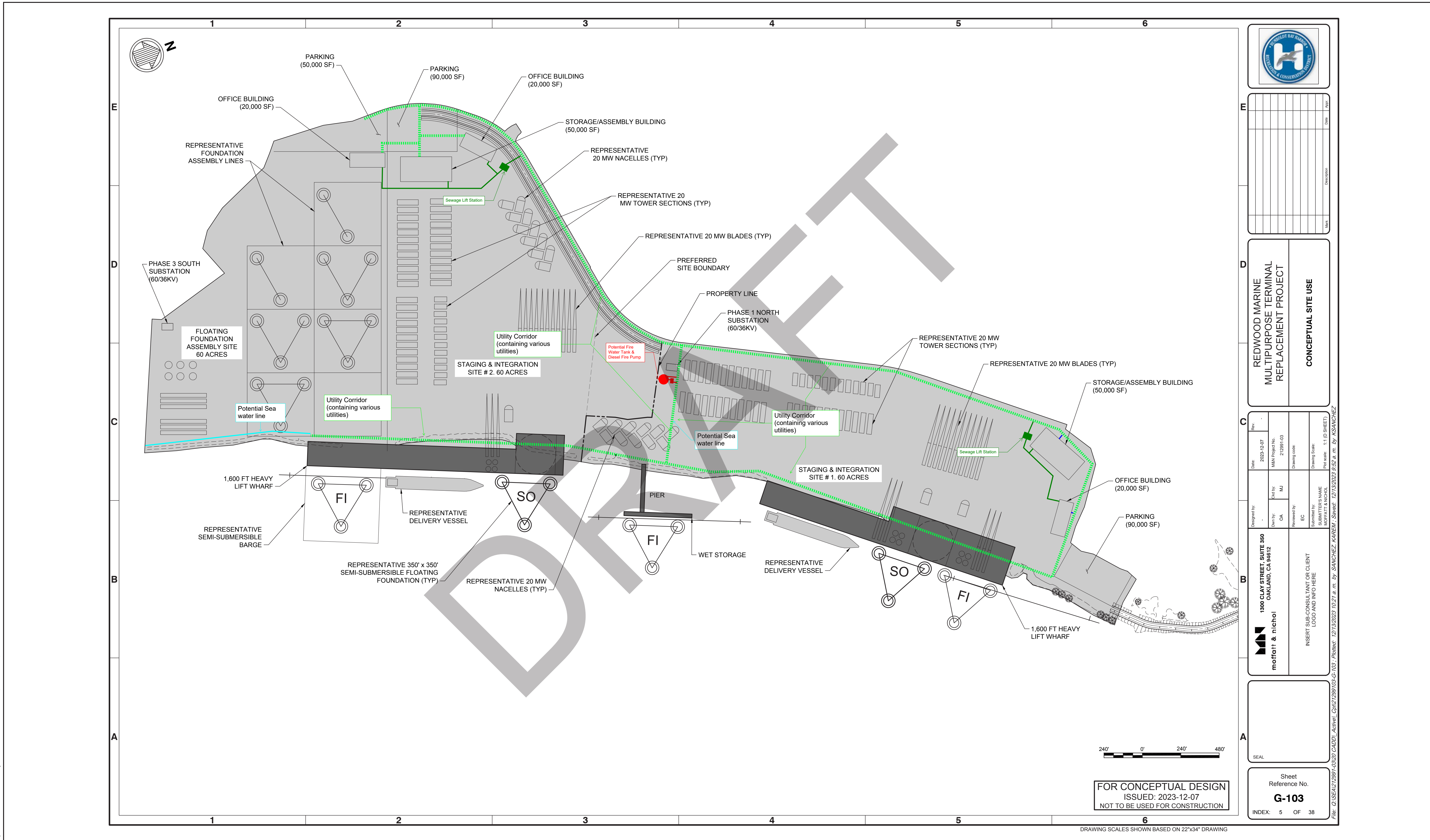
REDWOOD MARINE MULTIPURPOSE TERMINAL REPLACEMENT PROJECT
SAMOA, CALIFORNIA

PROJECT OVERVIEW

SHEET
SEQ
DATE 01/2024
PROJ. NO. 022054

Graphics ... Humboldt Bay Harbor RMMT 104500 (4/25/2024)

Figure 19
Project Overview



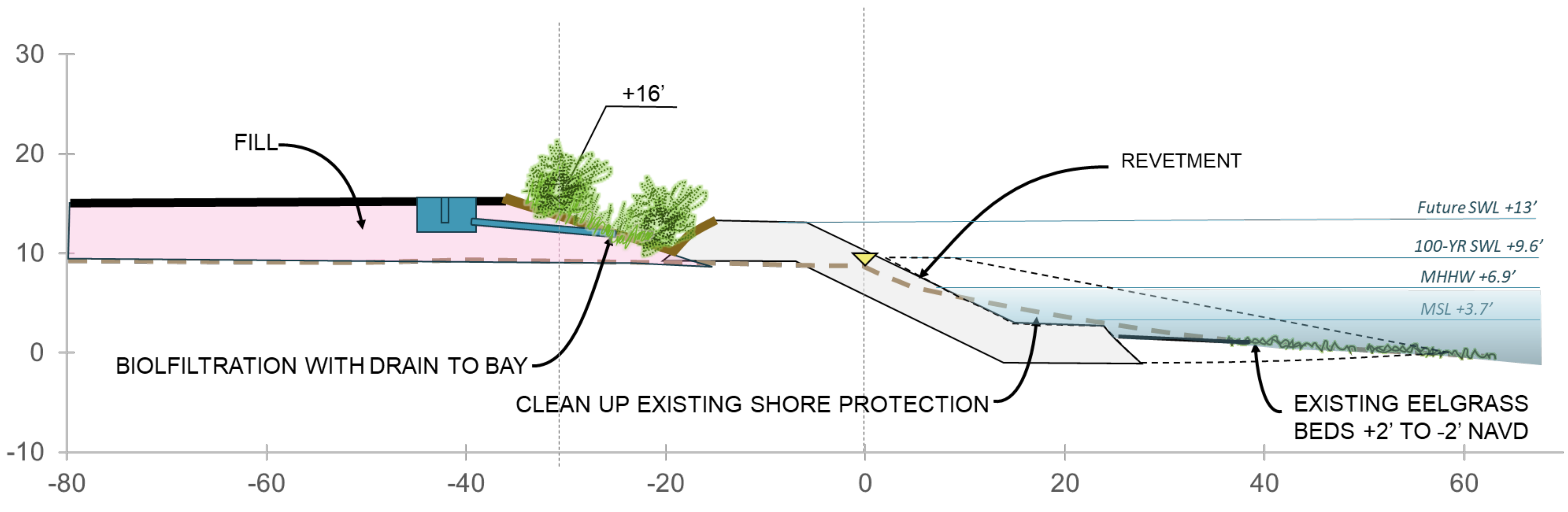
Graphics … Humboldt Bay Harbor RMMT 104500 (4/25/2024)

Figure 20
Conceptual Site Use

Shoreline Stabilization (Humboldt)

A – Revetment

Estimated length ≈ 850 ft (≈ 250m)



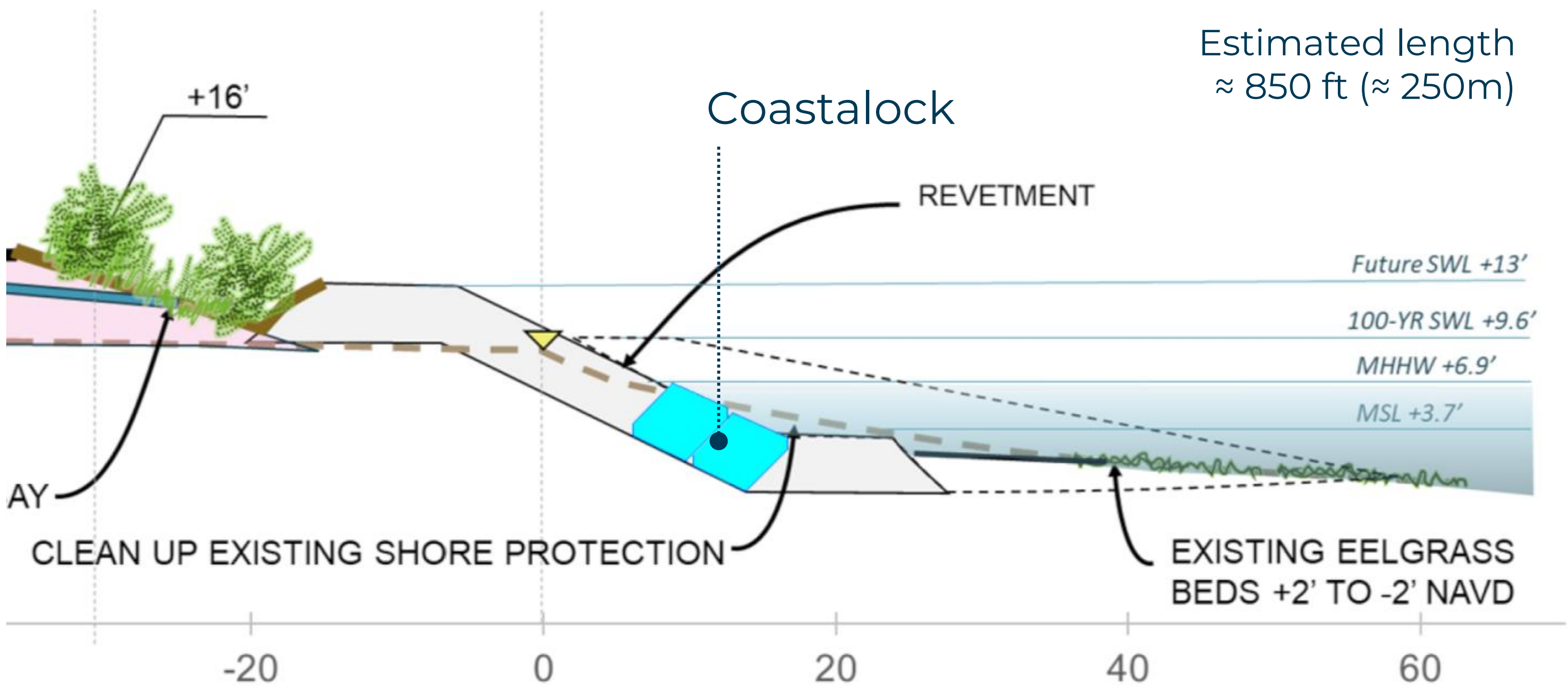
Project sample section (A)

ECONCRETE

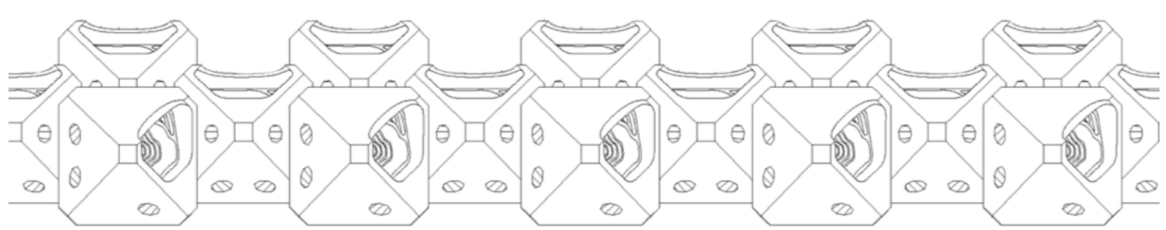
Figure 21
Shoreline Stabilization—Revetment

Shoreline Stabilization (Humboldt)

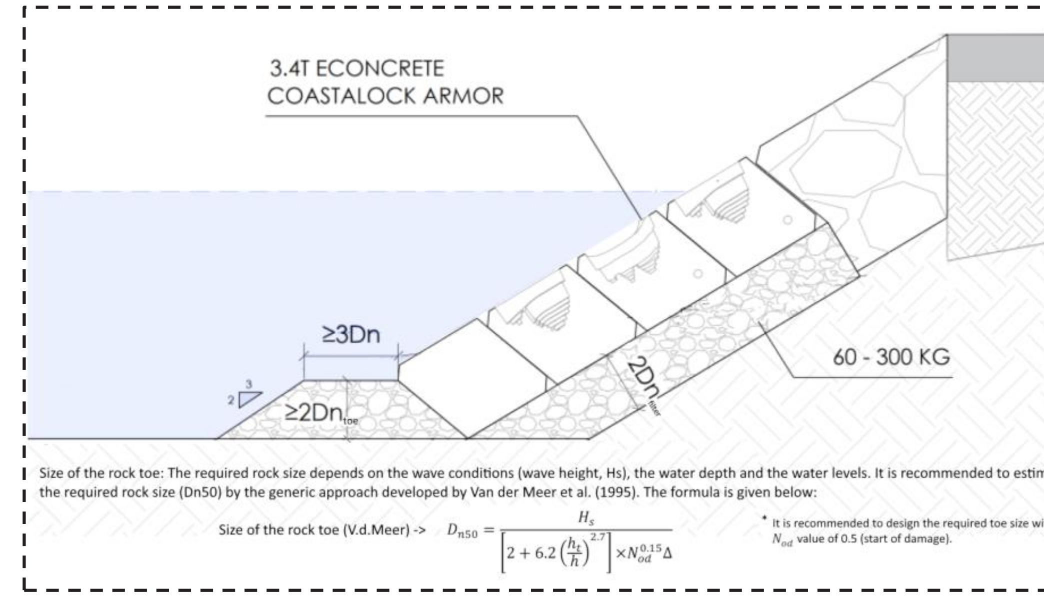
A – Revetment - Coastalock



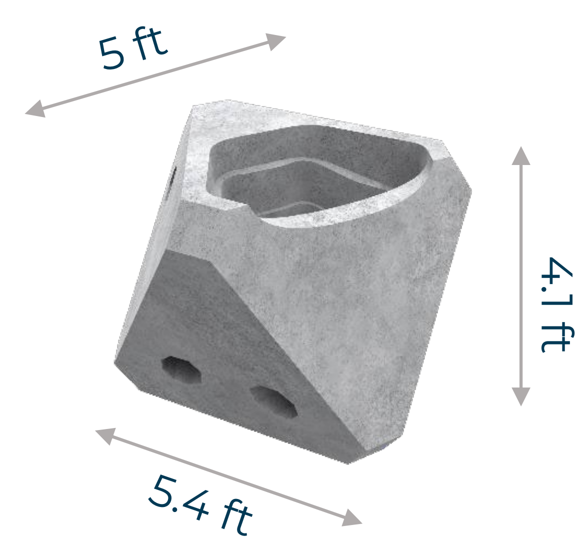
Project sample section (A), with 3 rows of Coastalocks



Elevation, interlocking placement (3 rows of Coastalocks)



Coastalock integration in a revetment
(general concept)



Volume (~1.86 yd³)
Weight (~7,515 lbs)

ECONCRETE

Figure 22
Shoreline Stabilization—Revetment/Coastalock

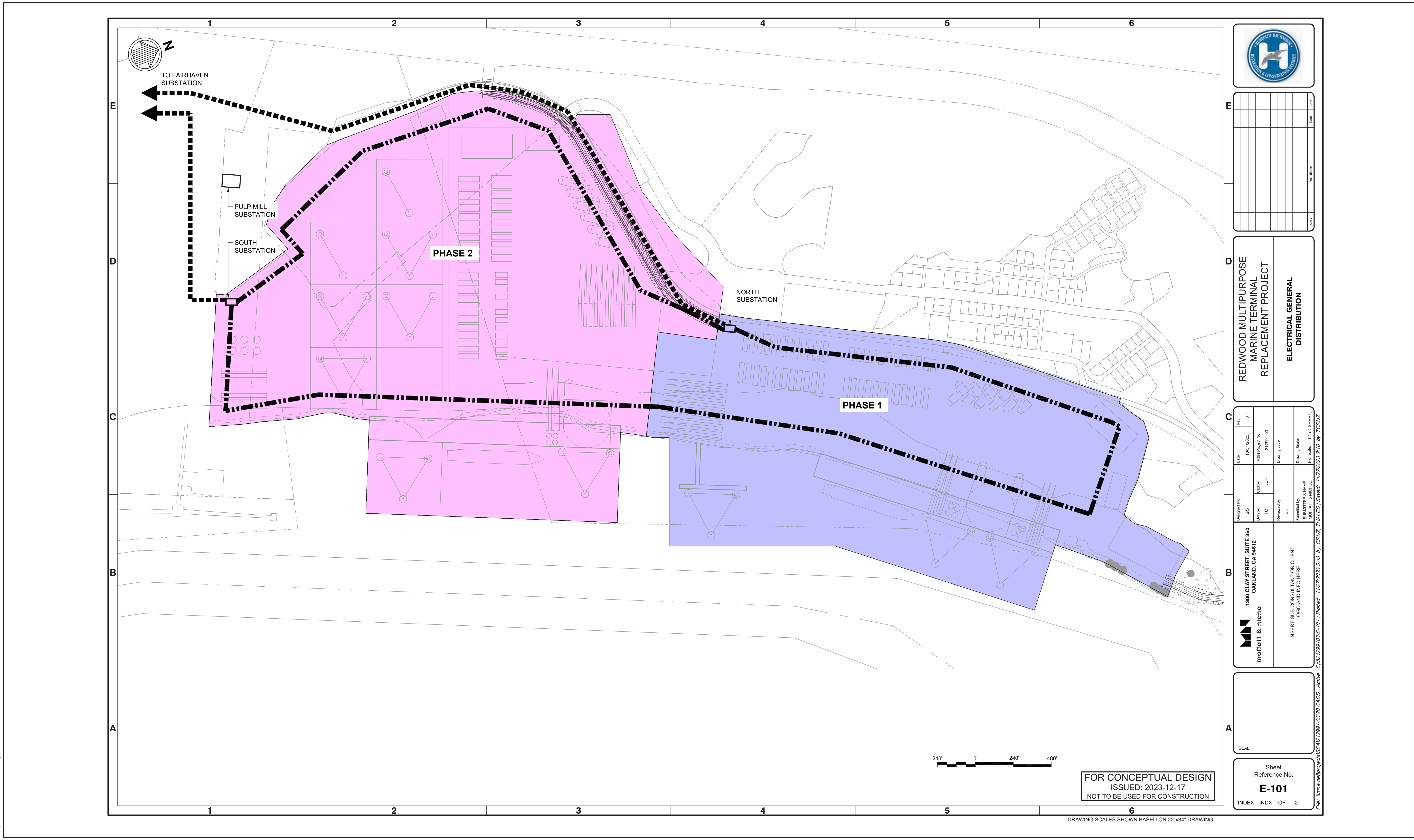


Figure 23
Electrical General Distribution