Request for Incidental Harassment Authorization of Marine Mammals Resulting from the Proposed Ketchikan Port Facility Recapitalization Project

National Oceanic and Atmospheric Administration

Office of Marine and Aviation Operations

Marine Operations Center-Pacific

Proposed Ketchikan Port Facility Recapitalization Project

Ketchikan, Alaska

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October 2021

EXECUTIVE SUMMARY

The National Oceanic and Atmospheric Administration (NOAA) proposes to recapitalize its property and facilities currently operated by the Office of Marine and Aviation Operations (OMAO) at the existing Marine Operations Center-Pacific (MOC-P) Ketchikan Port Facility.

NOAA OMAO has prepared this request for incidental harassment authorization (IHA) application in accordance with the Marine Mammal Protection Act (MMPA) of 1972, as amended (16 United States Code [U.S.C.] Section 1371(a)(5)(D)), to analyze the potential effects to marine mammals associated with the project. Section 1 through Section 14 of this application cover the 14 specific items required for this application, as set out by 50 Code of Federal Regulations (CFR) 216.104, Submission of Requests.

The facility is at 1010 Stedman Street in the city of Ketchikan, Alaska, and is the dedicated homeport for the NOAA Ship *Fairweather*. Due to failing and inadequate facilities, the existing NOAA homeport is unable to fully support the berthing of vessels or staging for cruises or missions carried out by the NOAA Ship *Fairweather* or other vessels. The Proposed Action would provide upgrades and replacement facilities necessary to reestablish homeport operations and maintenance functions for the NOAA Ship *Fairweather* and other vessels. The proposed recapitalization project would more effectively support NOAA missions conducted primarily in the North Pacific Ocean and the Arctic Continental Shelf.

The Proposed Action at the Ketchikan Port Facility would require demolition, disposal, and replacement of key structures and infrastructure in a 77,000-square-foot upland area and a 102,000 square foot in-water area owned by NOAA. Nearly all the existing OMAO facilities and assets at its Ketchikan Port Facility would be affected.

Nearly all of the existing in-water infrastructure at the Ketchikan Port Facility would be removed, including the following in-water and over-water structures and assets:

- Remnant wooden access trestle and parallel utility trestle and supporting piles
- Main pile-supported pier structure (9,000 square feet) and supporting piles
- Steam plant (boiler) shed on the pier
- Three concrete-filled steel mooring dolphins
- Two single piles extending above the water surface
- Floating cylindrical fendering (250 linear feet); this may be saved or salvaged by the contractor

The following in-water infrastructure would be retained and/or salvaged:

- Concrete/steel mooring platform (750 square feet) and breasting dolphin with fender—to be retained; connecting metal catwalks to be salvaged.

The following new in-water structures would be constructed:

- An approximately 240-foot long and 50-foot wide (48-foot wide pier with 2-foot fendering) floating replacement pier would replace the existing pier and its supporting piles. The floating pier would be secured and stabilized by 10 steel piles, each 24 inches in diameter, and accessed via a single, 144-foot long and 17-foot wide steel, truss-framed transfer bridge. The transfer bridge would be supported by a bridge support float adjacent to the pier and hinged to the shoreline cast in place concrete abutment. The 24-foot by 22-foot bridge support float would be secured by four additional 24-inch diameter steel piles. Replacement mooring dolphins and fenders for mooring would be installed. Ship utilities would be extended dockside attached to the transfer bridge (60 percent design drawings for the project are provided in Appendix A).
- A small boat dock, approximately 90 feet long by 14 feet wide, would be installed and connected to the floating dock by an aluminum gangway approximately 40 feet long and 5 feet wide. The small boat dock would be secured and stabilized by four steel piles, each 24 inches in diameter.
- The small boat launch ramp proposed at the northern portion of the NOAA-owned shoreline would be supported on a raised, rip-rap protected mound with side slopes of 2:1 (Horizontal:Vertical) and a footprint of approximately 200 feet by 70 feet wide.

Pile removal and placement associated with the proposed activities have the potential to affect marine mammals within the waterways adjacent to the proposed project, which could result in harassment under the MMPA of 1972, as amended.

NOAA used the National Marine Fisheries Service (NMFS) sound thresholds for assessing pile placement and removal on marine mammals, and used the practical spreading loss equation and empirically measured source levels from other similar steel pile-driving projects to estimate potential marine mammal exposures to pile-driving noise.

Predicted exposures are described in detail in Section 6 (Table 6-10); a summary is provided in Table ES-1. Level A harassments associated with pile-driving activities will be avoided for all species but harbor porpoise, Dall’s porpoise, and harbor seals by implementing mitigation measures described in Section 11. Conservative assumptions (including marine mammal densities) used to estimate the exposures are likely to overestimate the potential number of exposures and incidental take.

Table ES-1: Total Exposure Estimates

Species	Level B Take	Level A Take
Humpback whale Central North Pacific Stock Hawaii DPS	39	0
Humpback whale CA/OR/WA Stock Mexico DPS	1	0
Minke whale	1	0
Gray whale	4	0
Killer whale	20	0
Pacific white-sided dolphin	200	0
Harbor porpoise	20	10
Dall's porpoise	40	20
Steller sea lion Eastern Stock	470	0
Harbor seal	423	141

Pursuant to MMPA Section 101(a)(5)(A), NOAA OMAO submits this application to NMFS for the authorization of incidental, but not intentional, taking of individuals of nine marine mammal species during pile activities for project. The taking will be in the form of noninjurious, temporary harassment, and for harbor porpoise, Dall’s porpoise, and harbor seals will also include Level A harassment. All taking is expected to have a negligible impact on populations of these species. In addition, the taking will not have an adverse impact on the availability of these species for subsistence use.

Regulations governing the issuance of incidental take under certain circumstances are codified at 50 CFR Part 216, Subpart I (Sections 216.101–216.108). Section 216.104 sets forth 14 specific items that must be addressed in requests for take pursuant to Section 101 (a)(5)(A) of the MMPA. These 14 items are addressed in Section 1 through Section 14 of this IHA application.

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°F	degrees Fahrenheit
ADF&G	Alaska Department of Fish and Game
ADOT&PF	Alaska Department of Transportation and Public Facilities
CFR	Code of Federal Regulations
CV	coefficient of variation
dB	decibels
dB re 1 μPa	decibels referenced to 1 micro Pascal
DPS	distinct population segment
DTH	down-the-hole
eDPS	Eastern Distinct Population Segment
EFH	essential fish habitat
ENP	Eastern North Pacific
ESA	Endangered Species Act
FR	Federal Register
HTL	high tide line
Hz	Hertz
IHA	incidental harassment authorization
m	meter
MMPA	Marine Mammal Protection Act
MOC-A	Marine Operations Center-Atlantic
MOC-P	Marine Operations Center-Pacific
NAD83	North American Datum of 1983
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service, also referred to as NOAA Fisheries
NOAA	National Oceanic and Atmospheric Administration
NPFMC	North Pacific Fishery Management Council
OMAO	Office of Marine and Aviation Operations
PTS	permanent threshold shift
RMS	root mean square
SEL	sound exposure level
SEL_{CUM}	cumulative sound exposure level
SPL	sound pressure level
TL	transmission loss
TTS	temporary threshold shift
U.S.	United States
U.S.C.	United States Code
wDPS	Western Distinct Population Segment
ZOI	zone of impact

1.0 INTRODUCTION AND DESCRIPTION OF ACTIVITIES

A detailed description of the specific activity or class of activities that can be expected to result in incidental taking of marine mammals.

1.1 INTRODUCTION

The National Oceanic and Atmospheric Administration (NOAA) has prepared this incidental harassment authorization (IHA) application of marine mammals for its project to recapitalize its property and facilities currently operated by the Office of Marine and Aviation Operations (OMAO) at the existing Marine Operations Center-Pacific (MOC-P) Ketchikan Port Facility.

Under the Marine Mammal Protection Act (MMPA) of 1972, as amended (16 United States Code [U.S.C.] Section 1371[a][5][D]), NOAA OMAO is requesting an IHA for project activities that are expected to result in the unintentional take of marine mammals. Section 1 through Section 14 of this application cover the 14 specific items required for this application, as set out by 50 Code of Federal Regulations (CFR) 216.104 Submission of Requests.

Construction of the project is expected to occur from February 2022 through December 2022. The NOAA OMAO will notify the National Marine Fisheries Service (NMFS) of any changes to project dates. Dates and durations are described in Section 2.

1.1.1 Overview

The mission of the NOAA OMAO is to safely deliver effective Earth-observation capabilities; integrate emerging technologies; and provide a specialized, flexible, and reliable team responsive to NOAA and the nation. In order to meet its mission, OMAO manages and operates NOAA's fleet of 16 research and survey ships and nine aircraft.

OMAO’s research and survey ships comprise the largest fleet of federal research ships in the nation. Ranging from large oceanographic research vessels capable of exploring the world’s deepest ocean to smaller ships responsible for charting the shallow bays and inlets of the United States (U.S.), the fleet supports a wide range of marine activities including fisheries research, nautical charting, and ocean and climate studies.

Administrative, engineering, maintenance, and logistical support for the NOAA fleet are based out of either the MOC-P or the Marine Operations Center-Atlantic (MOC-A). The MOC-P is in Newport, Oregon and the MOC-A is in Norfolk, Virginia. Although a few NOAA ships are berthed at the MOC-P or MOC-A facilities, for efficiency and continuance of operation, a majority of NOAA ships are strategically berthed at locations closer in proximity to their dedicated or primary mission support areas.

NOAA proposes to recapitalize property and facilities operated by its OMAO at their MOC-P Ketchikan Port Facility in the city of Ketchikan in the southeast region of Alaska (Figure 1-1). The Ketchikan Port Facility is a dedicated homeport for the NOAA Ship *Fairweather* and may temporarily support other OMAO MOC-P vessels, or by arrangement, vessels managed by other agencies or entities. The existing NOAA facilities are currently unable to fully support the berthing of vessels or staging for cruises or missions carried out by OMAO. Proposed actions to recapitalize the facility are described in Section 1. NOAA has tentatively identified physical and operational design requirements for the Ketchikan Port Facility for upland and in-water environments. Prior to implementing proposed or alternative actions, NOAA will select a design/build contractor through its source selection process and award a contract in Fiscal Year 2021.

1.1.2 Background

OMAO operates and maintains its MOC-P Ketchikan Port Facility at 1010 Stedman Street in the city of Ketchikan, Alaska (Figure 1-2). The facility was acquired to serve as the dedicated homeport for the NOAA Ship *Fairweather* in support of its primary mission to conduct surveys to provide updates to nautical charts and other hydrographic products. This data enables accurate mapping of the continental shelf in the Arctic and bathymetry for safe navigation throughout the North Pacific. In addition to

supporting marine navigation, *Fairweather*'s data is also used for marine ecosystem studies, fisheries habitat mapping, and ocean research.

Although Ketchikan Port Facility was acquired as the NOAA Ship *Fairweather*'s dedicated homeport and berthing facility, the *Fairweather* and other vessels have been unable to berth at the facility for several years due to deteriorating or obsolete upland and in-water conditions. In 2008, NOAA condemned its wooden approach trestle and wooden pier leading out to the concrete waterfront pier as unsafe due to disrepair of existing wooden pier piles and structural support members. Due to this deficiency and OMAO being unable to use the Ketchikan Port Facility as a ship berthing location, the *Fairweather* has been temporarily using the nearby Coast Guard Station Ketchikan pier when in Ketchikan. NOAA/OMAO is proposing to recapitalize the Ketchikan Port Facility by demolishing obsolete facilities; regrading upland areas; and upgrading or replacing necessary in-water, over-water, and upland structures and infrastructure.

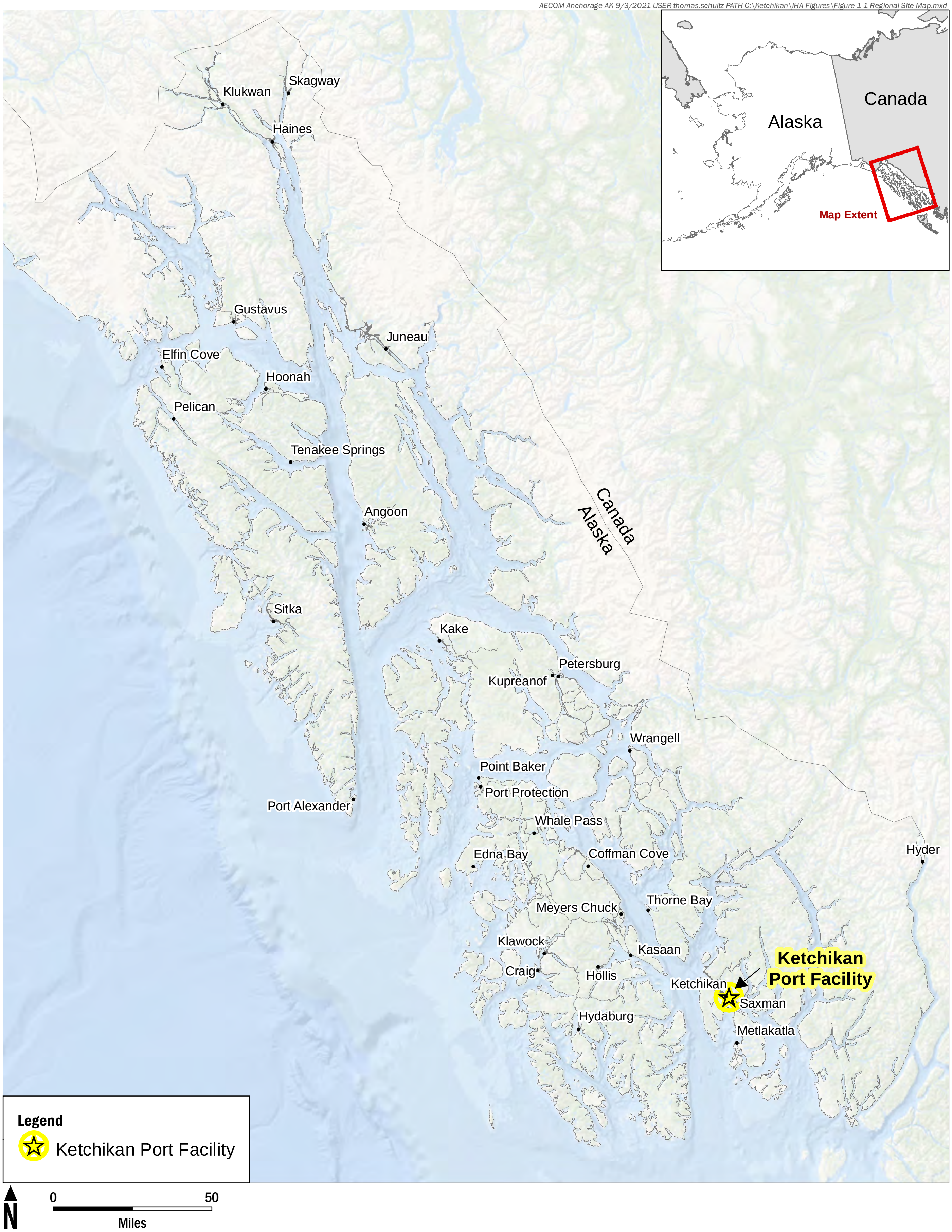
1.2 Proposed Action

NOAA/OMAO is proposing to recapitalize its MOC-P Ketchikan Port Facility to reestablish homeport operations and maintenance functions for the NOAA Ship *Fairweather* and other vessels. The Proposed Action would include the removal and appropriate disposal of unused or obsolete structures and infrastructure, in both a 77,000-square-foot upland area and within 102,000 square feet of the in-water area, all owned by NOAA. Unnecessary upland structures and remnant infrastructure associated with prior uses of the property will be removed. Upland structures critical to OMAO include the existing office and warehouse buildings. Other areas will be razed, graded, and paved for parking and vehicle circulation. Most existing in-water structures, including pier, access trestle, and mooring dolphins present above and below the water surface, are inadequate and would be removed. The in-water structures would be replaced by adequately sized and structurally sound elements necessary for berthing, preparing, and maintaining vessel operations. Details regarding NOAA's actions for implementing the proposed recapitalization project are provided in Section 1.

1.2.1 Purpose and Need

The existing facilities at the Ketchikan Port Facility are inefficient to berth the Ship *Fairweather*; the in-water pier, access trestle, and mooring dolphin infrastructure are in disrepair and have been closed to berthing or staging of vessels since 2008. The existing pier is undersized with severe deterioration of timber piles; the bracing for the trestle and pier have made them unsafe for use. Consequently, the NOAA Ship *Fairweather* has been without a dedicated Alaskan homeport facility and is wintering at the MOC-P facility in Newport, Oregon.

The purpose of the Proposed Action to recapitalize the property and facilities operated by its OMAO at its existing Ketchikan Port Facility to enable OMAO to provide critical management and operational and logistical support to the NOAA Ship *Fairweather* and intermittently to other NOAA and non-NOAA vessels.



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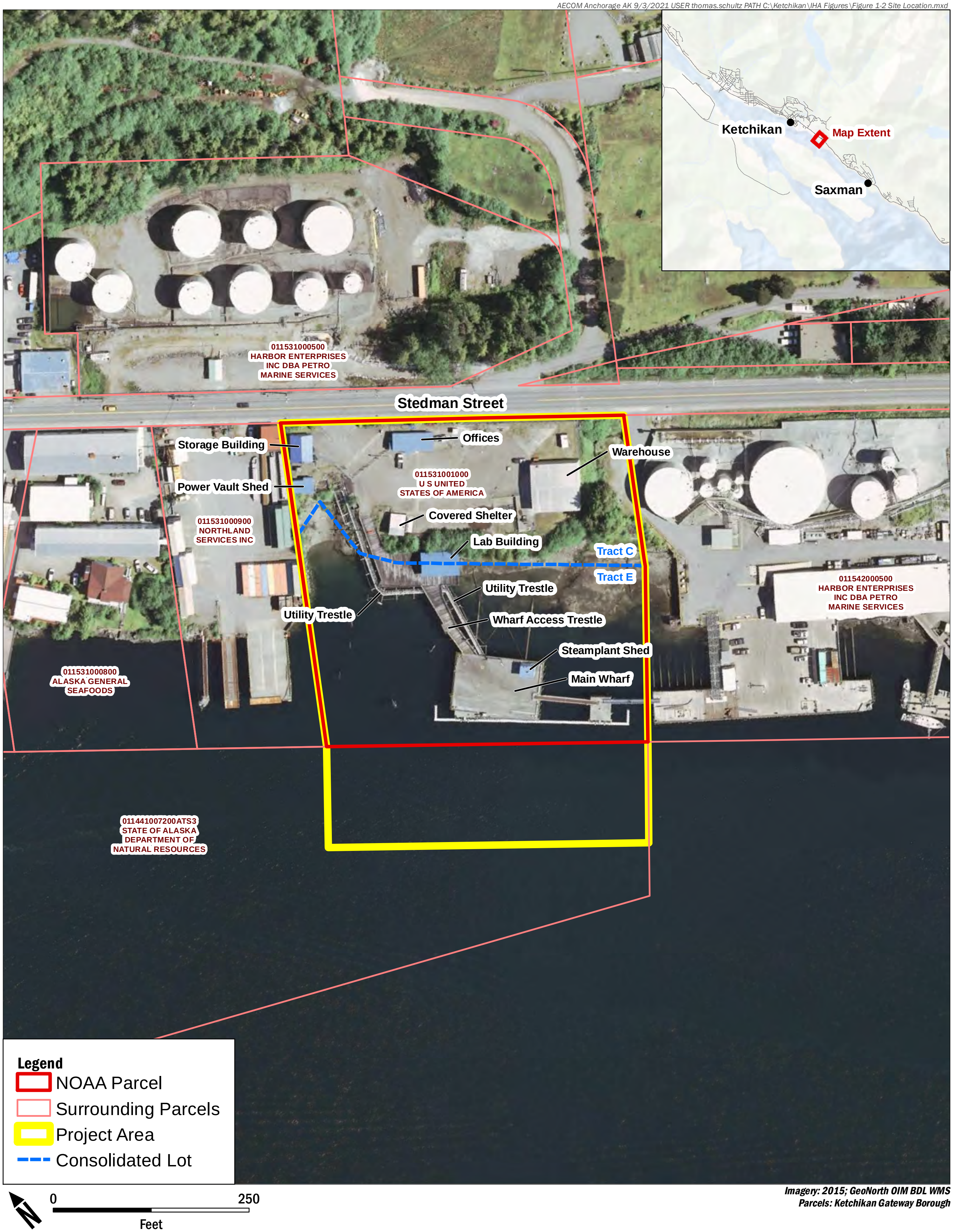
INCIDENTAL HARASSMENT AUTHORIZATION

REGIONAL SITE MAP

Figure 1-1



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INCIDENTAL HARASSMENT AUTHORIZATION

SITE LOCATION

Figure 1-2

The need for the Proposed Action is to meet the congressional mandate of the Frank LoBiondo Coast Guard Authorization Act of 2018 (Public Law 115-282), including Section 1003, Homeport of Certain Research Vessels, subpart (a) Acceptance of Funds Authorized. This subpart states, as mandated:

> The Secretary of Commerce may accept non-Federal funds for the purpose of the construction of a new port facility, including obtaining such cost estimates, designs, and permits as may be necessary to facilitate the homeporting of the R/V FAIRWEATHER in accordance with Title II of the Departments of Commerce, Justice, and State; the Judiciary; and Related Agencies Appropriations Act, 2002 (Public Law 107-77; 115 Stat. 775) at a location that during such homeporting shall be under the administrative jurisdiction of the under Secretary of Commerce for Oceans and Atmosphere. Statute 775 specifically provides that the R/V FAIRWEATHER shall be homeported in Ketchikan, Alaska.

1.2.1 Project Location/Setting

The Proposed Action would occur on property and facilities obtained by NOAA in 2004 and operated by OMAO as its existing Ketchikan Port Facility at 1010 Stedman Street in the city of Ketchikan, Ketchikan Gateway Borough, Alaska (Figure 1-1). The geographical coordinates of the 4.11-acre property are 55° 20' 04.30" North; 131" 37' 46.89" West, based on the North American Datum of 1983 (NAD83).

The property, formerly a fuel transfer dock and warehouse area owned and operated by the Tesoro Refining and Marketing Company (Tesoro), is composed of a portion of Tract C, U.S. Survey Number (No) 1381, consisting of land above the meander line at the Tongass Narrows, and a portion of Tract E, City of Ketchikan Tidelands Subdivision, Tidelands Addition to Survey Number 1381. It is in an area zoned as Heavy Industrial with approximately 410 linear feet of submerged water frontage.

Except for areas adjacent to and below the high tide line (HTL), the majority of the upland property is covered with asphalt or cement and various structures.

1.2.2 Proposed Upland Actions

Nearly all the existing OMAO facilities and assets developed at its Ketchikan Port Facility would be affected. Proposed actions upland of the HTL elevation include:

- Corrugated metal warehouse building (3,600 square feet)—to remain in use with upgrades to replace the existing roof and to install new windows
- Prefabricated office building (1,200 square feet)—to be removed and replaced (details of the new office building are provided below)
- Aluminum-sided storage building (900 square feet)—to be removed
- Aluminum-sided electrical power vault building (383 square feet)—to be removed
- Fuel/oil spill catchment shelter (832 square feet)—to be removed, graded, and paved
- Shoreside laboratory building (1,200 square feet)—to be removed
- Asphalt paved and unpaved areas for circulation, parking and outdoor storage—to be removed, graded and paved with asphalt
- Buried remnant infrastructure (e.g., fuel pipelines and pumps and abandoned utility conduit)—to be removed
- Existing utility infrastructure—to be rerouted on site, as needed
- Fencing and gates—to be removed and replaced
- New single story, pre-engineered metal office building (approximately 2,600 square feet) on a concrete pad to include six offices, two bathrooms, conference room, and light storage—to replace the existing prefabricated office building
- New cast in place concrete transfer bridge abutment (approximately 40 feet long and tapering from approximately 55 feet wide at the onshore end to approximately 35 feet at the offshore end)
- New concrete boat launch ramp (approximately 160 feet by 18 feet) of which approximately half would be a cast in place concrete apron and half of pre-cast concrete panels, supported on mound of shot rock fill with armor rock protection.

The remaining fenced grounds of the NOAA property would be regraded and paved to accommodate up to 40 parking spaces, typically used during vessel missions by NOAA personnel. The total upland impervious area is approximately 38,180 square feet. A drainage feature receiving surface water flows from higher elevations and culverts adjacent to and under Stedman Street emerges above ground and flows to Tongass Narrows at the most southerly portion of the Ketchikan Port Facility property. This surface drainage feature within the NOAA property but outside of the existing NOAA security fence would not be altered as part of the Proposed Action.

Remnant fuel lines and upland utilities—both buried and overhead—would be removed and utility conduit rerouted to connect with public utility service lines immediately off site. These service lines include electrical power, potable water, firefighting utilities, sewer, and telecommunications. A buried sewer-holding tank would be relocated farther upland on the property, requiring excavation of up to 8 feet for removal and installation of a replacement tank. Two existing fuel tanks and appurtenances would be salvaged. Concrete and other nonhazardous materials would be stockpiled for disposal to a regional landfill.

Upland demolition and construction activities are anticipated to be undertaken using an excavator, forklift, and 50-ton crane.

1.2.3 Proposed In-Water Actions

Nearly all of the existing in-water infrastructure would be removed, including the following in-water and over-water structures and assets:

- Remnant wooden access trestle and parallel utility trestle and supporting piles
- Main pile-supported pier structure (9,000 square feet) and supporting piles
- Steam plant (boiler) shed on the pier
- Three concrete-filled steel mooring dolphins
- Two single piles extending above the water surface
- Steel pipe struts and cable braces
- Floating cylindrical fendering (250 linear feet); this may be saved or salvaged by contractor

The following in-water infrastructure would be retained and/or salvaged:

- Concrete/steel mooring platform (750 square feet) and breasting dolphin with fender—to be retained; connecting metal catwalks to be salvaged.

In-water work would be performed using equipment based on a floating barge or from the shore, as needed. In-water concrete and other nonhazardous materials to be removed would be stockpiled for disposal to a regional landfill. An estimated 100 to 200 remnant piles would be removed. Wood piles would be choked and pulled by vibratory methods; if piles incur breakage or splintering during the removal process, the pile would be cut at or about 2 feet from the bottom. Steel piles would be cut at or near the mudline using a torch or plasma cutter for cuts above low water. For cuts made below low-water, or if the piles are concrete-filled, a wire saw would be used.

An approximately 240-foot long and 50-foot wide (48-foot wide pier with 2-foot fendering) floating replacement pier would replace the existing pier and its supporting piles. The floating pier would be secured and stabilized by 10 steel piles, each 24 inches in diameter, and accessed via a single, 144-foot long and 17-foot wide steel, truss-framed transfer bridge. The transfer bridge would be supported by a bridge support float adjacent to the pier and hinged to the shoreline cast in place concrete abutment. The 24-foot by 22-foot bridge support float would be secured by four additional 24-inch diameter steel piles. Replacement mooring dolphins and fenders for mooring would be installed. Ship utilities would be extended dockside attached to the transfer bridge (60 percent design drawings for the project are provided in Appendix A).

A small boat dock, approximately 90 feet long by 14 feet wide, would be installed and connected to the floating dock by an aluminum gangway approximately 40 feet long and 5 feet wide. Four piles are required to support this structure.

The small boat launch ramp proposed at the northern portion of the NOAA-owned shoreline would be supported on a raised, rip-rap protected mound with side slopes of 2:1 (Horizontal:Vertical) and a footprint of approximately 200 feet by 70 feet wide.

Installation of the new steel piles is anticipated to be undertaken using a barge mounted down-the-hole (DTH) system and vibratory hammer. Piles would be embedded into socket holes created by the DTH in bedrock to a minimum depth of 20 feet. The last foot of each pile would be “proofed” using an impact pile driver that is anticipated will require approximately 5 to 10 blows per pile based on the contractor’s experience at other pile-driving sites in the Ketchikan area.

1.2.4 Proposed Utilities and Other Services

NOAA would install or upgrade the utility services and security fencing. Utility services would include water, sewer, telephone, communications/cable, electrical, waste disposal, and janitorial services. Utility services will be extended to on-site structures and to berthing stations at the large vessel pier and small craft dock.

Existing active and abandoned electric, telephone, fueling, sewer, water, and communications conduits, as well as any other obsolete improvements or fixtures (lighting and fencing), will be removed to accommodate the accepted revised layout and design. This may include demolition of existing structures or substructures.

Anticipated electrical requirements would include: two ship power receptacles for 480 volts, 400 amperes, three-phase services; at least one industrial power receptacle for three-phase, four wire 277/480 volt, 200 amperes, and three three-wire 120/240 volt 20 amperes services; and at least three 110 volt AC ports for the ship service at each of the berths.

In addition to the proposed actions mentioned above, NOAA would install a self-contained backup power generator within a sound-attenuation enclosure and a double-walled diesel fuel supply for continuation of electrical power for emergency lighting and electronics during infrequent power outages. This unit would also be used for short periods during monthly preventative maintenance.

Telecommunication terminals would include two telephones, four cable runs, and eight single mode fiber optic cables with dual pathways per local service provider, to provide redundancy that does not interrupt service or act as a single point of failure.

Potable water service and expanded sewer disposal infrastructure will be provided on site and extended to berthing stations and adjacent connections with local service providers along Stedman Street. Bilge water would be separated from oily waste, which would be stored on board in a tank until it could be pumped on shore to a truck for disposal.

Security services and infrastructure will consist of the replacement of existing perimeter security fencing, use of electronic Common Access Card reader at the entry gate, and prearranged access for visitors and vendors. Temporary access will be provided for local construction contractors as well as those arriving from outside Southeast Alaska.

2.0 DATES, DURATION, AND REGION OF ACTIVITY

The dates and duration of such activity and the specific geographical region where it will occur.

2.1 DATES AND DURATION

No in-water work would begin until the NOAA has received all required permits and approvals. In-water work including pile removal and placement is anticipated to occur for 48 days between February 2022 through December 2022. Therefore, NOAA is requesting authorization from February 1, 2022 to January 31, 2023.

2.2 GEOGRAPHIC REGION OF ACTIVITIES

The project is in the city of Ketchikan, Ketchikan Gateway Borough, on Revillagigedo Island and the east shore of the Tongass Narrows waterway. The geographical coordinates of the 4.11-acre property are 55° 20' 04.30" North; 131" 37' 46.89" West, based on the NAD83.

The region consists of a coastal mountain range that stretches from northern British Columbia to Skagway, Alaska. The natural topography of the local area largely consists of moderately steep slopes trending toward the Tongass Narrows waterway. In this region, the Tongass Narrows is part of Southeast Alaska's Inside Passage where it splits into two channels by Pennock Island. The eastern side is bound by Revillagigedo Island and the western side by Gravina Island. The Inside Passage is a common route for maritime traffic between the Gulf of Alaska and Puget Sound.

The Proposed Action is at the existing NOAA-owned OMAO Ketchikan Port Facility in a shoreline industrial waterfront. At this location, OMAO staff currently manage a small administrative office, warehouse, electrical building, and other upland buildings, along with an existing inoperable main pier with breasting dolphin, a derelict access trestle, and individual mooring dolphin structures. The NOAA property consists of a portion of Tract C, U.S. Survey Number 1381, that includes approximately 77,000 square feet of largely paved land above the meander line at the Tongass Narrows, of which approximately 1,700 square feet consists of rocky shoreline. The NOAA property also includes an adjacent portion of Tract E, City of Ketchikan Tidelands Subdivision, Tidelands Addition to Survey Number 1381 that includes 102,000 square feet of land. It is situated in an area zoned as Heavy Industrial, with approximately 410 linear feet of submerged water frontage.

The general vegetation of the Tongass Narrows region includes forested areas of Sitka spruce (*Picea sitchensis*) and mountain hemlock (*Tsuga mertensiana*) with patches of alder (*Alnus* spp.) shoreline grasses and forbs in some locations. Except for areas adjacent to and below the HTL, about 90 percent of the property is covered with asphalt or cement. In the nearshore marine environment are rockweeds (*Fucus* spp.) and kelp (*Nereocystis* spp.).

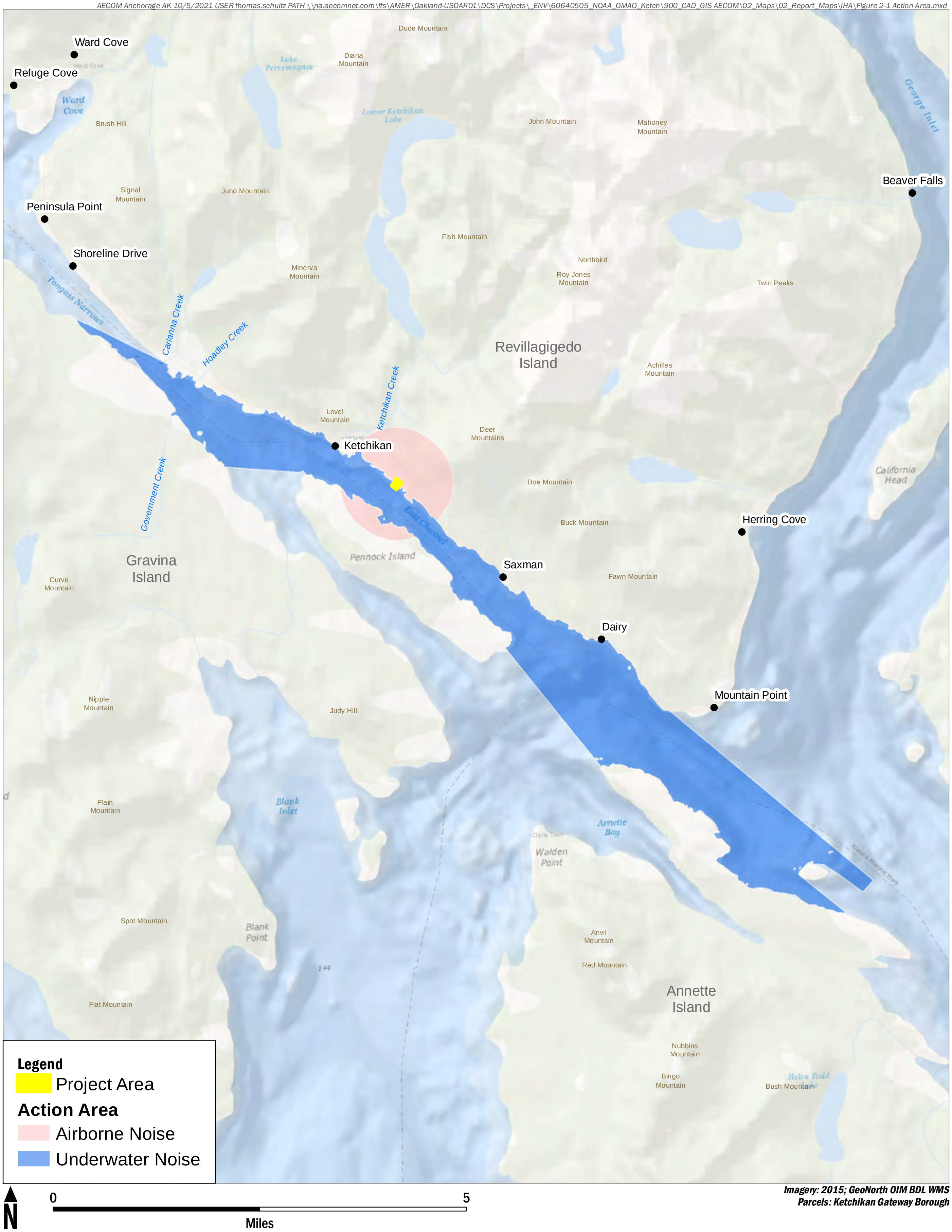
Above the HTL, much of the underlying silty sand, gravel, and rock were removed and the facilities and pavement placed directly on schist bedrock. Most of the onshore portion of the site consists of imported shot (crushed) rock fill. No previously undisturbed native soils exist at the site. The depth to bedrock underlying the imported fill varies from 1 to 2 feet in the southern half of the site, and up to 6.5 feet in the northern half of the site. Offshore marine sediments are reported to be minimal, with sediment cover depths progressively increasing away from the shoreline. Marine sediment depths overlying bedrock reportedly range from 4 to 5 feet and consist of coarse sand, rock fragments, and shells (Bristol 2003).

Ongoing vessel activities throughout Tongass Narrows waterway, land-based industrial and commercial activities, and regular aircraft operations result in elevated in-air and underwater sound conditions in the area. Sound levels likely vary seasonally, with elevated levels during summer when the tourism and fishing industries are at their peaks. The shoreline and underwater portions of the area are highly modified by existing dock structures and past dredging.

2.3 ACTION AREA

The action area includes all areas affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR Part 402.02). This area is the geographic extent of the physical, chemical, and biological effects (zones of impact) resulting from the project, including direct and indirect effects, and effects of interrelated and interdependent activities. This section briefly provides the extent of impacts and a more detailed analysis, which includes a description of noise and marine mammal injury; disturbance thresholds are provided in Section 6.

The action area encompasses project area as well as the spatial extent for underwater noise (12 kilometers) and airborne noise (1 kilometer). The complete action area, terrestrial and aquatic portions, is shown in Figure 2-1. An Underwater Noise Technical Memorandum prepared for installation/removal of piles at Ketchikan Port Facility is provided in Appendix B. The action area is also described in the biological assessment provided in Appendix C, and the essential fish habitat (EFH) assessment provided in Appendix D.



Imagery: 2015; GeoNorth OIM BDL WMS
Parcels: Ketchikan Gateway Borough

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INCIDENTAL HARASSMENT AUTHORIZATION

ACTION AREA

Figure 2-1

3.0 MARINE MAMMAL SPECIES AND NUMBERS

The species and numbers of marine mammals likely to be found within the activity area.

Known distribution ranges of a number of marine mammal species, subspecies, stocks, or distinct population segments (DPSs) encompass the portion of Tongass Narrows in which the proposed project would occur. The NMFS Alaska Protected Resources Division Species Distribution mapper lists the fin whale, humpback whale, minke whale, gray whale, killer whale, Pacific white sided dolphin, harbor porpoise, Dall's porpoise, harbor seal, and Steller sea lion as species with a range that may extend into the activity area (NMFS 2021). While the fin whale is mapped as having a range extending into the activity area, there are no known sightings in Tongass Narrows, and recent IHAs issued by NMFS in the Ketchikan area have not included the fin whale (Dalheim et al. 2009; HDR 2019). Based on this information, the fin whale is not included in this application and is not discussed further. A summary of MMPA / Endangered Species Act (ESA) status, stock abundance, and potential occurrence of marine mammal species is provided in Table 3-1. Life history information for each species is provided in Section 4.

Table 3-1: Marine Mammals Potential Occurring in Waters near the Activity Area

Species	Stock (and DPS)	MMPA Status	ESA Status	Stock Abundance	Potential Occurrence
Order Cetacea					
Suborder Mysticeti (baleen whales)					
Family Balaenopteridae (rorquals)					
Humpback whale (*Megaptera novaeangliae*)	Central North Pacific Hawaii DPS	**Depleted, Strategic**	Delisted in 2016	10,103	Common
	CA/OR/WA Mexico DPS	**Depleted, Strategic**	**Threatened**	2,900	Common
Minke whale (*Balaenoptera acutorostrata*)	Alaska	Nonstrategic, Non-Depleted	Not Listed	unknown	Rare
Family Eschrichtiidae (gray whale)					
Gray Whale (*Eschrichtius robustus*)	Eastern North Pacific	Nonstrategic, Non-Depleted	Not Listed	26,960	Rare
Suborder Odontoceti (toothed whales)					
Family Delphinidae (dolphins)					
Killer Whale (*Orcinus orca*)	Northern Resident	Nonstrategic, Non-Depleted	Not Listed	302	Intermittent
	Alaska Resident			2,347	
	West Coast Transients			349	
Pacific white-sided dolphin (*Lagenorhynchus obliquidens*)	North Pacific	Nonstrategic, Non-Depleted	Not Listed	26,880	Rare
Family Phocoenidae (porpoises)					
Harbor porpoise (*Phocoena phocoena*)	Southeast Alaska Stock	Strategic, Non-Depleted	Not Listed	1,354	Infrequent

Table 3-1: Marine Mammals Potential Occurring in Waters near the Activity Area

Species	Stock (and DPS)	MMPA Status	ESA Status	Stock Abundance	Potential Occurrence
Dall's porpoise (*Phocoenoides dalli*)	Entire Alaska Stock	Protected, Nonstrategic	Not Listed	83,400	Infrequent
Order Carnivora					
Suborder Pinnipedia					
Family Otariidae (fur seals and sea lions)					
Steller sea lion (*Eumetopias jubatus*)	Eastern Stock	Nonstrategic, Non-Depleted	Delisted in 2013	43,201	Common
	Western Stock	**Depleted, Strategic**	**Endangered**	52,932	Unlikely
Family Phocidae (true seals)					
Harbor seal (*Phoca vitulina*)	Clarence Strait	Nonstrategic, Non-Depleted	Not Listed	27,659	Common

Notes:
Source: National Marine Fisheries Service marine mammal stock assessment reports at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock
DPS = Distinct Population Segment
ESA = Endangered Species Act
MMPA = Marine Mammal Protection Act
Occurrence:
Rare: Few or no confirmed sighting or the distribution of the species is near enough to the area that the species could occur there. Infrequent: Confirmed, but irregular sightings.
Intermittent: Species known to use the action area periodically but are not residents.
Common: Confirmed and regular sightings of the species.

4.0 AFFECTED SPECIES AND STATUS AND DISTRIBUTION

A description of the status and distribution, including seasonal distribution (when applicable), of the affected species or stocks of marine mammals likely to be affected by such activities.

This section describes the status, distribution, behavior, and critical habitat for the affected species/stocks of marine mammals likely to be affected by the proposed project. Discussion of species prevalence in the project area is provided in Section 6.

4.1 HUMPBACK WHALE

4.1.1 Status and Management

In 1970, the humpback whale was listed as endangered under the Endangered Species Conservation Act (ESCA) (35 Federal Register [FR] 18319). NMFS conducted a global status review and reassessed the status of humpback whales under the ESA (replaced the ESCA in 1973) (Bettridge et al. 2015). Based on that review, 14 DPSs of humpback whales were identified, and listing status revised (81 FR 62260).

In the North Pacific, five DPSs that breed in subtropical and tropical waters from Asia to Central America and migrate north to feed in highly productive North Pacific feeding grounds were identified (Bettridge et al. 2015). Whales from three of these DPSs migrate to Alaskan waters: the Mexico DPS (ESA-listed as threatened), the Western North Pacific DPS (ESA-listed as endangered), and the Hawaii DPS (delisted) (81 FR 62260). These DPSs generally represent the California/Oregon/Washington, Western North Pacific, and Central North Pacific stocks, respectively.

4.1.2 Distribution

The humpback whale is distributed worldwide in all ocean basins. Relatively high densities of humpback whales are found in feeding grounds in Southeast Alaska and northern British Columbia, particularly during summer months. Based on extensive photo identification data, NMFS has determined that individual humpback whales encountered in Southeast Alaska and northern British Columbia have a 98 percent probability of being from the recovered (delisted) Hawaii DPS and a 2 percent probability of being from the currently threatened (ESA-listed) Mexico DPS (coefficient of variation [CV]=0.03) (Wade 2021). There is a 0 percent probability that humpback whales in Southeast Alaska are from the endangered Western North Pacific DPS (Wade 2021). Intermixed DPSs are not visually distinguishable; their identity can only be determined by DNA or photo identification. Therefore, this report uses the Wade (2021) DPS ratio that assumes 98 percent of humpbacks in Southeast Alaska are from the Hawaii DPS and 2 percent are from the Mexico DPS for ESA purposes.

Humpback whales migrate to Alaska to feed after months of fasting in the low latitude breeding grounds. The timing of migration varies among individuals: most begin returning to Alaska in spring and most depart Alaska for southern breeding grounds in fall or winter. Peak numbers of humpbacks in Southeast Alaska occur during late summer to early fall, but because there is significant overlap between departing and returning whales, humpbacks can be found in Alaska feeding grounds in every month of the year (Baker et al. 1985; Straley 1990; Witteveen and Wynne 2009). There is also an apparent increase in the number of humpback whales overwintering in feeding grounds in Alaska, including reports in Ketchikan during some years in the winter (Straley et al. 2017; Liddle 2015; 84 FR 36891).

<u>Hawaii Distinct Population Segment Humpback Whale (Hawaii DPS)</u>

Humpback whales that breed around the main Hawaiian Islands were observed in summer feeding grounds throughout the North Pacific. Most of the Hawaii DPS migrates to feeding grounds in Southeast Alaska and northern British Columbia (Bettridge et al. 2015). Mark-recapture analysis of identification photographs suggests the Hawaii DPS is composed of approximately 10,103 individuals and is increasing (Calambokidis et al. 2008). A multi-strata analysis estimated the abundance of the Hawaii DPS at 11,398 individuals (CV=0.04) (81 FR 62260). As mentioned above, Wade (2021) estimated that

98 percent of the humpbacks encountered in Southeast Alaska and Northern British Columbia are from the Hawaii DPS.

Mexico Distinct Population Segment Humpback Whale (Mexico DPS)

Whales in the Mexico DPS typically breed off of Mexico and migrate to northern feeding grounds ranging from British Columbia to the western Gulf of Alaska. Given their widespread range and their opportunistic foraging strategies, Mexico DPS humpback whales may be in the vicinity during the proposed project activities. In the final rule changing the status of humpback whales under the ESA (81 FR 62260), the abundance of the Mexico DPS was estimated to be 2,900 individuals (CV=0.06) with an unknown trend. Note that only a portion of the Mexico DPS migrates to Alaska for feeding; the probability that a whale encountered in Southeast Alaska and northern British Columbia is from the Mexico DPS is 2 percent, as mentioned above (Wade 2021).

4.1.3 Site-Specific Occurrence

Humpback whales occur frequently in Tongass Narrows and the adjacent Clarence Strait during summer and fall months to feed. Data on the distribution suggests that both the Mexico DPS and Hawaii DPS of humpback whales may be present in the Tongass Narrows area. Because humpback whale individuals of different DPS (natal) origin are generally visually indistinguishable, the frequency of occurrence is estimated using the DPS ratio (noted above) (Wade 2021).

The Alaska Department of Fish and Game reports that humpback whales occur in Clarence Strait year-round, with numbers peaking in May and June and falling off from July to September (ADF&G 2020). Local anecdotal reports indicate that humpback whales are becoming more common and abundant in Tongass Narrows during August and September, which is consistent with research in Southeast Alaska.

Dahlheim et al. (2009) found significant difference in the mean group size of humpback whales in Southeast Alaska from year to year and also found that the average group size was largest in the fall (September through October). Numbers of humpback whales peak in the summer and fall and are more uniformly distributed throughout the region. Humpback whales were observed in Clarence Strait every year, although less frequently than other areas of Southeast Alaska (Dahlheim et al. 2009).

The average group size during the fall surveys was two whales. During the spring months, humpback whales tend to congregate in areas outside of the Ketchikan area, such as Lynn Canal and Fredrick Sound (Dahlheim et al. 2009). Local reports of humpback whale group size in Tongass Narrows is similar, with the typical size being between one and three whales. Local residents report humpback whales in Tongass Narrows anywhere from once a month to several times weekly. There have also been several instances where whales have been observed more frequently, including a single whale that was observed by a ferry terminal employee every few days for several months (85 FR 673).

The City of Ketchikan Rock Pinnacle project reported one humpback whale sighting of one individual during the project (December 2019 through January 2020) in the Level B behavioral harassment zone[1]. The sighting was 55 minutes post-blast and not recorded as a take (Sitkiewicz 2020).

Marine mammal monitoring and sighting data in the Tongass Narrows for the Alaska Department of Transportation and Public Facilities (ADOT&PF) Gravina Access project from October 2020 to February 2021 and May 2021 to July 2021 resulted in mean group size of 1.3 with a range of 1 to 4 humpback whales. Sighting at the ADOT&PF Ward Cove project resulted in similar data with a mean group size of 1.7 and range of 1 to 6 humpback whales.

In the Biological Opinion issued for the ADOT&PF ferry terminal project IHA application, NMFS determined that up to two humpback whales may be present twice per week, based on a year-round project and the fluctuating seasonal abundance (NMFS 2019a). Given that the action area for this project encompasses a similar portion of Tongass Narrows and is consistent with local anecdotal and survey observations together with the NMFS determination, this estimate of up to two humpback whales twice

[1] The Level B behavioral harassment zone is the area which underwater noise generated from pile installation is greater than the sound thresholds established for marine mammal behavioral disturbance. The different zones of impact for this project are described in Section 6.

per week is a conservative estimate of humpback whale presence in the action area. Therefore, these estimates of distribution in the action area are used in this application.

4.1.4 Humpback Whale Critical Habitat

The final rule to designate critical habitat for the endangered Western North Pacific distinct population segment (DPS), the endangered Central America DPS, and the threatened Mexico DPS of humpback whales was published on April 21, 2021 (86 FR 21082) and was effective on May 21, 2021. The final rule excluded Southeast Alaska Unit 10 which includes the proposed action area.

Therefore, for the purpose of the application, critical habitat for humpback whales is not considered further.

4.2 Minke Whale

4.2.1 Status and Management

The minke whale is protected under the MMPA but is not listed as a strategic or depleted species. Minke whales are also not listed as threatened or endangered under the ESA. No abundance estimates are available for minke whales (Muto et al. 2019). The minke whale's population status is considered stable and they are the most abundant rorqual, or "great whale," in the world (NMFS 2020e).

4.2.2 Distribution

Minke whales are widely distributed throughout the northern hemisphere and are found in both the Pacific and Atlantic oceans. Minke whales in Alaska are considered migratory. During summer months these whales are typically found in the sub-Arctic and during winter months found near the equator (NMFS 2020e).

4.2.3 Site-Specific Occurrence

There are no known occurrences of minke whales within the action area. Since their ranges extend into the project area and have been observed in southeast Alaska, including in Clarence Strait (Dahlheim et al. 2009), it is possible the species could occur near the project area. During surveys, all but one encounter was with a single whale and, although infrequent, minke whales were observed during each of the seasons surveyed (spring, summer and fall). For the Ketchikan Berth IV project, NMFS estimated that one group of three whales may be present in the Tongass Narrows area once every four months (83 FR 22009). No minke whales where reported during the City of Ketchikan Rock Pinnacle Blasting Project (Sitkiewicz 2020).

4.3 Gray Whale

4.3.1 Status and Management

The gray whale is protected under the MMPA but is not listed as a strategic or depleted species under the MMPA (Carretta et al. 2019). The gray whale is not listed as threatened or endangered under the ESA. There are two stock of gray whales, Eastern North Pacific (ENP) and the Western North Pacific. The ENP stock gray whale was listed as endangered under the ESA in 1970 (35 FR 18319) and delisted in 1994 due to a successful recovery (59 FR 31094). The ENP stock grey whale is protected under the MMPA but is not listed as a strategic or depleted species (NMFS 2020f). The minimum population estimate for this stock is 25,849, an increase of 21% since 1988 (Carretta et al 2019; NPFMC 2009).

4.3.2 Distribution

Gray whales are distributed throughout the North Pacific Ocean and are found primarily in shallow coastal waters (NMFS 2020f; Carretta et al 2019). Gray whales in the ENP stock range from the southern Gulf of California, Mexico to the arctic waters of the Bering and Chukchi seas. Gray whales are generally solitary creatures and travel together alone or in small groups (NMFS 2020f). The gray whale was once abundant throughout the northern hemisphere but was extinct in the Atlantic Ocean by the early 1700s. Today gray whales are only commonly found in the North Pacific with single sightings reported in the Mediterranean Sea and off Namibia.

Most whales in the eastern population spend the summer and fall months feeding in the Chukchi, Beaufort, and northwestern Bering seas (Carretta et al 2019). A small number of whales spend summer and fall feeding along the Pacific coastline from Kodiak Island, Alaska to northern California.

4.3.3 Site-Specific Occurrence

Gray whales are rare in the action area and unlikely to occur in Tongass Narrows. Due to the large Level B Harassment zone and the overlap with the species' range, presence in the action area cannot be discounted. Therefore, it is possible for gray whales to be present in the Level B Harassment zone during construction. Gray whales were not observed during the Dahlheim et al. (2009) surveys of Alaska's inland waters with surveys conducted in the spring, summer and fall months. The presence of gray whales in the area is highly seasonal and occasional late fall/early winter sightings are recorded. Gray whales are generally observed in groups of two (84 FR 36891). No gray whales were reported during the City of Ketchikan Rock Pinnacle Blasting Project (Sitkiewicz 2020).

4.4 Killer Whale

4.4.1 Status and Management

NMFS considers three stocks of killer whales to occur in southeast Alaskan waters, which may occur separately or concurrently within the project area. These stocks are the Eastern North Pacific/Alaska Resident stock (2,347 individuals), Eastern North Pacific/Northern Resident stock (302 individuals), the West Coast Transient stock (349 individuals) (Muto et al. 2021). These stocks represent two of the three ecotypes of killer whales occurring within the North Pacific Ocean, resident (forages on fish) and transient (forages primarily on marine mammals). However, NMFS is evaluating new genetic information that may result in a revision of the stock structure (Muto et al. 2019). The killer whale is protected under the MMPA, but none of these stocks are listed as a strategic or depleted species under the MMPA nor listed as threatened or endangered under the ESA.

The population trend for the Northern Resident stock has shown an average annual increase of 2.2 percent over a 40-year time period ending in 2014; however, growth rates have slowed from 5.1 percent in 2014 to -0.3 percent in 2018 (Muto et al. 2019).

4.4.2 Distribution

Killer whales are found in every ocean of the world (NMFS 2020d) and are the most widely distributed marine mammal (Allen and Angliss 2014). Killer whales occur commonly within the waters of the project area and are observed within the project area several times annually. Occurrences could include members of one or more of the following designated stocks occurring in the project area: Eastern North Pacific/Alaska Resident, Eastern North Pacific/Northern Resident, and West Coast Transient.

The Dahlheim et al. surveys observed resident and transient killer whales in all major waterways during all seasons surveyed (spring, summer, and fall) and resident pods were frequently encountered in Clarence Strait. The mean group size observed in these surveys ranged from 16 to 70 whales, with the typical group size between 20 and 40 whales. Group size was not found to differ significantly by year or season.

4.4.3 Site-Specific Occurrence

Killer whales have been observed in Tongass Narrows year-round and are most common during the summer Chinook salmon (*Oncorhynchus tshawytscha*) run (May-July). During the Chinook salmon run, Ketchikan residents have reported pods of 20-30 whales and during the 2016/2017 winter a pod of five whales was observed in Tongass Narrows (84 FR 36891). NMFS estimated killer whale presence within Tongass Narrows at one pod per month (HDR 2019). While killer whales can be common, they are not known to linger in Tongass Narrows or other similar environments. During the City of Ketchikan's marine mammal monitoring for the Rock Pinnacle Removal project in December 2019 and January 2020, no killer whales were observed. Comparatively, the daily work durations were shorter than anticipated for this project.

Marine mammal monitoring and sighting data in the Tongass Narrows for the ADOT&PF Gravina Access project from October 2020 to February 2021 and May 2021 to July 2021 resulted in mean group size of 4.7 with a range of 2 to 8 killer whales. Sighting at the ADOT&PF Ward Cove project resulted in similar data with a mean group size of 3.5 and range of 2 to 5 whales.

4.5 Pacific White-Sided Dolphin

4.5.1 Status and Management

The Pacific white-sided dolphin is protected under the MMPA but is not listed as a strategic or depleted species (Carretta et al. 2019). The most recent minimum population estimate is 26,880 dolphins. This abundance estimate is greater than 8 years old and the minimum population size is considered unknown. No reliable information is available on the population trend of the Pacific white-sided dolphin (Muto et al. 2019).

4.5.2 Distribution

There are three stocks of the Pacific white-sided dolphin in U.S. waters. Only the North Pacific stock is found within the action area. The Pacific white-sided dolphin is distributed throughout the temperate north Pacific Ocean, north of Baja California to Alaska's southern coastline and Aleutian Islands. The North Pacific Stock ranges from Canada into Alaska (Muto et al. 2019).

Pacific white-sided dolphins are generally distributed in deep offshore waters and occur seasonally in some inland waters of Alaska. They also have been observed in Clarence Strait (Jefferson et al. 2015; Dahlheim et al. 2009; 84 FR 36891). Dahlheim et al. (2009) encountered Pacific white-sided dolphin on numerous occasions within Clarence Strait. The average group size varied widely and encounters were infrequent enough to determine the average group size. The majority of the Pacific white-sided dolphins encountered during Dahlheim et al. (2009) surveys were in the southern portion of Southeast Alaska, including in the Clarence Strait area. Numbers were highest in the spring and lowest in the fall. However, no observations (surveys) were conducted during winter months (Dahlheim et al. 2009).

4.5.3 Site-Specific Occurrence

There were no sightings of Pacific white-sided dolphins during the City of Ketchikan Rock Pinnacle Blasting Project during monitoring surveys conducted in December 2019 and January 2020 (Sitkiewicz 2020). In the project area, it is estimated that an average group size is approximately 20 dolphins (84 FR 36891).

4.6 Harbor Porpoise

4.6.1 Status and Management

The Southeast Alaska stock of harbor porpoise is not designated as depleted under the MMPA nor listed as threatened or endangered under the ESA. It is considered Strategic due to human-induced mortality (Muto et al. 2019).

4.6.2 Distribution

In the eastern North Pacific Ocean, the harbor porpoise ranges from Point Barrow, along the Alaska coast to Point Conception, California. NMFS currently acknowledges three stocks of harbor porpoise within this range (Muto et al. 2019), with the one encompassing the action area, the Southeast Alaska stock, ranging from Dixon Entrance to Cape Suckling. This stock is estimated to include 1,354 individuals based on 2010-2012 surveys; however, it is important to note that this minimum population estimate is negatively biased (Muto et al. 2019). When corrected for user bias, estimated corrected abundance increased to 11,146 harbor porpoises in the coastal and inside waters of Southeast Alaska (Hobbs and Waite 2010 as cited in Muto et al 2019). The current population trend is unknown. Data analyzed from Dahlheim et al. surveys between 1991 and 2010 suggested a decline of 2 to 4 percent; however, when data from 2011 and 2012 were included in the analysis, the decline was not significant (Muto et al. 2019). As data are now nearly a decade out of date, the current population trajectory is uncertain.

The harbor porpoise frequents nearshore waters and coastal embayments throughout their range, including bays, harbors, estuaries, and fjords less than 650 feet (198 m) deep (NMFS 2020c).

Dahlheim et al. (2015) reported that the highest densities of harbor porpoise were consistently found in two areas: 1) near Glacier Bay and Icy Strait and 2) around Zamobo Island/Wrangell. It was estimated that the abundance of harbor porpoises was 75 to 88 percent throughout the study area[2] in the inland waters of Southeast Alaska.

4.6.3 Site-Specific Occurrence

In the Clarence Strait to Ketchikan area the average expected group size of harbor porpoise during the summer ranged from 0 to 1.61 animals and the density ranged from 0 to 0.02 porpoises per kilometer, depending on the survey period (Dahlheim et al. 2009). The Dahlheim et al. (2009) surveys that occurred in the spring, summer and fall months found no evidence of seasonal changes in harbor porpoise abundance.

There are few reports of harbor porpoises within Tongass Narrows and harbor porpoises typically avoid areas with high levels of vessel activity and noise, such as most of the action area. Freitag (2017, as cited in 83 FR 22009) reports that harbor porpoises occur more commonly on the outside of Gravina Island and occasionally transit through Tongass Narrows year-round. During marine mammal monitoring for the Ketchikan Berth IV expansion project, harbor porpoises were observed zero to once per month (Freitag et al. 2017 as cited in 83 FR 22009).

The recent Ketchikan Rock Pinnacle Removal project's Level B harassment zones encompassed is similar to the Level B harassment zone calculated for this project and estimated that one group of five harbor porpoises may be exposed once every week of the project. The marine mammal monitoring associated with this project did not observe any harbor porpoise during surveys conducted in December 2019 and January 2020 (Sitkiewicz 2020).

Marine mammal monitoring and sighting data in the Tongass Narrows for the ADOT&PF Gravina Access project from October 2020 to February 2021 and May 2021 to July 2021 resulted in no observation of harbor porpoises. Sighting at the ADOT&PF Ward Cove project resulted in observations with a mean group size of 5 and range of 1 to 10 porpoises.

4.7 Dall's Porpoise

4.7.1 Status and Management

The Dall's porpoise is not designated as a depleted or strategic species under the MMPA, nor are they listed as threatened or endangered under the ESA. Only one stock of Dall's porpoise is currently recognized in Alaskan waters, the Alaska stock, with an estimated abundance of 83,400, although this estimate is outdated (Muto et al. 2019). While the Dall's porpoise is generally considered abundant, there is insufficient data on population trends to determine whether the population is stable, increasing or decreasing (NMFS 2020b).

4.7.2 Distribution

Dall's porpoises are widely distributed in the North Pacific Ocean, usually in deep oceanic waters (>600 ft/183 m), over the continental shelf or along slopes (NMFS 2020c; Muto et al. 2019). They can be found along the west coast of the U.S. ranging from California to the Bering Sea in Alaska (NMFS 2020c).

Dall's porpoise is typically in waters in excess of 600 feet (183 meters) deep, favoring pelagic and inland waters. Most of the waters in the action area are shallower with the exception of just south of Pennock Island where a small area has depths just over 600 feet (185 meters) and other small areas where depths reach up to 550 feet (170 meters). Dall's porpoise may also be found in habitats not typically used by this

[2] The study area included all major waterways from the Glacier Bay area to lower Clarence Strait. These included Icy Strait, Lynn Canal, Chatham Strait, Stephens Passage, Fredrick Sound and Sumner Straight, all of which were surveyed each year between 1991 and 2007. Many smaller bays, inlets and passages adjacent to the previously listed major waterways were surveyed when time permitted but not every year.

species including bays, shallow water, and nearshore areas Moran et al. (2018b). This species also has a tendency to bow-ride with vessels and both commercial and recreational vessels are prevalent in the action area.

4.7.3 Site-Specific Occurrence

Dall's porpoises have exhibited strong seasonal patterns with the highest abundance in the spring (April/May), decreasing in the summer (June/July/August) and reaching the lowest in fall (Muto et al. 2019). While Dall's porpoises are more likely to be present in the action area during the spring, there are reports of sightings in Tongass Narrows during the fall and winter months (84 FR 36891).

During the Dahlheim et al. (2009) surveys, Dall's porpoises were encountered consistently in Clarence Strait during the spring, summer and fall months, including concentrations of animals in Clarence Strait. Group sizes were generally small, under 5 individuals, with a mean group size of 2.6. However, group size in the Clarence Strait/Tongass Narrows area is reported between 10 and 15 animals (Freitag 2017 as cited in 83 FR 22009, Solstice 2018 as cited in 84 FR 36891).

During the City of Ketchikan's marine mammal monitoring for the Rock Pinnacle Removal project in January of 2019, no Dall's porpoises were observed in the maximum extent of the Level B harassment zone 5 kilometers for blasting activities. This zone was smaller than that of the proposed project (Sitkiewicz 2020).

Marine mammal monitoring and sighting data in the Tongass Narrows for the ADOT&PF Gravina Access project from October 2020 to February 2021 and May 2021 to July 2021 resulted in mean group size of 8.6 with a range of 6 to 10 of Dall's porpoises. Sighting at the ADOT&PF Ward Cove project resulted in a mean group size of 4 and range of 3 to 5 porpoises.

The City of Ketchikan's Berth IV Expansion Project (Solstice [2020] cited Freitag [2017]) estimates for the project area, as 10 to 15 porpoises (with a maximum of 20) observed 0 to 1 times per month. The action area was similar to that of the proposed project, so it is reasonable to use the same estimates for this project. As a conservative measure, we use the maximum of 20 Dall's porpoises observed one time per month for this application

4.8 Steller Sea Lion

4.8.1 Status and Management

The Steller sea lion was listed as a threatened species under the ESA in 1990 following declines of 63% on certain rookeries since 1985 and declines of 82 percent since 1960 (55 FR 12645). In 1997, two DPSs of Steller sea lion were identified based on differences in genetics, distribution, and population trends (Fritz et al. 2013, 62 FR 24345). These DPSs are the Eastern U.S. DPS (which includes animals east of Cape Suckling, Alaska [144°W]) and the Western U.S. DPS. The Eastern U.S. DPS was recently delisted under the ESA; the Western U.S. DPS remains listed as endangered (62 CFR 30772; Allen and Angliss 2010). The DPSs under ESA are also the MMPA stock delineations.

In 2014, the worldwide population estimate was 142,360-157,498 Steller sea lions (Allen and Angliss 2014). The Eastern DPS (eDPS) was removed from ESA listing in 2013 (78 FR 66140). The eDPS of Steller sea lions is protected under the MMPA but is not a strategic or depleted species.

The Western DPS (wDPS) is listed as endangered under the ESA and is a depleted, strategic stock under the MMPA. The population of the Western U.S. DPS declined about 75 percent between 1976 and 1990. The overall trend for the wDPS in Alaska is an annual increase of 2.05 percent for nonpups and 1.52 percent for pups between 2002 and 2018. It should be noted there were strong regional differences in the population trend. Factors that contributed to the decline of the stock include incidental take in fisheries, illegal and legal shooting, predation or certain diseases, climate change, and contaminants (Muto et al. 2019).

4.8.2 Distribution

Steller sea lions range throughout the North Pacific Ocean from Japan, east to Alaska, and south to central California (Muto et al. 2019). In 2014, the worldwide population estimate was 142,360 to 157,498 Steller sea lions (Allen and Angliss 2014). Most sea lions occupying either rookeries or haulouts, depending on the season. Male sea lions are more likely to disperse beyond their typical habitat, but this primarily occurs after the breeding season (NMFS 2020). Rookeries are used by adult sea lions for pupping, nursing, and mating during the reproductive season (generally from late May to early July). Haulouts are used by all age classes of both genders but are generally not where sea lions reproduce. At sea, they are seen alone or in small groups, but may gather in large "rafts" at the surface near rookeries and haulouts or foraging sites.

Members of this species are not known to migrate, but individuals disperse widely outside of the breeding season (late May to early July). At sea, Steller sea lions commonly occur near the 656-foot (200-meter) depth contour but have been found from nearshore to well beyond the continental shelf (Kajimura and Loughlin, 1988). Sea lions move on- and offshore to pelagic waters for feeding excursions. They are also capable of traveling long distances in a season. Sea lions may make semi-permanent or permanent one-way movements from one site to another (Chumbley et al. 1997; Burkanov and Loughlin 2005).

Eastern DPS

The eDPS stock generally occurs east of Cape Suckling (144° W longitude) and is commonly found in the project area waters. They were most recently surveyed in Southeast Alaska in June and July of 2015. The current population estimate is 41,638 individuals. In Southeast Alaska, the estimated total abundance is 28,594 individuals (20,756 nonpups and 7,838 pups). The eDPS has been increasing between 1990 to 2015 with an estimated annual increase of 4.76 percent for pups and 2.84 percent for nonpups (Muto et al. 2019).

Western DPS

The wDPS generally occurs west of Cape Suckling with the centers of abundance and distribution located in the Gulf of Alaska and Aleutian Islands. While there is some mixing of the wDPS east of the 144° line, Hastings et al. 2020 considered the Ketchikan area to be outside of the mixing zone; there are no known occurrences of wDPS animals in Tongass Narrows. As such, the wDPS is not considered further in this application.

4.8.3 Site-Specific Occurrence

The project location is not located near any designated critical habitat (major rookery or haulout as shown in Figure 5. However, there are other minor haulouts located at Grindall Island, Point Islet and West Rock. Grindall Island is the closest to the project site, located approximately 21 miles (34 km) northwest of the project site. Two winter surveys have been conducted at Grindall Island in 1993 and 1994. In March of 1993, there were 293 animals recorded at the haulout and in December of 1994 there were 211 animals recorded (85 FR 673). During these surveys, no Steller sea lion pups were observed.

While there are no haulouts in close proximity to the project site, Steller sea lions are known to occur intermittently in the action area and are known to transit through Tongass Narrows while foraging (especially during Chinook salmon runs). Steller sea lions in this area congregate near seafood processing facilities and hatcheries in the area, several of which are located in proximity to the project site. Trident Seafoods Corporation operates two processing plants approximately 0.65 miles (1 km) from the site, one to the north and one to the south of the project site. Additionally, the Deer Mountain Hatchery is located just east of the project site and the Whitman Lake Hatchery is located east of the project site just outside of the action area. Both hatcheries are operated by the Alaska Department of Fish and Game (HDR 2019).

The ADOT&PF Tongass Narrows Project (HDR 2019), citing Freitag 2017 in 83 FR 22009, reported average Steller sea lion occurrence in Tongass Narrows as traveling as individuals or in groups of 6-10 from one to two times per week. Steller sea lions are found in Tongass Narrows year-round, and more abundant during the winter months.

The City of Ketchikan conducted pinnacle rock blasting in December 2019 and January 2020 near vicinity of the proposed project and recorded 11 Steller sea lion sightings of an estimated 12 individuals during 76.2 hours of observation in the 150-meter observation zone (Sitkiewicz 2020).

Marine mammal monitoring and sighting data in the Tongass Narrows for the ADOT&PF Gravina Access project from October 2020 to February 2021 and May 2021 to July 2021 resulted in mean group size of Steller sea lions of 1.2 with a range of 1 to 5. Sighting at the ADOT&PF Ward Cove project resulted in similar data with a mean group size of 1.6 and range of 1 to 6 sea lions.

4.8.4 Steller Sea Lion Critical Habitat

NMFS designated critical habitat for Steller sea lions on August 27, 1993 (58 FR 45269). The project is not within designated critical habitat and is over 175 kilometers by air from the closest major haulout or rookery (Forrester Island).

4.9 HARBOR SEAL

4.9.1 Status and Management

The harbor seal is protected under the MMPA but is not listed as a strategic or depleted species (Muto et al. 2019). The harbor seal is not listed as threatened or endangered under the ESA.

The total statewide abundance estimate is 205,090 seals based on surveys taken between 1998 and 2011 (Muto et al. 2019). In the northeast Pacific, 12 stocks of harbor seals have been identified by NMFS, ranging from Baja California to the Aleutians and north to Cape Newman and the Pribilof Islands (Allen and Angliss 2014). In Alaska, there are a total of 12 stocks of harbor seals ranging along the coastal waters from the eastern coast of the Aleutian Islands to Cape Muzon in Southeast Alaska (Muto et al. 2019).

Only the Clarence Strait stock is found in the project area waters and the only stock considered in this application. The current population estimate for Clarence Strait stock is 27,659 individuals, and the 8-year trend estimate is +138. The probability of decrease of this stock is 0.413 (Muto et al. 2019).

4.9.2 Distribution

Harbor seals are found in coastal and estuarine waters ranging from Baja California to the eastern Aleutian Islands of Alaska. Harbor seals often inhabit nearshore coastal waters and are considered nonmigratory, typically staying within 15 to 31 miles of their home. Harbor seals have been found up to 62 miles (100 kilometers) from the shore (Klinkhart et al. 2008).

Up to 44 percent of harbor seals time is spent hauled out, with hauling out occurring more often during the summer (Pitcher and Calkins 1979; Klinkhart et al. 2008). Harbor seals typically haul out in groups of 30 or less but have been known, rarely, to haul out in numbers of several hundred. Harbor seals use a variety of terrestrial sites to haul out for resting (year-round), pupping (May to July), and molting (August-September) including tidal and intertidal reefs, beaches, sand bars, and glacial/sea ice (Sease 1992; Klinkhart et al. 2008).

4.9.3 Site-Specific Occurrence

There are no known harbor seal haulouts within Tongass Narrows, or within the anticipated project specific ensonified area (HDR 2019). Although NOAA 2018 abundance estimates for the unit in which the action area is located states 0 harbor seals, local anecdotal observations and numerous surveys report harbor seals in the area daily (HDR 2019) (Figure 6). The City of Ketchikan conducted pinnacle rock blasting in December 2019 and January 2020 near the vicinity of the proposed project and recorded a total of 21 harbor seal sightings of 24 individuals over 76.2 hours of pre- and post-blast monitoring (Sitkiewicz 2020).

Marine mammal monitoring and sighting data in the Tongass Narrows for the ADOT&PF Gravina Access project from October 2020 to February 2021 and May 2021 to July 2021 resulted in mean group size of 1.3 with a range of 1 to 4 harbor seals. Sighting at the ADOT&PF Ward Cove project resulted in similar data with a mean group size of 1 and range of 1 to 3 seals.

Harbor seals were observed in groups ranging from one to three animals throughout the 1.12-kilometer observation zone. Groups of one to three harbor seals in the area also have been reported by local residents (85 FR 673). NMFS estimates a maximum group size of three individuals (83 FR 2009).

5.0 TAKE AUTHORIZATION REQUESTED

The type of incidental taking authorization that is being requested (i.e., takes by harassment only, takes by harassment, injury, and/or death), and the method of incidental taking.

5.1 Take Authorization Request

Under Section 101 (a)(5)(D) of the MMPA, NOAA OMAO requests an incidental take authorization of marine mammals described in this application resulting from the proposed action at the Ketchikan Port Facility in Ketchikan, Alaska.

Under the 1994 amendments to the MMPA, harassment is statutorily defined as any act of pursuit, torment, or annoyance that:

- has the potential to injure a marine mammal or marine mammal stock in the wild (known as Level A harassment); or
- has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including—but not limited to—migration, breathing, nursing, breeding, feeding, or sheltering but does not have the potential to injure a marine mammal or marine mammal stock in the wild (known as Level B harassment).

5.2 Method of Incidental Taking

This authorization request considers noise from DTH, impact, and vibratory pile removal and placement, as outlined in Section 1, that has the potential to disturb or displace marine mammals or produce a temporary shift in their hearing ability (temporary threshold shift [TTS]) resulting in Level B harassment, as defined above.

The project has the potential to produce a permanent shift in the ability of marine mammals to hear from pile placement resulting in Level A harassment. Level A harassment is only requested where the zones are too large, difficult to safely access, or obscured by structured or land masses to fully monitor; in combination with the cryptic nature of some marine mammal species which are extremely difficult to track.

Vibratory pile drivers will be the primary method of steel pile installation. Vibratory pile drivers also have relatively lower sound levels (less than 180 decibels [dB] referenced to 1 microPascal [dB re 1 μPa] at 10 meters) that are lower than impact pile driving and are not expected to cause injury to marine mammals due to the nature of the sound.

All pile installation will either not start or be halted if marine mammals are observed approaching the Level A injury zone (“shutdown zone”). Level A takes are requested for harbor porpoise, Dall’s porpoise, and harbor seals because of the difficulty in detecting these species, size of the shutdown zone, and potential for visibility issue depending on sea state. Level A harassment will be minimized to the extent practicable, given the methods of installation and measures designed to minimize the possibility of injury to marine mammals.

The Proposed Action is not anticipated to affect the prey base or significantly affect other habitat features of marine mammals that would meet the definition of take. To minimize, to the extent practicable, Level B harassment of ESA-listed humpback whales and non-ESA-listed marine mammals, NOAA OMAO will implement a shutdown of pile driving if marine mammals are seen entering a monitoring zone. This measure is intended to avoid exposure to underwater sound that could result in harassment (more details on the proposed impact reduction and mitigation measures are provided in Section 11).

6.0 NUMBERS AND SPECIES EXPOSED

By age, sex, and reproductive condition (if possible), the number of marine mammals (by species) that may be taken by each type of taking, and the number of times such takings by each type of taking are likely to occur.

6.1 INTRODUCTION

Construction activities could temporarily increase the local underwater and airborne noise environment in the vicinity of the project. Research suggests that increased noise may impact marine mammals in several ways and that these impacts depend on many factors. Noise impacts are discussed in more detail in Section 7. Assessing whether a sound may disturb or injure a marine mammal involves understanding the characteristics of the acoustic source and the potential effects that sound may have on the physiology and behavior of that marine mammal. Although it is known that sound is important for marine mammal communication, navigation, and foraging (National Research Council 2003, 2005), there are many unknowns in assessing impacts, such as the potential interaction of different effects and the significance of responses by marine mammals to sound exposures (Nowacek et al. 2007; Southall et al. 2007). Furthermore, many other factors besides the received level of sound may affect an animal's reaction, such as the animal's physical condition, prior experience with the sound, and proximity to the source of the sound.

In-water construction activities associated with the proposed project include DTH, impact, and vibratory pile removal and placement as described in Section 1.3. Noise-related impacts discussed in this application could result in Level A and Level B exposure of marine mammals as defined under the MMPA. The methods for estimating the number and types of exposures are summarized below.

6.2 DESCRIPTION OF NOISE SOURCES

Ambient sound is a composite of sounds from multiple sources, including environmental events, biological sources, and anthropogenic activities. Physical noise sources include waves at the surface, precipitation, earthquakes, ice, and atmospheric noise, among other events. Biological sources include marine mammals, fish, and invertebrates. Anthropogenic sounds are produced by vessels (small and large), dredging, aircraft overflights, construction activities, geophysical explorations, commercial and military sonars, and other marine or coastal human activities. A summary of known noise levels and frequency ranges associated with anthropogenic sources similar to those that would be used for this project is provided in Table 6-1.

Table 6-1: Representative Levels of Underwater Anthropogenic Noise Sources

Noise Source	Frequency Range (Hz)	Source Level	Reference
Dredging	1–500	161–186 dB RMS re: 1 µPa at 1 meter	Richardson et al. 1995; Department for Environment, Food, and Rural Affairs 2003; Reine et al. 2014
Small vessels	860–8,000	141–175 dB RMS re: 1 µPa at 1 meter	Galli et al. 2003; Matzner and Jones 2011; Sebastianutto et al. 2011
Large ship	20–1,000	176–186 dB re: 1 μPa^2sec SEL at 1 meter	McKenna 2011
Tug docking gravel barge	200–1,000	149 dB at 100 meters	Blackwell and Greene 2002

Notes:
dB = decibel; Hz = Hertz; RMS = root mean square; sec = second; SEL = sound exposure level, dB re 1 µPa @ 1 m = decibels (dB) referenced to (re) 1 micro (µ) Pascal (Pa) at 1 meter

The sounds produced by these activities fall into two sound types: impulsive and nonimpulsive (defined below). Impact pile driving produces impulsive sounds, while vibratory pile driving produces nonimpulsive sounds. The distinction between these two general sound types is important because their potential to cause physical effects differs, particularly with regard to hearing (Ward 1997).

Impulsive sounds (e.g., explosions, seismic air gun pulses, and impact pile driving), which are referred to as pulsed sounds by Southall et al. (2007), are brief, broadband, atonal transients (Harris 1998) and occur either as isolated events or are repeated in some succession (Southall et al. 2007). Impulsive sounds are characterized by a relatively rapid rise from ambient pressure to a maximal pressure value, followed by a decay period that may include a period of diminishing, oscillating maximal and minimal pressures (Southall et al. 2007). Impulsive sounds generally have a greater capacity to induce physical injury compared with sounds that lack these features (Southall et al. 2007).

Nonimpulsive sounds (referred to as nonpulsed in Southall et al. 2007) can be tonal, broadband, or both. They lack the rapid rise time and can have longer durations than impulsive sounds. Nonimpulsive sounds can be either intermittent or continuous. Examples of nonimpulsive sounds include vessels, aircraft, and machinery operations such as drilling, dredging, and vibratory pile driving (Southall et al. 2007). In some environments, the duration of both impulsive and nonimpulsive sounds can be extended due to reverberations.

6.3 Vocalization and Hearing of Marine Mammals

All marine mammals that have been studied can produce sounds and use sounds to forage, orient, detect, and respond to predators and to facilitate social interactions (Richardson et al. 1995). Measurements of marine mammal sound production and hearing capabilities provide some basis for assessing whether exposure to a particular sound source may affect a marine mammal behaviorally or physiologically. Marine mammal hearing abilities are quantified using live animals either via behavioral audiometry or electrophysiology (Schusterman 1981; Au 1993; Wartzok and Ketten 1999; Nachtigall et al. 2007). Behavioral audiograms, which are plots of an animal’s exhibited hearing threshold versus frequency, are obtained from captive, trained live animals using standard testing procedures with appropriate controls. These audiograms are considered to be a more accurate representation of a subject’s hearing abilities. However, behavioral audiograms of many marine mammal species are difficult to obtain or impossible because many species are too large, too rare, and too difficult to acquire and maintain for experiments in captivity. Consequently, our understanding of a species’ hearing ability may be based on the behavioral audiogram of a single individual or a small group of animals or another species that is considered to be similar in its hearing abilities. In addition, captive animals may be exposed to local ambient sounds and other environmental factors that may impact their hearing abilities and may not accurately reflect the hearing abilities of free-swimming animals.

For animals that are not available in captive or stranded settings (including large whales and rare species), estimates of hearing capabilities are made based on anatomical and physiological structures, the frequency range of the species’ vocalizations, and extrapolations from related species.

Electrophysiological audiometry measures small electrical voltages produced by neural activity when the auditory system is stimulated by sound. The technique is relatively fast, does not require a conscious response, and is routinely used to assess the hearing of newborn humans. It has recently been adapted for use on nonhumans, including marine mammals (Dolphin, 2000). For both methods of evaluating hearing ability, hearing response in relation to frequency is a generalized U-shaped curve or audiogram showing the frequency range of best sensitivity (lowest hearing threshold) and frequencies above and below with higher threshold values.

The NMFS reviewed studies of the hearing sensitivity of marine mammals and developed thresholds for use as guidance when assessing the effects of anthropogenic sound on marine mammals based on measured or estimated hearing ranges (NMFS 2018). The guidance places marine mammals into the following functional hearing groups based on their generalized hearing sensitivities: high-frequency cetaceans, mid-frequency cetaceans, low-frequency cetaceans (mysticetes), phocid pinnipeds (true seals), and otariid pinnipeds (sea lions and fur seals). A summary of the sound production and hearing capabilities of the marine mammal species assessed in this application is provided in Table 6-2.

Table 6-2: Hearing and Vocalization Ranges for Marine Mammal Functional Hearing Groups and Species Potentially within the Project Areas

Functional Hearing Group	Species	Functional Hearing Range[1]
Low-frequency cetaceans	Humpback whale, gray whale, minke whale	7 Hz to 35 kHz
Mid-frequency cetaceans	Killer whale, Pacific white-sided dolphin	150 Hz to 160 kHz
High-frequency cetaceans	Harbor porpoise, Dall's porpoise	275 Hz to 160 kHz
Phocidae	Harbor seal	In-water: 50 Hz to 86 kHz In-air: 75 Hz to 30 kHz
Otariidae	Steller sea lion	In-water: 60 Hz to 39 kHz In-air: 50 Hz to 75 kHz

Notes:
Hz = Hertz; kHz = kilohertz
[1]In-water hearing data from NMFS, 2018; in-air data from Schusterman 1981; Hemila et al. 2006; Southall et al. 2007.

6.4 SOUND EXPOSURE CRITERIA AND THRESHOLDS

Under the MMPA, NMFS has defined levels of harassment for marine mammals. Level A harassment is defined as "Any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild." Level B harassment is defined as "Any act of pursuit, torment, or annoyance which has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including but not limited to migration, breathing, nursing, breeding, feeding, or sheltering."

To date, no studies have been conducted that examine impacts to marine mammals from pile-driving sounds from which empirical noise thresholds have been established. Currently, NMFS uses underwater sound exposure thresholds to determine when an activity could result in impacts to a marine mammal defined as Level A (injury) or Level B (disturbance including behavioral and TTS) harassment (NMFS 2005). NMFS (2018) has recently developed acoustic threshold levels for determining the onset of permanent threshold shift (PTS) in marine mammals in response to underwater impulsive and nonimpulsive sound sources. The criteria use cumulative sound exposure level (SEL) metrics (dB SEL_{CUM}) and peak pressure (dB PEAK) rather than the previously used dB root mean square (RMS) metric. NMFS equates the onset of PTS, which is a form of auditory injury, with Level A harassment under the MMPA, and with "harm" under the ESA. Level B harassment occurs when marine mammals are exposed to impulsive underwater sounds above 160 dB RMS re 1 µPa, such as from impact pile driving, and to nonimpulsive underwater sounds above 120 dB RMS re 1 µPa, such as from vibratory pile driving (NMFS 2005) (Table 6-3). The onset of TTS is a form of Level B harassment under the MMPA and a form of "harassment" under the ESA. All forms of harassment, either auditory or behavioral, constitute "incidental take" under these statutes.

Table 6-3: Injury and Disturbance Threshold Criteria for Underwater and Airborne Noise

Marine Mammal Functional Hearing Group	Airborne Noise (impact and vibratory pile driving) (re 20 µPa)[1]	Underwater Vibratory Pile-Driving Noise (nonimpulsive sounds) (re 1 µPa)		Underwater Impact Pile-Driving Noise (impulsive sounds) (re 1 µPa)	
	Disturbance Guideline (haulout)[2]	PTS Onset (Level A) Threshold	Level B Disturbance Threshold	PTS Onset (Level A) Threshold[3]	Level B Disturbance Threshold
Low-Frequency Cetaceans	Not applicable	199 dB SEL_{CUM}[4]	120 dB RMS	219 dB Peak[5] 183 dB SEL_{CUM}[4]	160 dB RMS
Mid-Frequency Cetaceans	Not applicable	198 dB SEL_{CUM}[4]	120 dB RMS	230 dB Peak[5] 185 dB SEL_{CUM}[4]	160 dB RMS

Table 6-3: Injury and Disturbance Threshold Criteria for Underwater and Airborne Noise

Marine Mammal Functional Hearing Group	Airborne Noise (impact and vibratory pile driving) (re 20 μPa)[1]	Underwater Vibratory Pile-Driving Noise (nonimpulsive sounds) (re 1 μPa)		Underwater Impact Pile-Driving Noise (impulsive sounds) (re 1 μPa)	
	Disturbance Guideline (haulout)[2]	PTS Onset (Level A) Threshold	Level B Disturbance Threshold	PTS Onset (Level A) Threshold[3]	Level B Disturbance Threshold
High-Frequency Cetaceans	Not applicable	173 dB SEL_{CUM}[4]	120 dB RMS	202 dB Peak[5] 155 dB SEL_{CUM}[4]	160 dB RMS
Otariidae (fur seals and sea lions)	100 dB RMS (unweighted)	219 dB SEL_{CUM}[4]	120 dB RMS	232 dB Peak[5] 203 dB SEL_{CUM}[4]	160 dB RMS
Phocidae (true seals)	90 dB RMS (unweighted)	201 dB SEL_{CUM}[4]	120 dB RMS	218 dB Peak[5] 185 dB SEL_{CUM}[4]	160 dB RMS

Notes:
μPa = microPascal; dB = decibel; PTS = permanent threshold shift; RMS = root mean square; SEL = sound exposure level;
[1]Airborne disturbance thresholds not specific to pile driver type.
[2]Sound level at which pinniped haulout disturbance has been documented. This is not considered an official threshold, but is used as a guideline.
[3]Dual metric acoustic thresholds for impulsive sounds. Whichever results in the largest isopleth for calculating PTS onset is used in the analysis.
[4]Cumulative sound exposure level over 24 hours.
[5]Flat weighted or unweighted peak sound pressure within the generalized hearing range.

NMFS uses generic sound exposure thresholds to determine when an activity in the ocean that produces an airborne sound might result in impacts to a marine mammal (70 FR 1871). Construction-period airborne noise would have little impact to cetaceans because noise from airborne sources would not transmit as well underwater (Richardson et al. 1995); thus, noise would primarily be a problem for hauled-out pinnipeds near the project locations. NMFS has identified behavioral harassment threshold criteria for airborne noise generated by pile driving for pinnipeds regulated under the MMPA. Level A injury threshold criteria for airborne noise have not been established. The Level B behavioral harassment threshold for harbor seals is 90 dB RMS re 20 μPa (unweighted), and for all other pinnipeds it is 100 dB RMS re 20 μPa (unweighted).

6.5 LIMITATIONS OF EXISTING NOISE CRITERIA

The application of the 120 dB RMS re 1 μPa behavioral threshold can sometimes be problematic because this threshold level can be either at or below the ambient noise level of certain locations. The 120 dB RMS re 1 μPa threshold level for nonimpulsive noise originated from research conducted by Malme et al. (1984, 1988) for California gray whale response to continuous industrial sounds, such as drilling operations. The 120 dB re 1 μPa nonimpulsive sound threshold should not be confused with the species-specific 120 dB pulsed sound criterion established for migrating bowhead whales in the Arctic as a result of research in the Beaufort Sea [Richardson et al. 1995; Miller et al. 1999].)

To date, there is no research or data supporting a response by pinnipeds or odontocetes to nonimpulsive sounds from vibratory pile driving as low as the 120 dB RMS re 1 μPa threshold. Southall et al. (2007) reviewed studies conducted to document the behavioral responses of harbor seals and northern elephant seals to nonimpulsive sounds under various conditions. They concluded that those limited studies suggest that exposures between 90 dB and 140 dB RMS re 1 μPa generally do not appear to induce strong behavioral responses.

6.6 AUDITORY MASKING

Natural and artificial sounds can disrupt behavior through auditory masking or interference with a marine mammal's ability to detect and interpret other relevant sounds, such as communication and echolocation

signals (Wartzok et al. 2004). Masking occurs when both the signal and masking sound have similar frequencies and either overlap or occur very close to each other in time. A signal is very likely to be masked if the noise is within a certain "critical bandwidth" around the signal's frequency and its energy level is similar or higher (Holt 2008). Noise within the critical band of a marine mammal signal will show increased interference with detection of the signal as the level of the noise increases (Wartzok et al. 2004). For example, in delphinid subjects, relevant signals needed to be 17 to 20 dB louder than masking noise at frequencies below 1 kHz to be detected and 40 dB greater at approximately 100 kHz (Richardson et al. 1995). Noise at frequencies outside of a signal's critical bandwidth will have little to no effect on the detection of that signal (Wartzok et al. 2004).

Additional factors influencing masking are the temporal structure of the noise and the behavioral and environmental context in which the signal is produced. Continuous noise is more likely to mask signals than intermittent noise of the same amplitude; quiet "gaps" in the intermittent noise allow detection of signals that would not be heard during continuous noise (Brumm and Slabbekoorn 2005). The behavioral function of a vocalization (e.g., contact call, group cohesion vocalization, echolocation click) and the acoustic environment at the time of signaling may both influence the call source level (Holt et al. 2011), which directly affects the chances that a signal will be masked (Nemeth and Brumm 2010). Miksis-Olds and Tyack (2009) showed that manatees modified vocalizations differently during increased noise, depending on whether or not a calf was present.

Masking noise from anthropogenic sources could cause behavioral changes if the masking disrupts communication, echolocation, or other hearing-dependent behaviors. As noted above, noise frequency and amplitude both contribute to the potential for vocalization masking; noise from pile driving typically covers a frequency range of 10 Hz to 1.5 kHz, which is likely to overlap with the frequencies of vocalizations produced by species that may occur in the project area. Amplitude of noise from both impact and vibratory pile-driving methods is variable and may exceed that of marine mammal vocalizations within an unknown range of each incident pile. Depending on the animal's location and vocalization source level, this range may vary over time.

Based on the frequency overlap between noise produced by both vibratory and impact pile driving (10 Hz to 1.5 kHz), animals that remain in a project area during steel pile driving may be vulnerable to masking for the duration of pile driving (typically 2 hours or less, intermittently over the course of a day depending on site and project). Energy levels of vibratory pile driving are less than half that of impact pile driving; therefore, the potential for masking noise would be limited to a small radius around a pile. The likelihood that vibratory pile driving would mask relevant acoustic signals for marine mammals is negligible. In addition, most marine mammal species that may be subject to masking are transitory within the project areas. The animals most likely to be at risk for vocalization masking are resident pinnipeds (harbor seals and sea lions around local haulout areas). Possible behavioral reactions to vocalization masking include changes to vocal behavior (including cessation of calling), habitat abandonment (short or long term), and modifications to the acoustic structure of vocalizations (which may help signalers compensate for masking) (Brumm and Slabbekoorn 2005; Brumm and Zollinger 2011). Given the relatively high source levels for most marine mammal vocalizations, the Navy has estimated that masking events could occur concurrently within the zones of behavioral harassment estimated for vibratory and impact pile driving (Section 6.7.2) and are therefore taken into account in the exposure analysis.

6.7 Modeling Noise from Pile Removal/Placement Activities

An Underwater Noise Technical Memorandum prepared for installation/removal of piles at Ketchikan is provided in Appendix B. This memorandum describes underwater noise fundamentals, applicable noise criteria, protected species, an estimation of pile driving and removal noise, and a discussion on potential effects of proposed in-water construction noise would have on fish and marine mammals. Distances of criteria level exceedance for noise for different types of piles installed by different methods at different depths are provided in the tables in the memorandum.

6.7.1 Underwater Sound Propagation

Pile removal and placement activities will generate underwater noise that potentially could result in disturbance to marine mammals in a project area. Transmission loss (TL) underwater is the decrease in

acoustic intensity as an acoustic pressure wave propagates out from a source until the source becomes indistinguishable from ambient sound. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, bottom composition and topography. A standard sound propagation model was used to estimate the range from pile-driving activity to various expected sound pressure levels (SPLs) at potential project structures. This model follows a geometric propagation loss based on the distance from the driven pile, resulting in a 4.5 dB reduction in level for each doubling of distance from the source. In this model, the SPL at some distance away from the source (e.g., a driven pile) is governed by a measured source level, minus the transmission loss of the energy as it dissipates with distance. The TL equation is:

$$TL = 15\log_{10}\left(\frac{R_1}{R_2}\right)$$

where

TL is the transmission loss in dB,

R1 is the distance of the modeled SPL from the driven pile, and

R2 is the distance from the driven pile of the initial measurement.

The degree to which underwater noise propagates away from a noise source is dependent on a variety of factors, most notably by bathymetry and the presence or absence of reflective or absorptive conditions, including the sea surface and sediment type. The TL model described above was used to calculate the expected noise propagation from both impact and vibratory pile driving, using representative source levels to estimate :Level A and B harassment zones or area exceeding the noise criteria.

6.7.2 Underwater Noise from Pile Driving

The intensity of pile driving sound is greatly influenced by factors such as the type of pile, the type of placement method, and the physical environment in which the activity takes place. To determine reasonable sound pressure levels SPLs from pile driving, studies with similar properties to the proposed project were evaluated and is summarized in

Pile installation would be mostly conducted using DTH system and impact pile driving would be used to install the last foot of the piles. The DTH system would be used for longer periods (i.e., to drive all but the last foot of the pile into the substrate) than the impact pile driving (which would only be used to proof the last 12 inches of each pile). A vibratory pile driver would also be used to remove existing timber piles. Therefore, three scenarios (vibratory pile driving, impact pile driving, and DTH system) were evaluated in this report. Source sound levels are described in Appendix B and provided in Table 6-4.

Table 6-4: Proxy Underwater Sound Source Levels for Pile Placement and Removal

Pile Activity Method	Pile Size, Type	RMS (dB re 1 μPa)	Peak (dB re 1 μPa)	SEL (dB re 1 μPa^2•sec)	Piles Per Day
Impact	24-inch, steel	197.0	211.2	183.2	1.5
DTH	24-inch, steel	164.0	179.0	154.0	1.5
Vibratory	14-inch, timber	157.0	184.0	145.0	10

Notes:
dB re 1 μPa = decibels referenced at 1 micropascal; N/A = not applicable; RMS = root mean square; SEL = sound exposure level; SPL = Sound Pressure Level.

A summary of the calculated distances to the underwater marine mammal thresholds during impact pile driving for the various hearing groups is provided in Table 6-5, and a summary of the distances to the Peak PTS onset thresholds is provided in Table 6-6.

Vibratory pile-driving sound levels can be 20 to 30 or more decibels lower than impact-driving sound levels and do not produce the high peak amplitudes with fast rise times typical of steel pile driving. Therefore, bubble curtains are not used for vibratory pile driving.

A summary of the calculated distances to the underwater marine mammal thresholds during vibratory driving is provided in Table 6-7. The extent and area of each Level A and Level B harassment zone for a pile representing the worst-case extent of noise propagation (furthest from the shore) is shown in Figure 6-1. Distances to certain thresholds are not depicted in Figure 6-1 if they are smaller than the worst-case scenario.

Table 6-5: Calculated Radial Distances to Underwater Marine Mammal Impact and Down the Hole Rock Socket Driving Noise to Cumulative Sound Exposure Level PTS and Behavioral Disturbance Thresholds

Pile Size, Type	Pile Placement Method	Distance (m) to Injury (PTS Onset) Level A Pinnipeds		Distance (m) to Injury (PTS Onset) Level A Cetaceans			Behavioral Disturbance Level B Radial Distance (m) to Threshold
		PW	OW	LF	MF	HF	
24-inch, Steel	Impact	81	6	151	5	179	2,590[A]
24-inch, Steel	Down-the-hole	70	5	130	5	155	11,659[B]

Notes:
PTS= permanent threshold shift; dB RMS= decibel root mean square; PW = phocid pinniped underwater (harbor seal); OW= otariid pinniped underwater (sea lion); LF = low frequency cetacean; MF = mid frequency cetacean; HF = high frequency cetacean; m = meter
A = Based on 160 dB RMS; B = Based on 120 dB RMS
Calculations for Level A based on SEL_{CUM} threshold criteria provided in Table 6-3.

Table 6-6: Calculated Radial Distances to Underwater Marine Mammal Impact– Peak PTS Thresholds

Pile Size, Type	Pile Placement Method	Distance (m) to Injury (PTS Onset) Level A Pinnipeds		Distance (m) to Injury (PTS Onset) Level A Cetaceans			Behavioral Disturbance Level B (160 dB RMS) Radial Distance (m) to Threshold
		PW	OW	LF	MF	HF	
24-inch, Steel	Impact	3	N/A	2	N/A	33	2,590

Notes:
PTS= permanent threshold shift; dB RMS= decibel root mean square; PW = phocid pinniped underwater (harbor seal); OW= otariid pinniped underwater (sea lion); LF = low frequency cetacean; MF = mid frequency cetacean; HF = high frequency cetacean; m = meter
Calculations for Level A based on peak threshold criteria are provided in Table 6-3. Distances to peak PTS thresholds calculated using practical spreading loss model.

Table 6-7: Calculated Radial Distances to Underwater Marine Mammal Vibratory Removal Noise Thresholds Within Threshold Distances

Pile Size, Type	Pile Placement/ Removal Method	Distance (m) to Injury (PTS Onset) Level A Pinnipeds		Distance (m) to Injury (PTS Onset) Level A Cetaceans			Behavioral Disturbance Level B (120 dB RMS)
		PW	OW	LF	MF	HF	Radial Distance (m) to Threshold
14-inch, Timber	Vibratory Removal	1	0	2	0	3	2,929

Notes:
PTS= permanent threshold shift; dB RMS= decibel root mean square; PW = phocid pinniped underwater (harbor seal); OW= otariid pinniped underwater (sea lion); LF = low frequency cetacean; MF = mid frequency cetacean; HF = high frequency cetacean; m = meter
Calculations for Level A based on SEL_{CUM} threshold criteria provided in Table 6-3.

6.7.3 Airborne Sound Propagation

Pile driving can generate airborne noise that could potentially result in disturbance to marine mammals (pinnipeds) that are hauled out or at the water's surface. As a result, the potential for pinnipeds hauled out or swimming at the surface to be exposed to airborne SPLs could result in Level B behavioral harassment. The airborne noise threshold for behavioral harassment for all pinnipeds except harbor seals is 100 dB RMS re 20 μPa (unweighted), and this noise threshold for harbor seals is 90 dB RMS re 20 μPa (unweighted) (see Table 6-3). Construction noise behaves as point-source noise and thus propagates in a spherical manner with a 6 dB decrease in the SPL over water ("hard-site" condition) per doubling of distance (Washington State Department of Transportation, 2018). A spherical spreading loss model, assuming average atmospheric conditions, was used to estimate the distance to the 100 dB and 90 dB RMS re 20 μPa (unweighted) airborne thresholds. The transmission loss equation is:

$$TL = 20\log_{10}\left(\frac{R_1}{R_2}\right)$$

where

TL is the transmission loss in dB

R1 is the distance of the modeled SPL from the driven pile

R2 is the distance from the driven pile of the initial measurement

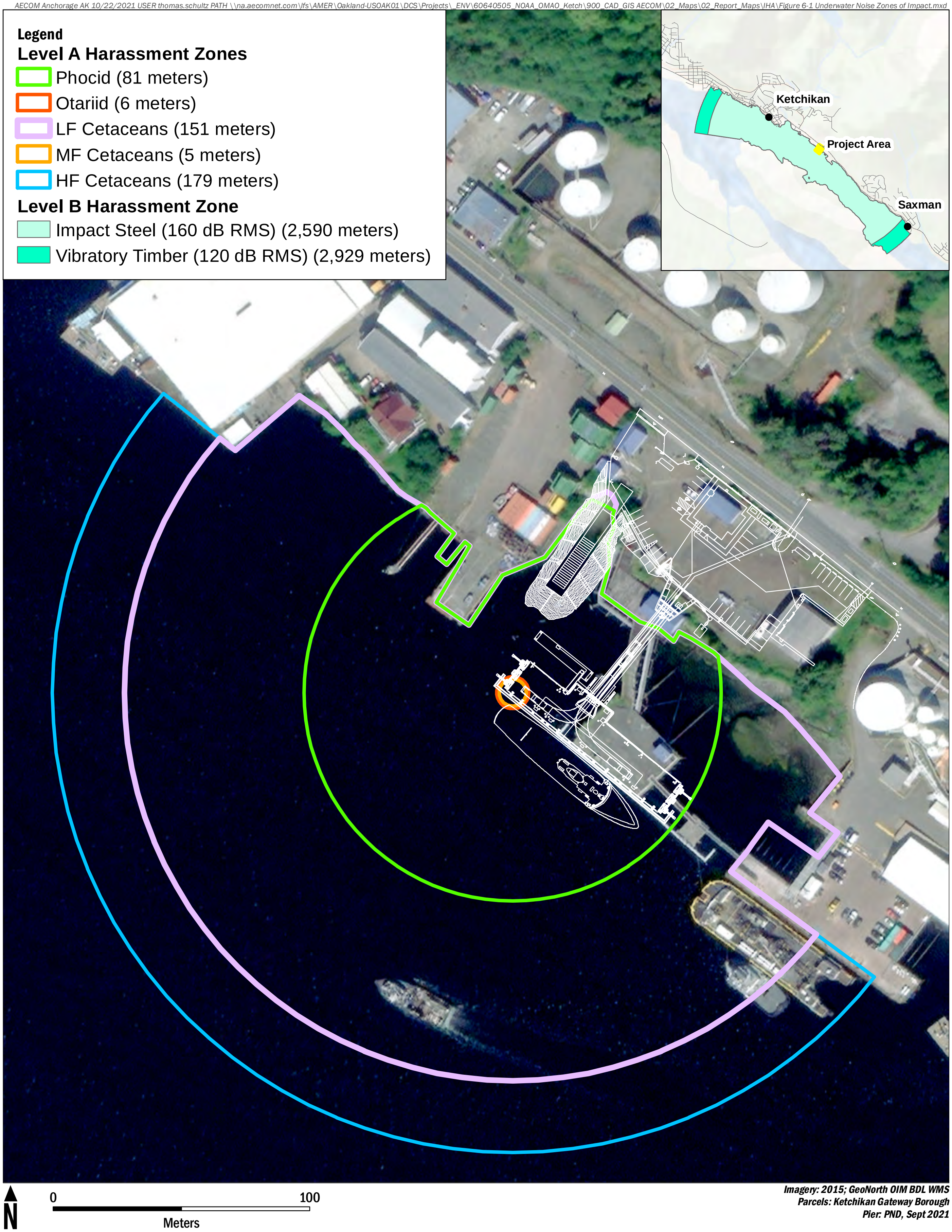
The intensity of pile-driving sounds is greatly influenced by factors such as the type of piles, the type of hammers, and the physical environment in which the activity takes place. To determine reasonable airborne source SPLs, source levels were chosen based on a review of available pile driving in situ recordings. The calculations are based on air noise source level of 95 dBA for pile driving, additional detail is provided in the Underwater Noise Technical Memorandum (Appendix B).

The distances to the airborne harassment thresholds were calculated for steel pile impact and vibratory driving with the airborne transmission loss formula. The distances to the pinniped airborne noise thresholds produced by the impact installation are provided in Table 6-8 and shown in Figure 6-2. Because these areas are smaller than the underwater behavioral threshold zones, a separate analysis of Level B take was not conducted for the airborne zones. Animals in the airborne zones would already have been exposed within a Level B underwater zone; therefore, no additional takes due to exposure to airborne noise are requested.

Table 6-8: Calculated and Measured Distances to Pinniped Behavioral Airborne Noise Thresholds Impact Pile Driving

Placement/Removal Method	Pile Size, Type	Harbor Seal Distance (m) to Threshold (90 dB RMS)	Steller Sea lion Distance (m) to Threshold (100 dB RMS)
Impact	24-inch, Steel	54	17
Down the Hole	24-inch, Steel	38	12
Vibratory	14-inch, Timber	27	9

Notes:
dB RMS = decibel root mean square; m = meters



AECOM

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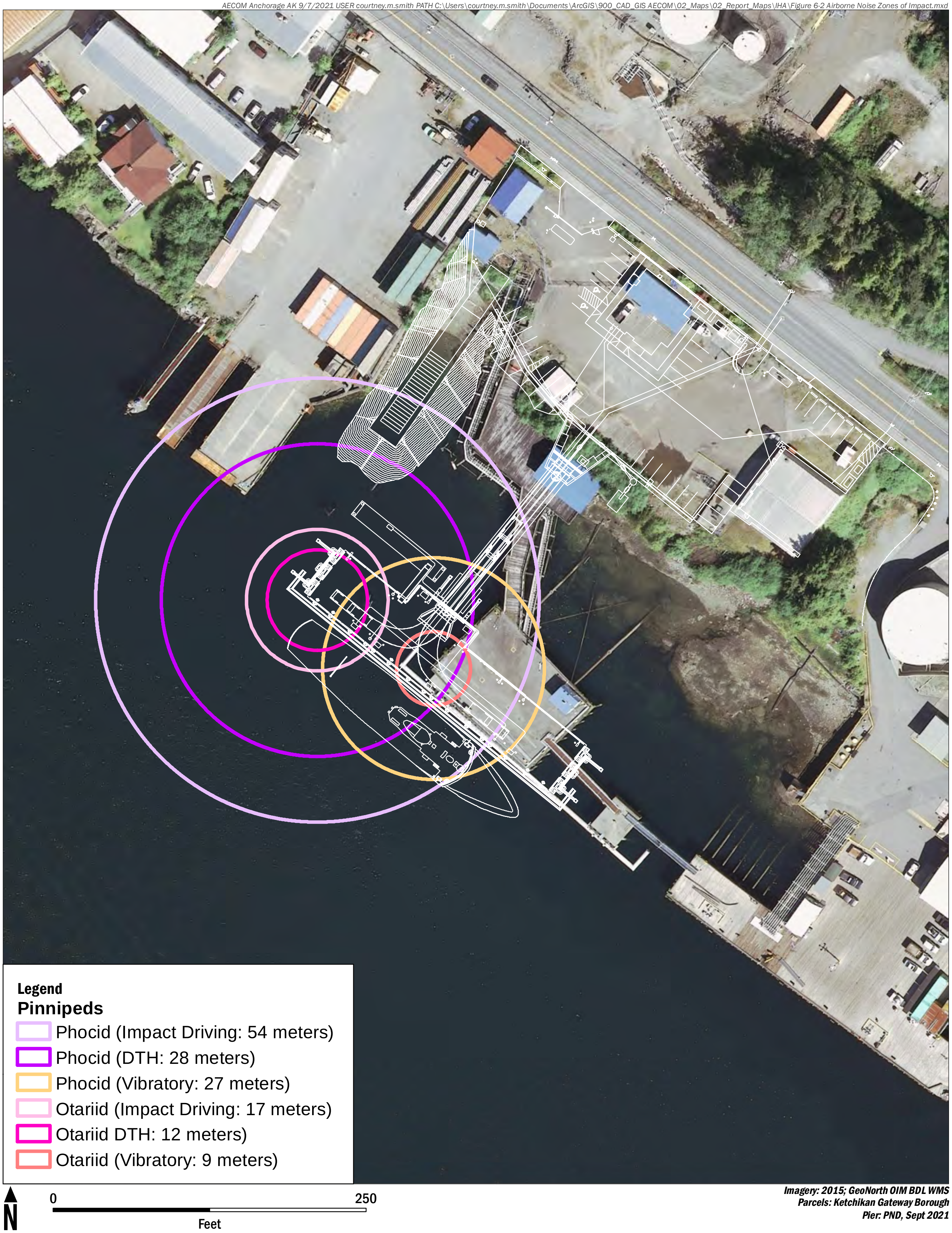
Ketchikan Homeport Revitalization Project

INCIDENTAL HARASSMENT AUTHORIZATION

REPRESENTATIVE ZONES OF IMPACT FOR PILE REMOVAL AND INSTALLATION UNDERWATER NOISE

Figure 6-1



AECOM

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Ketchikan Homeport Revitalization Project

INCIDENTAL HARASSMENT AUTHORIZATION

REPRESENTATIVE ZONES OF IMPACT FOR PILE REMOVAL AND INSTALLATION AIRBORNE NOISE

Figure 6-2

6.8 Exposure Estimates

Exposure estimates generally do not differentiate age, sex, or reproductive condition. However, some inferences can be made based on what is known about the life stages of the animals that visit or inhabit the activity area. When possible and with the available data, these inferences are discussed by species in the sections that follow.

6.8.1 Evaluation of Potential Species Presence

Because density estimated are not available for the activity area, historical occurrence and numbers as well as group size were reviewed from previous applications and monitoring reports for other projects to develop predictable occurrence and a realistic estimate of potential exposure. A summary of estimated group size and predictable occurrence of marine mammals in the zones of impact is provided in Table 6-9.

Table 6-9: Estimated Group Size and Predictable Occurrence of Marine Mammals in the Zones of Impact

Species	Estimated Group Size	Predictable Occurrence in Level B ZOI	Predictable Occurrence in Level A ZOI
Humpback whale Central North Pacific Stock Hawaii DPS	2	Twice a week	Not expected with monitoring and shutdown
Humpback whale CA/OR/WA Stock Mexico DPS	2	Twice a week	Not expected with monitoring and shutdown
Minke whale	1	Yearly	Not expected with monitoring and shutdown
Gray whale	2	Monthly	Not expected with monitoring and shutdown
Killer whale	10	Monthly	Not expected with monitoring and shutdown
Pacific white-sided dolphin	20	Weekly	Not expected with monitoring and shutdown
Harbor porpoise	5	Twice a month	Twice during in-water work period
Dall's porpoise	20	Monthly	Once during in-water work period
Steller sea lion Eastern Stock	10	Daily (October to February)	Not expected with monitoring and shutdown
Harbor seal	3	3 groups per day	1 group per day

Notes:
ZOI = zone of impact

6.8.2 Estimated Duration of Pile Placement and Removal

Eighteen piles would be installed for the project and each pile would take approximately 1.5 days to install for a total of 27 pile placement days. Removal of 100-200 timber piles are estimated to take 10 piles a day, for a total of 20 pile removal days. Therefore, the estimate duration for in-water pile placement and removal would be 47 days (10 weeks [5-day work weeks]).

6.8.3 Number of Marine Mammals that May Be Affected

The assumptions of marine mammal presence (potential exposures) in the action area used for the take estimates are provided in Table 6-10. A summary of anticipated underwater exposure estimates for marine mammal species expected to be in the project area is provided in Table 6-11.

Table 6-10: Potential Exposures of Marine Mammals During Project Activities

Species	Level B Take	Level A Take
Humpback whale, Central North Pacific Stock Hawaii DPS	2 whale x (2/week x 10 weeks) = 40 Hawaii DPS (98%) = 39	Not expected with monitoring and shutdown
Humpback whale CA/OR/WA Stock Mexico DPS	2 whale x (2/week x 10 weeks) = 40 Hawaii DPS (2%) = 1	Not expected with monitoring and shutdown
Minke whale	1 whale x 1 year = 1	Not expected with monitoring and shutdown
Gray whale	2 whale x 2 months = 4	Not expected with monitoring and shutdown
Killer whale	10 whales x 2 months = 20	Not expected with monitoring and shutdown
Pacific white-sided dolphin	20 dolphins x 10 weeks = 200	Not expected with monitoring and shutdown
Harbor porpoise	5 porpoises x (2 x 2 months) = 20	5 porpoises x 2 = 10
Dall's porpoise	20 porpoises x 2 months = 40	20 porpoises x1 = 20
Steller sea lion Eastern Stock	10 sea lions x 47 days = 470	Not expected with monitoring and shutdown
Harbor seal	9 seals x 47 days = 423	3 seals x 47 days = 141

Table 6-11: Take Request Summary

Species	Level B Take	Level A Take	Stock Abundance	Percent of Stock
Humpback whale Central North Pacific Stock Hawaii DPS	39	0	10,103	0.39%
Humpback whale CA/OR/WA Stock, Mexico DPS	1	0	2,900	0.03%
Minke whale	1	0	26,880	<0.01%
Gray whale	4	0	26,960	0.01%
Killer whale	20	0	2,892	0.69%
Pacific white-sided dolphin	200	0	Unknown	Unknown
Harbor porpoise	20	10	1,354	2.22%
Dall's porpoise	40	20	83,400	0.07%
Steller sea lion Eastern Stock	470	0	43,201	1.08%
Harbor seal	423	141	27,659	2.03%

Notes:
Bold = ESA-listed species

7.0 IMPACTS TO MARINE MAMMALS AND STOCKS

The anticipated impact of the activity upon the species or stock of marine mammals.

7.1 Potential Effects of Pile Removal and Installation on Marine Mammals

7.1.1 Potential Effects Resulting from Underwater Noise

The effects of pile-driving noise on marine mammals depend on several factors, including the species, the size of the animal, and the animal's proximity to the source; the depth, intensity, and duration of the pile-driving sound; the depth of the water column; the substrate of the habitat; the distance between the pile and the animal; and the sound propagation properties of the environment.

Impacts to marine mammals from pile-driving activities are expected to result primarily from acoustic pathways. As such, the degree of effect is intrinsically related to the received level and duration of the sound exposure, which are in turn influenced by the distance between the animal and the source. In general, sound exposure should be less intense farther away from the source. The substrate and depth of the habitat affect the sound propagation properties of the environment. Shallow environments are typically more structurally complex, which leads to more rapid sound attenuation. In addition, substrates that are soft (i.e., sand) will absorb the sound more readily than hard substrates (rock), which may reflect the acoustic wave. Soft porous substrates will also likely require less time to drive the pile, and possibly less forceful equipment, which would ultimately decrease the intensity of the acoustic source.

Potential impacts to marine species can be caused by physiological responses to both the type and strength of the acoustic signature (Viada et al. 2008). Behavioral impacts may also occur, although the type and severity of these effects are more difficult to define because studies addressing the behavioral effects of impulsive sounds on marine mammals are limited. Potential effects from impulsive sound sources can range from Level B effects, such as brief behavioral disturbance, tactile perception, and physical discomfort, to Level A impacts, which may include slight injury to the internal organs and the auditory system and possible death of the animal (Yelverton et al. 1973; O'Keefe and Young 1984; Ketten 1995; Navy 2001).

7.1.2 Physiological Responses

Direct tissue responses to impact/impulsive sound stimulation may range from mechanical vibration or compression with no resulting injury to tissue trauma (injury). Because the ears are the most sensitive organ to pressure, they are the organs most sensitive to injury (Ketten 2000). Sound-related trauma can be lethal or sublethal. Lethal impacts are those that result in immediate death or serious debilitation in or near an intense source and are often related to lung injury (Ketten 1995). Sublethal damage to the ear from a pressure wave can rupture the tympanum, fracture the ossicles, and damage the cochlea and can cause hemorrhage as well as leakage of cerebrospinal fluid into the middle ear (Ketten 2004). Sublethal impacts also include hearing loss, which is caused by exposure to perceptible sounds. Sublethal effects can contribute to reduced fitness which can negatively affect the probability of survival of an individual.

Moderate injury implies partial hearing loss. Permanent hearing loss (also called PTS) can occur when the hair cells of the ear are damaged by a very loud event as well as by prolonged exposure to noise. Instances of TTSs and/or auditory fatigue are well documented in marine mammal literature as being one of the primary avenues of acoustic impact. Temporary loss of hearing sensitivity has been documented in controlled settings using captive marine mammals exposed to strong sound exposure levels at various frequencies (Mooney et al. 2009).

While injuries to other sensitive organs are possible, they are less likely because pile-driving impacts are almost entirely acoustically mediated, unlike explosive sounds, which also include a shock wave that can result in damage. Based on the mitigation measures outlined in Section 11 and the conservative modeling assumptions discussed in Section 6, Level A harassment is not expected to any individuals, except potentially to harbor seals during impact pile driving. Therefore, auditory effects could be experienced by

individual harbor seals, but will not cause population-level impacts or affect the continued survival of the species.

7.1.3 Behavioral Responses

Behavioral responses to sound can be highly variable. For each potential behavioral change, the magnitude of the change ultimately determines the severity of the response. A number of factors may influence an animal's response to noise, including its previous experience, its auditory sensitivity, its biological and social status (including age and sex), and its behavioral state and activity at the time of exposure. Habituation occurs when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok et al. 2004). Animals are most likely to habituate to sounds that are predictable and unvarying. The opposite process is sensitization—when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure.

Behavioral state or differences in individual tolerance levels may affect the type of response as well. For example, animals that are resting may show greater behavioral change in response to disturbing noise levels than animals that are highly motivated to remain in an area for feeding (Richardson et al. 1995; National Research Council 2003; Wartzok et al. 2004; Southall et al. 2007). Indicators of disturbance may include sudden changes in the animal's behavior or avoidance of the affected area. A marine mammal may show signs that it is startled by the noise and/or it may swim away from the sound source and avoid the area. Increased swimming speed, increased surfacing time, and cessation of foraging in the affected area would indicate disturbance or discomfort. Pinnipeds may increase their haulout time, possibly to avoid in-water disturbance.

Marine mammals encountering pile-driving operations over a project's construction time frame would likely avoid affected areas in which they experience noise-related discomfort, limiting their ability to forage or rest there. As described in the section above, individual responses to pile-driving noise are expected to vary. Some individuals may occupy a project area during pile driving without apparent discomfort, but others may be displaced with undetermined effects. Avoidance of the affected area during pile-driving operations would reduce the likelihood of injury impacts. Noise-related disturbance may also inhibit some marine mammals from transiting the area. There is a potential for displacement of marine mammals from affected areas due to these behavioral disturbances during the in-water construction season. However, in some areas, habituation may occur, resulting in a decrease in the severity of the response. Since pile driving will only occur during daylight hours, marine mammals transiting a project area or foraging or resting in a project area at night will not be affected. Effects of pile-driving activities will be experienced by individual marine mammals but will not cause population-level impacts or affect the continued survival of the species.

7.1.4 Potential Effects Resulting from Airborne Noise

Marine mammals that occur in the project area could be exposed to airborne sounds associated with pile driving that have the potential to cause behavioral harassment, depending on their distance from pile-driving activities. Airborne pile-driving noises are expected to have very little impact on cetaceans because noise from atmospheric sources does not transmit well through the air-water interface (Richardson et al. 1995). Consequently, cetaceans are not expected to be exposed to airborne sounds that will result in harassment as defined under the MMPA.

Airborne noise will primarily be an issue for pinnipeds that are swimming or hauled out within the range of impact as defined by the acoustic criteria discussed in Section 6. Airborne sound is most likely to cause behavioral responses similar to those discussed above in relation to underwater noise. For instance, anthropogenic sound could cause hauled-out pinnipeds to exhibit changes in their normal behavior, such as a reduction in vocalizations, or could cause them to temporarily abandon their usual or preferred locations and move farther from the noise source. Pinnipeds swimming in the vicinity of pile driving may avoid or withdraw from the area, or they may show increased alertness or alarm (e.g., heading out of the water and looking around). However, studies of ringed seals by Blackwell et al. (2004) and Moulton et al. (2005) indicate a tolerance or lack of response to unweighted airborne sounds as high as 112 peak dB and 96 dB RMS, which suggests that habituation occurred.

Marine mammals in the impact zones may exhibit temporary behavioral reactions to airborne pile-driving noise. However, these exposures may have a temporary effect on individual animals or groups of animals, but this level of exposure is very unlikely to result in population-level impacts.

7.2 VESSEL INTERACTIONS

Close proximity to vessels has been observed to disrupt feeding aggregations of humpbacks and separation of mothers and calves, as well as dispersal of the fish schools targeting by the whales (Krieger and Wing 1986). In addition to acoustic impacts, vessel traffic also poses a direct threat to humpbacks through ship-strike injury and mortality (Muto et al. 2019). Vulnerability to ship-strike may be higher in areas where humpbacks rest, as they spend three times as much time at the surface when resting than when traveling fast. Vessel strikes are not a major source of mortality for other marine mammals listed in this application, with the exception of resident killer whales observed following fishing vessels to consume the processing waste that is discharged, often close to ship propellers where whales may feed on the processing waste (Muto et al. 2019).

Sea Grant research indicates that humpback whales may increase energy expenditures when vessels are nearby. Observations included changes in direction, higher swim speeds, a decrease of time in-between breaths at the surface as the number of vessels increased (Schuler and Pearson 2019; Teerlink 2017). These effects may result in changes in habitat use and distribution (Schuler and Pearson 2019). Teerlink (2017) measured concentrations of steroid hormones, including cortisol, from biopsy samples in whales in the Juneau area that area subjected to large amounts of vessel traffic and compared the results to whales in other areas with less vessel traffic. No physiological evidence of increased stress response was found in whales in the Juneau area indicating humpback whales in the Juneau area likely are habituated to vessel traffic (Teerlink 2017).

Steller sea lions and harbor seals may be disturbed by approaching vessels when on haulout sites which can lead to stampedes as individuals flee towards the water. There are no documented Steller sea lion or harbor seal haulouts or rookeries in the project area. The nearest sea lion haulout is approximately 20 miles northwest of the project area (Geoengineers 2018).

The project area is expected to experience an increase in the amount of vessel traffic within marine mammal habitat based on a projected increase in tourism of the area; however, due to the substantial amount of existing vessel traffic in the area coupled with the continued use of the habitat by marine mammals, the effects on marine mammals from project vessel noise are expected to be minor and negligible. In addition, 33 CFR 162.240, Tongass Narrows, Ketchikan, Alaska; navigation, establishes a maximum speed limit of 7 knots for vessels of over 23 feet in length in Tongass Narrows, bounded on the north by Buoy ‘9’ and to the south by the East and West Channel Regulatory markers, respectively.

7.3 WATER QUALITY

Due to the localized and temporary nature of increased turbidity discussed in Section 10.2, effects to marine mammals in this application and their prey species would be short term and negligible. Implementation of the shutdown zones discussed in Section 11 will reduce the potential of effects of water quality changes on marine mammals. Displacement or disaggregation of prey species would be temporary and result in prey species avoiding the area temporarily. Consequently, there are no permanent effects on marine mammal populations anticipated due to water quality.

7.4 PREY AVAILABILITY

The action area provides habitat for the marine mammal species that supports foraging, migration, refuge and reproductive activities. Because the proposed piles will be installed on or adjacent to existing structures, in waters with significant marine debris and in an industrial area, no long-term effects to EFH are anticipated. Effects due to underwater sound or turbidity would be limited to temporary displacement or disaggregation of prey species. These effects would be short in duration with prey species returning to the project area upon completion of the project.

7.5 Conclusions Regarding Impacts to Species or Stocks

Individual marine mammals may be exposed to SPLs during pile driving, which may result in Level B behavioral harassment and, for harbor porpoise, Dall's porpoise, and harbor seals, some Level A harassment.

Any marine mammals that are exposed (harassed) may change their normal behavior patterns (e.g., swimming speed, foraging habits) or be temporarily displaced from the area of construction. Any exposures to Level B harassment will likely have only a minor effect on individuals and no effect on the population. Exposure to Level A harassment during steel impact driving could result in a permanent change in hearing thresholds. To avoid permanent impacts to marine mammal hearing, a shutdown zone will be implemented that will encompass as much of the Level A zone as practicable. The sound generated from vibratory pile driving will not result in injury to marine mammals because the areas where injury could potentially occur are small and will be fully monitored, and pile driving will be shut down if marine mammals are approaching these zones.

Mitigation is expected to avoid most potential adverse underwater impacts to marine mammals from impact pile driving. Nevertheless, some exposure is unavoidable. The expected level of unavoidable exposure (defined as acoustic harassment) is provided in Section 6. This level of effect is not anticipated to have any adverse impact to harbor porpoise, Dall's porpoise, or harbor seal population recruitment, survival, or recovery.

8.0 IMPACTS TO SUBSISTENCE

The anticipated impact of the activity on the availability of the species or stock of marine mammals for subsistence uses.

Alaska Natives have traditionally harvested subsistence resources in Southeast Alaska for many hundreds of years, particularly large terrestrial mammals, marine mammals, salmon, and other fish (ADF&G 1997). Harbor seals are the marine mammal species most regularly harvested for subsistence by households in Ketchikan and Saxman. Eighty harbor seals were harvested by Ketchikan residents in 2007, which ranked fourth among all communities in Alaska that year for harvest of harbor seals. Thirteen harbor seals were harvested by Saxman residents in 2007. Hunting usually occurs in October and November (ADF&G 2009). In 2008, two Steller sea lions were harvested by Ketchikan-based subsistence hunters, but this is the only record of sea lion harvest by residents of either Ketchikan or Saxman. The Alaska Department of Fish and Game has not recorded harvest of cetaceans from either community (ADF&G 2018).

Approximately 17 percent of Ketchikan residents and 51 percent of Saxman residents identify as Alaska Native. There are approximately 10 households in Ketchikan that subsistence hunt, while there are approximately 110 such households in Saxman. Based on data from 1999, marine mammals account for approximately 5.1 percent (6,978 pounds) of all subsistence harvest in Saxman (ADF&G 2018).

All project activities will take place within the industrial area of Tongass Narrows immediately adjacent to Ketchikan where subsistence activities do not generally occur. The project will not have an adverse impact on the availability of marine mammals for subsistence use at locations farther away. Some minor, short-term disturbance of the harbor seals could occur, but this is not likely to have any measurable effect on subsistence harvest activities in the region. No changes to availability of subsistence resources will result from project activities.

In accordance with the Alaska Native Claims Settlement Act (43 U.S.C. 1602), NOAA reached out to all potentially interested Indian Tribes (which include native villages, regional corporations, or village corporations) regarding the proposed project. The outreach, consistent with the National Environmental Policy Act (NEPA) and Section 106 National Historic Preservation Act, included letters and invitations for Indian Tribes to participate in an online meeting for the purposes of information exchange. The online open house was held on April 16, 2021. No comments were received. A list of invited parties is provided in Appendix E.

9.0 IMPACTS TO MARINE MAMMAL HABITAT AND THE LIKELIHOOD OF RESTORATION

The anticipated impact of the activity upon the habitat of the marine mammal populations, and the likelihood of restoration of the affected habitat.

9.1 EFFECTS OF PROJECT ACTIVITIES ON MARINE MAMMAL HABITAT

Construction of the project would involve pile and pier removal work and placement of structures in the Tongass Narrows, which would result in direct impacts to aquatic habitat. A summary of the worst-case direct impacts to aquatic habitats associated with the project is provided in Table 9-1.

Table 9-1: Estimate of Direct Impacts to Aquatic Habitats from Proposed Structures

Structures	Fill Material	Pile Quantity	Seafloor Footprint (square feet)	Over-Water Footprint (square feet)
Floating Pier	Steel piles, 24-inch diameter	10	31	12,000
Transfer Bridge	N/A	N/A	N/A	2,448
Transfer Bridge Support Frame and Float	Steel piles, 24-inch diameter	4	13	528[1]
Transfer Bridge Abutment	Concrete, shot rock, armor rock, base course	N/A	620	N/A
Small Boat Dock	Steel piles	N/A	13	1,264
Small Boat Dock Suspended Gangway	N/A	4	N/A	150
Suspended Gangway/Catwalk Mooring Dolphins	N/A	N/A	N/A	N/A
Small Boat Launch Ramp	Concrete, shot rock, armor rock, base course	N/A	11,190	N/A
	Total	18	11,867 (0.27 acre)	16,390 (0.38 acre)

Notes:
[1]The bridge support float would overlap with that of the bridge itself, therefore the support float area is excluded from the calculation of total over-water footprint.
N/A = not applicable
Data in this table are AECOM Technical Services, Inc. estimates and were calculated using maximum quantities and dimensions.

Construction of the project would involve installation of 18 piles and in-water fill associated with the transfer bridge abutment and the small boat launch ramp, which would modify approximately 0.27 acre of marine substrate. Proposed in-water infrastructure would have an estimated over-water footprint of approximately 0.38 acre. These structures would remain present through operations of the NOAA Ketchikan port (20 to 50 years) and would be removed according to industry standards at the time of decommissioning, unless continued for future use. These direct impacts would be partially offset by removal of existing dilapidated in-water structures; approximately 100 to 200 pilings (approximately 0.009 to 0.014 acre, depending on exact number and diameter of removed piles) and approximately 0.36 acre of over-water infrastructure would be removed. Therefore, the net increase in seafloor footprint at the project site would be approximately 0.27 acre, whereas the net increase in over-water footprint would be approximately 0.02 acre.

The nearshore and intertidal habitat where the project will occur is an area of relatively high marine vessel and aircraft traffic. Most marine mammals do not generally use the area within the footprints of the project

components. Temporary, intermittent, and short-term habitat alteration may result from increased noise levels within the Level B harassment zones.

Although Southeast Alaska in its entirety is listed as a biologically important area for humpback whales, the project area does not contain particularly high value habitat and is not unusually important for the species. Furthermore, mitigation measures (Section 11), such as marine mammal monitoring, would limit the number of humpback whales exposed to underwater noise as a result of the project. Avoidance of the project area by humpback whales is possible, but would be temporary and intermittent in duration.

9.2 Effects of Project Activities on Marine Mammal Prey Habitat

EFH has been designated within the project area for all five species of salmon (i.e., chum salmon, pink salmon, coho salmon, sockeye salmon, and Chinook salmon; NMFS 2017), which are common prey of marine mammals. An EFH assessment is provided in Appendix D. Fish populations in the project area that serve as marine mammal prey could be temporarily affected by noise from in-water pile installation. The frequency range in which fish generally perceive underwater sounds is 50 to 2,000 Hz, with peak sensitivities below 800 Hz (Popper and Hastings 2009). Fish behavior or distribution may change, especially with strong and/or intermittent sounds that could potentially harm fish. High underwater SPLs have been documented to alter behavior; cause hearing loss; and injure or kill individual fish by causing serious internal injury (Hastings and Popper 2005).

Drilling of rock sockets and pile installation and removal may result in a small increase in sedimentation within a few feet of the piles. In general, turbidity associated with pile installation is expected to be localized to about a 25-foot radius around the pile (Everitt et al. 1980). A small amount of sediment and drill tailings may be deposited in proximity to each pile. Minor and temporary increases in turbidity may result from this process, but the effects on fish and marine mammal prey would be negligible. Indirect effects to prey would be insignificant and discountable due to the temporary nature of the activity and are expected to be undetectable to marine mammals.

In general, impacts on marine mammal prey species are expected to be minor and temporary. Additional overwater structures and shading have the potential to impact marine mammal prey. The area likely impacted by the project is relatively small compared to the available habitat in Tongass Narrows and throughout Southeast Alaska. The most likely impact to fish from the project would be temporary behavioral avoidance of the immediate area, although any behavioral avoidance of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat. Therefore, the impact on marine mammal prey during the project is expected to be minor.

10.0 IMPACTS TO MARINE MAMMALS FROM LOSS OR MODIFICATION OF HABITAT

The anticipated impact of the loss or modification of the habitat on the marine mammal population involved.

The potential impacts of the project on marine mammal habitat are discussed in Section 9. Anticipated impact of the loss or modification of habitat on marine mammal populations presented in this application are negligible and discountable due to the temporary nature of the proposed construction activities. The permanent net loss of habitat would occur in an area where most marine mammals do not generally use because of high marine vessel traffic and limited foraging opportunities.

Potential displacement of marine mammals by noise would not be permanent and would not have long-term effects. The project is not expected to have any habitat-related effects that could cause significant or long-term consequences for individual marine mammals or their populations, because pile installation/removal and other noise sources will be temporary and intermittent.

11.0 MITIGATION MEASURES

The availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks, their habitat, and on their availability for subsistence uses, paying particular attention to rookeries, mating grounds, and areas of similar significance.

11.1 General Construction Activities

The proposed project avoids impacts as much as practicable. Tongass Narrows is an active marine environment, with high levels of vessel traffic (Section 2.5.1), particularly during summer months. There is an elevated level of ambient noise within the area compared to natural conditions. The mitigation measures and best management practices that will be implemented are designed to reduce the project's impacts within the action area.

The following measures and best management practices will be incorporated by the applicant in order to minimize potential impacts:

- Improvement structures are designed to provide barrier-free migration and vertical movement for marine and estuarine fish. The improvements will be maintained in a manner that does not introduce any pollutants or debris into the water or cause a migration barrier for fish, such that prey continues to be available to marine mammals in the area.
- The improvement structures are designed to limit contaminant releases and will be maintained in a manner that manages pollutants and debris streams to avoid incidental introduction of deleterious materials into Tongass Narrows.
- Fuels, lubricants, chemicals and other hazardous substances will be stored above the high tide line to prevent spills.
- Oil booms will be readily available for containment should any releases occur.
- To prevent spills or leakage of hazardous material during construction, standard spill-prevention measures will be implemented during construction. The contractor will provide and maintain a spill clean-up kit on-site at all times.
- The contractor will monitor equipment and gear storage areas for drips or leaks regularly, including inspection of fuel hoses, oil drums, oil or fuel transfer valves and fittings, and fuel storage that occurs at the project site. Equipment will be maintained and stored properly to prevent spills.
- If contaminated or hazardous materials are encountered during construction, all work in the vicinity of the contaminated site will be stopped until a corrective action plan is devised and implemented to minimize impacts on surface waters and organisms in the project area.

11.2 Pile Removal and Installation Activities

A Marine Mammal Monitoring and Mitigation Plan will be implemented for all pile installation activities. To ensure consistency under NEPA, ESA, and MMPA, the Marine Mammal Monitoring and Mitigation Plan will be drafted once mitigation measures and environmental commitments under NEPA, ESA, and MMPA are decided. The Marine Mammal Monitoring and Mitigation Plan includes protected species observers (PSOs) that will be positioned at the practical and optimal vantage points to detect marine mammals entering monitoring and shutdown zones.

The plan will also provide the qualifications and training required for the PSOs; the required equipment, including guidance and reference materials; and required data collection protocols to ensure that clear and concise data records are kept and that data interpretation, post-season data QA/QC, analyses, and reporting are accurate.

Two zones are proposed for all marine mammals: a monitoring zone and shutdown zone. The monitoring zone would be set at 3 kilometers from the project area (Figure 11-1). This 3-kilometer zone is based on Level B harassment zones during impact driving (2.6 kilometers) and vibratory removal of piles

(2.9 kilometers). The shutdown zone would be set at 180 meters from the project area. The 180-meter zone protects all marine mammal function hearing groups from Level A harassment and is protective of non-auditory injury and mortality. The Level B harassment zone for DTH placement extends to 12 kilometers which is an area that is difficult to monitor given the characteristics of the Tongass Narrows (see Figure 2-1).

The daily construction window for pile driving will begin no sooner than 30 minutes after sunrise to allow for 30 minute pre-activity monitoring and work may not begin without sufficient daylight or weather conditions to conduct pre-activity monitoring. When construction ceases at least 30 minutes prior to sunset, post-activity monitoring will be conducted for 30 minutes. In the case of work extending into the night hours (as described in Section 2.1), post-activity monitoring will not be conducted.

In case of fog or reduced visibility, observers must be able to observe the entire shutdown zones before permitted activities can be initiated; work may continue if shutdown zones are visible. Takes will be extrapolated, in these cases, based on the amount of the Level B harassment zone visible. Where weather conditions limit the visibility of the zone after work has commenced and where Level B zones are too large to be fully observed, takes will be extrapolated based on the percentage of the Level B harassment zone that is visible and the number/species observed. Percentages visible for each day will be determined and documented by the monitoring team using maps and land features visible during monitoring efforts.

All efforts will be made to avoid Level A takes of any marine mammals.

For marine mammals for which no Level B takes are requested or permitted, all in water pile driving activities will shut down immediately until the animals leave the Level B harassment zone of their own volition.

11.2.1 Pile Installation Methods

To minimize impacts to marine mammals and their prey vibratory installation and/or hammering will be used as the primary methods of pile installation. Impact driving or DTH will be minimized and used only as needed to seat the pile in its final position or to penetrate material that is too dense for a vibratory hammer. Use of bubble curtains are not proposed as mitigation because the large calculated exclusion zones are truncated by land masses.

11.2.2 Soft Start Procedures

To allow marine mammals to leave the area prior to exposure to maximum noise levels, soft start procedures will be used prior to impact pile driving/hammering each day and when work ceases for more than 30 minutes. No soft start is proposed for vibratory pile driving or DTH.

For impact hammers, the soft start procedure includes initiating approximately three strikes at a reduced energy level, followed by a 30-second waiting period. This procedure will be repeated two additional times before beginning in-water pile driving/hammering operations.

11.2.3 Vessel Interactions

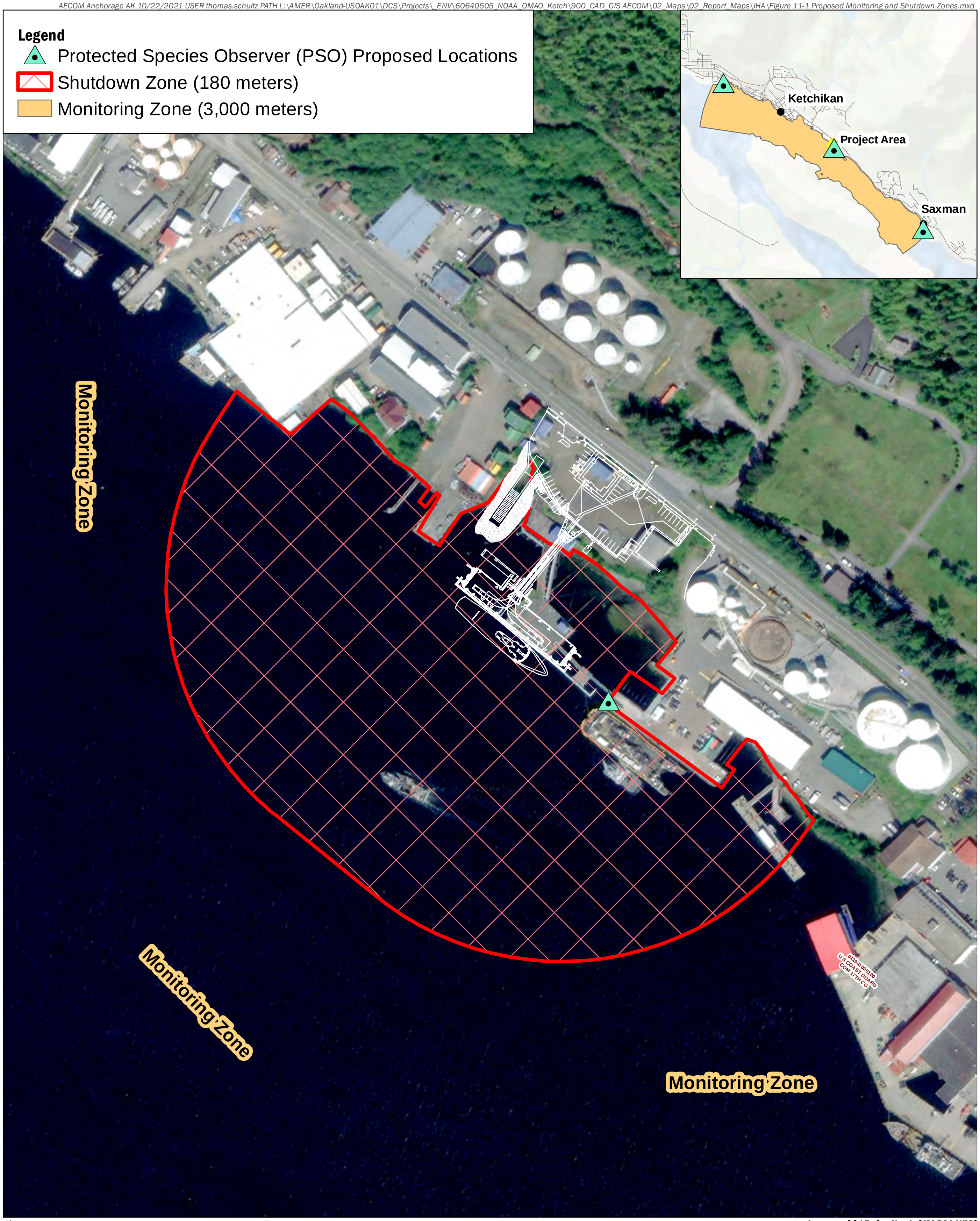
In order to minimize impacts from vessel interactions with marine mammals, the crew aboard project vessels will follow NMFS's marine mammal viewing guidelines and regulations as practicable (NOAA 2020b).In additional speed reduction to a minimum possible if within 10 meters of a marine mammal.

11.2.4 In-Water or Over-Water Construction Activities

During in-water or over-water construction activities, a shutdown zone of 10 meters will be implemented for all marine mammals to prevent physical injury interaction with construction equipment. If any marine mammal is observed in this zone, shutdown will be implemented immediately until the animal has left of its own volition and/or vessel speeds reduced to the minimum level required to maintain steerage and safe working conditions.

11.2.5 Compensatory Habitat Mitigation

NOAA has requested a permit for the proposed project under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act from the U. S. Army Corps of Engineers. To receive that permit, NOAA will be required to avoid, minimize, and mitigate impacts to intertidal habitat. For impacts that cannot be avoided or minimized, NOAA will coordinate compensatory mitigation with U. S. Army Corps of Engineers.



N

0 100

Meters

Imagery: 2015; GeoNorth OIM BDL WMS
Parcels: Ketchikan Gateway Borough
Pier: PND, Sept 2021

AECOM

NOAA

Ketchikan Homeport Revitalization Project

INCIDENTAL HARASSMENT AUTHORIZATION

PROPOSED MONITORING AND SHUTDOWN ZONES

Figure 11-1

12.0 EFFECTS ON ARCTIC SUBSISTENCE HUNTING AND PLAN OF COOPERATION

Where the proposed activity would take place in or near a traditional Arctic subsistence hunting area and/or may affect the availability of a species or stock of marine mammal for Arctic subsistence uses, the applicant must submit either a plan of cooperation or information that identifies what measures have been taken and/or will be taken to minimize any adverse effects on the availability of marine mammals for subsistence uses. A plan must include the following:

(i) A statement that the applicant has notified and provided the affected subsistence community with a draft plan of cooperation

(ii) A schedule for meeting with the affected subsistence communities to discuss proposed activities and to resolve potential conflicts regarding any aspects of either the operation or the plan of cooperation

(iii) A description of what measures the applicant has taken and/or will take to ensure that proposed activities will not interfere with subsistence whaling or sealing

(iv) What plans the applicant has to continue to meet with the affected communities, both prior to and while conducting activity, to resolve conflicts and to notify the communities of any changes in the operation

The project will take place in Ketchikan, which is in waters south of the 60˚ North latitude demarcation. No activities will take place in or near a traditional Arctic subsistence hunting area. The project will not impact the availability of marine mammals for Arctic subsistence uses and no plan of cooperation is required for this project. Further, as addressed in Section 8, this project is not likely to impact the availability of any marine mammal for subsistence uses.

13.0 MONITORING AND REPORTING EFFORTS

The suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species, the level of taking, or impacts on populations of marine mammals that are expected to be present while conducting activities and the suggested means of minimizing burdens by coordinating such reporting requirements with other schemes already applicable to persons conducting such activity. Monitoring plans should include a description of the survey techniques that will be used to determine the movement and activity of marine mammals near the activity site(s) including migration and other habitat uses, such as feeding.

13.1 MONITORING AND REPORTING EFFORTS

Monitoring measures for the potential impacts the project could have on marine mammals are discussed briefly in Section 11.

13.2 REPORTING

A comprehensive annual marine mammal monitoring report documenting marine mammal observations will be submitted to NMFS at the end of the in-water work season. The draft comprehensive marine mammal monitoring report will be submitted to NMFS within 90 calendar days of the end of the in-water work period. The report will include marine mammal observations (pre-activity, during-activity, and post-activity) during pile driving/hammering days. A final comprehensive report will be prepared and submitted to NMFS within 30 calendar days following resolution of comments on the draft report from NMFS.

(a) The marine mammal report must contain the informational elements described in the Monitoring Plan and, at minimum, must include:

- (i) Dates and times (begin and end) of all marine mammal monitoring;
- (ii) Construction activities occurring during each daily observation period, including:
  - A. The number and type of piles that were driven and the method (e.g., impact, vibratory, down-the-hole);
  - B. Total duration of driving time for each pile (vibratory driving) and number of strikes for each pile (impact driving); and
  - C. For down-the-hole drilling, duration of operation for both impulsive and non-pulse components.
- (iii) PSO locations during marine mammal monitoring;
- (iv) Environmental conditions during monitoring periods (at beginning and end of PSO shift and whenever conditions change significantly), including Beaufort sea state and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon, and estimated observable distance;
- (v) Upon observation of a marine mammal, the following information:
  - A. Name of PSO who sighted the animal(s) and PSO location and activity at time of sighting;
  - B. Time of sighting;
  - C. Identification of the animal(s) (e.g., genus/species, lowest possible taxonomic level, or unidentified), PSO confidence in identification, and the composition of the group if there is a mix of species;
  - D. Distance and bearing of each marine mammal observed relative to the pile being driven for each sighting (if pile driving was occurring at time of sighting);

E. Estimated number of animals (min/max/best estimate);

F. Estimated number of animals by cohort (adults, juveniles, neonates, group composition, etc.);

G. Animal's closest point of approach and estimated time spent within the harassment zone;

H. Description of any marine mammal behavioral observations (e.g., observed behaviors such as feeding or traveling), including an assessment of behavioral responses thought to have resulted from the activity (e.g., no response or changes in behavioral state such as ceasing feeding, changing direction, flushing, or breaching);

(vi) Number of marine mammals detected within the harassment zones, by species; and

(vii) Detailed information about implementation of any mitigation (e.g., shutdowns and delays), a description of specific actions that ensued, and resulting changes in behavior of the animal(s), if any.

(b) The Holder must submit all PSO datasheets and/or raw sighting data with the draft report, as specified in condition 6(b) of this IHA.

14.0 RESEARCH EFFORTS

Suggested means of learning of, encouraging, and coordinating research opportunities, plans, and activities relating to reducing such incidental taking and evaluating its effects.

The data recorded during marine mammal monitoring for the proposed project will be provided to NMFS in monitoring reports. These reports will provide information on the usage of the site by humpback whales, Steller sea lions, harbor seals, harbor porpoises, Dall's porpoises, killer whales, and any other marine mammals observed during the project. The monitoring data will inform NMFS and future permit applicants about the behavior and adaptability of pinnipeds and cetaceans for future projects of a similar nature.

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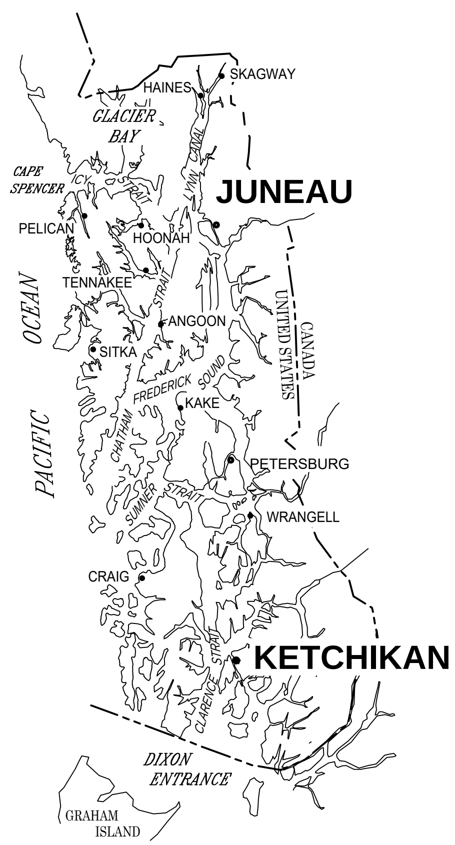
Appendix A: Engineering Drawings

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT
CONTRACT NO. 1305M421CNAAJ0005

VICINITY



SOUTHEAST ALASKA

VICINITY MAP

SCALE IN MILES

0 ¼ ½ 1

TIDAL DATA

SOURCE: NOAA NOS/CO-OPS STATION ID: 9450460 KETCHIKAN, AK. 9/26/11

DESCRIPTION	ELEV. (FT.)
HIGHEST OBSERVED WATER LEVEL	+21.3
MEAN HIGHER HIGH WATER (MHHW)	+15.5
MEAN HIGH WATER (MHW)	+14.5
MEAN SEA LEVEL (MSL)	+8.1
MEAN TIDE LEVEL (MTL)	+8.1
MEAN LOW WATER (MLW)	+1.6
MEAN LOWER LOW WATER (MLLW)	0.0
LOWEST OBSERVED WATER LEVEL	−5.3

Ahtna Infrastructure & Technologies, LLC

REV.	DATE	DESCRIPTION	DWN.	CKD.	APP.

PND ENGINEERS, INC.
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Juneau, Alaska 99801
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www.pndengineers.com

60% DESIGN SUBMITTAL

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: TITLE SHEET AND VICINITY MAP

G1.01

DESIGN: CRS CHECKED: JLD SCALE: AS SHOWN
DRAWN: PJD APPROVED: CRS

DATE: AUGUST 11, 2021

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

DRAWING INDEX

DWG. NO.	TITLE
	GENERAL
G1.01	TITLE SHEET, VICINITY MAP
G1.02	DRAWING INDEX
G1.03	GENERAL NOTES, LEGEND AND ABBREVIATIONS
G1.04	EXISTING CONDITIONS, SURVEY CONTROL AND BOREHOLE LOCATIONS
G1.05	DEMOLITION PLAN
G1.06	GENERAL SITE PLAN
G1.07	DOCK UTILITY ARRANGEMENT & VEHICLE TURNING DIAGRAM
	CIVIL – UPLANDS
C1.01	UPLANDS SITE PLAN
C1.02	POINT LAYOUT TABLES
C1.03	TYPICAL SECTIONS
C1.04	CIVIL DETAILS
C1.05	FENCE DETAILS
C1.06	GATE DETAILS
C1.07	PARTIAL SITE & STORM DRAIN PLAN
C1.08	STORM DRAIN DETAILS
	CIVIL – BOAT LAUNCH RAMP
C2.01	BOAT LAUNCH RAMP PLAN & PROFILE
C2.02	BOAT LAUNCH RAMP TYPICAL SECTIONS
C2.03	BOAT LAUNCH RAMP PLANK & SLEEPER DETAILS
C2.04	BOAT LAUNCH RAMP APRON DETAILS
	DOCK UTILITIES – WATER, WASTEWATER & FIRE SUPPRESSION
C3.01	UTILITIES SITE PLAN
C3.02	UPLAND UTILITIES DETAILS
C3.03	UTILITIES TRANSFER BRIDGE DETAILS
C3.03A	UTILITIES TRANSFER BRIDGE DETAILS ALTERNATE
C3.04	FLOATING DOCK PIPE ROUTING DETAILS
C3.04A	FLOATING DOCK PIPE ROUTING DETAILS ALTERNATE
C3.05	FLOATING DOCK UTILITIES DETAILS
C3.06	FLOATING DOCK UTILITIES DETAILS

DRAWING INDEX

DWG. NO.	TITLE
	STRUCTURAL – BRIDGE ABUTMENT
S1.01	TRANSFER BRIDGE ABUTMENT PLAN AND ELEVATION
S1.02	TRANSFER BRIDGE ABUTMENT DETAILS
S1.03	TRANSFER BRIDGE ABUTMENT DETAILS
	STRUCTURAL – TRANSFER BRIDGE
S2.01	TRANSFER BRIDGE GENERAL PLAN AND ELEVATION
S2.02	BRIDGE PLAN AND ELEVATION
S2.03	TYPICAL SECTION AND DETAILS
S2.04	END BEAM DETAILS
S2.05	FLOAT BEARING DETAILS
S2.06	SAFETY CHAIN DETAILS
S2.07	TRANSITION PLATE DETAILS
S2.08	BRIDGE SUPPORT FLOAT
S2.09	BRIDGE SUPPORT FLOAT
	STRUCTURAL – FLOATING DOCK
S3.01	FLOATING DOCK PLAN AND SECTION
S3.02	FLOATING DOCK FRAMING PLAN & TYPICAL SECTION
S3.03	FLOAT MODULE "A", "A1" AND "A2"
S3.04	FLOAT MODULE "B", "B1" AND "B2"
S3.05	FLOAT MODULE "C", "C1", "C2" AND "C3"
S3.06	FLOAT MODULE "D"
S3.07	BRIDGE SUPPORT BEAM
S3.08	TYPICAL SECTIONS
S3.09	FLOATING DOCK DETAILS
S3.10	FLOATING DOCK DETAILS
S3.11	PILE HOOPS
S3.12	FLOATING DOCK TRANSITION APRON
S3.13	PILE SCHEDULE AND PILE DETAILS
S3.14	NW / SE MOORING FRAME DETAILS
S3.15	BRIDGE SUPPORT FRAME
	STRUCTURAL – GANGWAY
S4.01	GANGWAY PLAN, ELEVATION AND TYPICAL SECTION
S4.02	GANGWAY DETAILS
S4.03	GANGWAY DETAILS
	STRUCTURAL – FLOATING CAMEL
S5.01	EXISTING CAMEL MODIFICATIONS
S5.02	CAMEL AND FENDER DETAILS

Ahtna Infrastructure & Technologies, LLC

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DESIGN: CRS CHECKED: JLD
DRAWN: PJD APPROVED: CRS
SCALE: NA

60% DESIGN SUBMITTAL

DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: DRAWING INDEX

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

G1.02

GENERAL NOTES

1. **EROSION AND POLLUTION CONTROL PLANS**

   DEVELOP AND SUBMIT FOR AGENCY REVIEW AND APPROVAL A STORM WATER POLLUTION PREVENTION PLAN (SWPPP). THIS PLAN SHALL INCLUDE AN EROSION AND SEDIMENT CONTROL PLAN BASED UPON THE CONTRACTOR'S SCHEDULING, EQUIPMENT AND WORK. TO THE GREATEST EXTENT POSSIBLE FOLLOW THE ALASKA DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES (ADOT/PF) ALASKA STORM WATER POLLUTION PREVENTION PLAN GUIDE (ASWPPPG). THE PLAN SHALL CONSIDER FIRST PREVENTING EROSION, THEN MINIMIZING AND TRAPPING SEDIMENT PRIOR TO ITS ENTERING THE WATERWAYS. THE PLAN MUST ADDRESS THE SITE-SPECIFIC CONTROLS AND MANAGEMENT FOR THE CONSTRUCTION SITE AND AFFECTED AREAS. THE PLAN MUST INCORPORATE ALL THE REQUIREMENTS OF THE PROJECT PERMITS. BEST MANAGEMENT PRACTICES AS LISTED IN THE ASWPPPG SHALL BE USED.

   THE CONTRACTOR SHALL PREPARE A HAZARDOUS MATERIAL CONTROL PLAN (HMCP) FOR THE HANDLING, STORAGE, CLEAN-UP AND DISPOSAL OF PETROLEUM AND OTHER HAZARDOUS SUBSTANCES. THE CONTRACTOR SHALL LIST AND GIVE LOCATIONS OF ALL HAZARDOUS MATERIALS, INCLUDING FIELD OFFICE MATERIALS, TO BE USED AND STORED ON-SITE AND THEIR ESTIMATED QUANTITIES. THE PLAN SHALL PROVIDE DETAILS FOR STORING THESE MATERIALS AS WELL AS DISPOSING WASTE PETROLEUM PRODUCTS AND OTHER HAZARDOUS MATERIALS GENERATED BY THE PROJECT.

   IDENTIFY THE LOCATIONS WHERE HAZARDOUS MATERIAL STORAGE, FUELING AND MAINTENANCE ACTIVITIES WILL TAKE PLACE. IF ON-SITE, DESCRIBE THE MAINTENANCE ACTIVITIES AND LIST ALL CONTROLS TO PREVENT THE ACCIDENTAL SPILLAGE OF OIL, PETROLEUM PRODUCTS AND OTHER HAZARDOUS MATERIALS. DETAIL PROCEDURES FOR CONTAINMENT AND CLEANUP OF HAZARDOUS SUBSTANCES INCLUDING A LIST OF THE TYPES AND QUANTITIES OF EQUIPMENT AND MATERIALS AVAILABLE ON-SITE TO BE USED.

   THE PLAN SHALL PROVIDE DETAILS FOR PREVENTION, CONTAINMENT, CLEAN-UP AND DISPOSAL OF SOIL AND WATER CONTAMINATED BY ACCIDENTAL SPILLS AND FOR UNEXPECTED CONTAMINATED SOIL AND WATER ENCOUNTERED DURING CONSTRUCTION.

2. MATCH EXISTING GRADES AT PROJECT LIMITS AND WHERE REQUIRED TO MATCH ELEVATIONS AT EXISTING ROADS.

3. ALL REMOVED MATERIALS THAT ARE NOT SUITABLE FOR REUSE ON THE PROJECT SHALL BE PROPERLY DISPOSED OF OFF SITE.

4. THE LOCATIONS OF EXISTING FEATURES AND UTILITIES SHOWN ON THE DRAWINGS ARE APPROXIMATE. ADDITIONAL UTILITIES MAY BE PRESENT HOWEVER ARE NOT SHOWN. THE CONTRACTOR SHALL VERIFY ALL UTILITY LOCATIONS IN THE FIELD AS NECESSARY, PRIOR TO BEGINNING WORK. THE HORIZONTAL AND VERTICAL LOCATIONS OF ALL UTILITIES ENCOUNTERED IN THE FIELD SHALL BE RECORDED ON THE CONTRACTOR'S RECORD DRAWINGS. CONTACT LOCAL UTILITY COMPANIES PRIOR TO ANY/ ALL EXCAVATIONS AT THE FOLLOWING TELEPHONE NUMBERS:

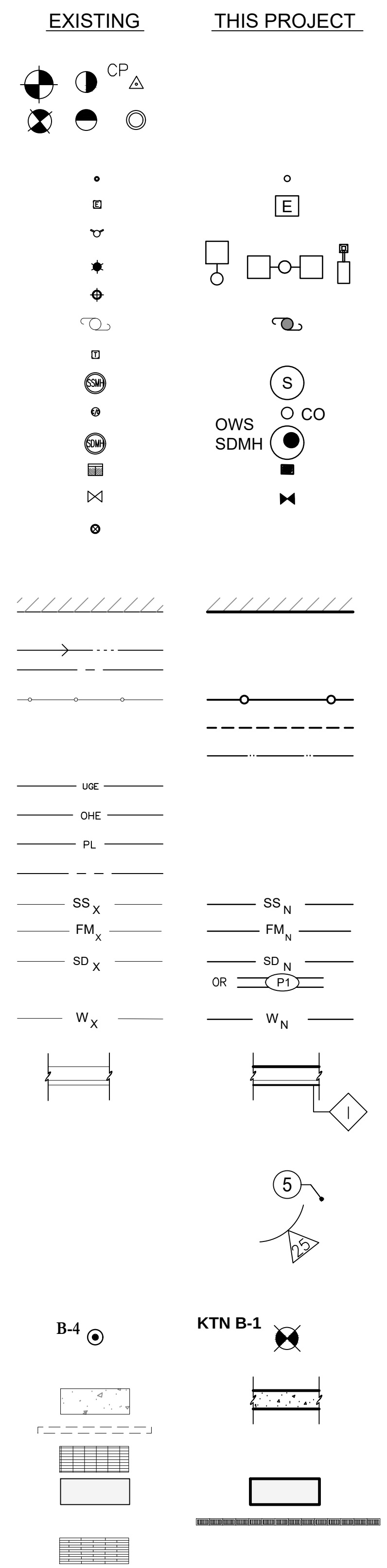
DIAL BEFORE YOU DIG!
907-228-4727
UNDERGROUND POWER, TELEPHONE, T.V., COMMUNICATIONS, WATER AND SEWER LINES ARE IN THE AREA. UTILITIES SHOWN ON THE PLANS DO NOT SUBSTITUTE FOR FIELD LOCATES.

5. PROPERTY DISTURBED DURING CONSTRUCTION OUTSIDE OF PROJECT LIMITS SHALL BE RESTORED TO ITS PRE-CONSTRUCTION CONDITION.

6. GRADING AND ALIGNMENT OF PIPE, STRUCTURES & FINAL SURFACING ARE SUBJECT TO MINOR REVISIONS BY THE ENGINEER TO FIT SITE CONDITIONS. GRADE ALL IMPROVEMENTS WITH POSITIVE DRAINAGE AWAY FROM STRUCTURES.

7. PROPERTY LINE LOCATIONS USED IN THESE PLANS ARE DERIVED FROM RECORD PLATS AND DO NOT REPRESENT A BOUNDARY SURVEY.

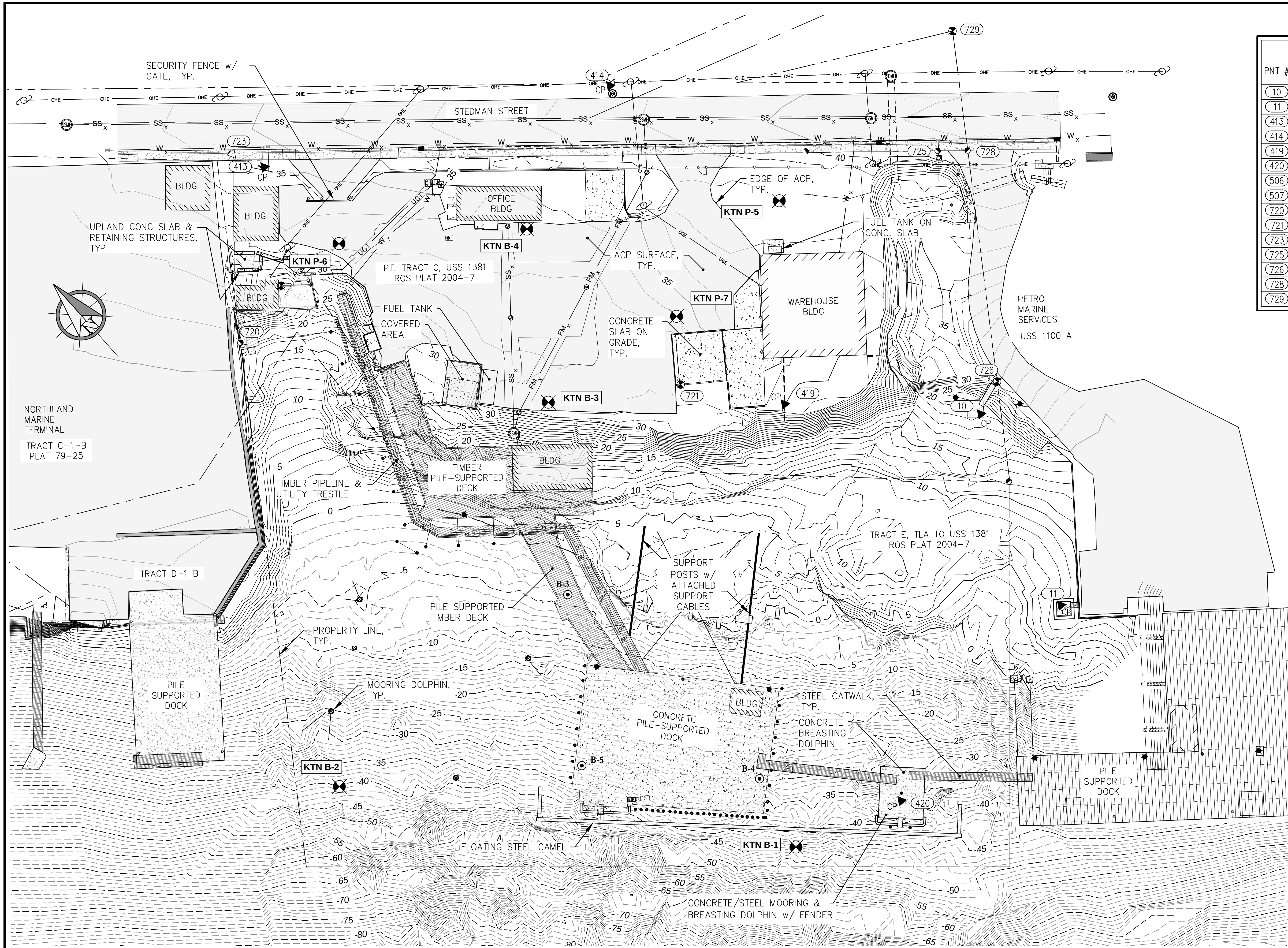
LEGEND



SURVEY CONTROL
BOLLARD
ELECTRIC PEDESTAL
FIRE HYDRANT
LIGHT POLE w/ LUMINAIRE
METAL PILING
POWER POLE
TELEPHONE PEDESTAL
SANITARY SEWER MANHOLE
SANITARY SEWER CLEAN OUT
STORM DRAIN MANHOLE
STORM DRAIN CATCH BASIN
WATER VALVE
WOOD PILING
BUILDING LINE
CENTER OF CREEK
CENTER LINE
FENCELINE
GEOTEXTILE REINFORCEMENT
GRADE BREAK
OVERHEAD ELECTRIC
UNDERGROUND ELECTRIC
PIPELINE
PROPERTY LINE
SANITARY SEWER
SANITARY SEWER FORCE MAIN
STORM DRAIN
WATER LINE
CURB & GUTTER w/ TYPE
LAYOUT POINT
LAYOUT RADIUS
TEST HOLE
CONCRETE/SIDEWALK
CULVERT
METAL PLATFORM
PAVEMENT/ACP
TRENCH DRAIN
WOOD DOCK

ABBREVIATIONS

A	
@	AT
AC	ASBESTOS CEMENT PIPE
ACP	ASPHALT CONCRETE PAVEMENT
ADA	AMERICANS WITH DISABILITIES ACT
ADJ	ADJUSTABLE
APF	ASSOCIATED PILE AND FITTING CORP.
APPROX. or APPX.	APPROXIMATE
ATS	ALASKA TIDELANDS SURVEY
AV	AIR RELEASE VALVE
B	
BCC	BEGINNING OF CURB CUT
BFV	BUTTERFLY VALVE
BLDG	BUILDING
BOP	BEGINNING OF PROJECT
BTM, BOT	BOTTOM
BTWN	BETWEEN
C	
C&G	CURB & GUTTER
CB	CATCH BASIN
CI	CAST IRON
CIP	CAST-IN-PLACE
CJ	CONTROL JOINT
℄	CENTER LINE
CLR	CLEAR
CMP	CORRUGATED METAL PIPE
CO	CLEANOUT
C.O.E.	CORPS OF ENGINEERS
COMM	COMMUNICATION
CONC.	CONCRETE
CONT	CONTINUOUS
CP	COMPLETE PENETRATION
CPEP/CPP	CORRUGATED POLYETHYLENE PIPE
COR	CORNER
CSC	COUNTERSINK
CTE	CONNECT TO EXISTING
CTR	CENTER
CY	CUBIC YARD
D	
DPC	DISSIMILAR PIPE COUPLING
D/DIA	DIAMETER
DBL	DOUBLE
DEMO	DEMOLITION
DFT	DRY FILM THICKNESS
DL	DEAD LOAD
DIP	DUCTILE IRON PIPE
DIM	DIMENSION
DN	DOWN
DTL	DETAIL
E	
E	EAST
EA.	EACH
EC	EDGE OF CONCRETE
ECC	END OF CURB CUT
EG	EXISTING GRADE
EJ	EXPANSION JOINT
EL/ELEV	ELEVATION
ELEL	ELECTRICAL
EOP	END OF PAVEMENT
EQ	EQUAL
EQUIP	EQUIPMENT
EST	ESTIMATE
EW	EACH WAY
EXC	EXCAVATE
EXIST	EXISTING
F	
FC	FACE OF CURB
FD	FLOOR DRAIN
FF	FINISHED FLOOR
FG	FINISHED GRADE
FH	FIRE HYDRANT, FLAT HEAD
FIN	FINISH (ED)
FM	FORCE MAIN SEWER
FND	FOUNDATION
FOC	FACE OF CURB
FT	FOOT
FT-LBS	FOOT POUNDS
FTG	FOOTING
FL	FLOWLINE OR FLANGE
G	
GALV	GALVANIZED
GB	GRADE BREAK
GRD	GROUND
GRS	GALVANIZED RIGID STEEL
GV	GATE VALVE
H	
H&T	HUB & TACK
HD	HEAVY DUTY
HDG	HOT-DIPPED GALVANIZED
HDPE	HIGH DENSITY POLYETHYLENE
HORIZ	HORIZONTAL
HSE	HOUSE
HT	HEIGHT
HWY.	HIGHWAY
I	
IAW	IN ACCORDANCE WITH
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IN	INCH
IP	IRON PIPE
INCL	INCLUDE (D) (ING)
INSUL	INSULATE (D) (ION)
INV	INVERT
J	
JB	JUNCTION BOX
L	
LBS	POUNDS
LF	LINEAR FEET
LL	LIVE LOAD
LOC	LOCATION
LS	LUMP SUM
M	
MAX	MAXIMUM
M.E.	MATCH EXISTING
MECH	MECHANICAL
MFR	MANUFACTURE (R)
MH	MANHOLE
MJ	MECHANICAL JOINT
MI	MALLEABLE IRON
MIN	MINIMUM
MLLW	MEAN LOWER LOW WATER
MSF	1000 SQUARE FEET
MSE	MECHANICALLY STABILIZED EARTH
MTL	MATERIAL (S)
N	
N	NORTH
NFS	NON FROST SUSCEPTIBLE
NIC	NOT IN CONTRACT
NO	NUMBER
NTS	NOT TO SCALE
O	
OBD	OVERBURDEN
OC	ON CENTER
OD	OUTSIDE DIAMETER
OG	ORIGINAL GOUND
OHE	OVERHEAD ELECTRICAL
OS	OWNER SUPPLIED
OWS	OIL-WATER SEPARATOR
OPP	OPPSITE
P	
P	PIPE
PC	POINT OF CURVATURE, PIECE
PCC	PRECAST CONCRETE
	POINT OF COMPOUND CURVATURE
PE	POLYETHYLENE
PED	PEDESTAL
PER	PERIMETER
PERF	PERFORATE (D)
PI	POINT OF INTERSECTION
PLWD	PLYWOOD
PL	PROPERTY LINE, PLATE
POC	POINT OF CURVE
PP	POLYPROPYLENE
PRC	POINT OF REVERSE CURVATURE
PROJ	PROJECT
PRKG	PARKING
PRV	PRESSURE REDUCING VALVE
PSI	POUND PER SQUARE INCH
PT	POINT, PRESSURE TREATED,
	POINT OF TANGENCY
PVC	POINT OF VERTICAL CURVATURE,
	POLY-VINYL CHLORIDE
PVI	POINT OF VERTICAL INTERSECTION
Q	
QA	QUALITY ASSURANCE
QC	QUALITY CONTROL
QTY	QUANTITY
R	
RAD	RADIUS
RE	RIM ELEVATION
REF	REFERENCE
REINF	REINFORCEMENT
REQD	REQUIRED
RTW	RETAINING WALL
RO	ROUGH OPENING
ROW	RIGHT OF WAY
S	
S	SOUTH
SCHED/SCH	SCHEDULE
SD	STORM DRAIN
SDI	STORM DRAIN INLET STRUCTURE
SDO	STORM DRAIN OUTLET STRUCTURE
SDR	STANDARD DIMENSION RATIO
SF	SQUARE FOOT
SHLDR	SHOULDER
SI	STREET INTERSECTION
SPEC	SPECIFICATION (S)
SQ	SQUARE
SRB	SHOT ROCK BORROW
SSC	SANITARY SEWER CONNECTION
SS	STAINLESS STEEL, SANITARY SEWER
SDMH	STORM DRAIN MANHOLE
SSMH	SANITARY SEWER MANHOLE
STA	STATION
STD	STANDARD
STL	STEEL
STRG	STRONG
SW	SIDEWALK
SWR	SEWER
SY	SQUARE YARD
SYM	SYMMETRICAL
T	
t	THICK
T&B	TOP AND BOTTOM
T&G	TONGUE AND GROOVE
TBC	TOP BACK OF CURB
TBD	TO BE DETERMINED
TBM	TEMPORARY BENCH MARK
TD	TRENCH DRAIN
TEL	TELEPHONE
TEMP	TEMPERATURE, TEMPORARY
TH	TEST HOLE
THK	THICK
TRANS	TRANSVERSE
TSM	THERMAL SPRAY METALIZE
TV	TELEVISION
TYP	TYPICAL
U	
UAMH	UTILITY ACCESS MANHOLE
UBC	UNIFORM BUILDING CODE
UE	UNDERGROUND ELECTRIC
UMC	UNIFORM MECHANICAL CODE
UHMW	ULTRA HIGH MOLECULAR WEIGHT
UON/UNO	UNLESS OTHERWISE NOTED
UPC	UNIFORM PLUMBING CODE
UV	ULTRAVIOLET
V	
VB	VALVE BOX
VERT	VERTICAL
VG	VALLEY GUTTER
W	
W	WEST
W/	WITH
WD	WOOD
WELDMT	WELDMENT
WL	WATERLINE
WQU	WATER QUALITY UNIT
WV	WATER VALVE
WW	WATER WATER
WWTP	WASTE WATER TREATMENT PLANT
W/O	WITHOUT
X	
XFMR	TRANSFORMER
<PT	ANGLE POINT



SURVEY CONTROL

PNT #	NORTHING	EASTING	ELEV. (FT.)	DESCRIPTION
10	1284789.36	3110264.32	22.23	FAM
11	1284673.15	3110230.45	22.53	FBC
413	1285164.15	3110030.18	35.54	SNS
414	1285074.19	3110216.71	38.38	SNS
419	1284865.85	3110178.99	35.56	SNL
420	1284643.26	3110086.34	22.04	SNL
506	1286137.51	3107894.00	22.62	TB-3 2001, 3.25" DOMED SBC
507	1287128.46	3107465.89	21.77	TB-4 2001, 3.25" DOMED SBC
720	1285093.27	3109954.97	22.61	FAC
721	1284912.80	3110139.13	32.66	FBC
723	1285181.88	3110020.50	34.76	FNS
725	1284924.42	3110341.32	41.00	FAC
726	1284798.08	3110283.60	31.09	FBC
728	1284913.57	3110355.07	40.64	FRBR
729	1284973.24	3110392.08	50.07	FBC

SURVEY NOTES:

1. BASIS OF COORDINATES FOR THIS SURVEY ARE NAD 83, ALASKA STATE PLANE ZONE 1 IN U.S. SURVEY FEET, DERIVED FROM AND HOLDING VALUES PROVIDED ON THE US ARMY CORPS OF ENGINEERS, ALASKA DISTRICT, "THOMAS BASIN HARBOR TOPOGRAPHIC / HYDROGRAPHIC SURVEY" DATED FEBRUARY 20-24, 2017. COORDINATES OF "TB-3 2001," (POINT 506 THIS SURVEY) HELD FOR THIS PROJECT ARE:
   N=1286137.510
   E=3107894.000
2. THE VERTICAL CONTROL FOR THIS SURVEY IS MEAN LOWER LOW WATER (MLLW=0.0') IN U.S. SURVEY FEET, DERIVED FROM AND HOLDING VALUES PROVIDED ON THE US ARMY CORPS OF ENGINEERS, ALASKA DISTRICT, "THOMAS BASIN HARBOR TOPOGRAPHIC / HYDROGRAPHIC SURVEY" DATED FEBRUARY 20-24, 2017. ELEVATION OF "TB-3 2007," (POINT 506 THIS SURVEY) HELD FOR THIS PROJECT ARE:
   EL=22.62
3. THE FIELD SURVEY WAS PERFORMED APRIL 27-29, 2021, BY PND ENGINEERS.
4. ALL DIMENSIONS AND COORDINATES ARE IN U.S. SURVEY FEET UNLESS OTHERWISE NOTED.
5. THIS SURVEY WAS COMPLETED USING GNSS SURVEY TECHNIQUES. REAL TIME KINEMATIC (RTK) OBSERVATIONS WERE STORED USING TRIMBLE R10 MODEL 2, GNSS RECEIVERS.
6. BATHYMETRIC DATA COLLECTED USING AN OHMEX SONARMITE INTEGRATED WITH TRIMBLE R10 MODEL 2 GNSS RECEIVER.
7. UTILITY LOCATES WERE SURVEYED WHERE MARKED BY LOCATE COMPANIES.
8. CONTOURS ARE IN FEET, WITH ONE FOOT INTERVALS.
9. NO TITLE SEARCH WAS PREPARED FOR THIS SURVEY. EASEMENTS AND ENCUMBRANCES SHOWN HEREON ARE FROM PLATS OF RECORD. OTHER EASEMENTS AND ENCUMBRANCES MAY EXIST.
10. EXISTING SURFACE SHOWN HEREON IS A COMPOSITE OF UPLANDS AND BATHYMETRY DATA COLLECTED DURING THIS SURVEY.

BOREHOLE LEGEND

KTN B-1 — PND (2021)

B-4 — DAMES & MOORE (1974)

Ahtna Infrastructure & Technologies, LLC

REV.	DATE	DESCRIPTION	DWN.	CKD.	APP.

PND ENGINEERS, INC.
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Fax: 907-586-2099
www.pndengineers.com

DESIGN: CRS CHECKED: PJD
DRAWN: PJD APPROVED: CRS
SCALE: SCALE IN FEET 0 30 60 FT.

60% DESIGN SUBMITTAL

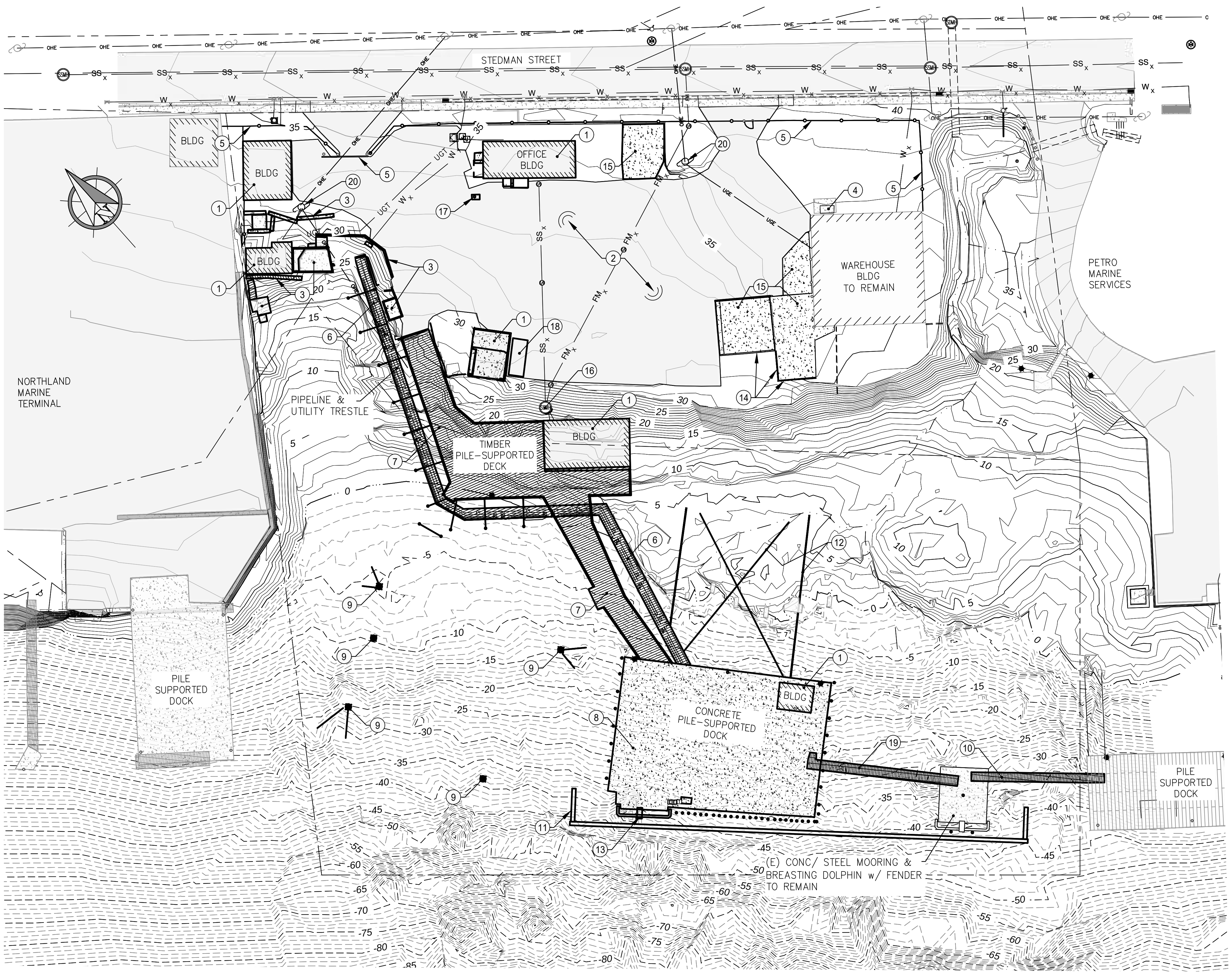
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE:
EXISTING CONDITIONS, SURVEY CONTROL AND BOREHOLE LOCATIONS

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

G1.04



GENERAL NOTES

A	ALL DEMOLISHED MATERIALS SHALL BE REMOVED FROM SITE AND PROPERLY DISPOSED OFF SITE PER REGULATORY REQUIREMENTS.
B	DEMOLISH (E) UTILITIES CONFLICTING WITH NEW IMPROVEMENTS. PLUG (E) UTILITIES TO REMAIN WITH CONCRETE AND/ OR CAP AS REQ'D.
C	PREVENT DEBRIS FROM ENTERING WATER. IMMEDIATELY COLLECT AND REMOVE ANY DEBRIS FALLING INTO WATER.
D	PERFORM DIVE INSPECTION OF COMPLETE PROJECT AREA UPON COMPLETION OF DEMOLITION ACTIVITIES. REMOVE ANY/ ALL DEBRIS FROM SEAFLOOR. PROVIDE VIDEO RECORDING OF SEAFLOOR FOLLOWING COMPLETION OF ALL DEMOLITION ACTIVITIES.
E	REMOVE EXISTING PILES IN THEIR ENTIRETY OR CUT OFF AT SEAFLOOR WHERE ANCHORED INTO BEDROCK. REMOVE ENTIRELY WHERE CONFLICT WITH NEW IMPROVEMENTS.
F	DEMOLISH ANY/ ALL OTHER MISCELLANEOUS ITEMS ENCOUNTERED AS REQ'D. TO CONSTRUCT NEW IMPROVEMENTS.

DEMOLITION SUMMARY

1	DEMOLISH (E) BUILDING STRUCTURE IN ENTIRETY INCLUDING SLAB, FOUNDATION, FINISHES, EQUIPMENT & UTILITIES.
2	DEMOLISH ALL (E) ACP ON-SITE.
3	DEMOLISH (E) CONCRETE WALLS, VAULTS & STRUCTURES.
4	SALVAGE (E) FUEL TANK & APPURTENANCES.
5	DEMOLISH (E) SECURITY FENCE AND GATES.
6	DEMOLISH (E) TIMBER UTILITY TRESTLE INCLUDING DECKING, SUB-DECK, PILES, CONCRETE FOUNDATION AND ALL PIPELINES/ UTILITIES.
7	DEMOLISH (E) TIMBER PILE-SUPPORTED DECK, SUB-DECK, PILES AND CONCRETE FOUNDATIONS.
8	DEMOLISH (E) CONCRETE DECK, STEEL SUB-STRUCTURES, PILES, PILE CAPS, BRACING, STRUTS AND OTHER APPURTENANCES.
9	DEMOLISH ALL (E) PILES AND DOLPHIN STRUCTURES
10	SALVAGE (E) CATWALK, WELDMENTS & HARDWARE
11	SALVAGE (E) FLOATING STEEL CAMEL FOR REFURBISHMENT & REUSE ON-SITE.
12	DEMOLISH (E) STEEL PIPE STRUTS & CABLE BRACES.
13	DEMOLISH (E) CONCRETE & STEEL MOORING & BREASTING DOLPHIN WITH STEEL PILES AND FENDERS IN ENTIRETY.
14	DEMOLISH (E) TIMBER & CONCRETE RETAINING WALLS & FENCE.
15	DEMOLISH (E) CONCRETE SLABS ON-GRADE.
16	DEMOLISH (E) SEWER LIFT STATION & ASSOCIATED PIPING.
17	SALVAGE (E) FLAG POLE.
18	DISPOSE (E) FUEL TANK.
19	DISPOSE (E) CATWALK, WELDMENTS & HARDWARE.
20	DEMOLISH POWER POLE & OHE BY PUBLIC UTILITY (KPU).

DEMOLISH = REMOVE & DISPOSE AT CONTRACTOR PROVIDED DISPOSAL SITE.

SALVAGE = REMOVE, SAVE & SUITABLY STORE AT NOAA DESIGNATED LOCATION OR INCORPORATE INTO PROJECT AS SHOWN ON PLANS.

(E) = EXISTING

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www.pndengineers.com

DESIGN: CRS CHECKED: JLD
DRAWN: PJD APPROVED: CRS
SCALE: SCALE IN FEET 0 30 60 FT.

60% DESIGN SUBMITTAL

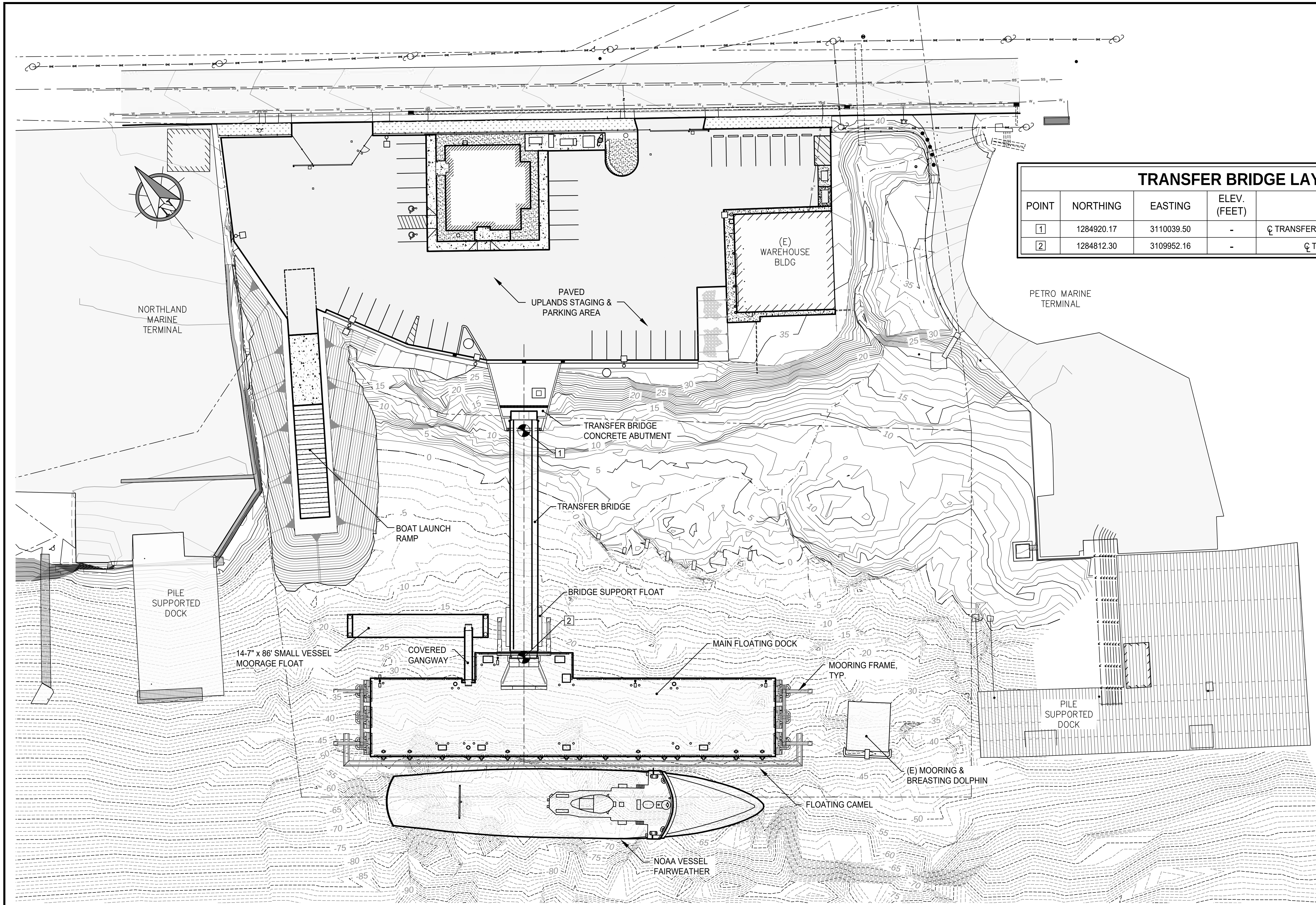
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: DEMOLITION PLAN

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

G1.05



TRANSFER BRIDGE LAYOUT TABLE

POINT	NORTHING	EASTING	ELEV. (FEET)	DESCRIPTION
1	1284920.17	3110039.50	-	℄ TRANSFER BRIDGE & CENTER FACE OF CONCRETE ABUTMENT
2	1284812.30	3109952.16	-	℄ TRANSFER BRIDGE & CENTER BEARING PIN

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SCALE: SCALE IN FEET 0 30 60 FT.

60% DESIGN SUBMITTAL

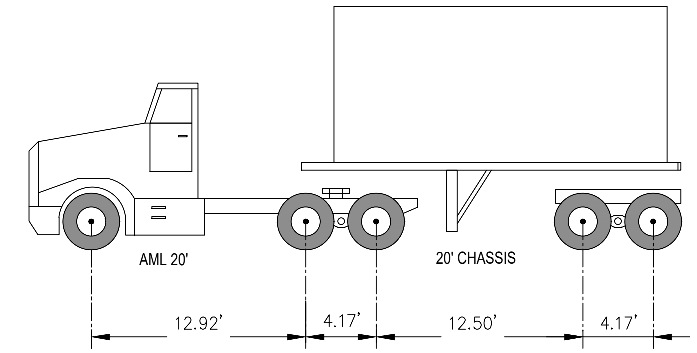
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: **GENERAL SITE PLAN**

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

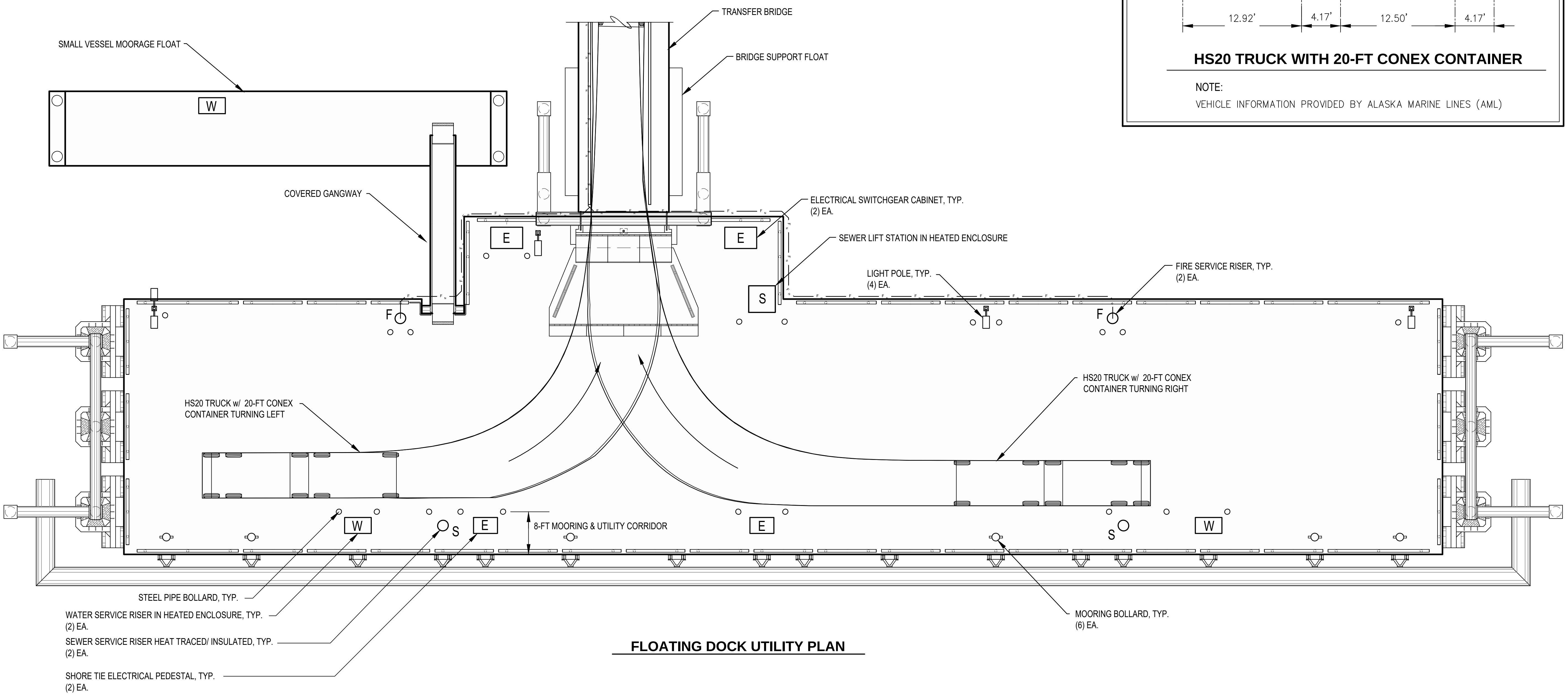
G1.06



HS20 TRUCK WITH 20-FT CONEX CONTAINER

NOTE:

VEHICLE INFORMATION PROVIDED BY ALASKA MARINE LINES (AML)



FLOATING DOCK UTILITY PLAN

Ahtna Infrastructure & Technologies, LLC

REV.	DATE	DESCRIPTION	DWN.	CKD.	APP.

PND ENGINEERS, INC.

9360 Glacier Highway Ste 100
Juneau, Alaska 99801

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www.pndengineers.com

DESIGN: CRS CHECKED: TCB
DRAWN: PJD APPROVED: CRS

SCALE: SCALE IN FEET 0 10 20 FT.

60% DESIGN SUBMITTAL

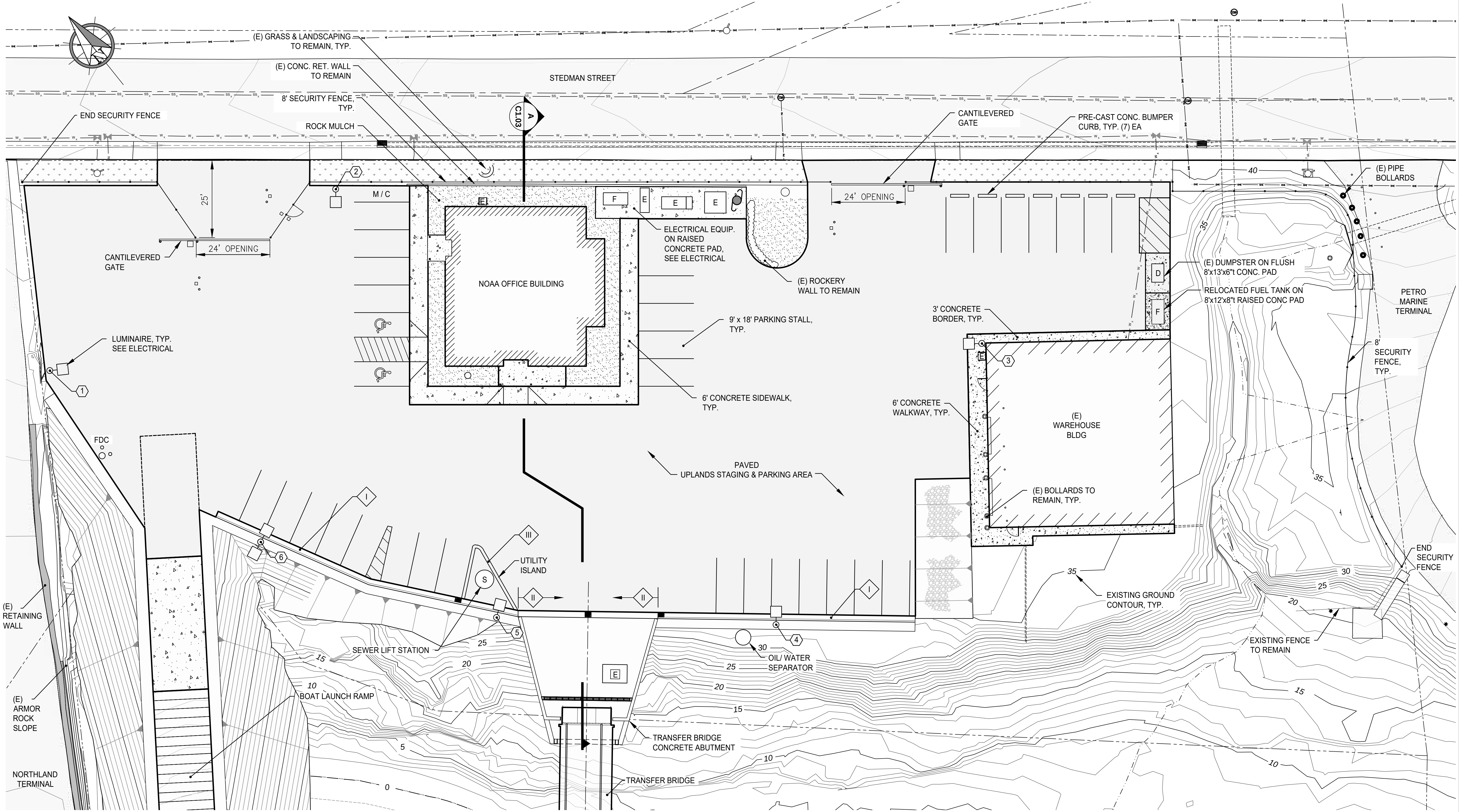
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE:
DOCK UTILITY ARRANGEMENT AND VEHICLE TURNING DIAGRAM

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

G1.07



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DESIGN: CRS CHECKED: TCB
DRAWN: PJD APPROVED: CRS

SCALE: SCALE IN FEET 0 15 30 FT.

60% DESIGN SUBMITTAL

DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE:

UPLANDS SITE PLAN

C1.01

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

POINT LAYOUT TABLE

POINT	NORTHING	EASTING	ELEV. (FEET)	DESCRIPTION
1	..	..	..	..
2	..	..	..	..
3	..	..	..	..
4	..	..	..	..
5	..	..	..	..
6	..	..	..	..
7	..	..	..	..
8	..	..	..	..
9	..	..	..	..
10	..	..	..	..
11	..	..	..	..
12	..	..	..	..
13	..	..	..	..
14	..	..	..	..
15	..	..	..	..
16	..	..	..	..
17	..	..	..	..
18	..	..	..	..
19	..	..	..	..
20	..	..	..	..
21	..	..	..	..
22	..	..	..	..
23	..	..	..	..
24	..	..	..	..
25	..	..	..	..
26	..	..	..	..
27	..	..	..	..
28	..	..	..	..
29	..	..	..	..
30	..	..	..	..

POINT LAYOUT TABLE (CONT.)

POINT	NORTHING	EASTING	ELEV. (FEET)	DESCRIPTION
31	..	..	..	..
32	..	..	..	..
33	..	..	..	..
34	..	..	..	..
35	..	..	..	..
36	..	..	..	..
37	..	..	..	..
38	..	..	..	..
39	..	..	..	..
40	..	..	..	..
41	..	..	..	..
42	..	..	..	..
43	..	..	..	..
44	..	..	..	..
45	..	..	..	..
46	..	..	..	..
47	..	..	..	..
48	..	..	..	..
49	..	..	..	..
50	..	..	..	..
51	..	..	..	..
52	..	..	..	..
53	..	..	..	..
54	..	..	..	..
55	..	..	..	..
56	..	..	..	..
57	..	..	..	..
58	..	..	..	..
59	..	..	..	..
60	..	..	..	..

LUMINAIRE POINT LAYOUT TABLE

POINT	NORTHING	EASTING	FND TYPE
1	1285123.86	3109977.39	CONCRETE BASE
2	1285112.68	3110087.19	CONCRETE BASE
3	1284943.00	3110221.50	CONCRETE BASE
4	1284912.48	3110112.16	CONCRETE BASE
5	1284970.64	3110042.07	CONCRETE BASE
6	1285037.51	3109996.88	CONCRETE BASE

NOTES :

1. SEE ELECTRICAL FOR LUMINAIRE AND FOUNDATION DETAILS.
2. SEE SHT C1.01 FOR LUMINAIRE LOCATIONS.

POINT TABLE ABBREVIATIONS:

- ACP ASPHALT CONCRETE PAVEMENT
- CDE CONCRETE DECK ELEVATION
- COR CORNER
- EC EDGE OF CONCRETE PAVING
- GB GRADE BREAK
- ME MATCH EXISTING
- PC POINT OF CURVATURE
- POC POINT ON CURVE
- PT POINT OF TANGENCY
- RE RIM ELEVATION
- RBC ROADWAY BASE COURSE
- SW SIDEWALK
- TD TRENCH DRAIN

NOTE:

TABLE ELEVATIONS AT MATCH POINTS ARE SHOWN FOR REFERENCE PURPOSES ONLY, MATCHING EXISTING SURFACES SHALL TAKE PRECEDENCE, NOTIFY ENGINEER PRIOR TO GRADING OF ANY SUBSTANTIAL DISCREPANCIES (± 0.02').

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DESIGN: TCB CHECKED: CRS
DRAWN: PJD APPROVED: CRS
SCALE: NA

60% DESIGN SUBMITTAL

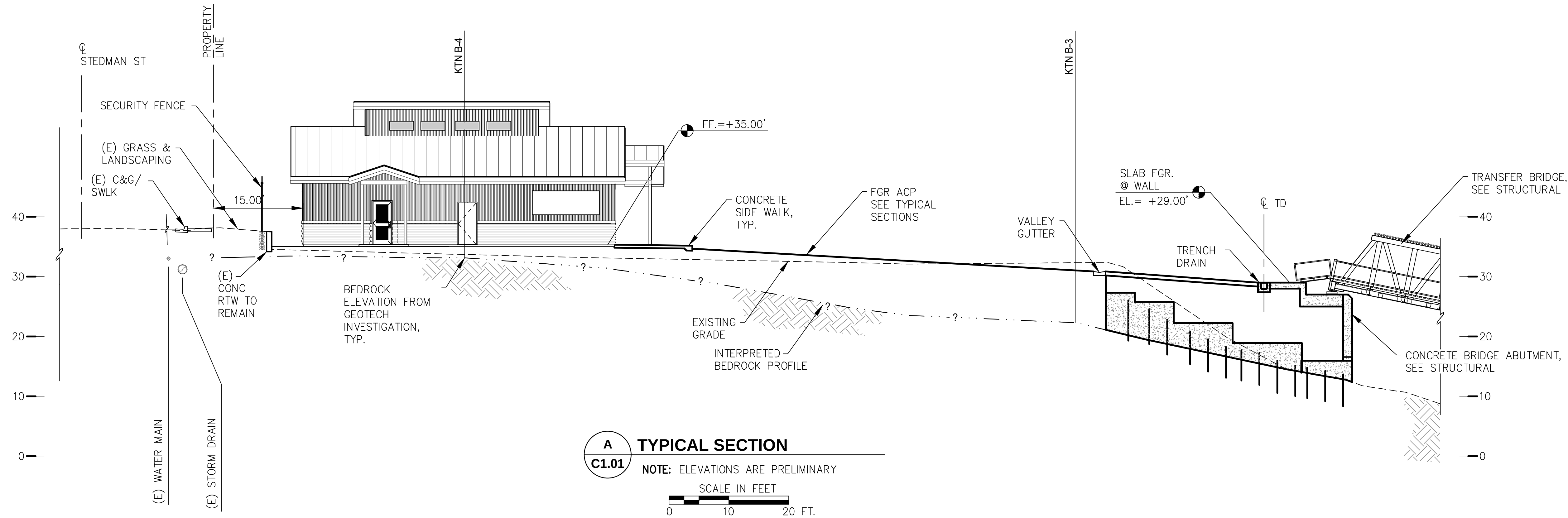
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: POINT LAYOUT TABLES

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

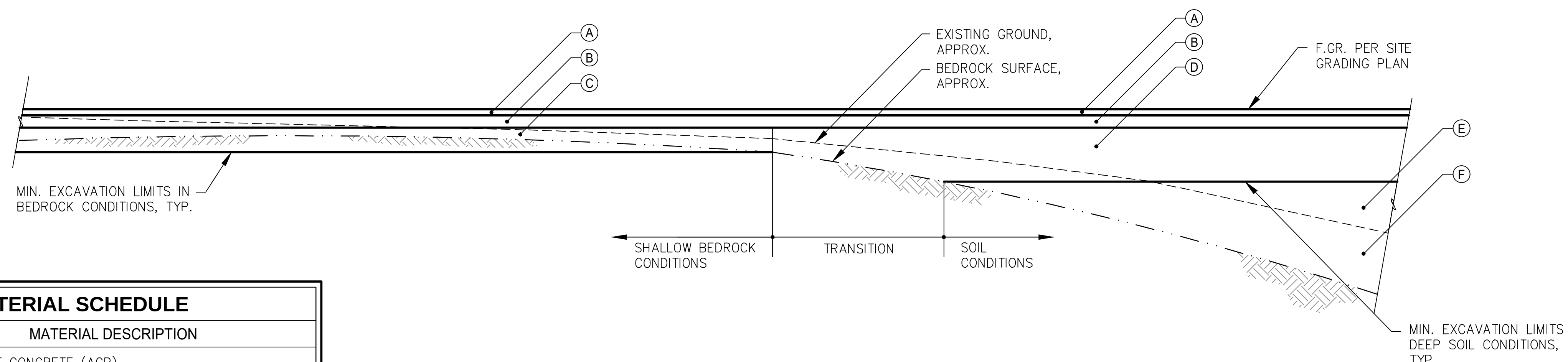
C1.02



A / C1.01 TYPICAL SECTION

NOTE: ELEVATIONS ARE PRELIMINARY

SCALE IN FEET: 0 10 20 FT.



TYPICAL SITE GRADING SECTION

NTS

MATERIAL SCHEDULE

SYMBOL	MATERIAL DESCRIPTION
(A)	3"t ASPHALT CONCRETE (ACP)
(B)	6"t LAYER ROADWAY BASE COURSE
(C)	12"t CLASS A SHOT ROCK BORROW
(D)	24"t CLASS A SHOT ROCK BORROW
(E)	CLASS B SHOT ROCK BORROW OR USEABLE EXCAVATION
(F)	EXISTING SOIL OVER BEDROCK TO REMAIN

Ahtna Infrastructure & Technologies, LLC

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www.pndengineers.com

60% DESIGN SUBMITTAL

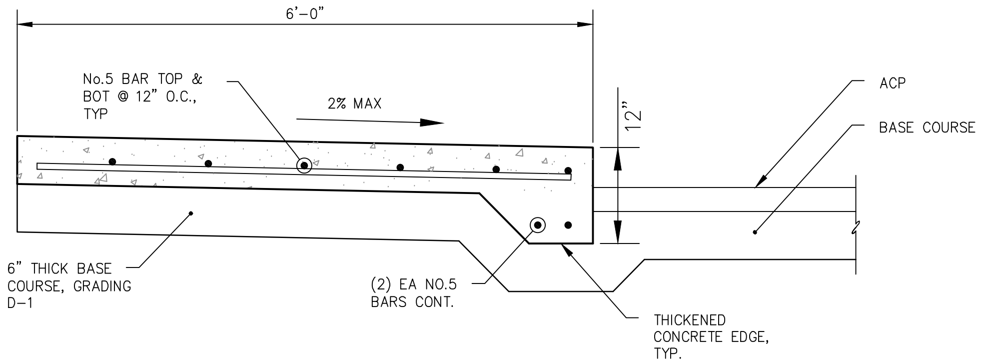
DESIGN: CRS CHECKED: TCB
DRAWN: PJD APPROVED: CRS
SCALE: AS SHOWN
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: **TYPICAL SECTIONS**

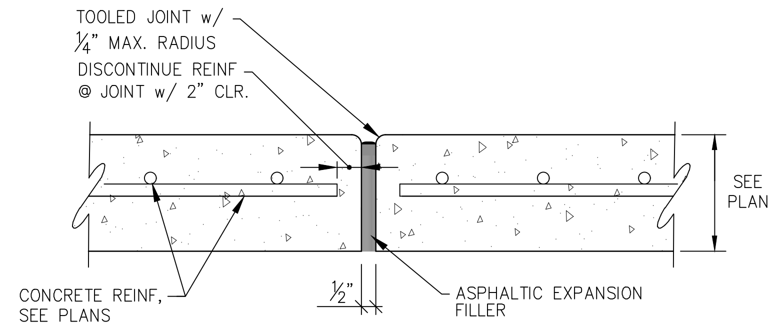
PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

C1.03



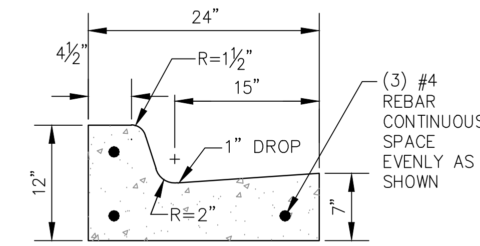
CONCRETE SIDEWALK @ BUILDING

NOTES:
1. ALL STEEL MUST HAVE A MINIMUM OF 2" OF CONCRETE COVER.
2. ALL JOINTS AND SEAMS SHALL BE EDGED.
3. EXPANSION JOINTS SHALL BE MAX ½", MIN ¼", WITH NO GAPS FOR WATER INTRUSION.
4. STEEL TROWELING FINISH REQUIRED PRIOR TO BROOM FINISHING ON ALL SURFACES.
5. CONCRETE INTERNATIONAL CORPORATION ASHFORD FORMULA OR APPROVED EQUAL SHALL BE APPLIED AS A CURING COMPOUND. APPLICATION SHALL CONFORM TO THE MANUFACTURERS RECOMMENDATIONS.



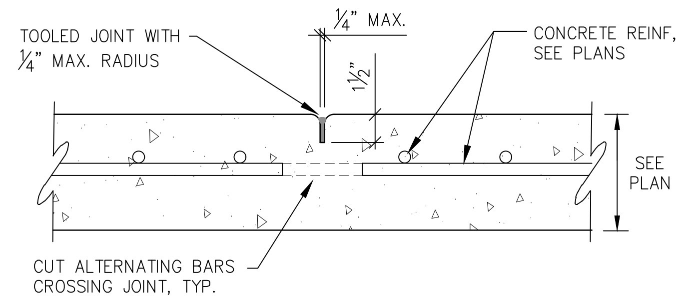
EXPANSION JOINT

NOTE: EXPANSION JOINTS IN CURB & GUTTER PLACED MAX. EVERY 30'-0" O.C.



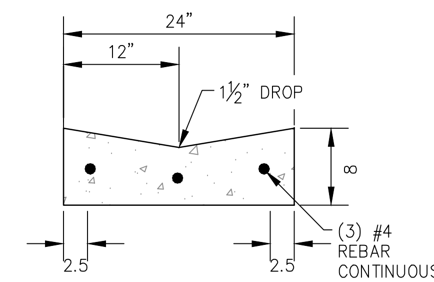
TYPE I CURB AND GUTTER

NOTE:
BED w/ MIN 6" BASE COURSE, GRADING D-1.



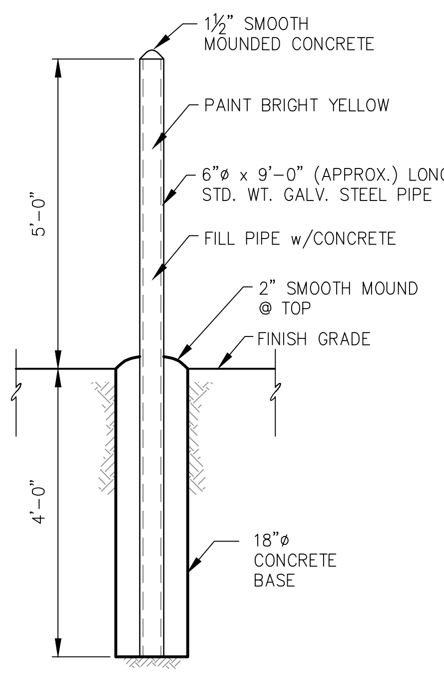
CONTROL JOINT

NOTE:
CONTROL JOINTS IN CURB & GUTTER PLACED MAX. EVERY 10'-0" O.C.
CONTROL JOINTS IN SIDEWALK EQUAL TO WIDTH.

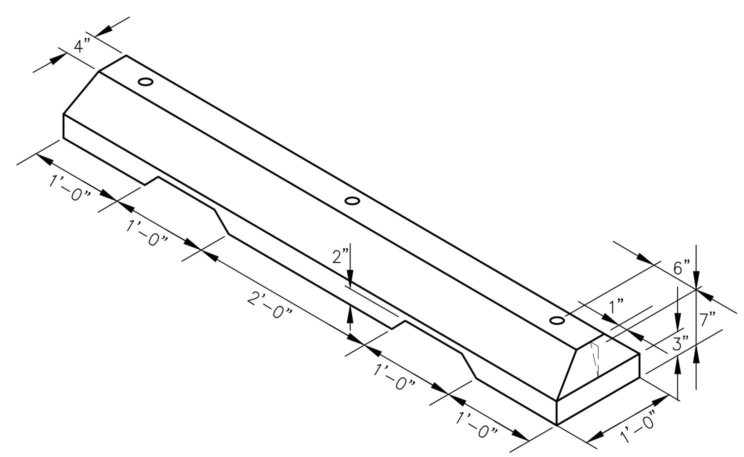


TYPE II GUTTER - VALLEY

NOTE:
BED w/ MIN 6" BASE COURSE, GRADING D-1.

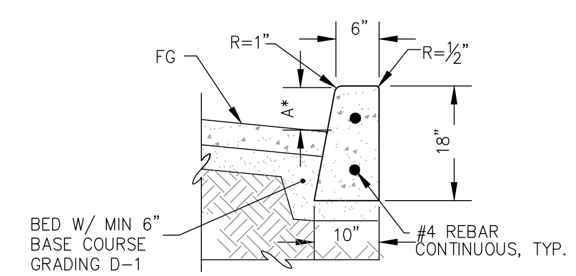


PIPE BOLLARD DETAIL



PRECAST CONCRETE BUMPER CURB DETAIL

(QUANTITY: 7 REQ'D.)



*DIMENSION "A" = CURB EXPOSURE, SHALL BE 6", UNO.

TYPE III CURB - VERTICAL

NOTE:
BED w/ MIN 6" BASE COURSE, GRADING D-1.

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DRAWN: PJD APPROVED: CRS

60% DESIGN SUBMITTAL

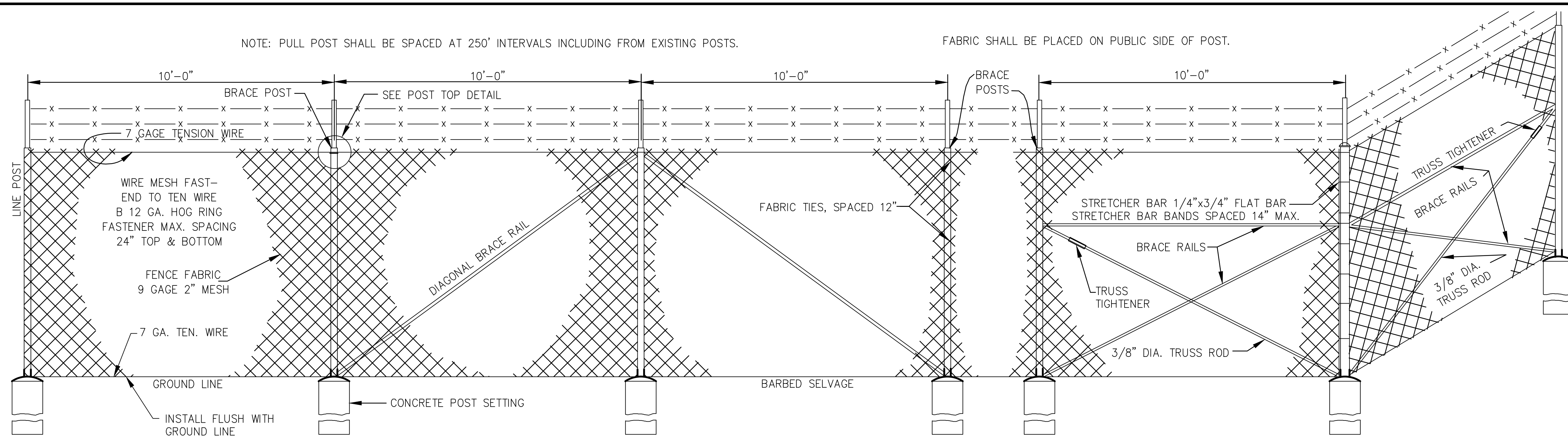
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: CIVIL DETAILS

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

C1.04



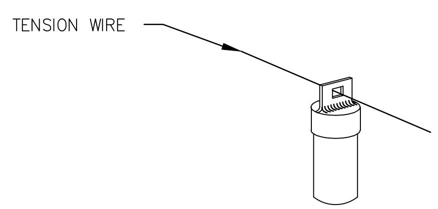
TYPICAL FENCE SECTION

TYPICAL PULL POST

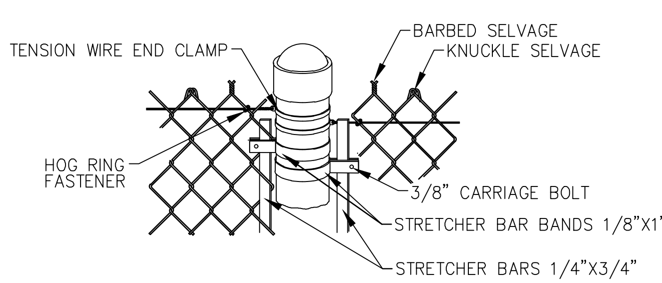
TYPICAL CORNER OR TERMINAL POST

NOTES:

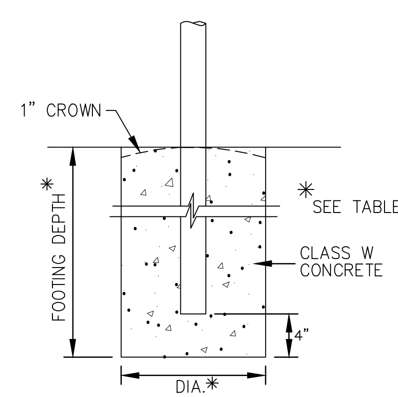
1. POSTS SHALL BE SPACED EQUAL DISTANCES APART. MAXIMUM SPACING SHALL BE 10 FEET UNLESS DIRECTED OTHERWISE BY THE ENGINEER.
2. POST TOPS SHALL BE SECURELY FASTENED TO POST.
3. BRACE RAILS AND TRUSS RODS SHALL BE SECURELY FASTENED TO POST WITH BRACE BANDS WITH THREADED TAKE–UP ADAPTER FOR TRUSS RODS.
4. FABRIC SHALL BE STRETCHED TO A SMOOTH UNIFORM APPEARANCE.
5. DETAILS SHOWN INDICATE GENERAL DESIGN AND DIMENSIONS MAY VARY AMONG MANUFACTURERS.



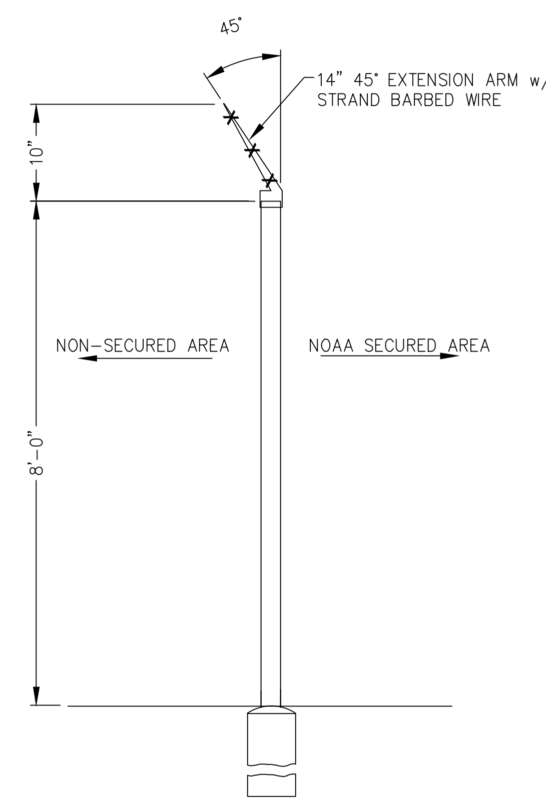
LINE POST TOP



PIPE STYLE POST TOP



CONCRETE POST SETTING



FENCE SECTION

FABRIC HEIGHT	POST							
	END–CORNER–PULL				LINE–BRACE			
	PIPE		FOOTING		PIPE		FOOTING	
	SIZE	WT/FT.	DEPTH	DIA.	SIZE	WT/FT.	DEPTH	DIA.
8'	2 1/2"	5.79 #	48"	15"	2"	3.65 #	40"	12"

NOAA

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DRAWN: PJD APPROVED: CRS

60% DESIGN SUBMITTAL

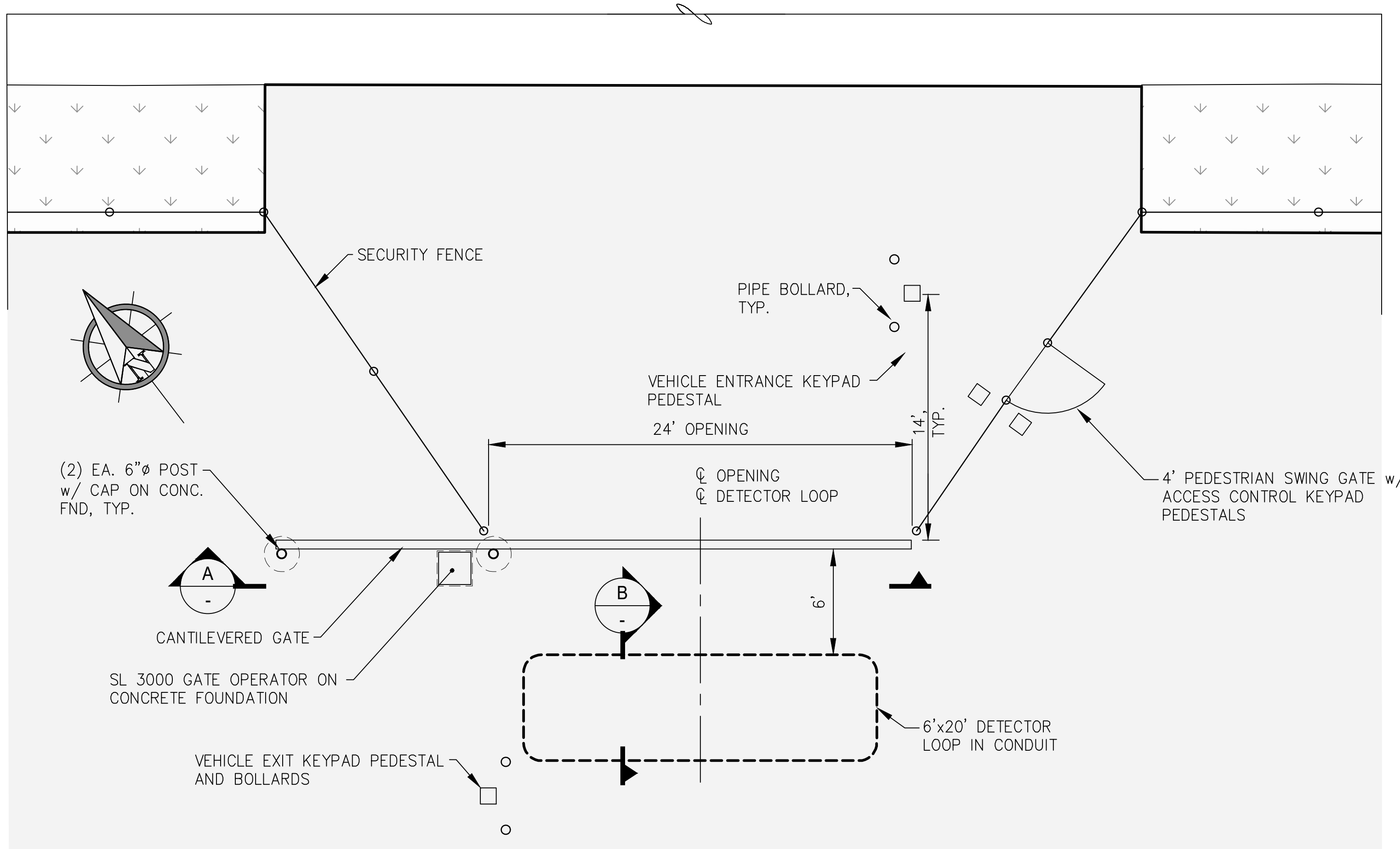
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: FENCE DETAILS

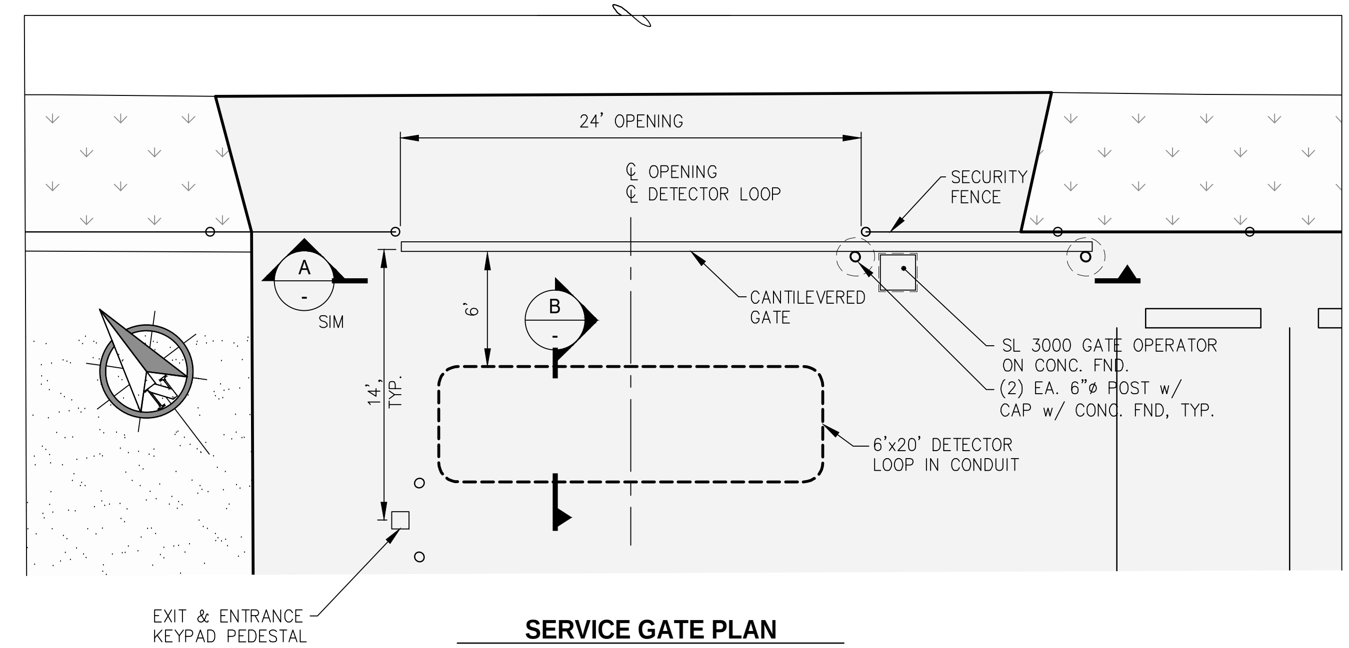
C1.05

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250



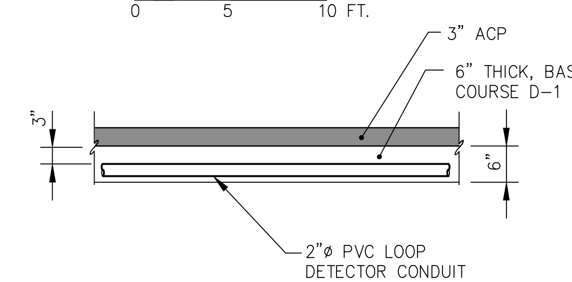
MAIN ENTRANCE GATE PLAN

SCALE IN FEET
0 5 10 FT.



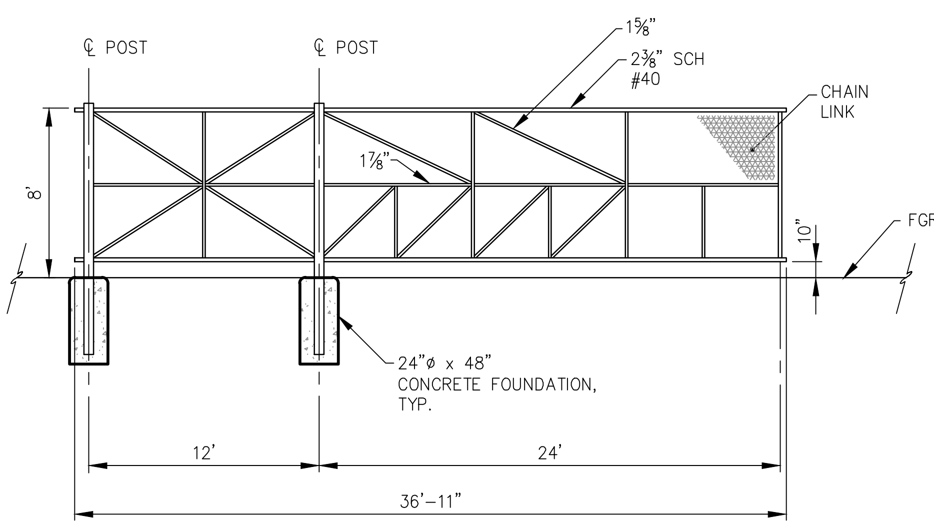
SERVICE GATE PLAN

SCALE IN FEET
0 5 10 FT.



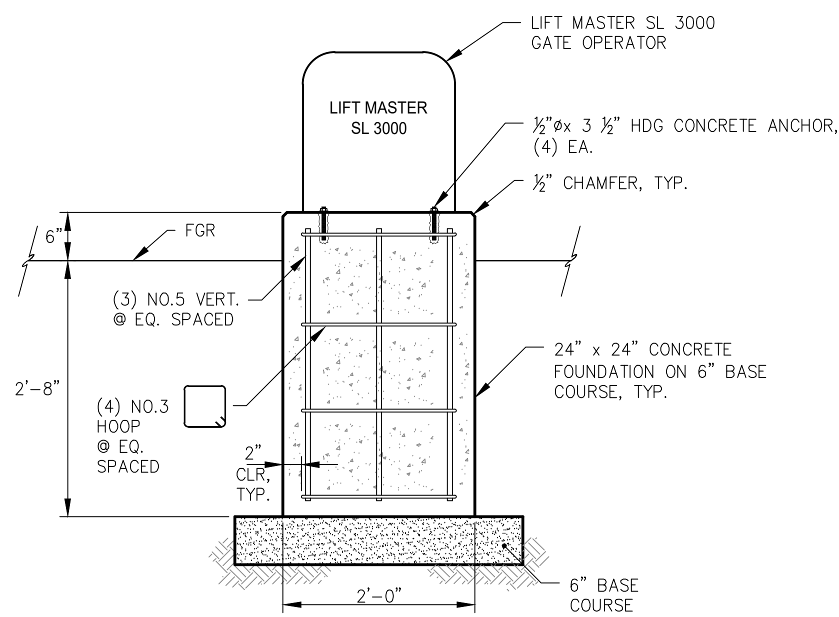
B LOOP DETECTOR DETAIL

NOTE: BED PVC LOOP DETECTOR CONDUIT IN BASE COURSE GRADING D-1.

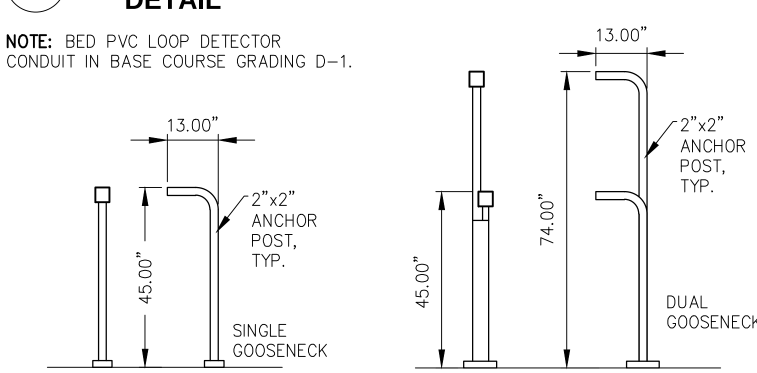


NOTE: SL 3000 GATE OPERATOR NOT SHOWN

A CANTILEVER GATE ELEVATION



GATE OPERATOR & FOUNDATION DETAIL



PEDESTRIAN

VEHICLE

KEY PAD AND PEDESTAL DETAILS

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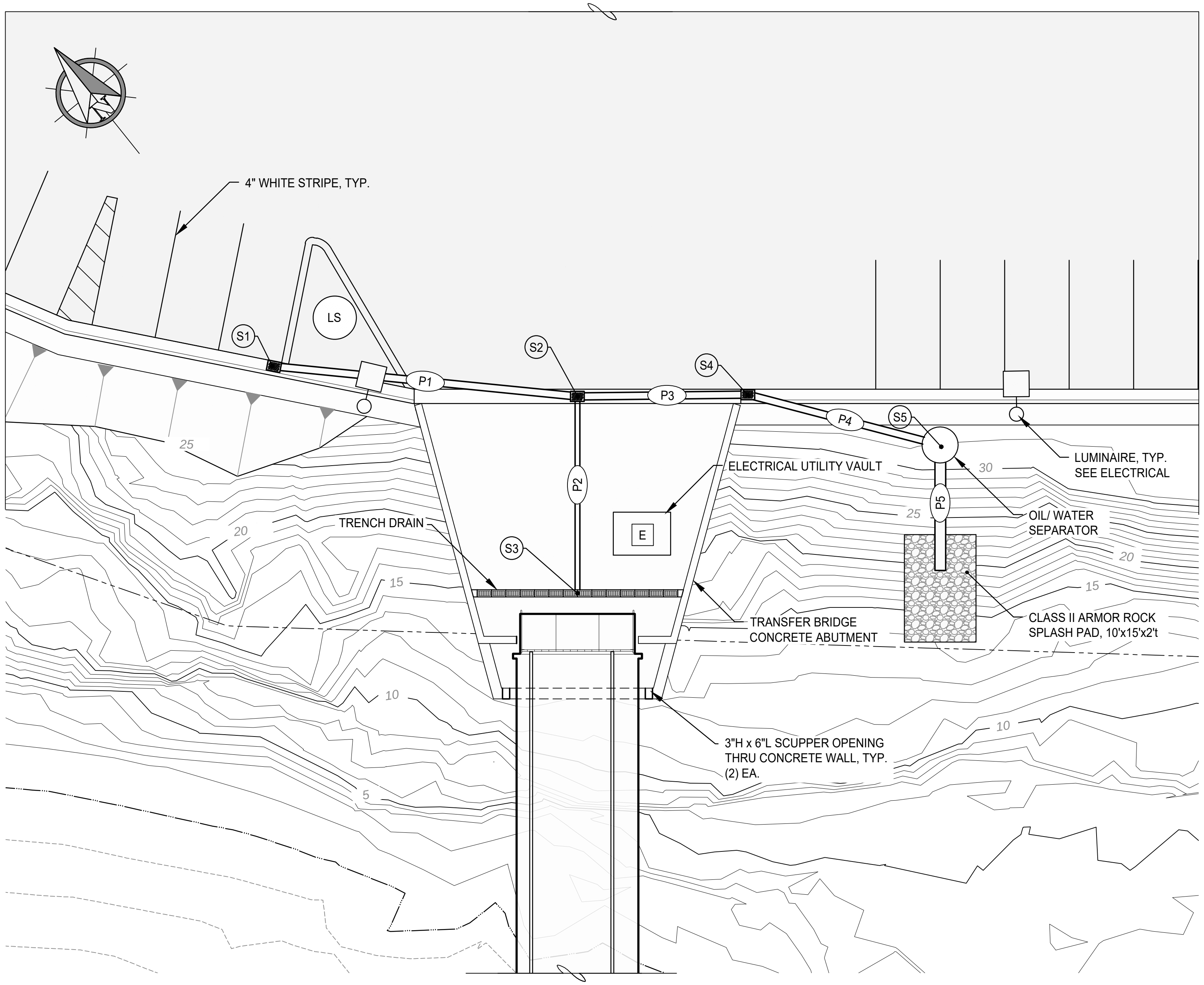
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: GATE DETAILS

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

C1.06



PARTIAL SITE PLAN

STORM DRAIN STRUCTURES

STRUCTURE DESIGNATION	NORTHING	EASTING	R.E. (FT)	DESCRIPTION
S1	1284982.91	3110035.79	–	CB w/ CIFG
S2	1284952.99	3110066.07	–	CB w/ VGIFG
S3	1284931.63	3110048.77	–	CENTER 28 LF TD
S4	1284938.21	3110084.71	–	CB w/ CIFG
S5	1284915.84	3110101.15	–	CENTER OWS w/ SOLID LID

CIFG = CURB INLET FRAME & GRATE
CB = CATCH BASIN
FG = FRAME & GRATE
OWS = OIL WATER SEPARATOR
RE = RIM ELEVATION
TD = TRENCH DRAIN
VGIFG = VALLEY GUTTER INLET FRAME & GRATE

STORM DRAIN PIPING

PIPE DESIGNATION	NOMINAL Ø	LENGTH (LF)	FROM	I.E. (FT)	TO	IE
P1	12" CPP	42'	S1	–	S2	–
P2	8" CPP	27'	TD	–	S2	–
P3	12" CPP	28'	S2	–	S4	–
P4	12" CPP	28'	S4	–	S5	–
P5	18" CPP	15'	S5	–	DAYLITE	–

CPP = CORRUGATED POLYETHYLENE PIPE, TYPE S

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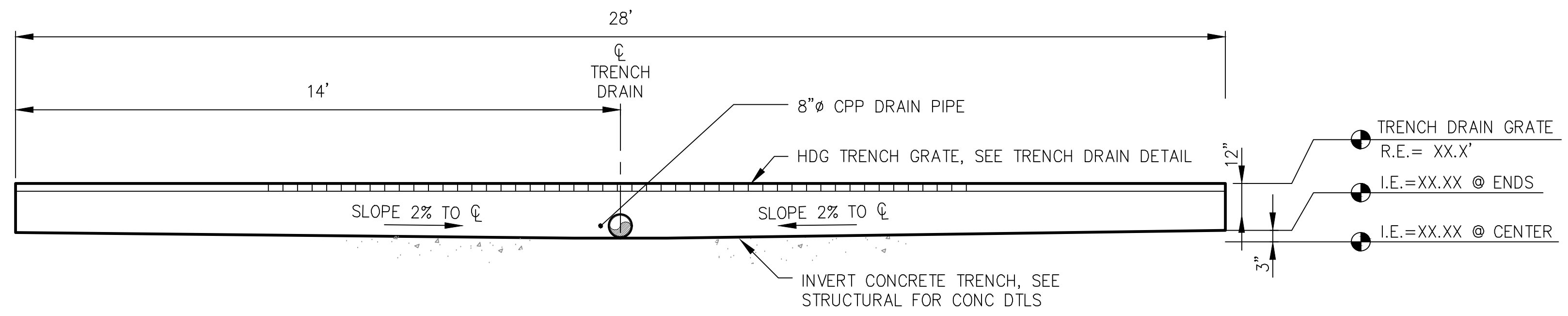
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

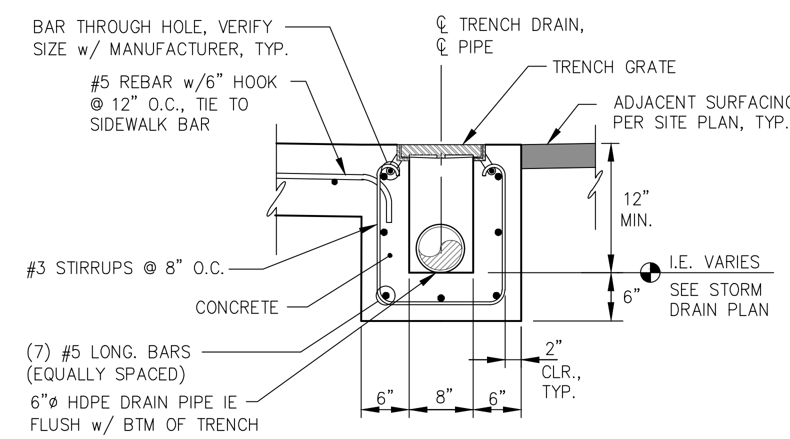
SHEET TITLE: PARTIAL SITE AND STORM DRAIN PLAN

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

C1.07



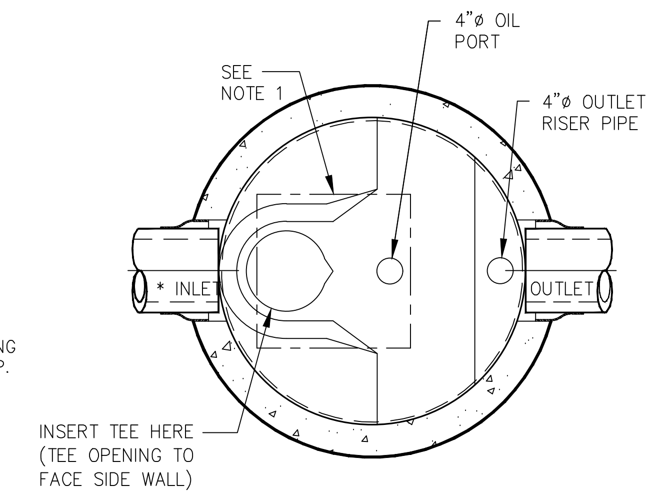
TRENCH DRAIN PROFILE



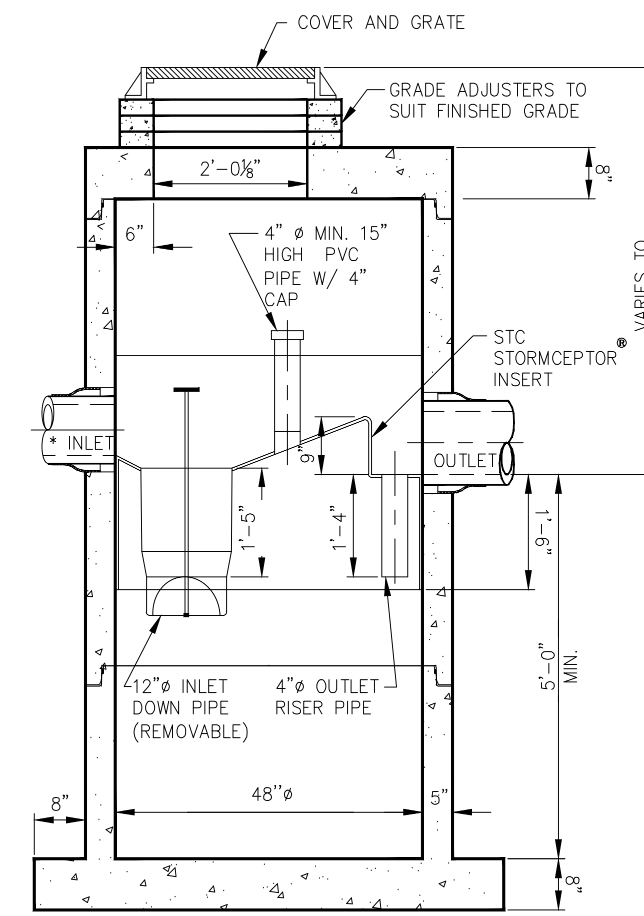
TRENCH DRAIN DETAILS

NOTES:

1. TRENCH GRATE SHALL BE EJIW V-7382-20 ADA BOLTED ASSEMBLY, OR APPROVED EQUAL, HOT-DIPPED GALVANIZED.
2. CAST 6" SCH. 40 PVC DRAIN PIPE INTO CONCRETE.

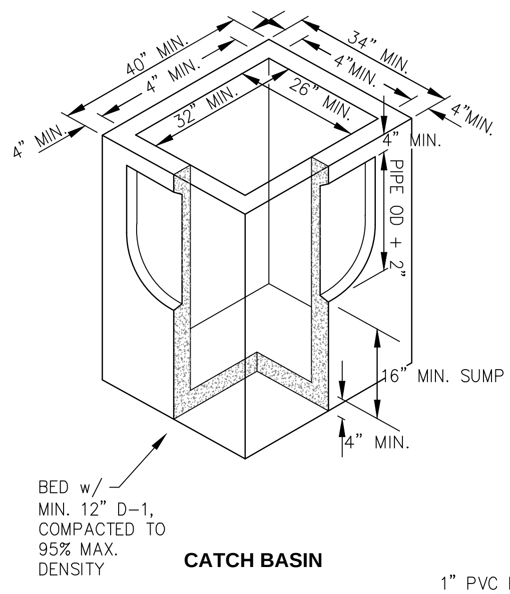


PLAN VIEW

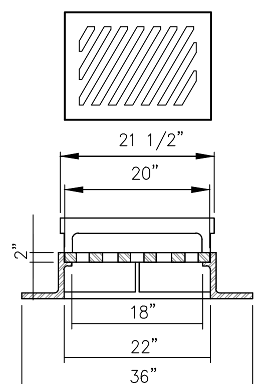


SECTION THRU CHAMBER

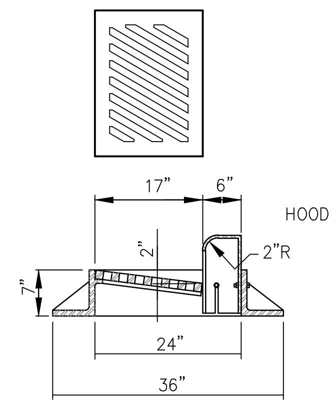
OIL WATER SEPARATOR, TYPE I



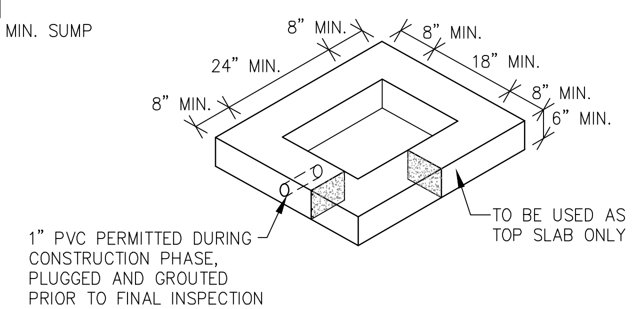
CATCH BASIN



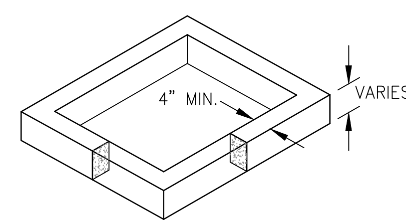
CURB INLET



FRAME AND GRATE



TOP SLAB



ADJUSTING RING

CATCH BASIN DETAILS

NOTES:

1. ALL JOINTS BETWEEN SECTIONS AND BETWEEN FRAME AND CONCRETE SECTIONS SHALL BE GROUTED INSIDE AND OUTSIDE.
2. ENTIRE KNOCKOUT IS TO BE REMOVED AND SEALED SHUT AROUND PIPE. ALL PIPES ARE TO EXTEND MIN. 1" AND MAX. 2" INTO CATCH BASIN.
3. FRAME AND GRATE SHALL BE DUCTILE IRON. FRAME MAY BE CAST INTO THE TOP UNIT OR PLACED OVER THE OPENING AS APPROVED BY THE ENGINEER. FRAME AND GRATE MUST BE OF A TYPE THAT WILL NOT CREATE A HAZARD FOR BICYCLE TRAFFIC.
4. CATCH BASIN SHALL MEET HIGHWAY STANDARD-HS20 LOAD REQUIREMENTS.
5. MINIMUM STEEL REQUIRED AS PER ASTM C-478-69.
6. MINIMUM SUMP DEPTH SHALL BE 16".
7. ADJUSTING RING SHALL BE THE SAME SIZE AS THE CATCH BASIN.
8. NO BRICKS, WOOD, OR OTHER MATERIALS PERMITTED FOR ADJUSTING GRADE, SOLID RISER OR FORMED TYPE II ONLY.
9. FRAME AND GRATE SHALL MATCH CURB TYPE. SEE PLAN FOR CURB TYPES AND STRUCTURE LOCATIONS.

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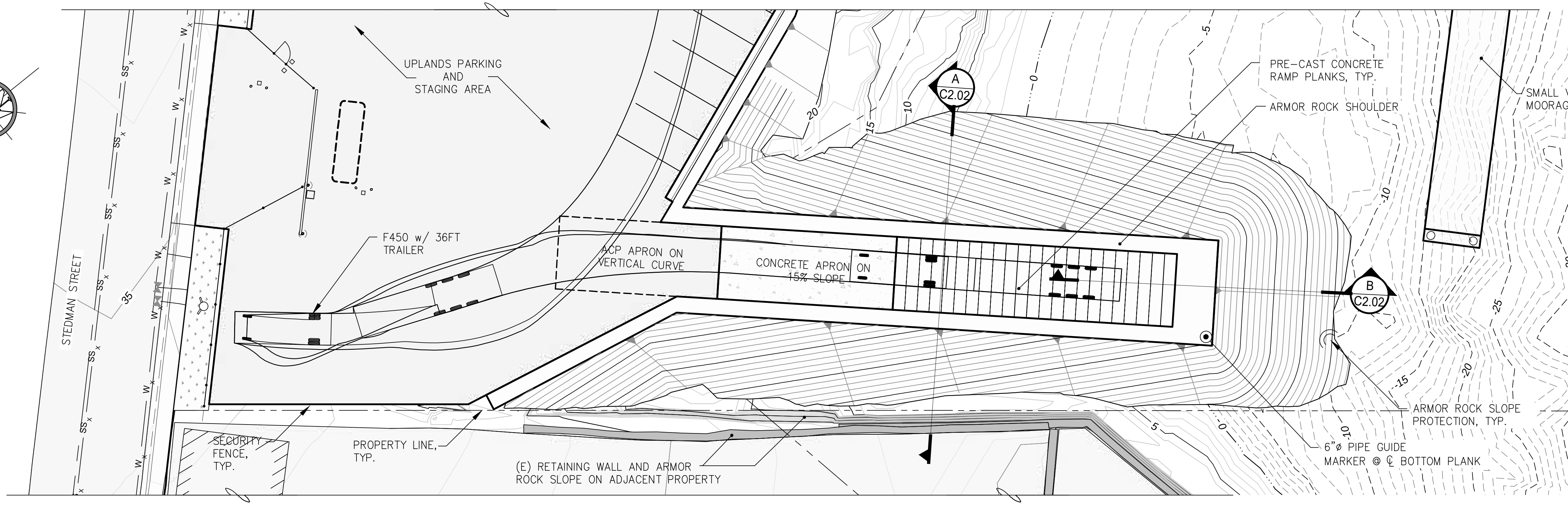
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

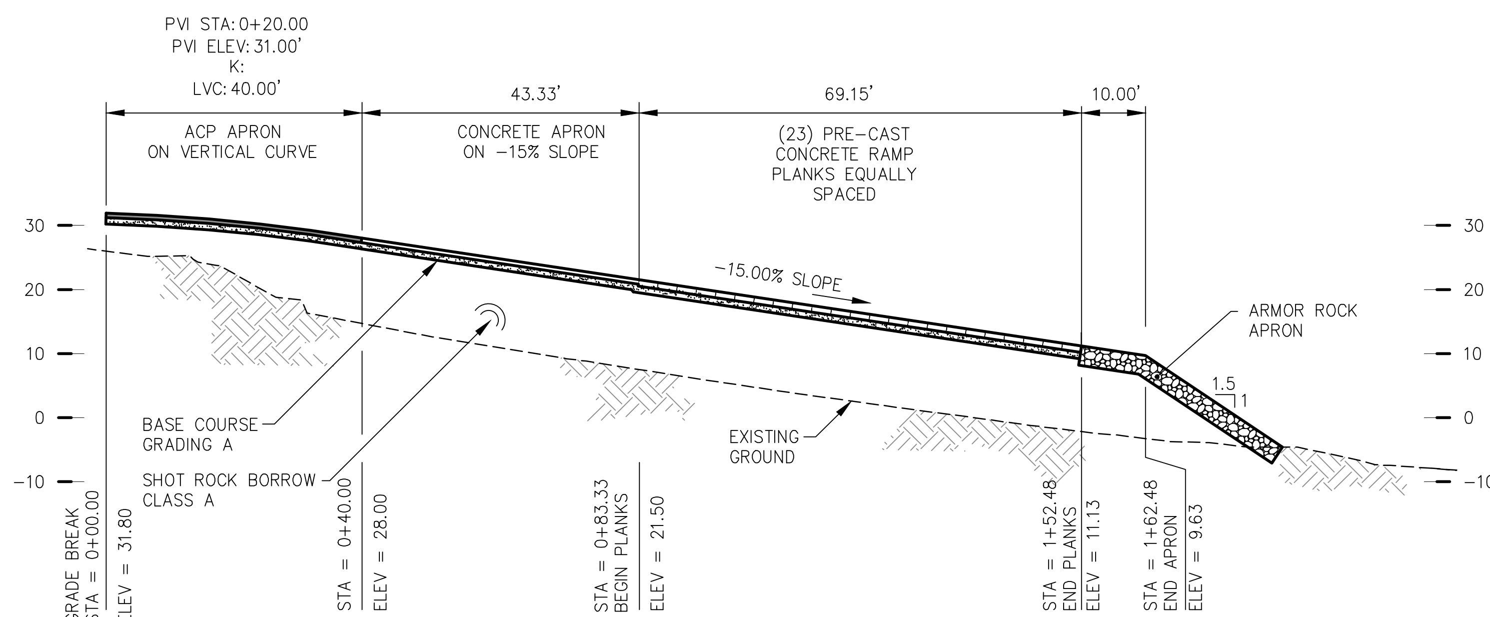
SHEET TITLE: STORM DRAIN DETAILS

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

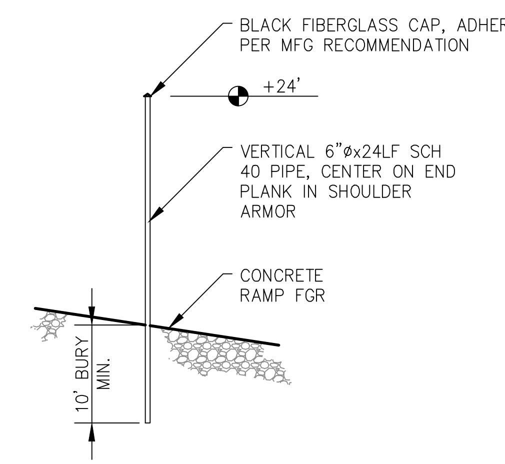
C1.08



BOAT LAUNCH RAMP PLAN



BOAT LAUNCH RAMP PROFILE



GUIDE MARKER PIPE DETAIL

(1) EA REQ'D NTS

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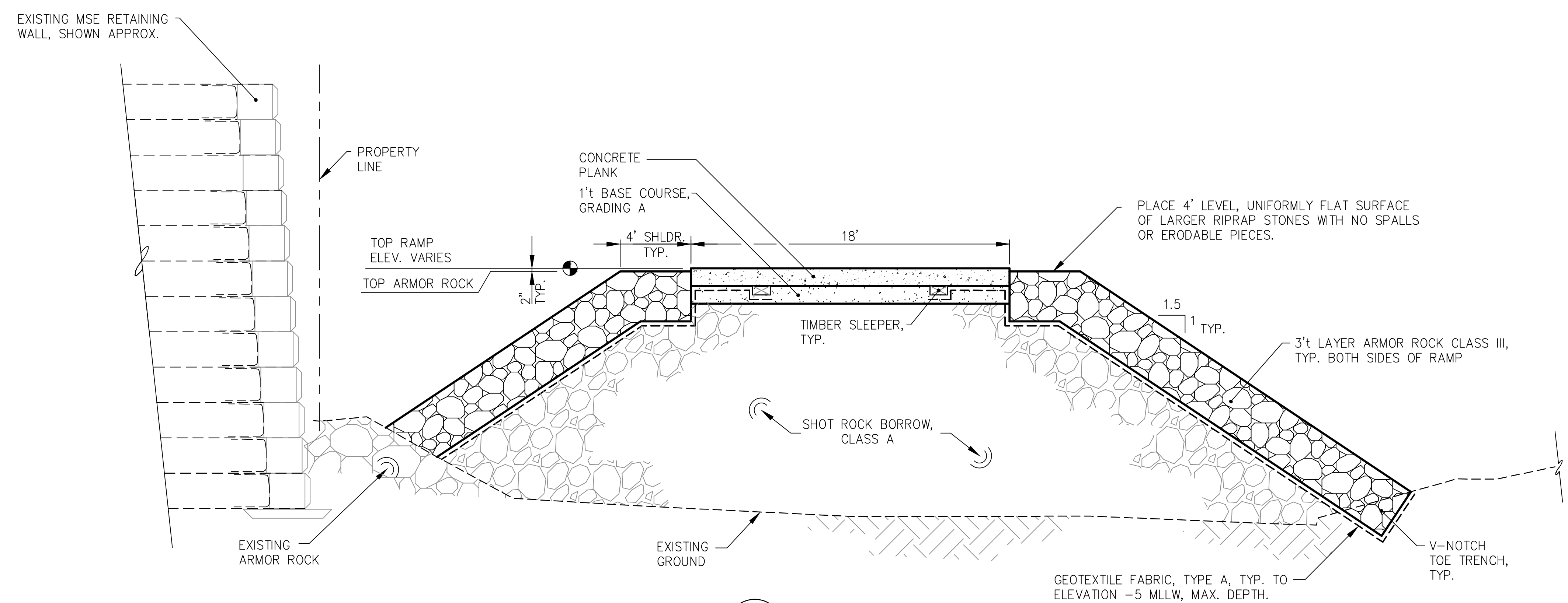
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: BOAT LAUNCH RAMP PLAN & PROFILE

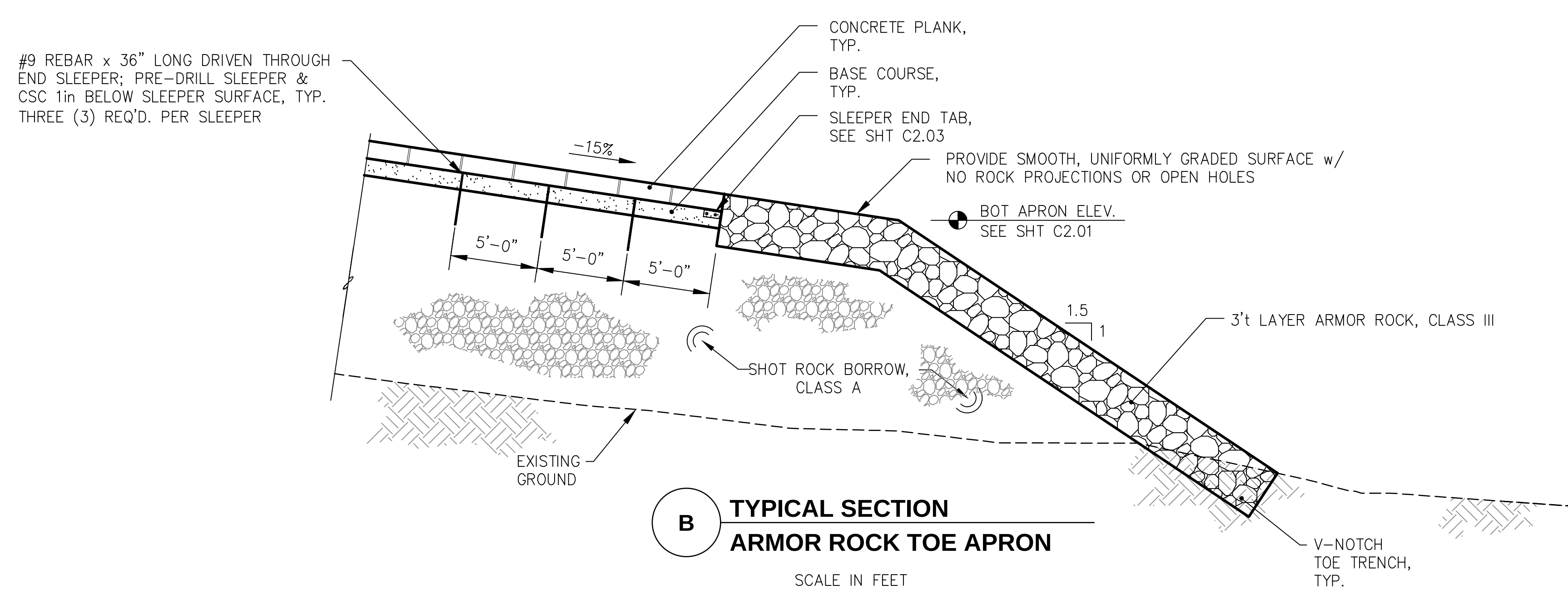
PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

C2.01



A **TYPICAL SECTION**
BOAT LAUNCH RAMP

SCALE IN FEET
0 4 8 FT.



B **TYPICAL SECTION**
ARMOR ROCK TOE APRON

SCALE IN FEET
0 5 10 FT.

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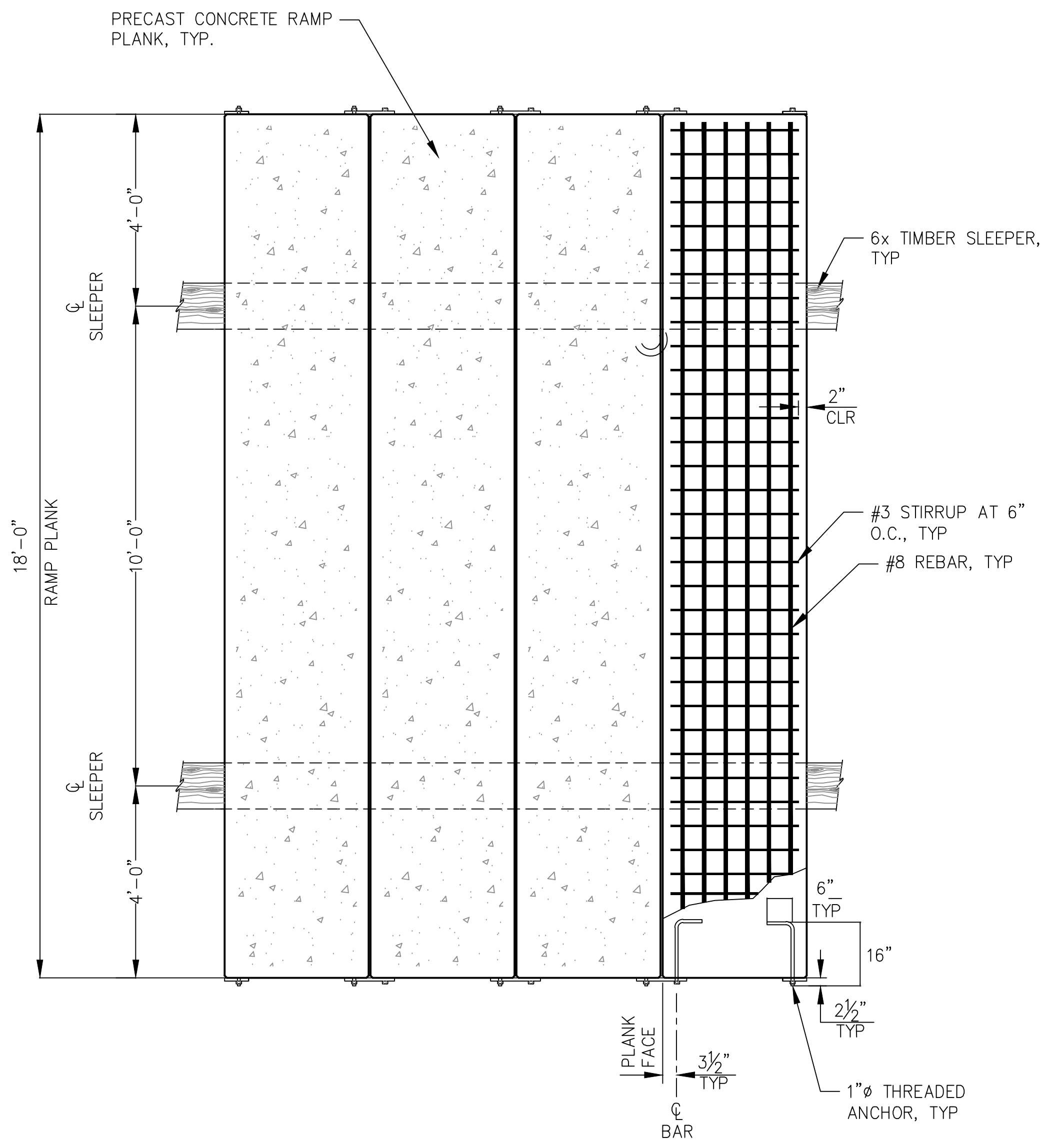
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: BOAT LAUNCH RAMP TYPICAL SECTIONS

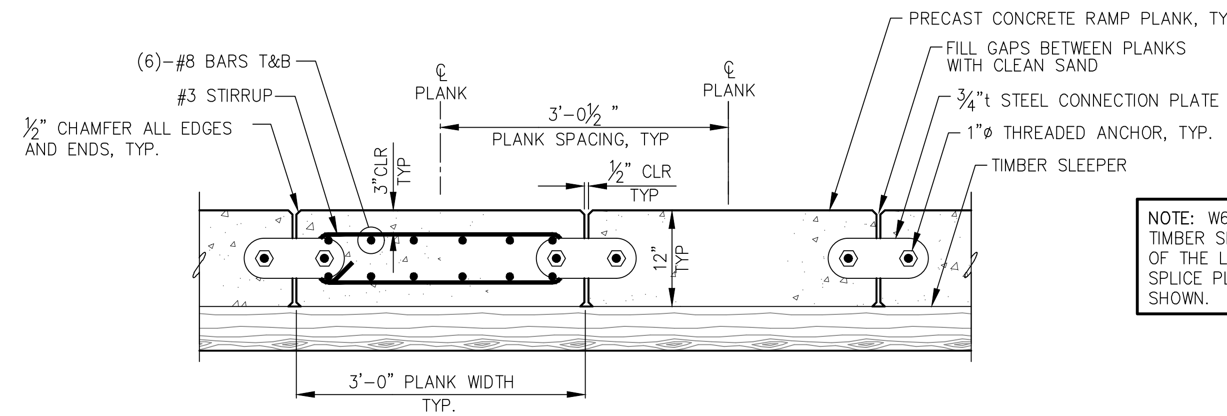
PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

C2.02



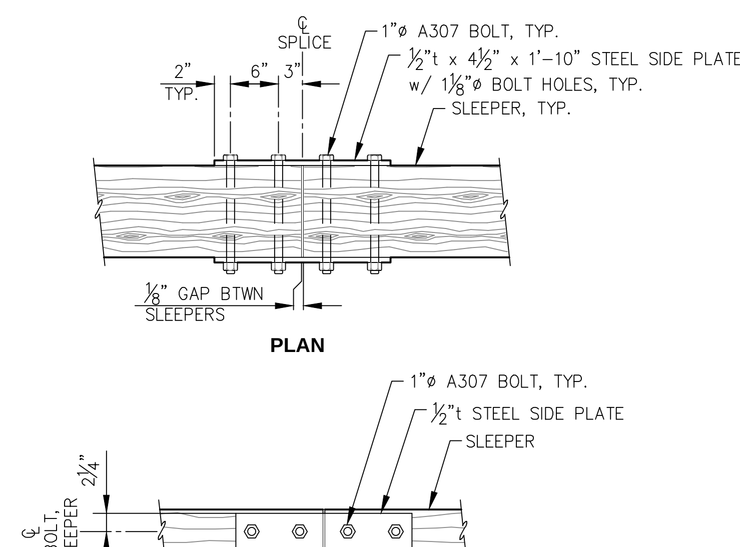
CONCRETE RAMP PLANKS - PLAN

NOTE: PROVIDE ROUGH TRANSVERSE TINE TEXTURE ON PLANKS



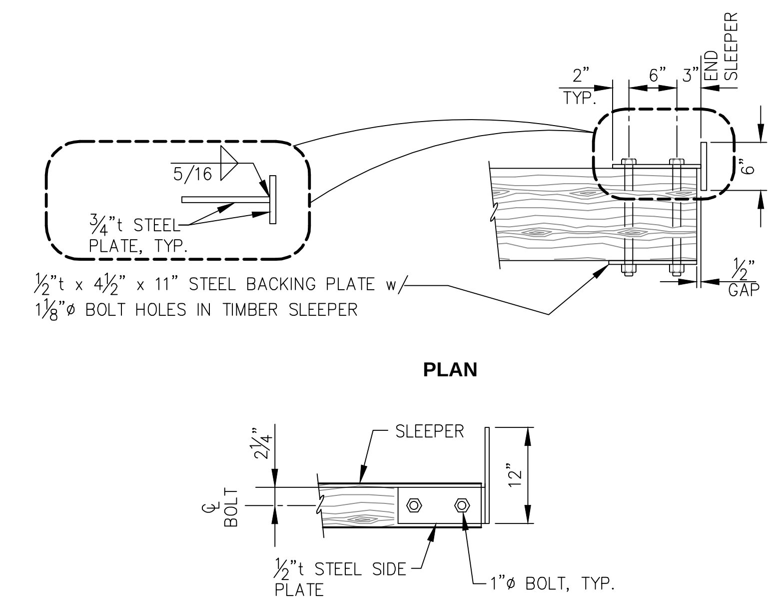
TYPICAL RAMP PLANK SECTION

NOTE: W6x26 BEAM MAY BE USED IN LIEU OF TIMBER SLEEPER ON THE SUBMERGED PORTION OF THE LAUNCH RAMP. ATTACH END TAB AND SPLICE PLATES TO BEAM WEB SIMILAR AS SHOWN.

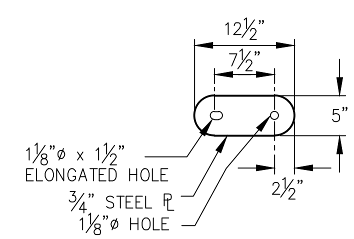


SLEEPER SPLICE DETAIL

NOTE: SLEEPER SPLICES SHALL BE STAGGERED.



SLEEPER END TAB DETAIL



CONNECTION PLATE DETAIL

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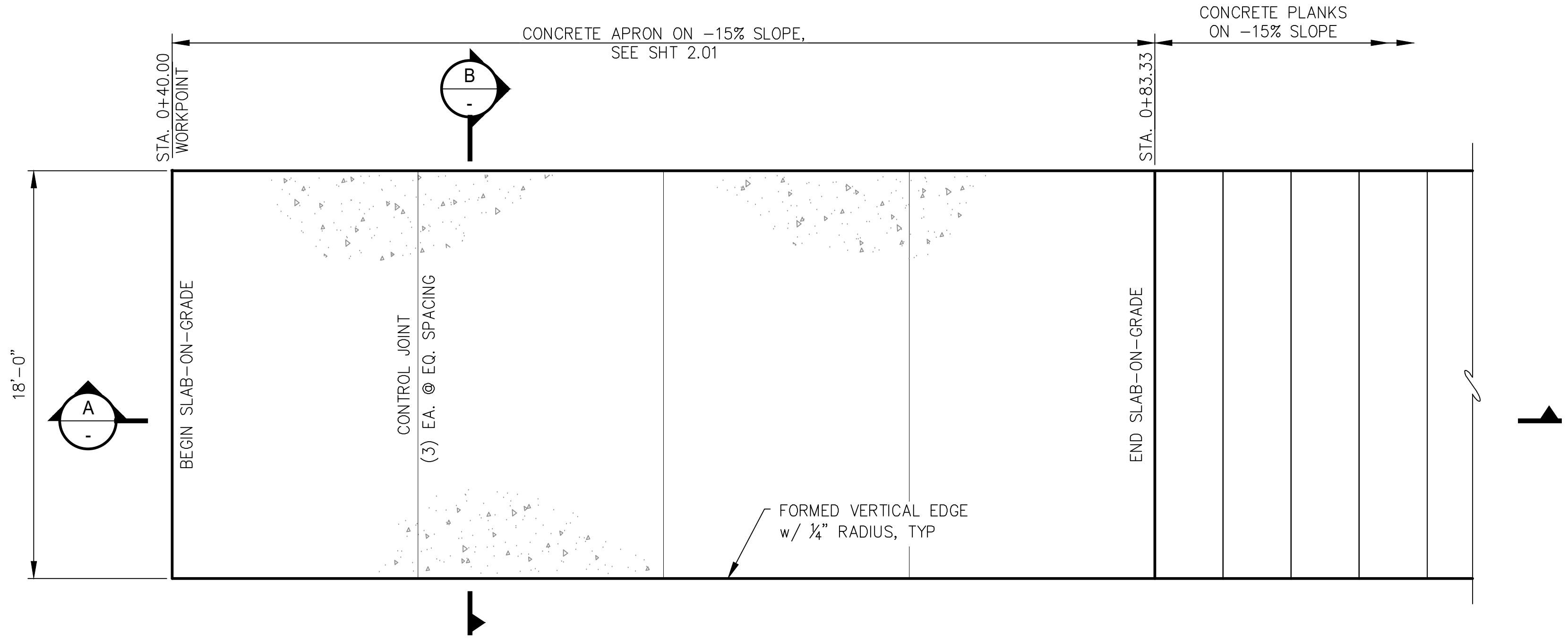
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: BOAT LAUNCH RAMP PLANK & SLEEPER DETAILS

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

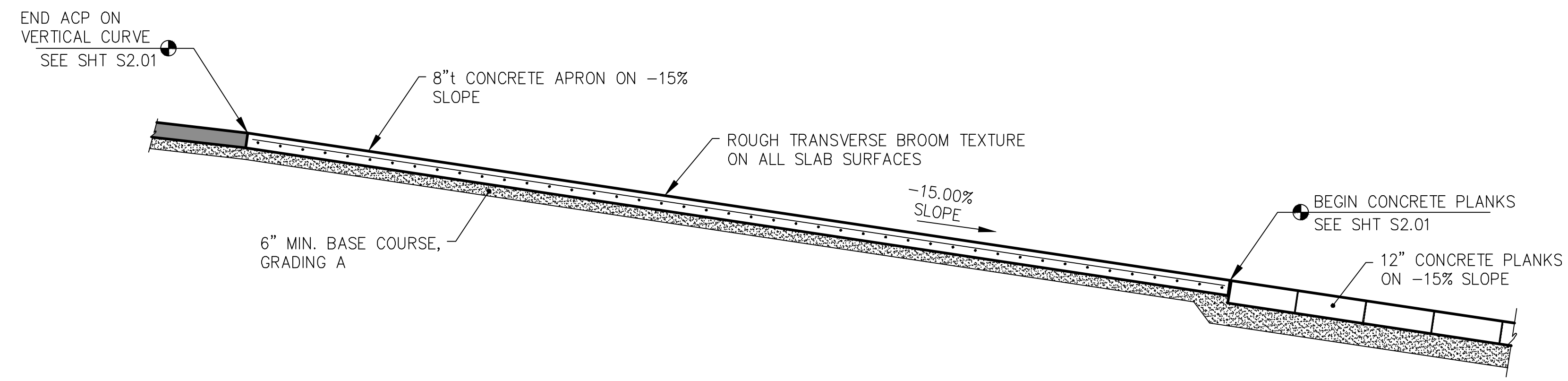
C2.03



CONCRETE APRON ON -15% SLOPE PLAN

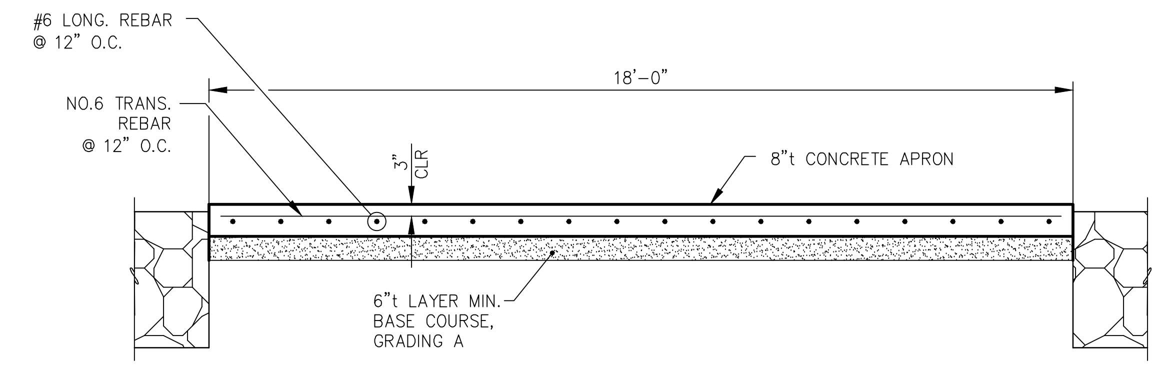
SCALE IN FEET
0 4 8 FT.

NOTES:
1. ARMOR ROCK NOT SHOWN FOR CLARITY.
2. CONTROL JOINTS ¼" x 1½" TOOLED JOINT w/ ¼" RADIUS. FILL SLOT w/ FIELD-MOLDED FILLER ASPHALT SEALANT.



A APRON PROFILE VIEW

SCALE IN FEET
0 4 8 FT.



B CONCRETE APRON -TYPICAL SECTION

NOTE:
MAINTAIN 3" CONCRETE COVER OVER REINFORCEMENT, TOP, BTM, AND ALL SIDES.

SCALE IN FEET
0 2' 4'

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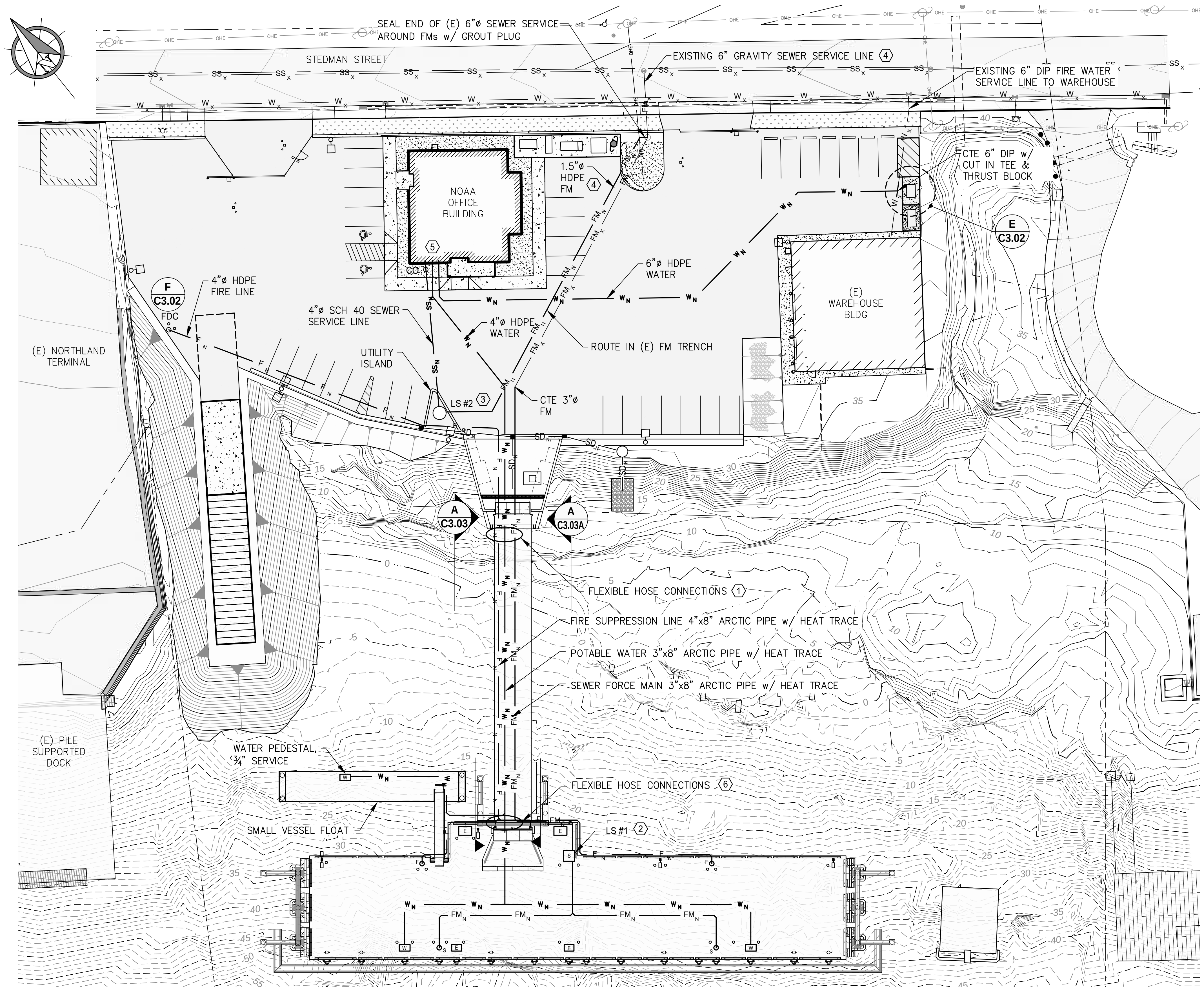
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: BOAT LAUNCH RAMP APRON DETAILS

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

C2.04



LEGEND:

SS	SANITARY SEWER (GRAVITY SERVICE)
FM	SEWER FORCE MAIN
W	WATER SERVICE
F	FIRE LINE
CO	CLEAN OUT
CTE	CONNECT TO EXISTING
FDC	FIRE DEPARTMENT CONNECTION
LS	SEWER LIFT STATION (2 EA. REQ'D.)
	BOLLARD
E	ELECTRICAL
F	FIRE HOSE CONNECTION
S	SHIP SEWER REMOTE PUMPING CENTER
W	SHIP WATER CONNECTION

KEY NOTES:

1. ALL EXPOSED PIPING AND HOSES ON TRANSFER BRIDGE AND MAIN FLOATING DOCK SHALL BE HEAT TRACED & INSULATED.
   WATER 3"
   FIRE 4"
   SEWER 3"
2. LS#1 - PERISTALTIC PUMP ASSEMBLY IN HEATED & INSULATED ENCLOSURE.
3. LS#2 - DUPLEX SUBMERSIBLE GRINDER PUMPS IN WET WELL.
4. EXISTING 3" FORCEMAIN IS SLIP LINED THROUGH EXISTING 6" SERVICE LINE. SLIP LINE NEW 1.5" HDPE FORCEMAIN THROUGH 6" SERVICE LINE ADJACENT TO EXISTING 3" FORCEMAIN & TERMINATE AT APPROXIMATE SAME LOCATION WITHIN MANHOLE.
5. SEE BUILDING MECHANICAL DRAWINGS FOR INTERNAL PIPING.
6. FLEXIBLE HOSE CONNECTIONS AT BOTTOM OF TRANSFER BRIDGE ARE SUBMERGED.

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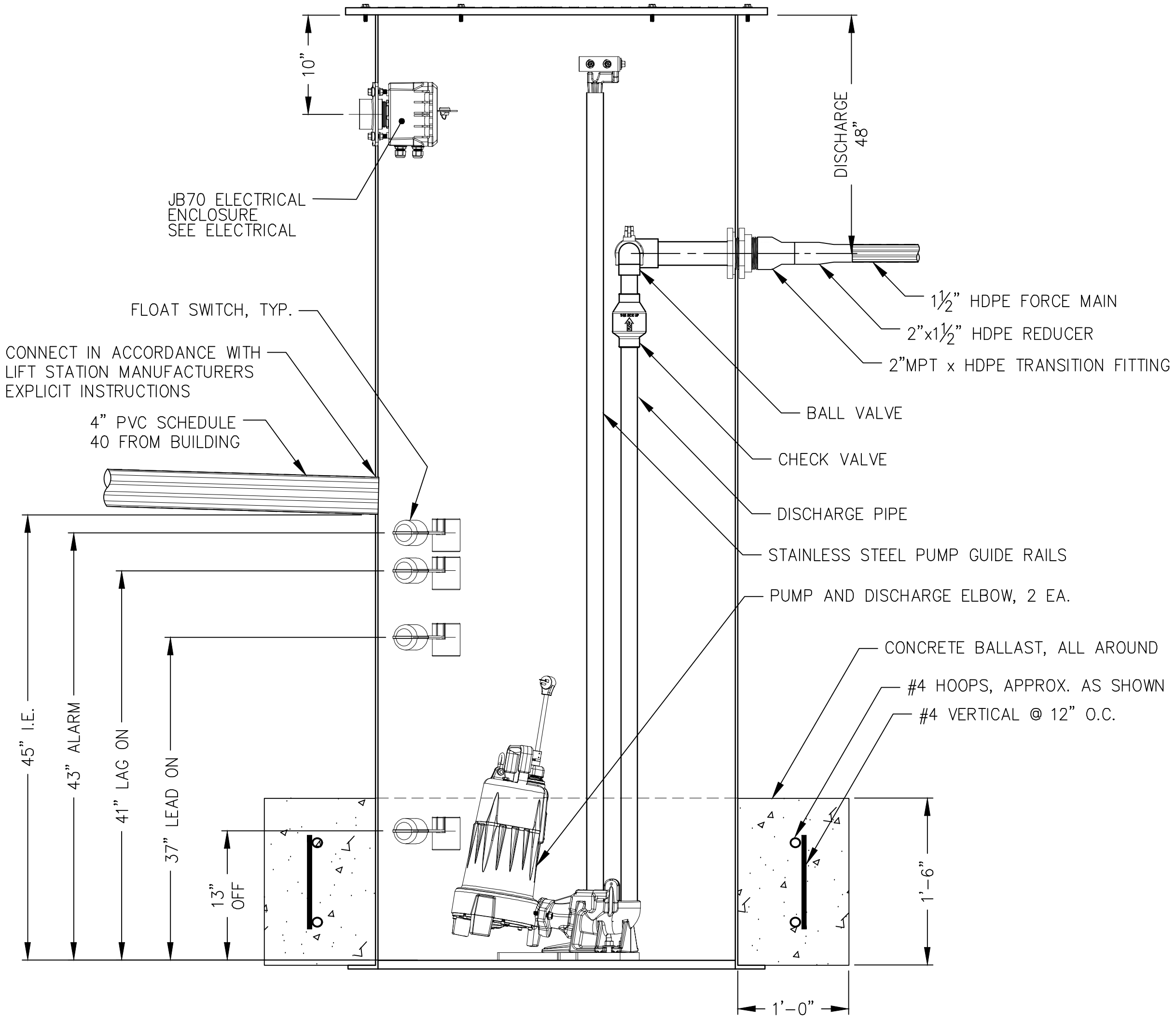
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: CIVIL UTILITIES SCHEMATIC PLAN

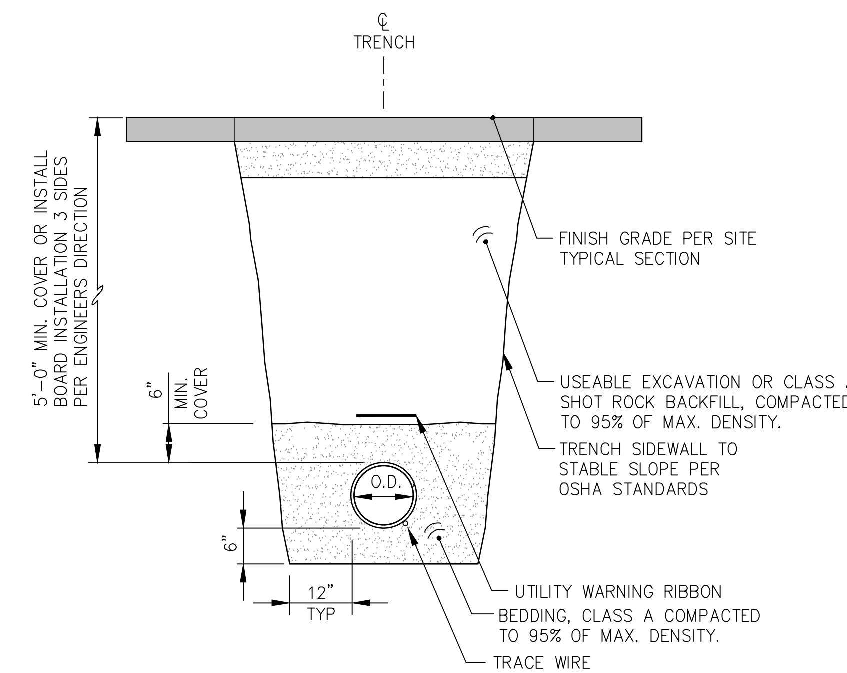
PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

C3.01



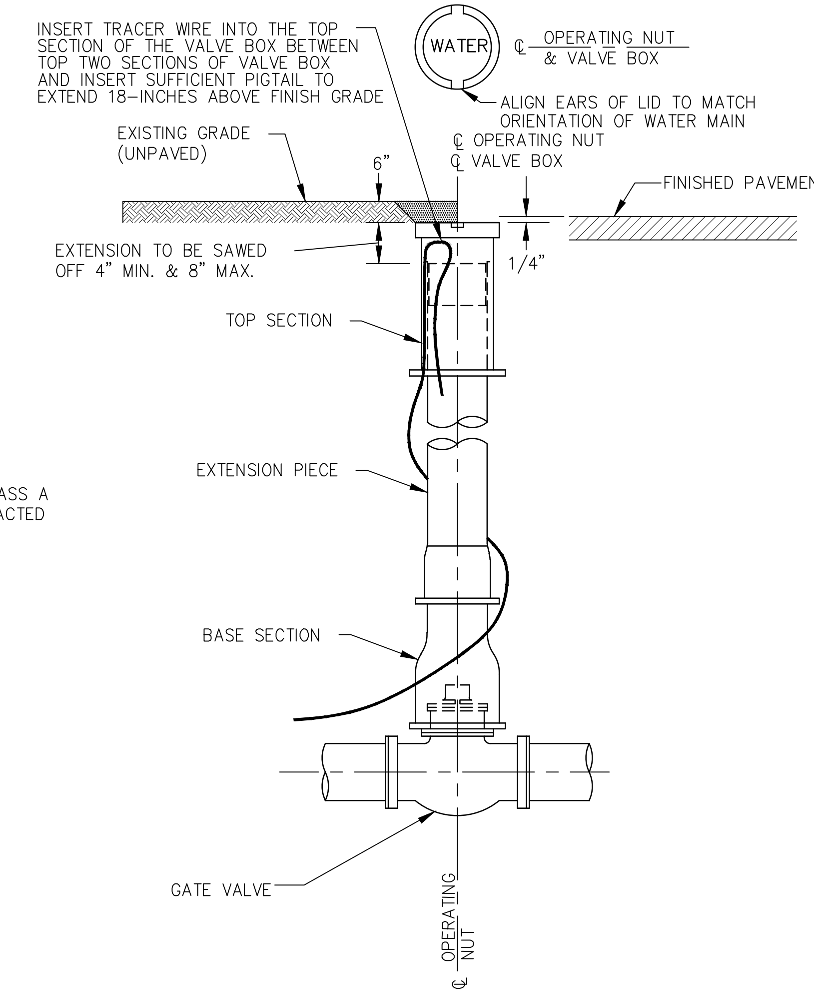
A - UPLAND LIFT STATION SECTION

NOTE:
PACKAGE DUPLEX GRINDER LIFT STATION, SEE SPECIFICATIONS.

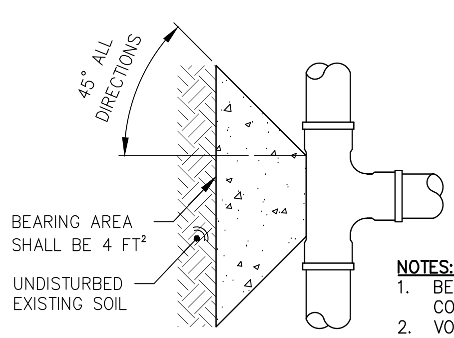


B - PIPE TRENCH DETAIL

ALL CIVIL UTILITIES AND DRAIN PIPE

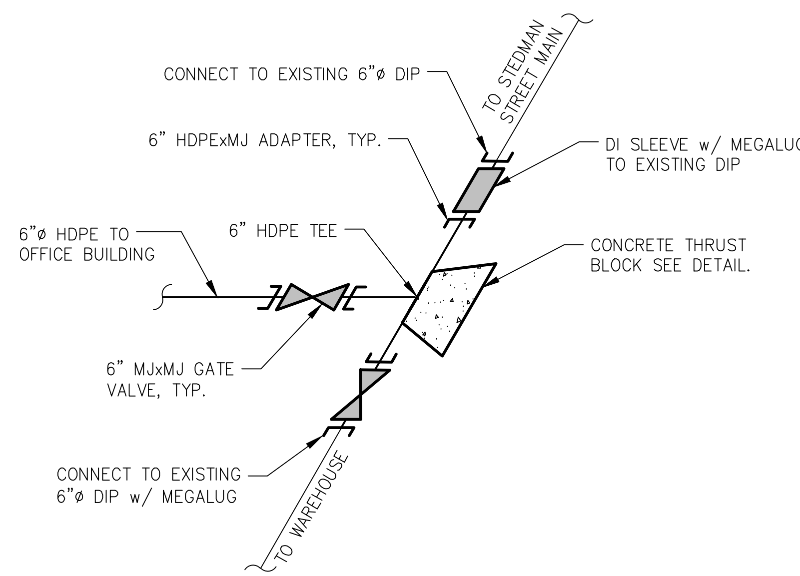


C - WATER VALVE, BOX AND COVER DETAIL

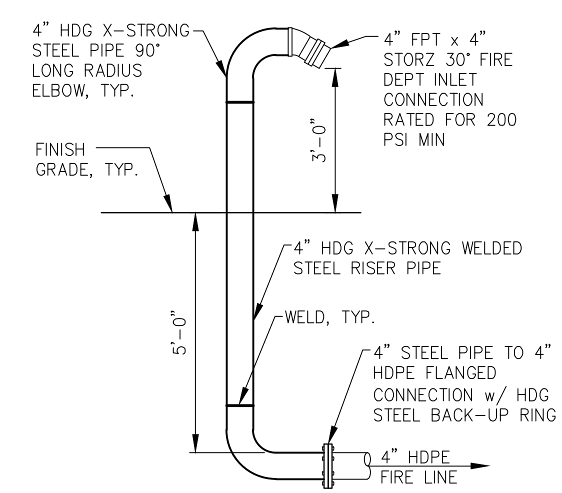


NOTES:
1. BED THRUST BLOCK WITH BEDDING MATERIAL, COMPACT TO 95% MAXIMUM DENSITY.
2. VOLUME SHALL BE 0.25 CY MIN.

D - TEE THRUST BLOCK DETAIL



E - WATER SERVICE CONNECTION DETAIL



F - FIRE LINE INLET CONNECTION DETAIL

NOTE:
INLET SHOWN IN PROFILE FOR ILLUSTRATIVE PURPOSES ONLY, ORIENT OUTLET TO FACE FIRE LANE

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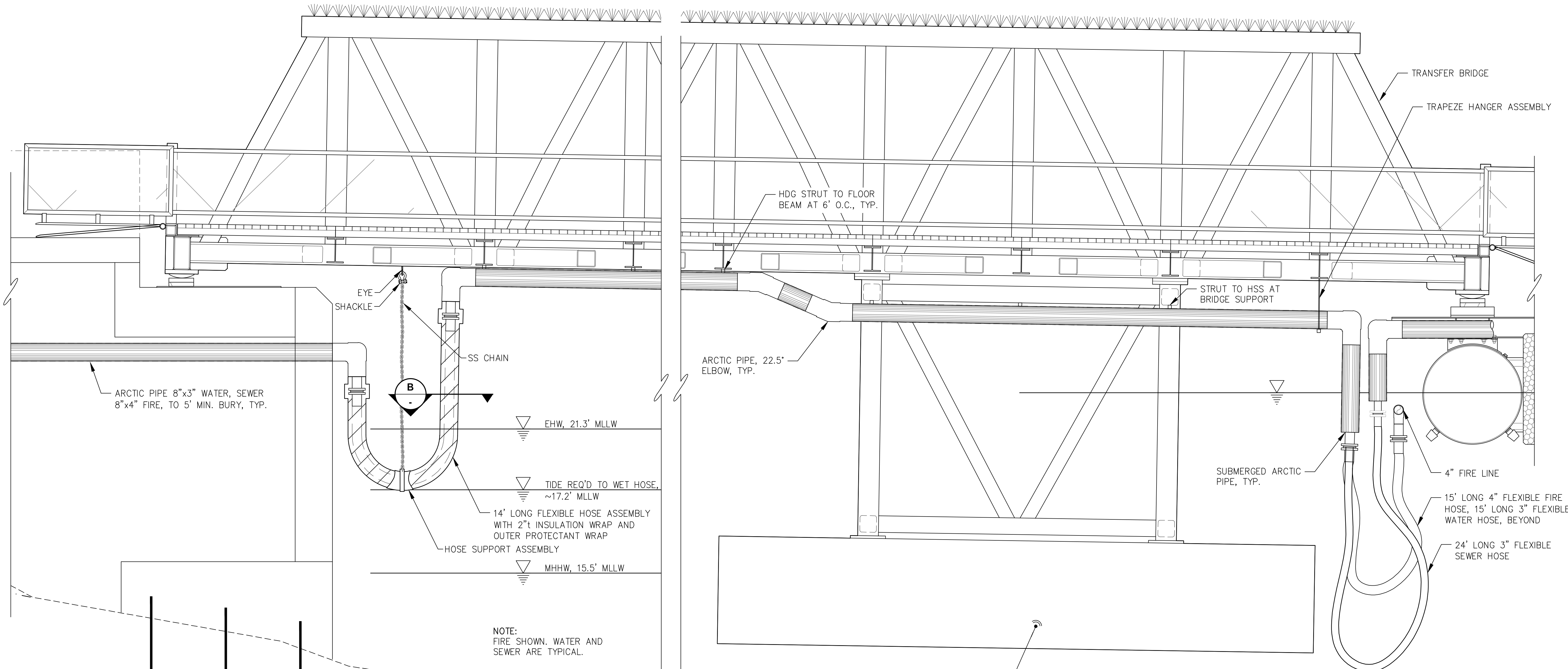
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

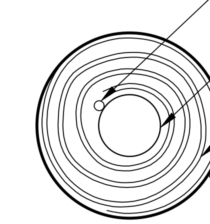
SHEET TITLE: UPLAND UTILITIES DETAILS

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

C3.02



A
C3.01
TRANSFER BRIDGE UTILITY ROUTING DETAIL



B
-
INSULATED FLEXIBLE HOSE DETAIL

NOTE:
SHEETS C3.03 AND C3.03A DISPLAY ALTERNATE TRANSFER BRIDGE PIPE ROUTING FOR PLAN REVIEW SET ONLY.

Ahtna Infrastructure & Technologies, LLC

REV.	DATE	DESCRIPTION	DWN.	CKD.	APP.

PND ENGINEERS, INC.
9360 Glacier Highway Ste 100
Juneau, Alaska 99801
Phone: 907-586-2093
Fax: 907-586-2099
www.pndengineers.com

DESIGN: TCB CHECKED: CRS
DRAWN: TCB APPROVED: CRS
SCALE: NTS

60% DESIGN SUBMITTAL

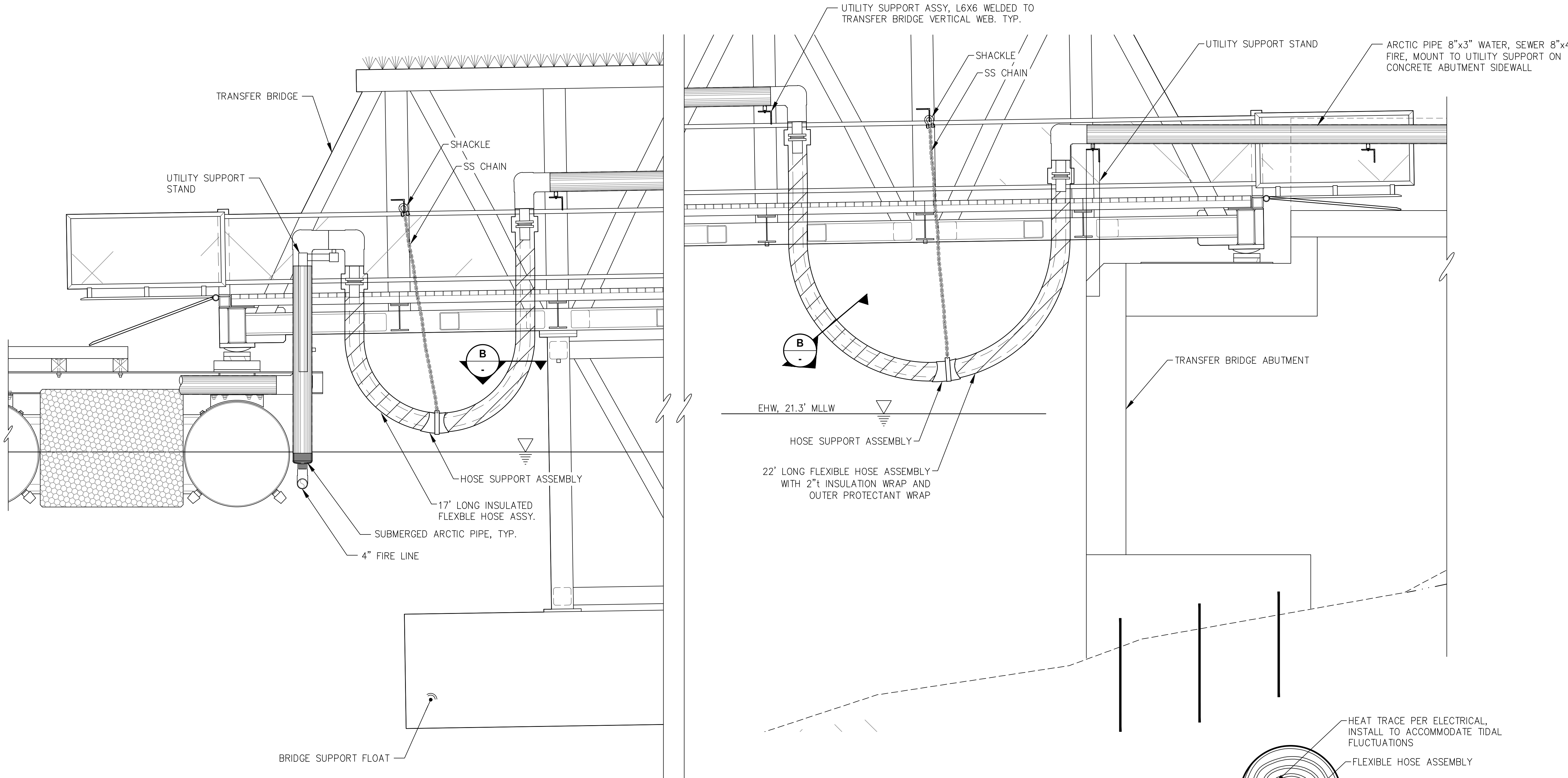
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

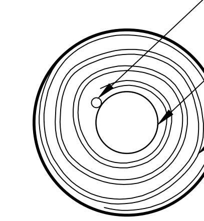
SHEET TITLE:
UTILITIES TRANSFER BRIDGE DETAILS

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

C3.03



A / C3.01 TRANSFER BRIDGE UTILITY ROUTING DETAIL



B / - INSULATED FLEXIBLE HOSE DETAIL

NOTE:
SHEETS C3.03 AND C3.03A DISPLAY ALTERNATE TRANSFER BRIDGE PIPE ROUTING FOR PLAN REVIEW SET ONLY.

ALTERNATE

Ahtna Infrastructure & Technologies, LLC

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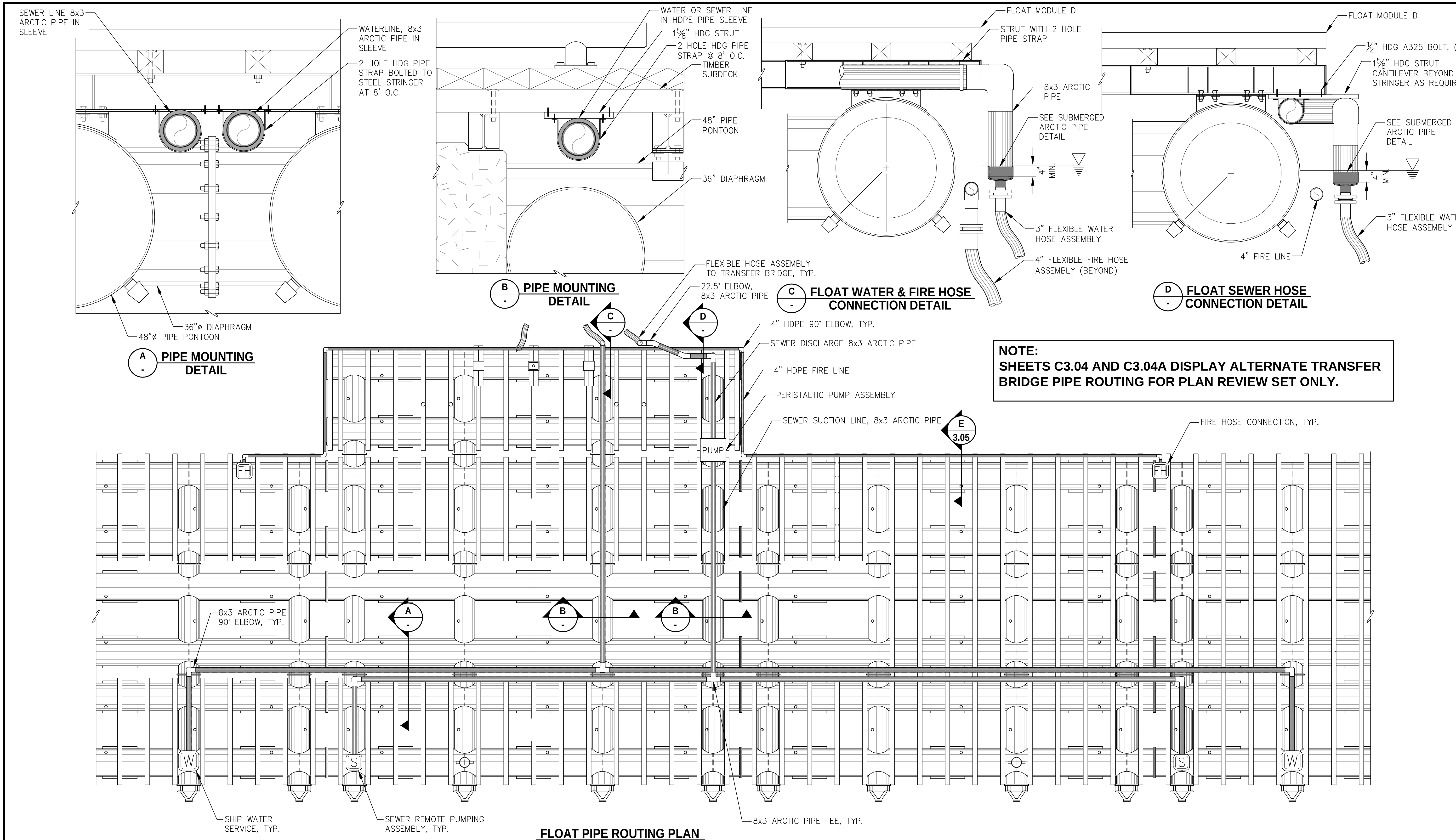
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE:
UTILITIES TRANSFER BRIDGE DETAILS ALTERNATE

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

C3.03A



NOTE:
SHEETS C3.04 AND C3.04A DISPLAY ALTERNATE TRANSFER BRIDGE PIPE ROUTING FOR PLAN REVIEW SET ONLY.

NOAA
Ahtna
Infrastructure & Technologies, LLC

REV.	DATE	DESCRIPTION	DWN.	CKD.	APP.

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SCALE:

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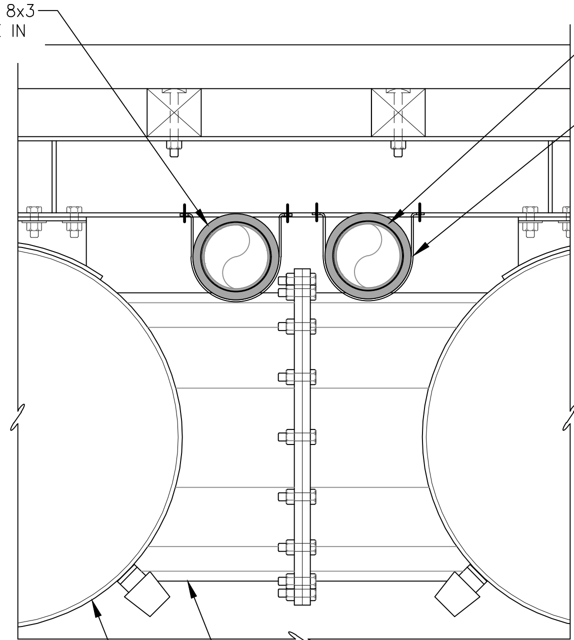
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

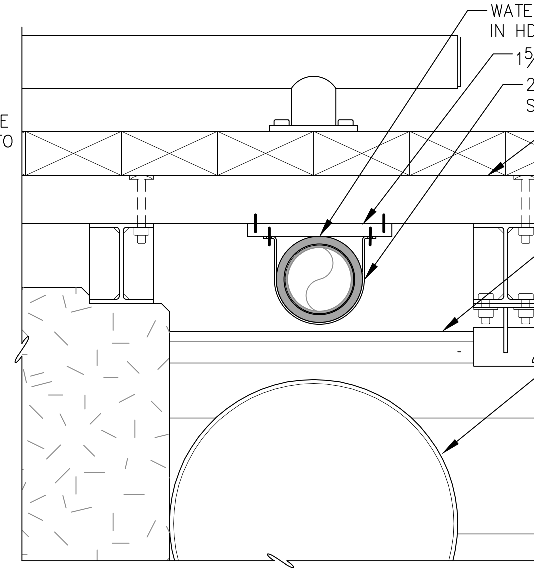
SHEET TITLE:
FLOATING DOCK PIPE ROUTING DETAILS

C3.04

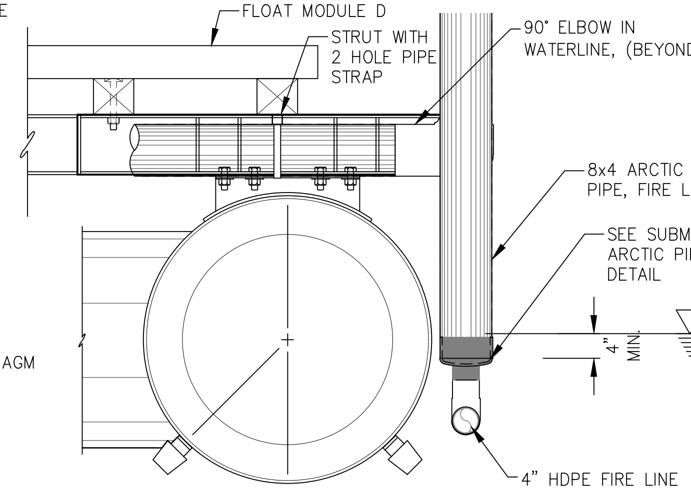
PND PROJECT NO.: 202101 C.A.N. NO.: AECC250



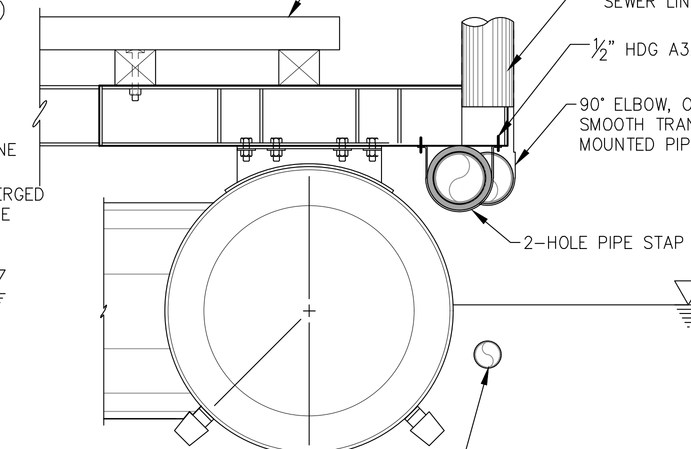
A - PIPE MOUNTING DETAIL



B - PIPE MOUNTING DETAIL

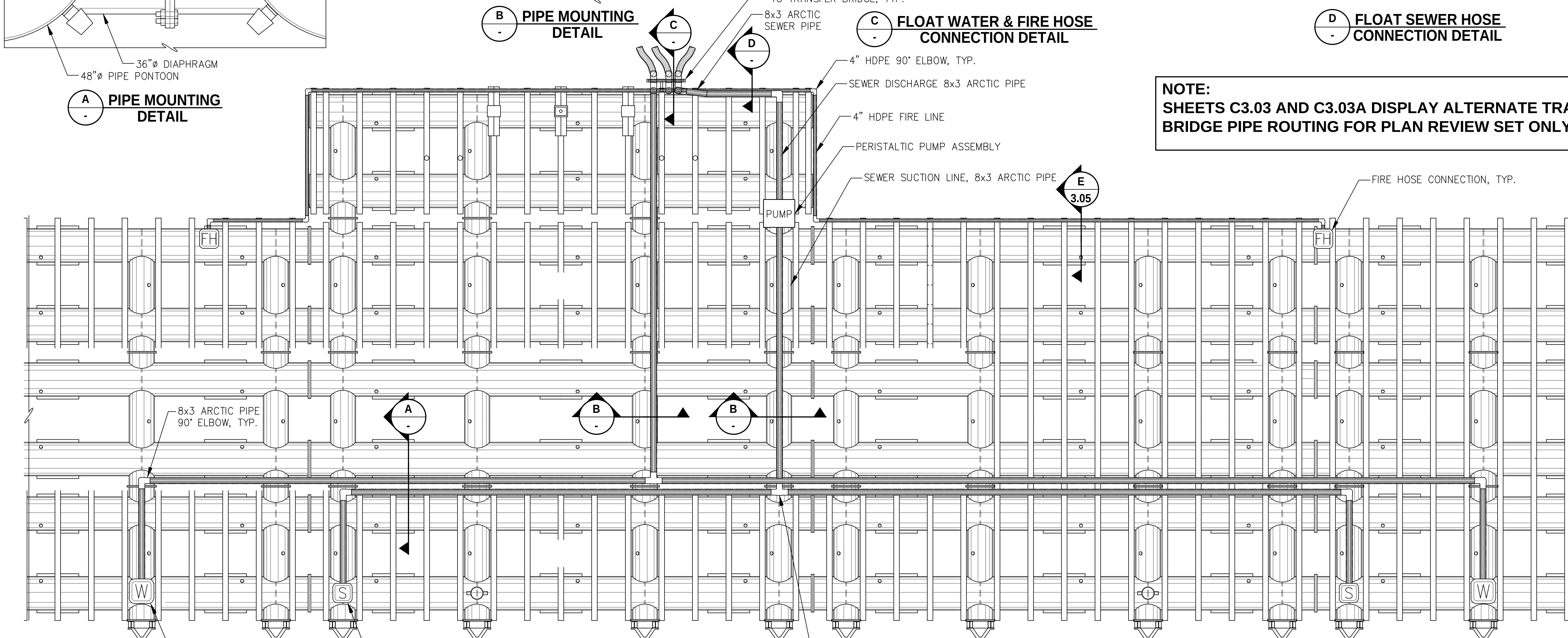


C - FLOAT WATER & FIRE HOSE CONNECTION DETAIL



D - FLOAT SEWER HOSE CONNECTION DETAIL

NOTE:
SHEETS C3.03 AND C3.03A DISPLAY ALTERNATE TRANSFER BRIDGE PIPE ROUTING FOR PLAN REVIEW SET ONLY.



FLOAT PIPE ROUTING PLAN

ALTERNATE

Ahtna Infrastructure & Technologies, LLC

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SCALE:

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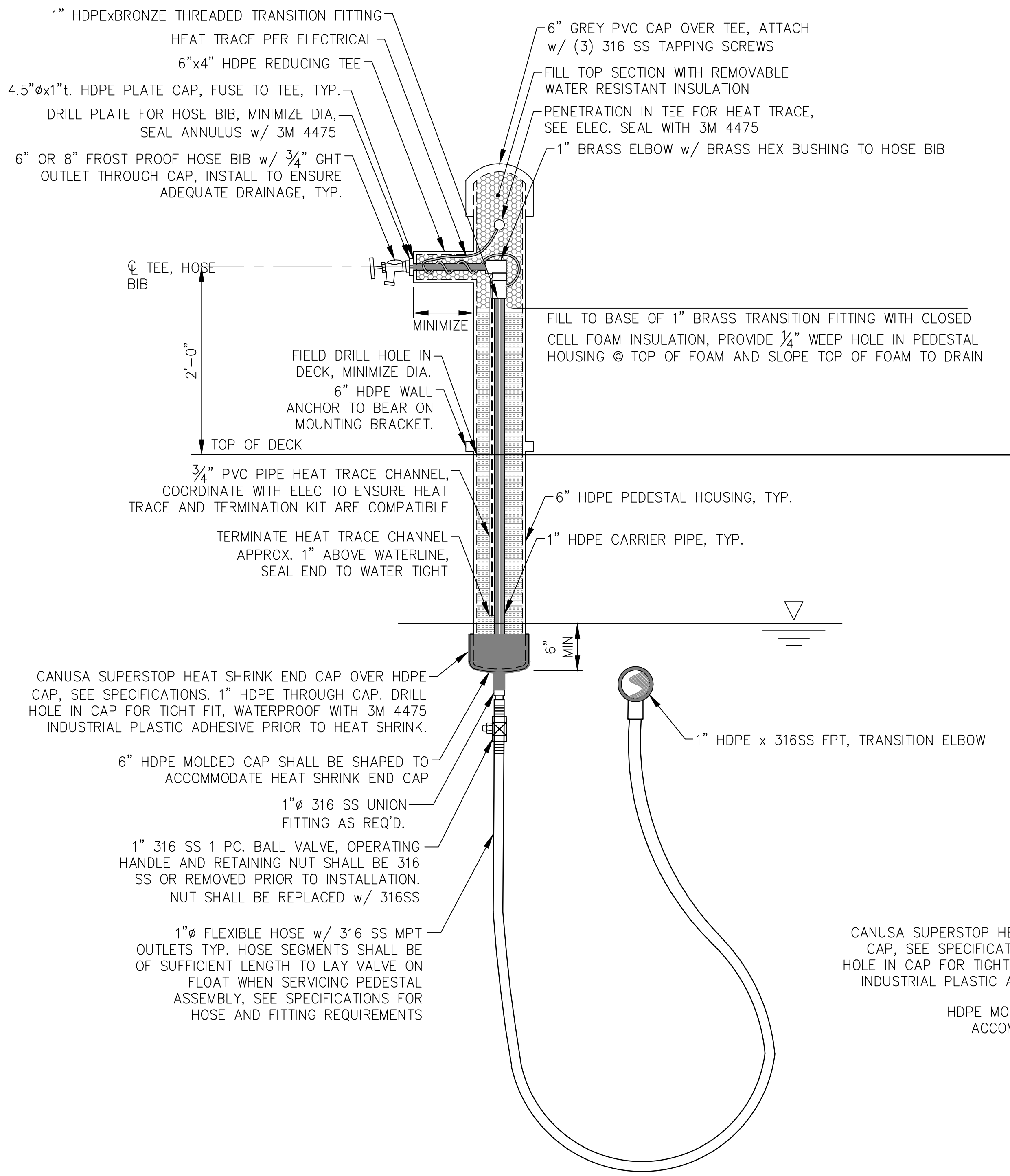
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

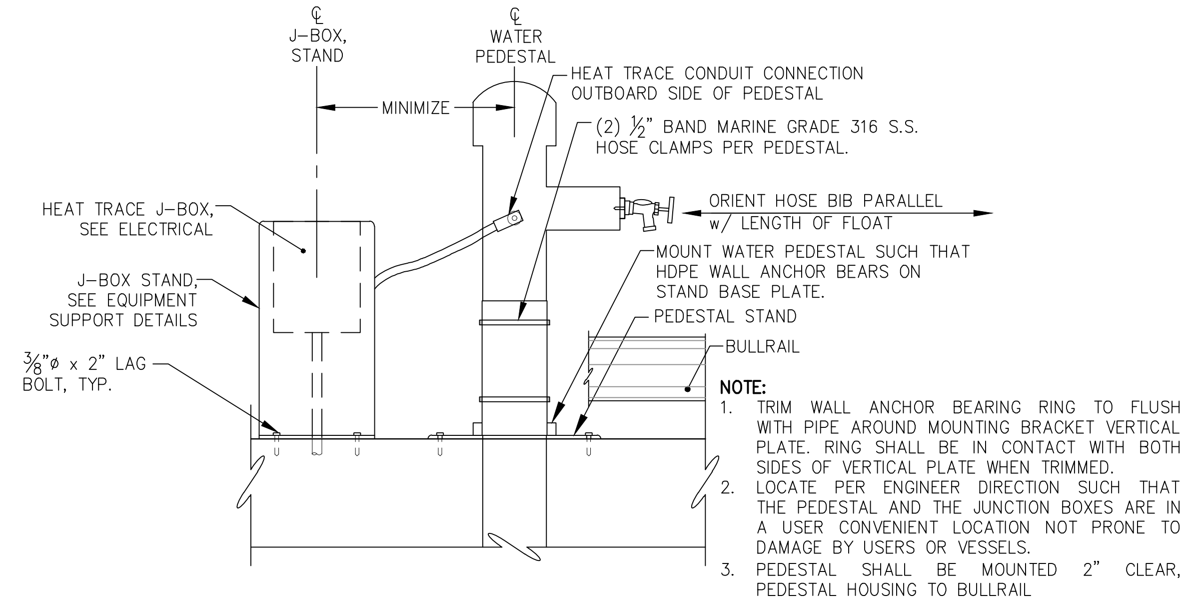
SHEET TITLE:
FLOATING DOCK PIPE ROUTING DETAILS ALTERNATE

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

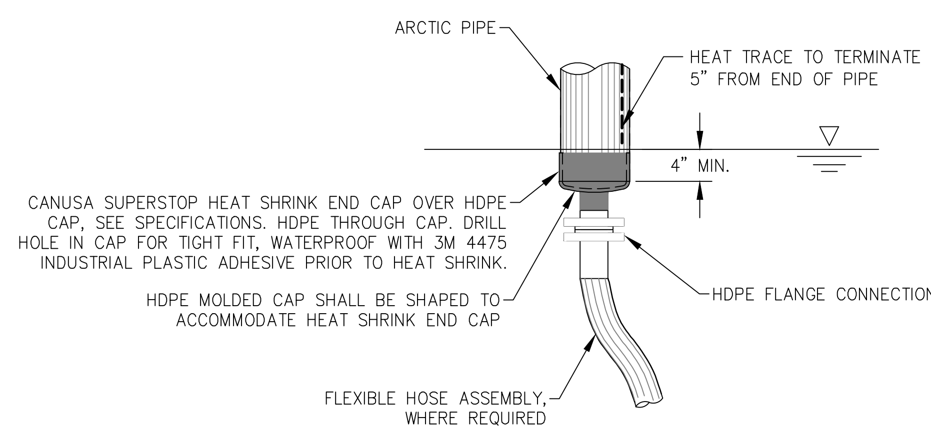
C3.04A



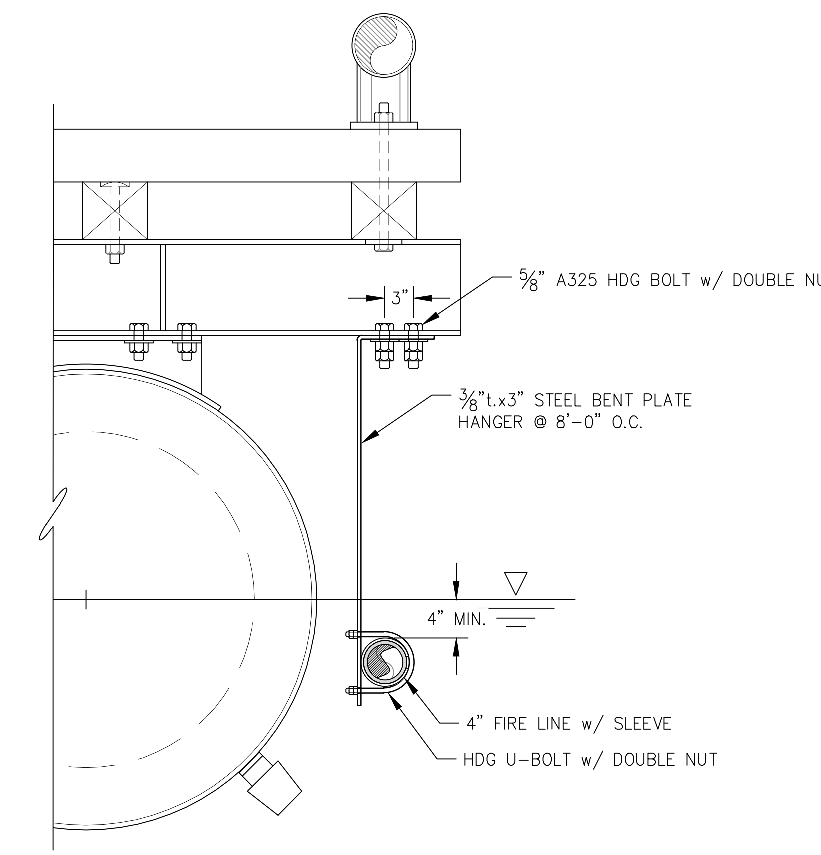
SMALL VESSEL FLOAT WATER PEDESTAL DETAIL



SMALL VESSEL FLOAT WATER PEDESTAL MOUNTING DETAIL



SUBMERGED ARCTIC PIPE DETAIL DETAIL



E / C3.04 **FIRE LINE HANGER DETAIL**

Ahtna Infrastructure & Technologies, LLC

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9360 Glacier Highway Ste 100
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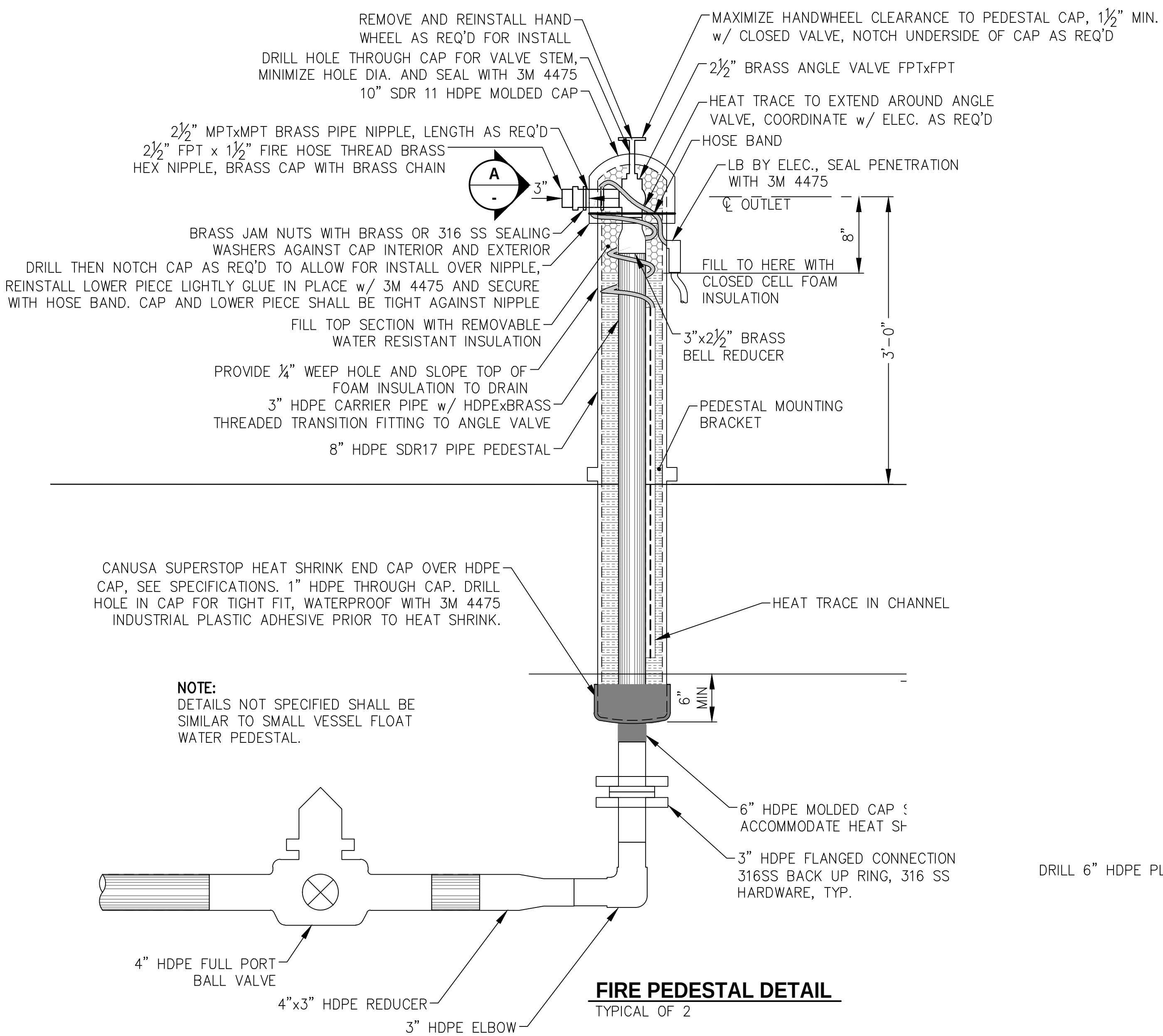
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: FLOATING DOCK UTILITIES DETAILS

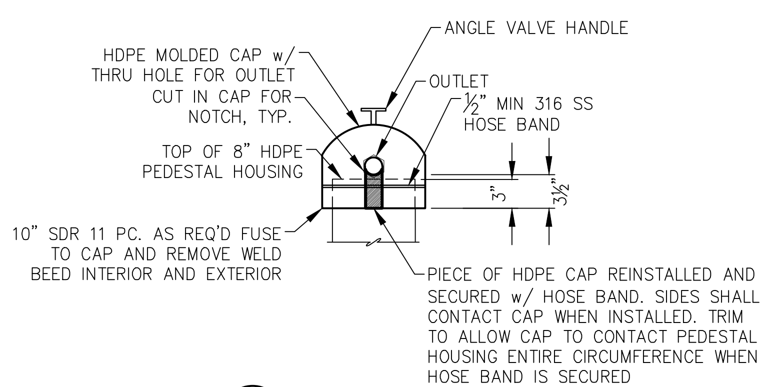
PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

C3.05

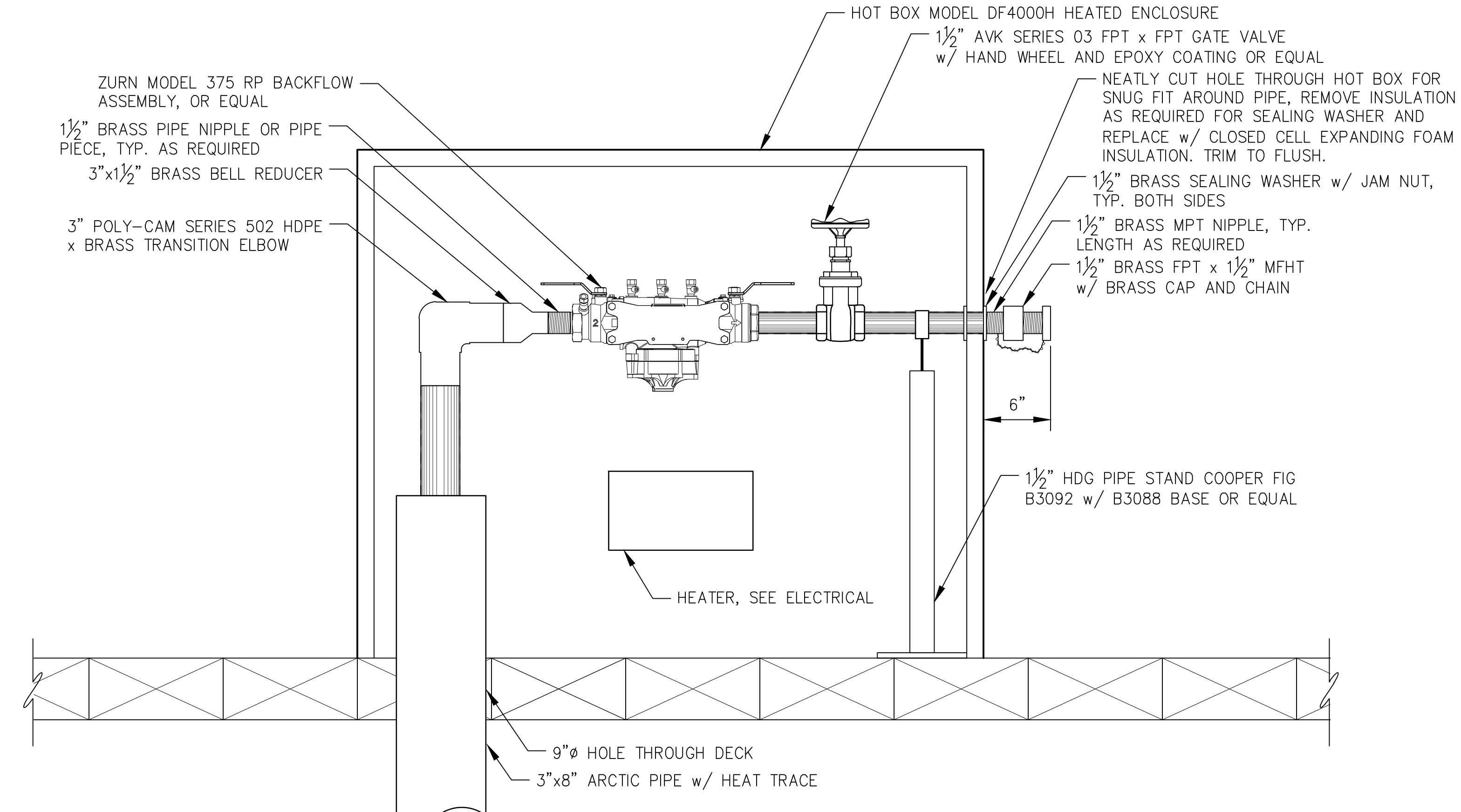


FIRE PEDESTAL DETAIL

TYPICAL OF 2

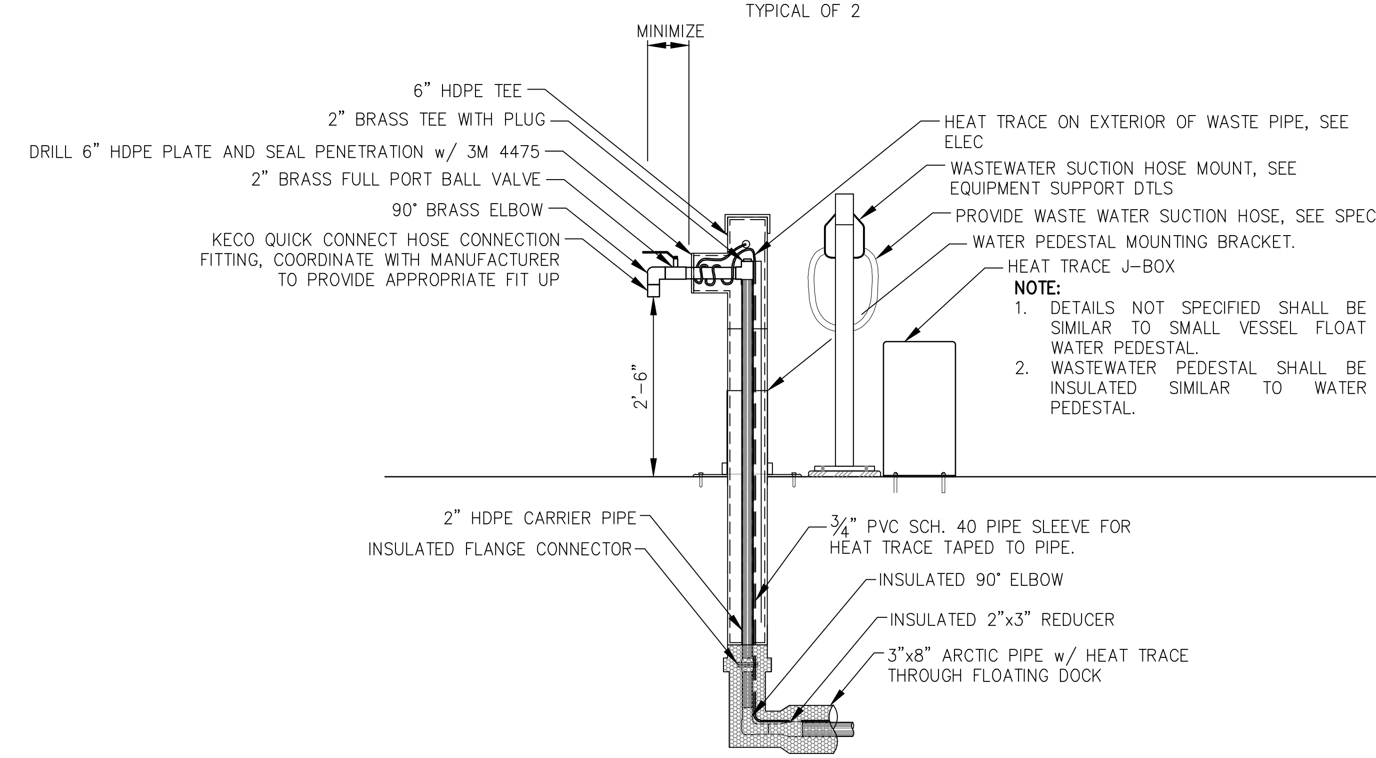


A - **FIRE PEDESTAL CAP DETAIL**



SHIP WATER SERVICE DETAIL

TYPICAL OF 2



SHIP SEWER REMOTE PUMPING CENTER ELEVATION

Ahtna Infrastructure & Technologies, LLC

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DRAWN: WRB APPROVED: CRS

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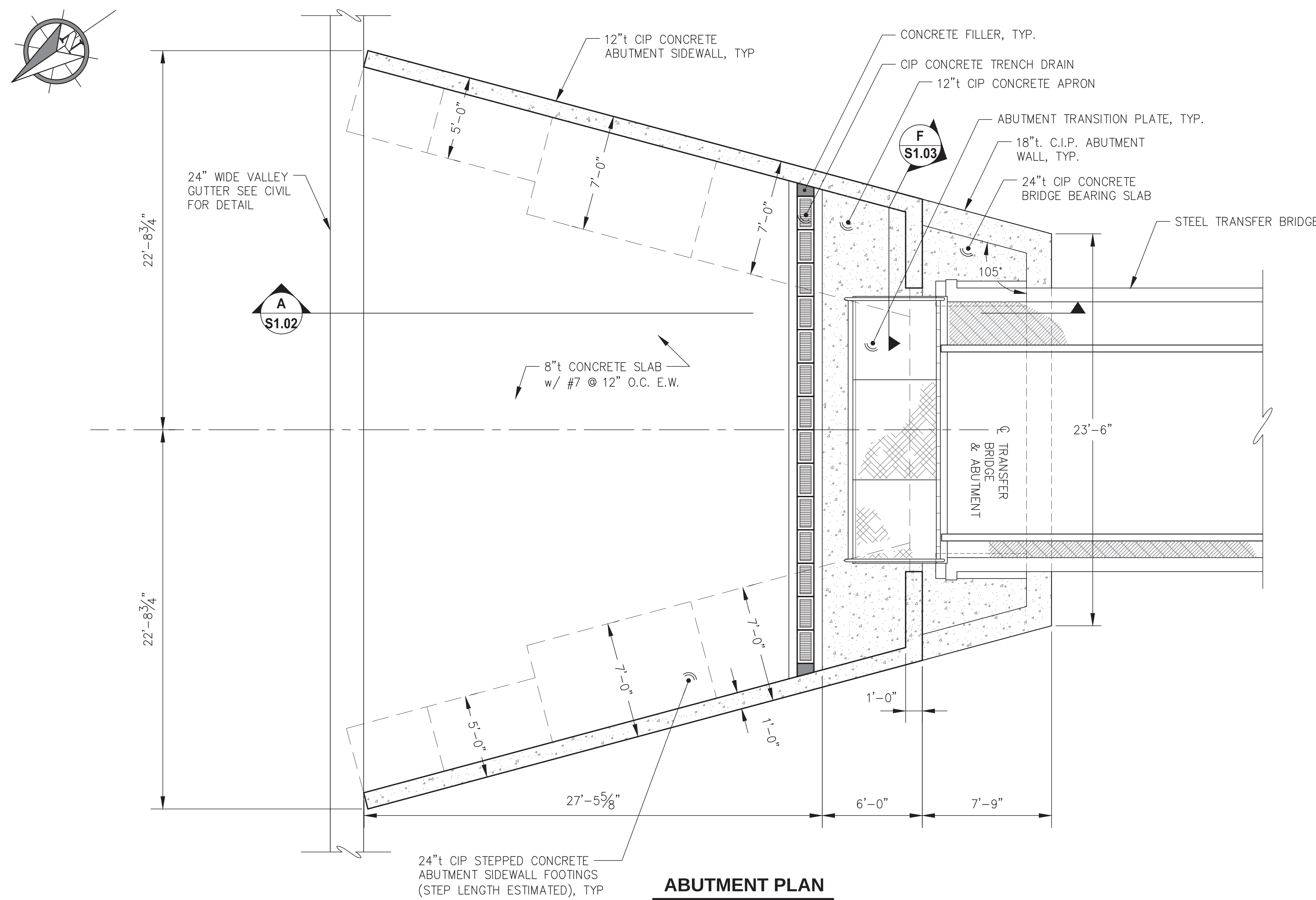
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: **FLOATING DOCK UTILITIES DETAILS**

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

C3.06



ABUTMENT PLAN

REV.	DATE	DESCRIPTION	DWN.	CKD.	APP.

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DESIGN: JLD CHECKED: ______
DRAWN: PJD APPROVED: CRS

SCALE: SCALE IN FEET
0 4 8 FT.

60% DESIGN SUBMITTAL

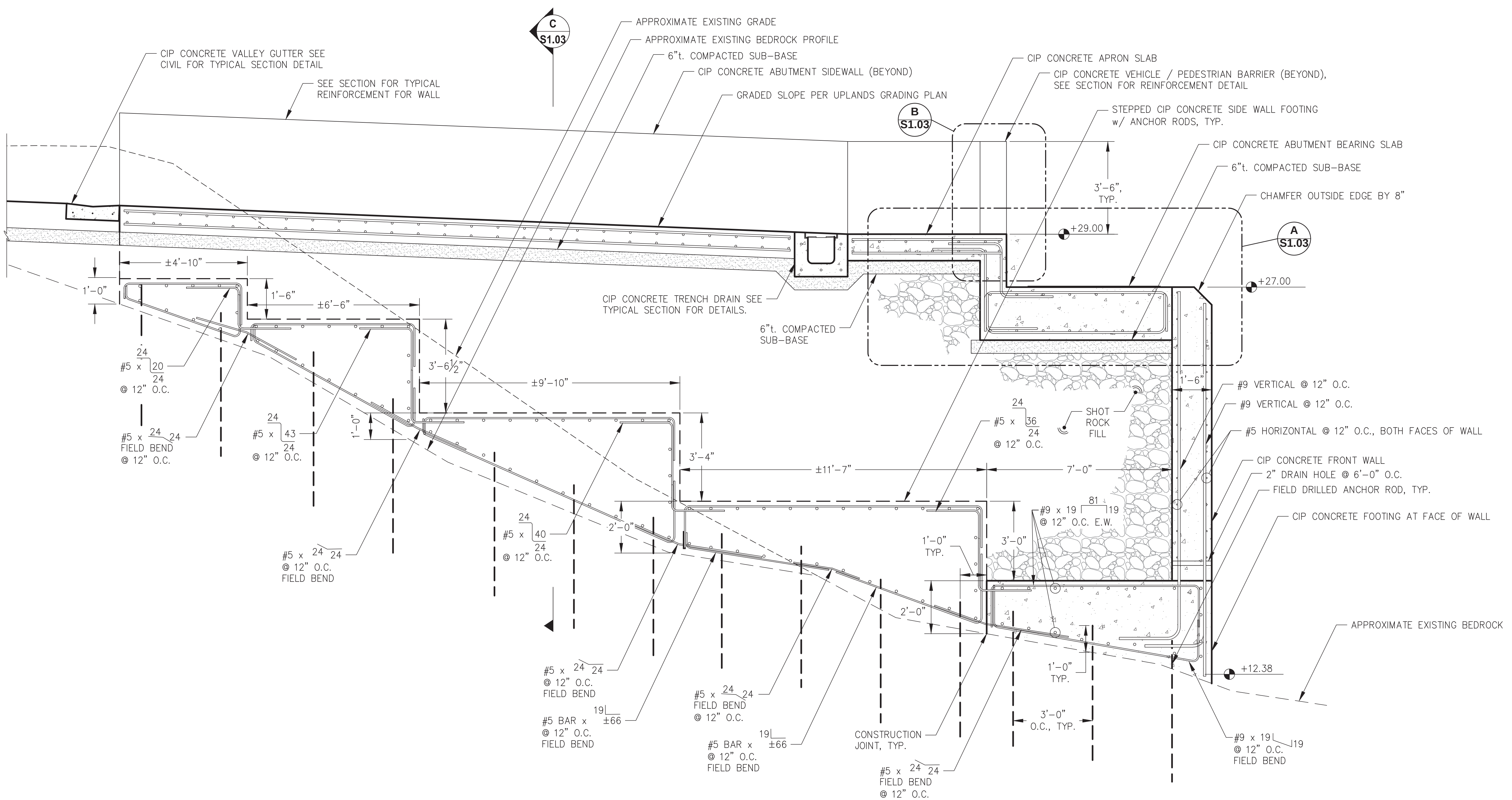
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE:
TRANSFER BRIDGE ABUTMENT PLAN

S1.01

PND PROJECT NO.: 202101
C.A.N. NO.: AECC250



NOTE:
ALL REBAR NEEDS TO BE 2" CLEAR FROM SIDES AND TOP, 3" CLEAR FROM BOTTOM UNLESS OTHERWISE NOTED.

A / S2.01 TRANSFER BRIDGE ABUTMENT SECTION

Ahtna Infrastructure & Technologies, LLC

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Juneau, Alaska 99801
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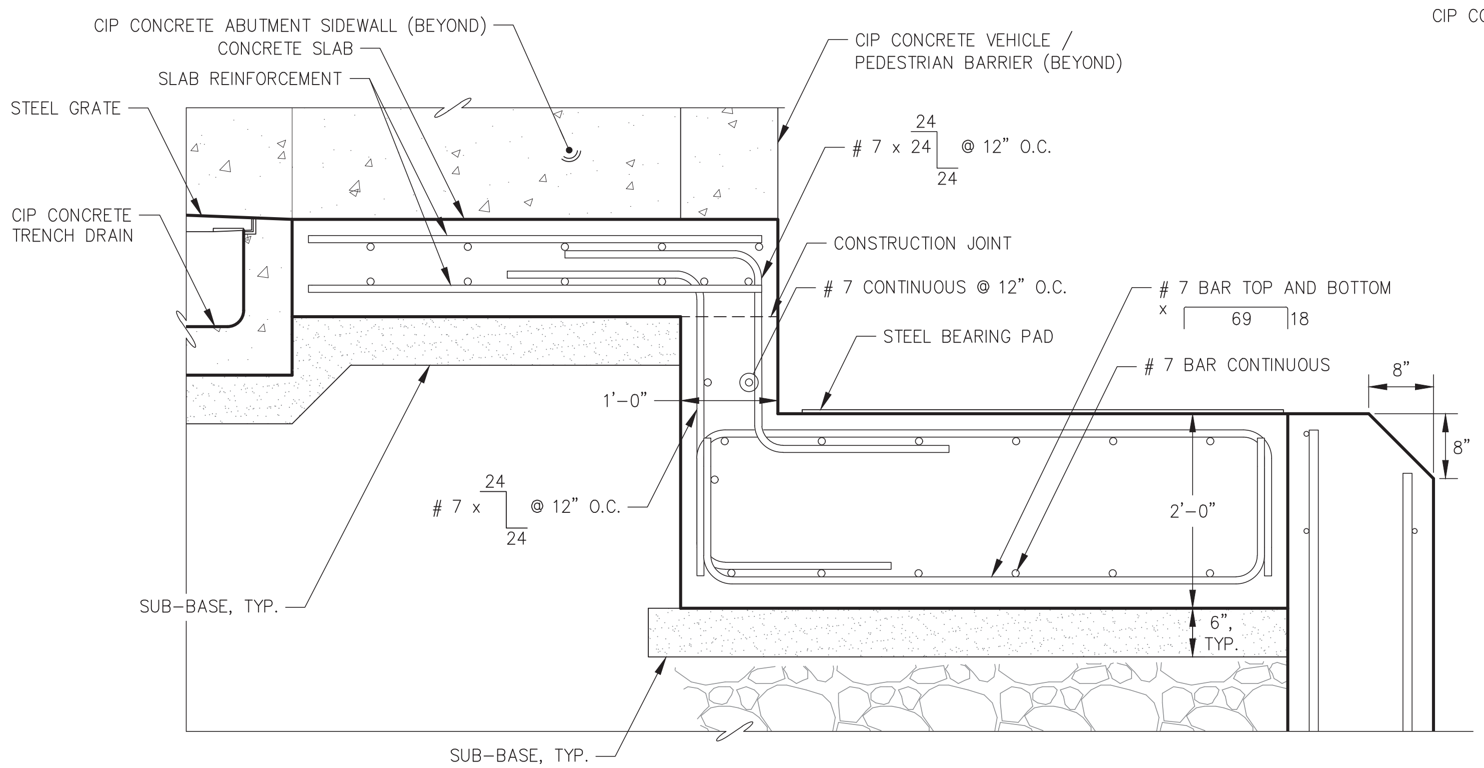
DESIGN: JLD CHECKED:
DRAWN: PJD APPROVED: CRS
SCALE: NTS

60% DESIGN SUBMITTAL
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

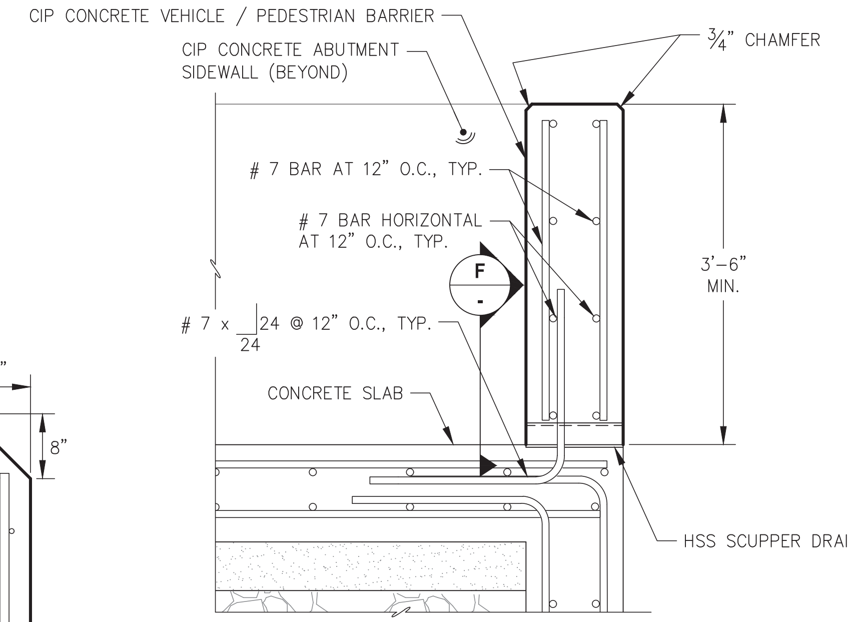
SHEET TITLE: TRANSFER BRIDGE ABUTMENT SECTION

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250



A S1.02 **BRIDGE FOUNDATION SECTION**

SCALE IN INCHES 0 12 24



B S1.02 **VEHICLE BARRIER SECTION**

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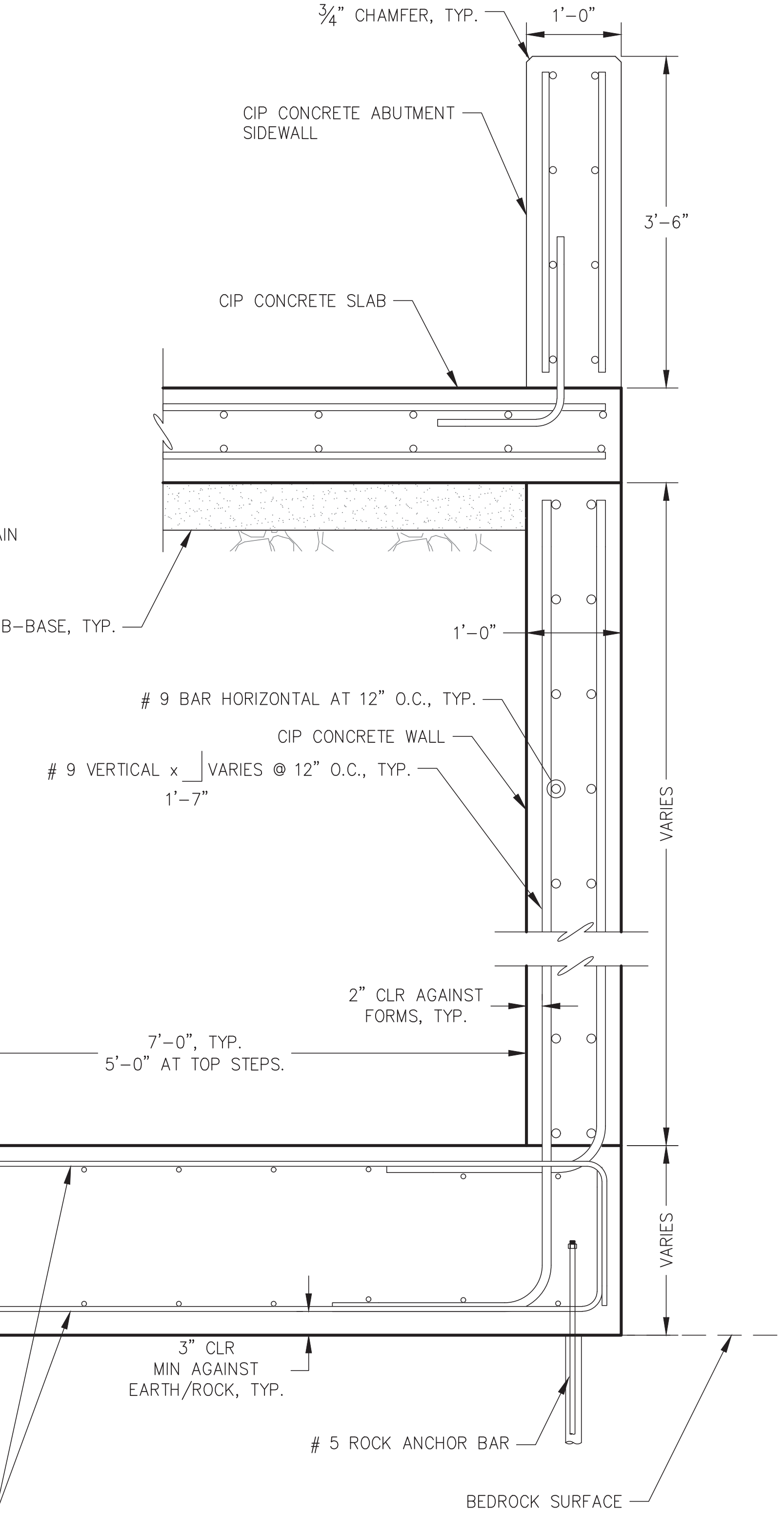
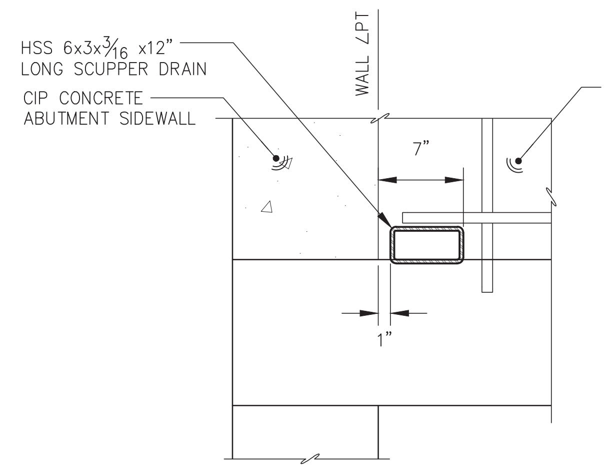


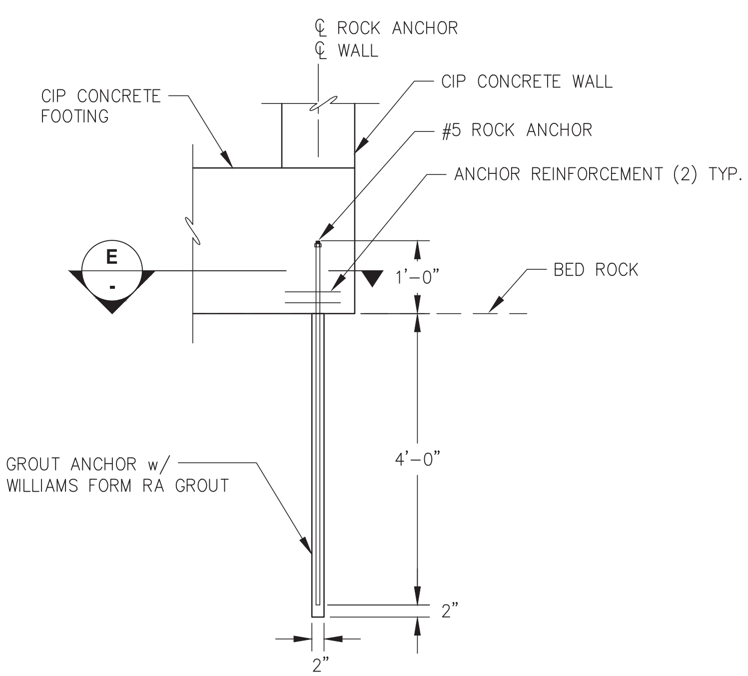


F - **SCUPPER DRAIN DETAIL**

SCALE IN INCHES 0 6 12 IN

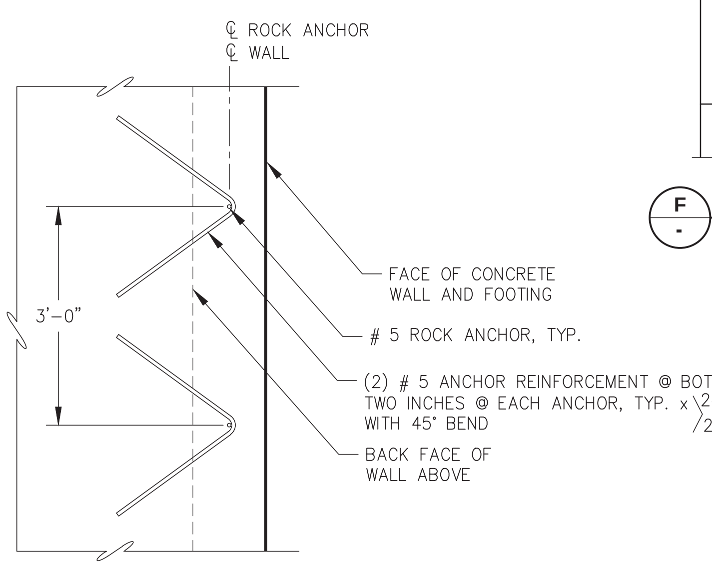
C S1.02 **TYPICAL SIDEWALL SECTION**

SCALE IN INCHES 0 12 24



D S1.02 **SECTION - ROCK ANCHOR TYPICAL**

SCALE IN FEET 0 1 2 3



E - **SECTION - ROCK ANCHOR TYPICAL**

SCALE IN FEET 0 1 2 3

NOTE:
ALL REBAR NEEDS TO BE 2" CLEAR FROM SIDES AND TOP, 3" CLEAR FROM BOTTOM UNLESS NOTED OTHERWISE.

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Phone: 907-586-2093
Fax: 907-586-2099
www.pndengineers.com

DESIGN: MDS CHECKED: JLD SCALE: AS SHOWN
DRAWN: KLL APPROVED: CRS

60% DESIGN SUBMITTAL

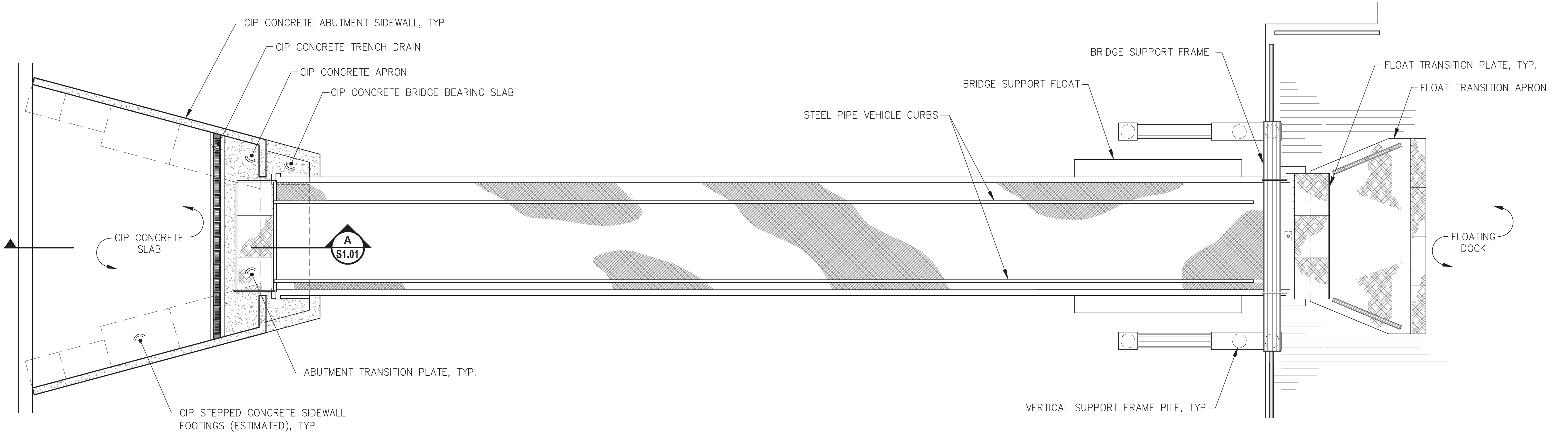
DATE: AUGUST 11, 2021

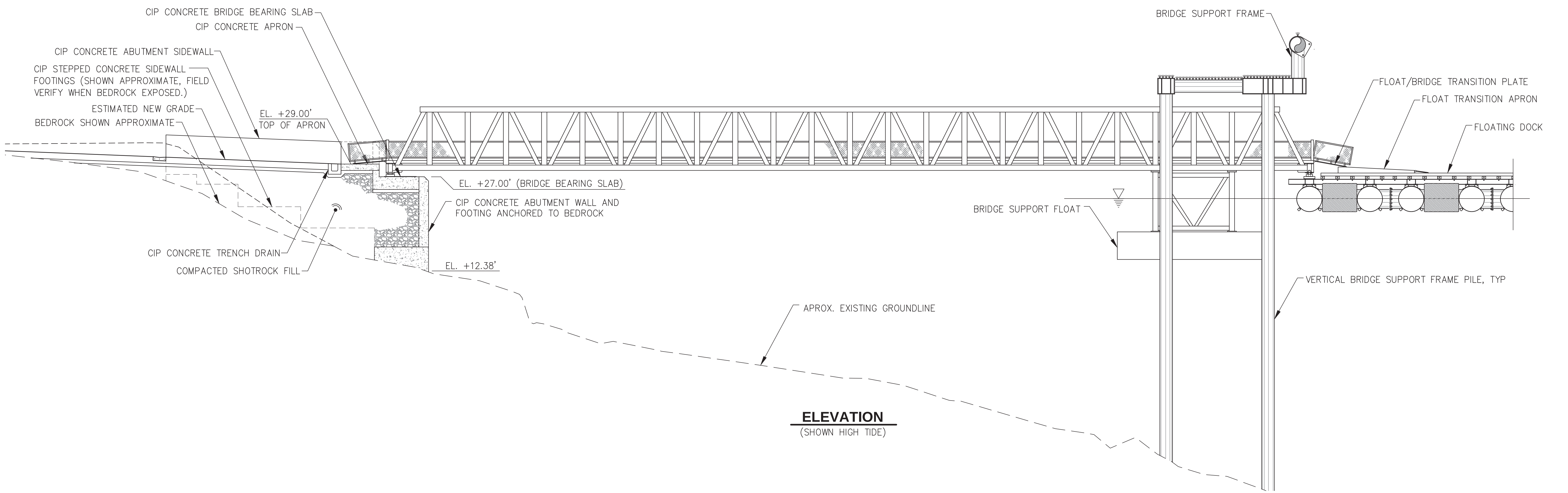
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: TRANSFER BRIDGE ABUTMENT DETAILS

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

S1.03





ELEVATION
(SHOWN HIGH TIDE)

REV.	DATE	DESCRIPTION	DWN.	CKD.	APP.

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SCALE: NTS

60% DESIGN SUBMITTAL

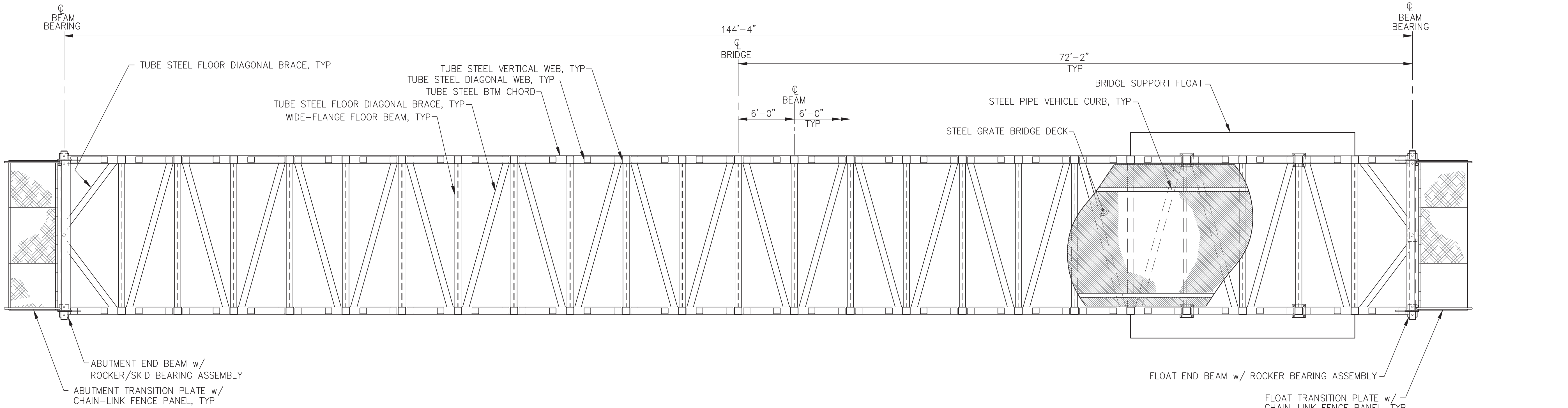
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: TRANSFER BRIDGE GENERAL PLAN AND ELEVATION

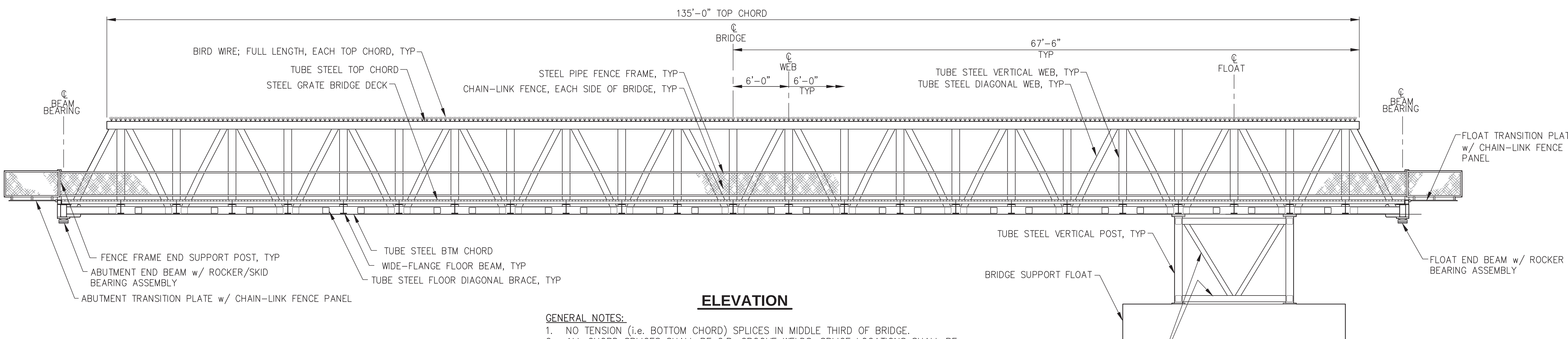
PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

S2.01



FLOOR PLAN

NOTE: TOP CHORD NOT SHOWN THIS VIEW FOR CLARITY.



ELEVATION

GENERAL NOTES:

1. NO TENSION (i.e. BOTTOM CHORD) SPLICES IN MIDDLE THIRD OF BRIDGE.
2. ALL CHORD SPLICES SHALL BE C.P. GROOVE WELDS. SPLICE LOCATIONS SHALL BE SUBMITTED BY FABRICATOR FOR ENGINEER APPROVAL.
3. TOP AND BOTTOM CHORD SPLICES SHALL BE STAGGERED 5-FT MIN.
4. PROVIDE CAMBER OF 3" AT MID-SPAN FOR BRIDGE DEAD LOAD. FABRICATOR SHALL SUBMIT COMPLETE CAMBER DIAGRAM AND METHOD TO ACHIEVE CAMBER FOR ENGINEER REVIEW PRIOR TO FABRICATION.
5. CONTRACTOR SHALL SUBMIT BRIDGE HANDLING AND INSTALLATION PLAN FOR ENGINEER APPROVAL.

Ahtna Infrastructure & Technologies, LLC

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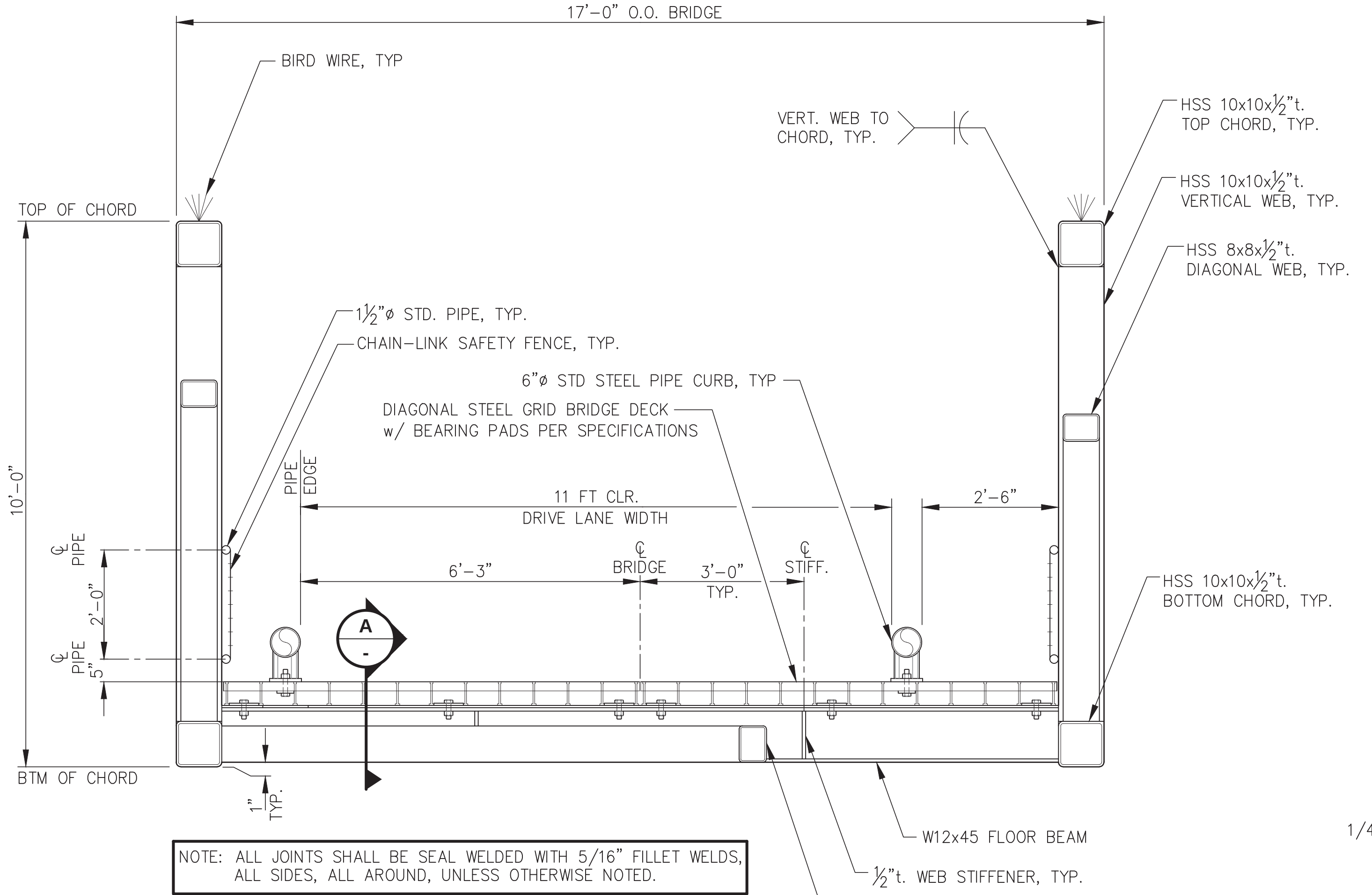
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

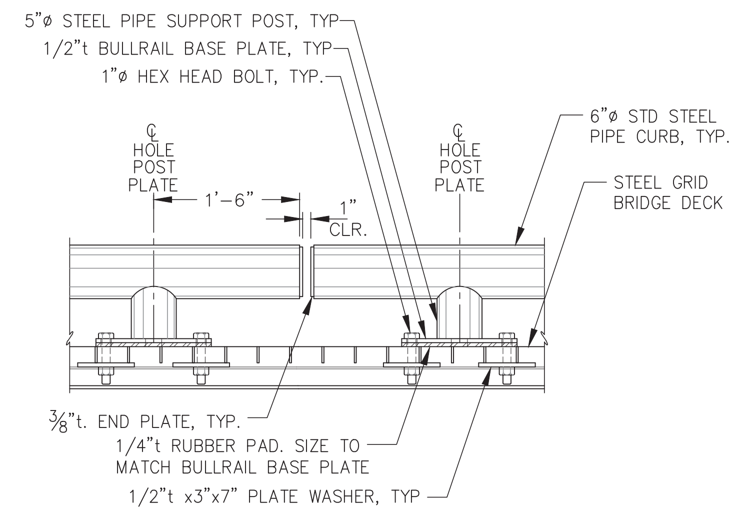
SHEET TITLE: BRIDGE PLAN AND ELEVATION

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

S2.02

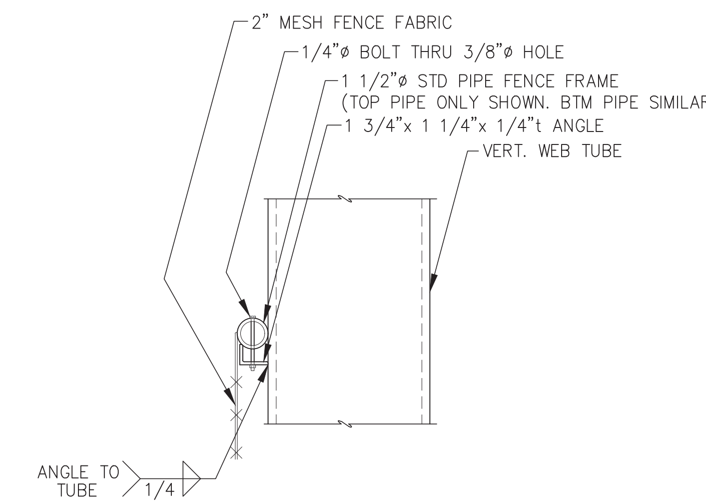


TYPICAL SECTION

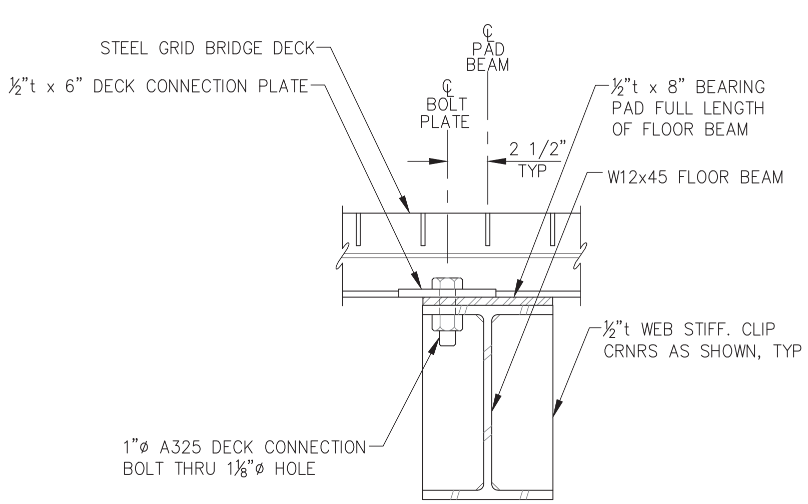


CURB CONNECTION - ELEVATION

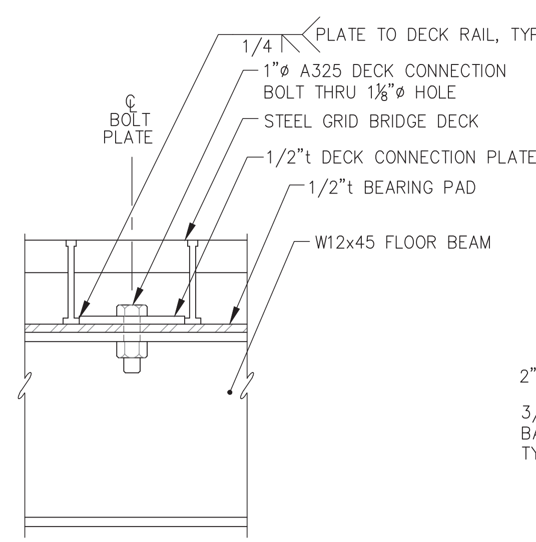
NOTE: SEE BRIDGE CURB DETAILS FOR DETAILS NOT SHOWN.



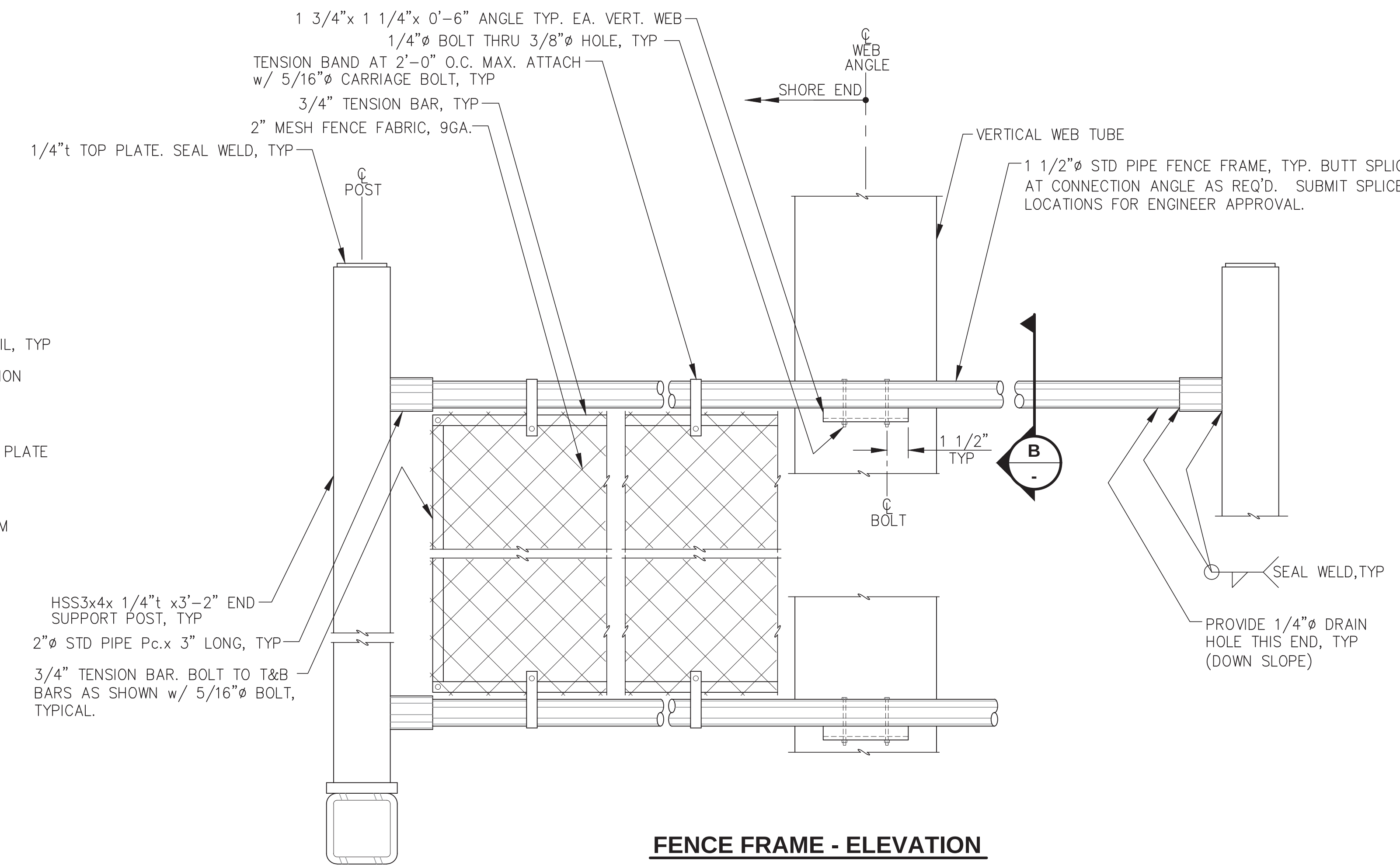
B FENCE FRAME - SECTION



A SECTION AT FLOOR BEAM



DECK CONNECTION



FENCE FRAME - ELEVATION

REV.	DATE	DESCRIPTION	DWN.	CKD.	APP.

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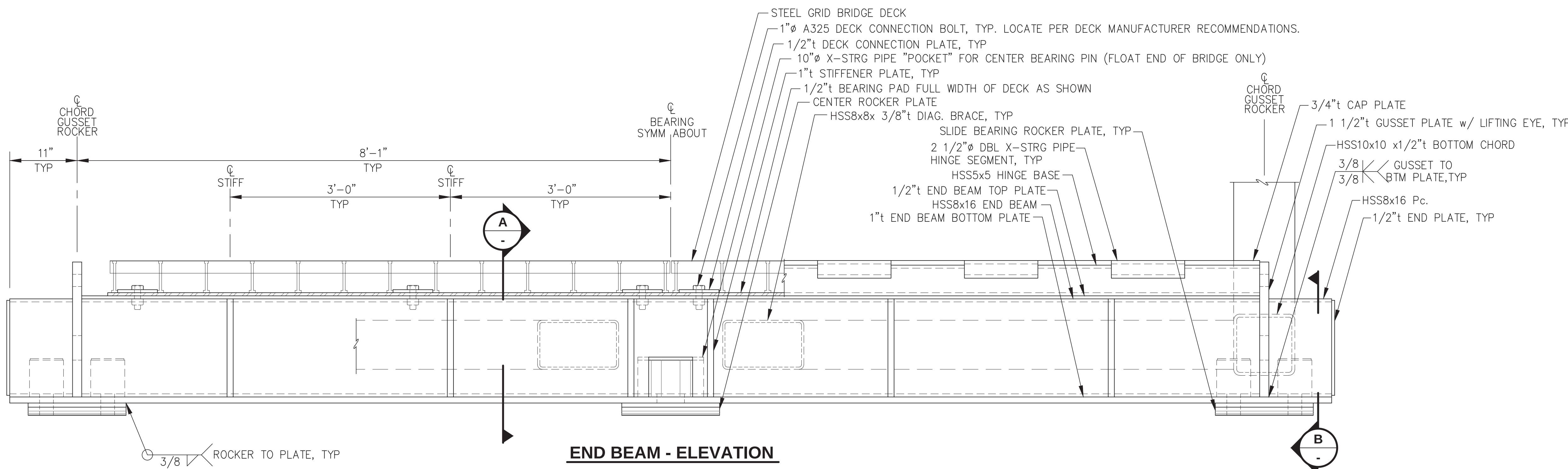
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: TYPICAL SECTION AND DETAILS

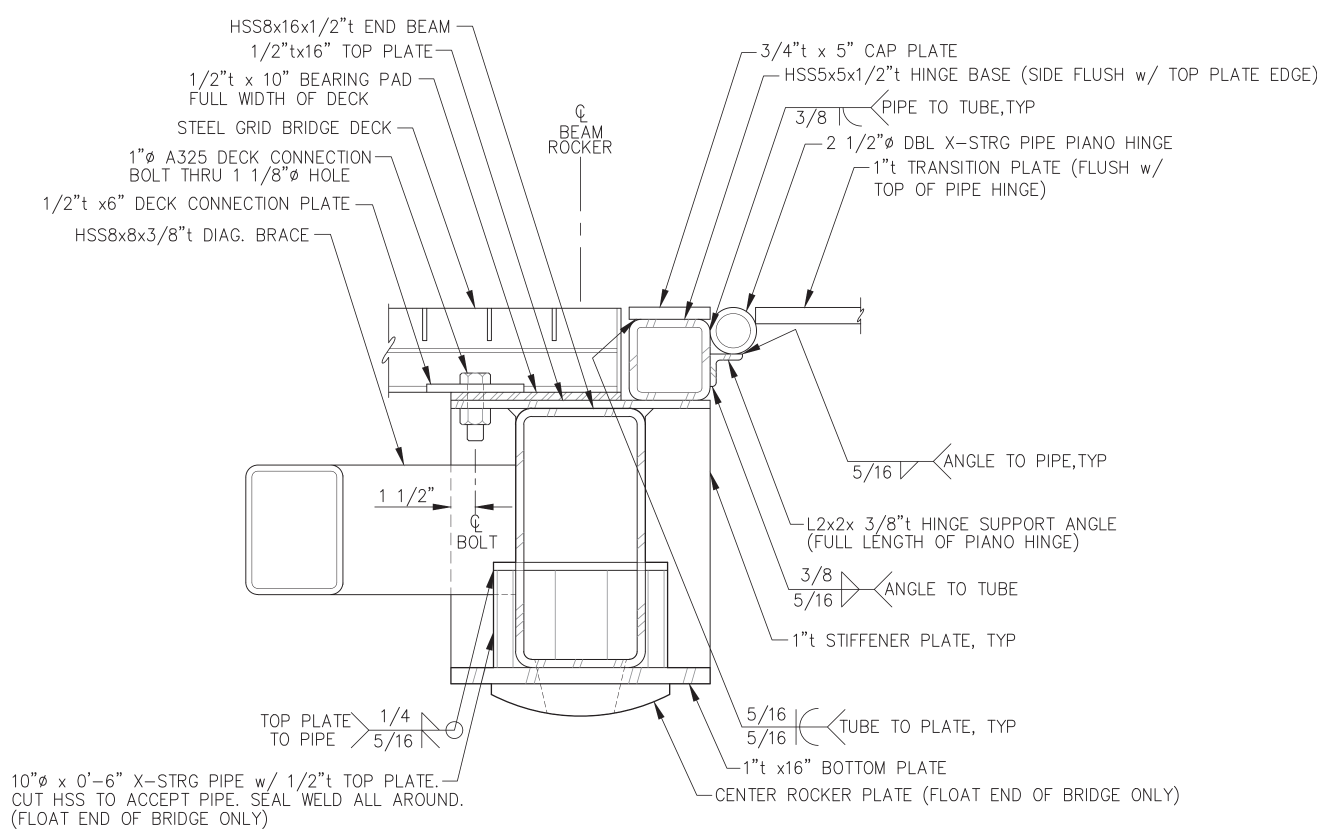
PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

S2.03



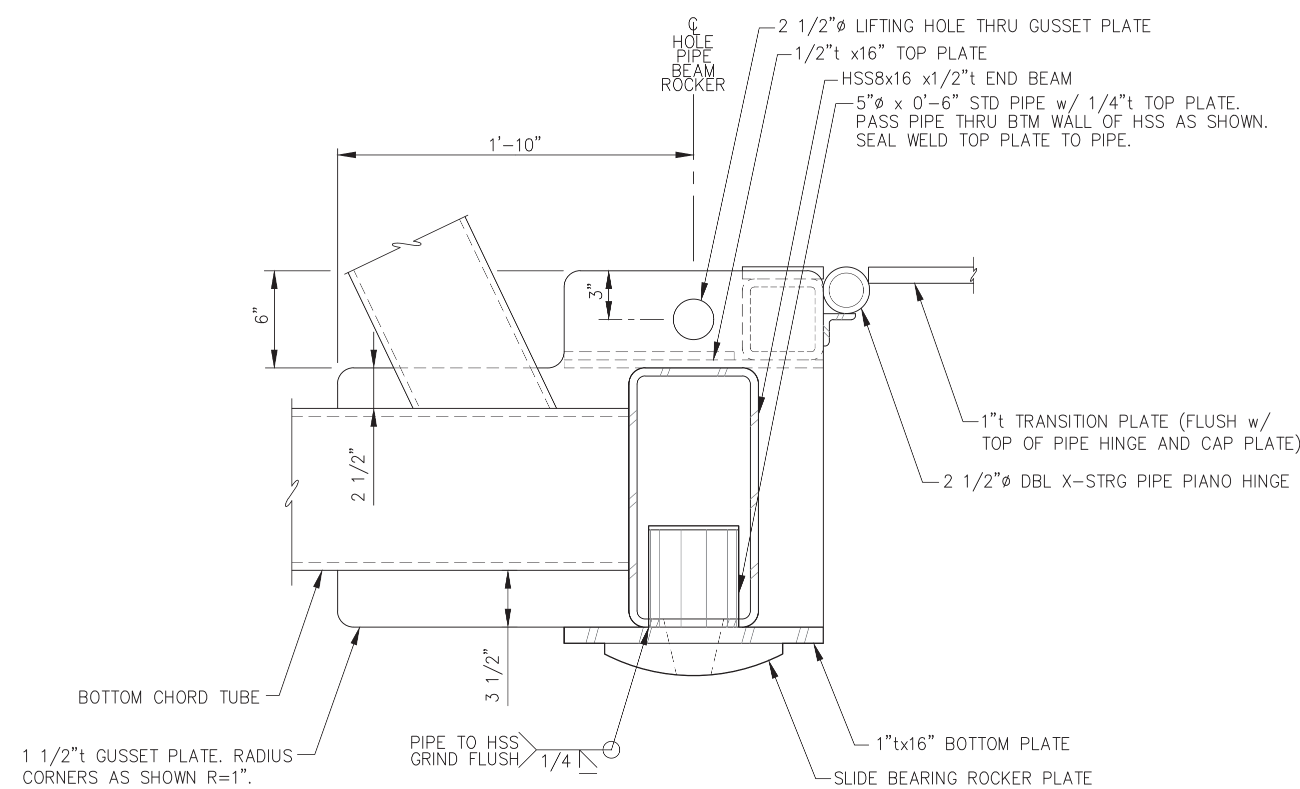
END BEAM - ELEVATION

NOTE: ALL JOINTS SHALL BE SEAL WELDED WITH 5/16" FILLET WELDS, ALL SIDES, ALL AROUND, UNLESS OTHERWISE NOTED.



(A/-) CENTER BEARING - SECTION

NOTE: BEVELED HOLE IN ROCKER PLATE SHALL EXTEND THRU END BEAM BTM. PLATE AND END BEAM AS SHOWN.



(B/-) SLIDE BEARING - SECTION

NOTE: BEVELED HOLE IN ROCKER PLATE SHALL EXTEND THRU END BEAM BTM. PLATE AND END BEAM AS SHOWN.

Ahtna Infrastructure & Technologies, LLC

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SCALE: NTS

60% DESIGN SUBMITTAL

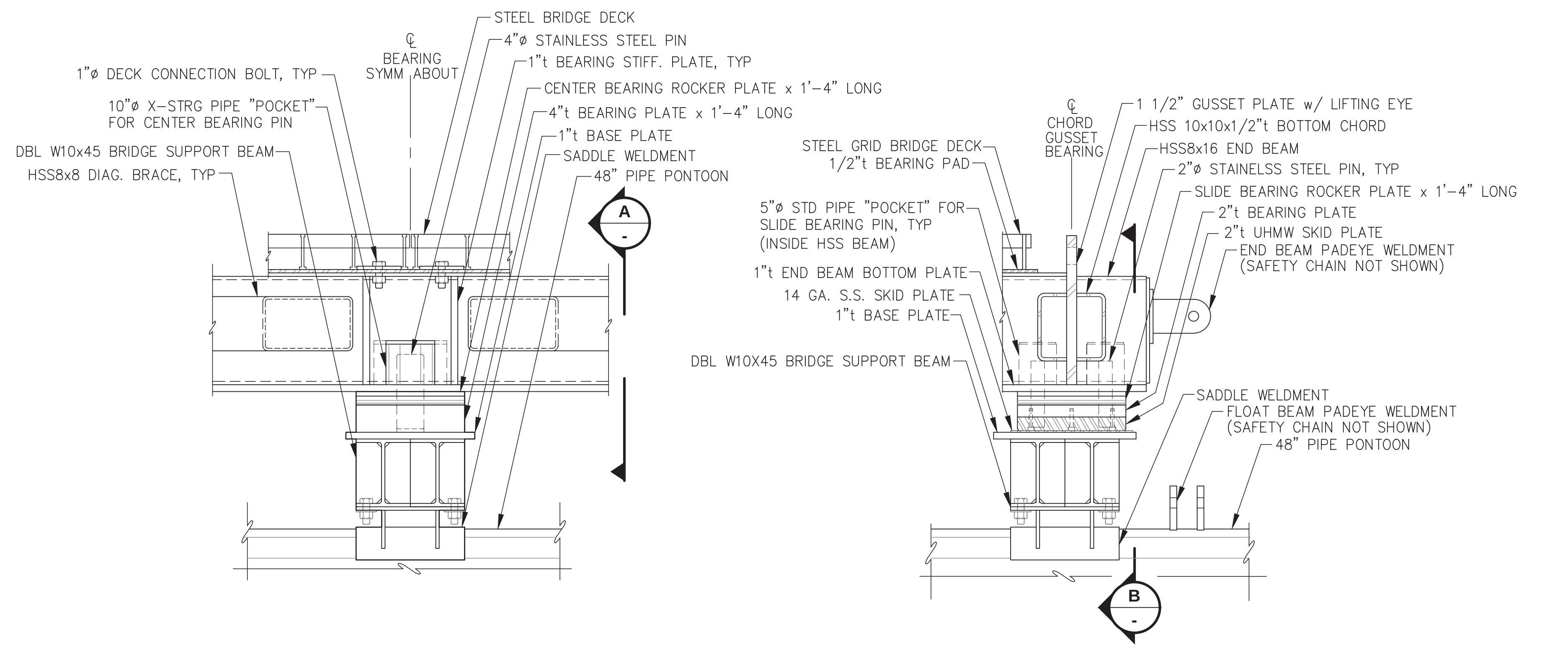
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: END BEAM DETAILS

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

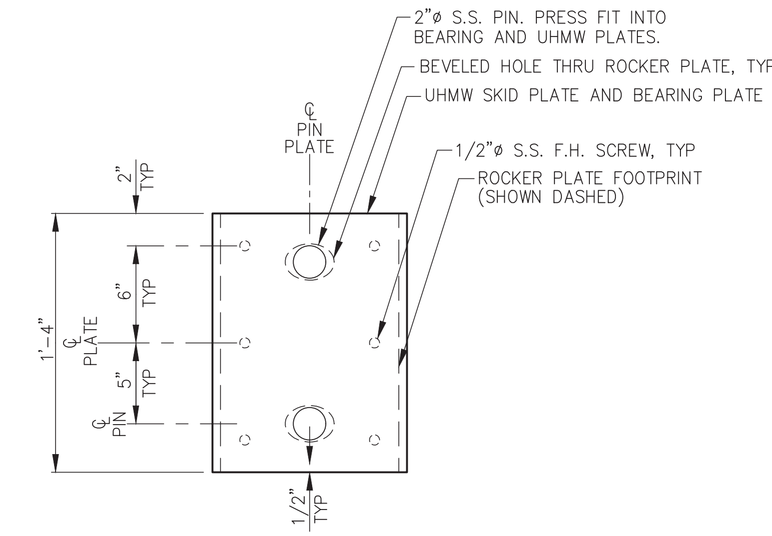
S2.04



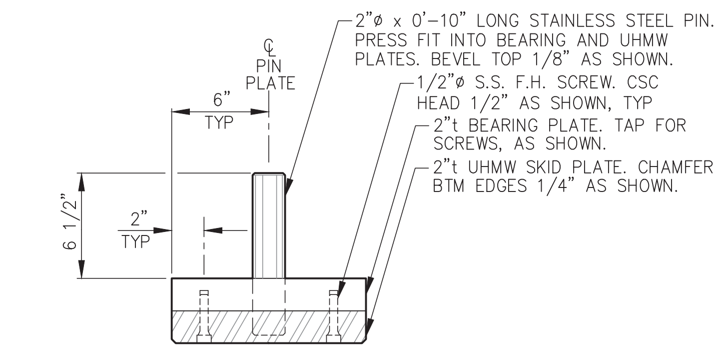
CENTER BEARING

SLIDE BEARING

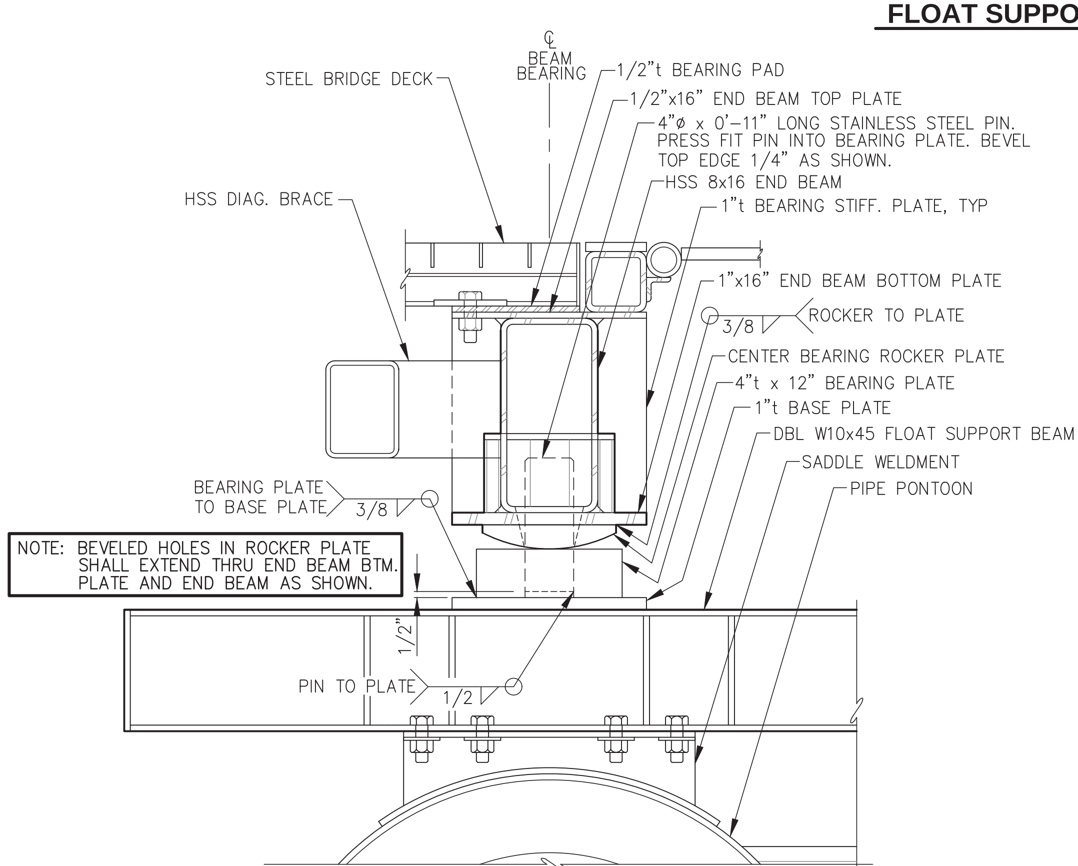
FLOAT SUPPORT BEAM BEARING - ELEVATION



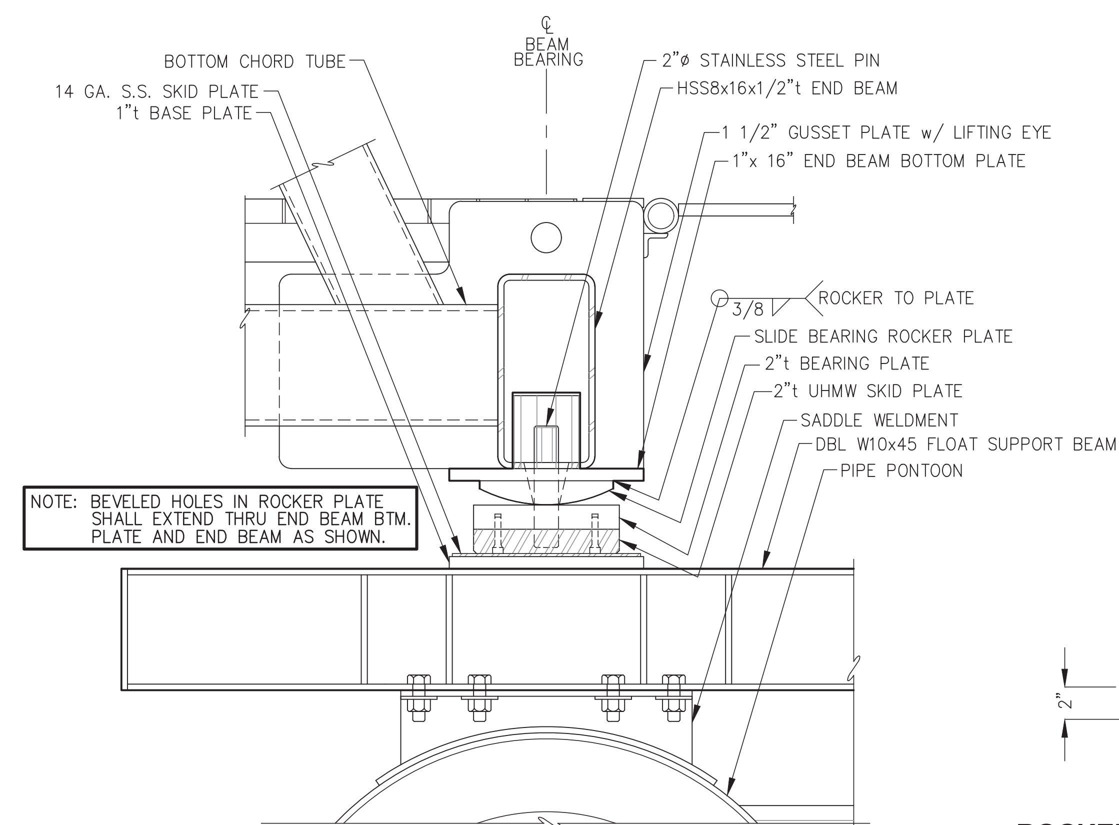
SLIDE BEARING - PLAN



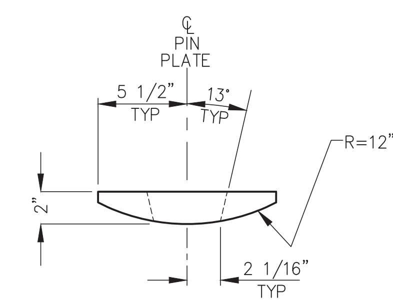
SLIDE BEARING - ELEVATION



A
-
CENTER BEARING - SECTION

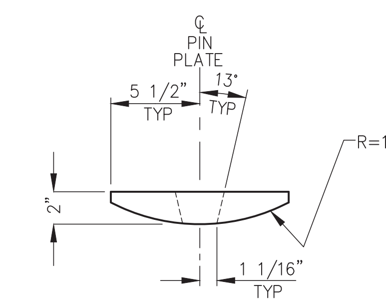


B
-
SLIDE BEARING - SECTION



ROCKER PLATE - ELEVATION

(CENTER BEARING – (1) TOTAL)



ROCKER PLATE - ELEVATION

(SLIDE BEARING – (2) TOTAL)

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Juneau, Alaska 99801
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Fax: 907-586-2099
www.pndengineers.com

DESIGN: JLD
CHECKED:
DRAWN: PJD
APPROVED: CRS
SCALE: NTS

60% DESIGN SUBMITTAL

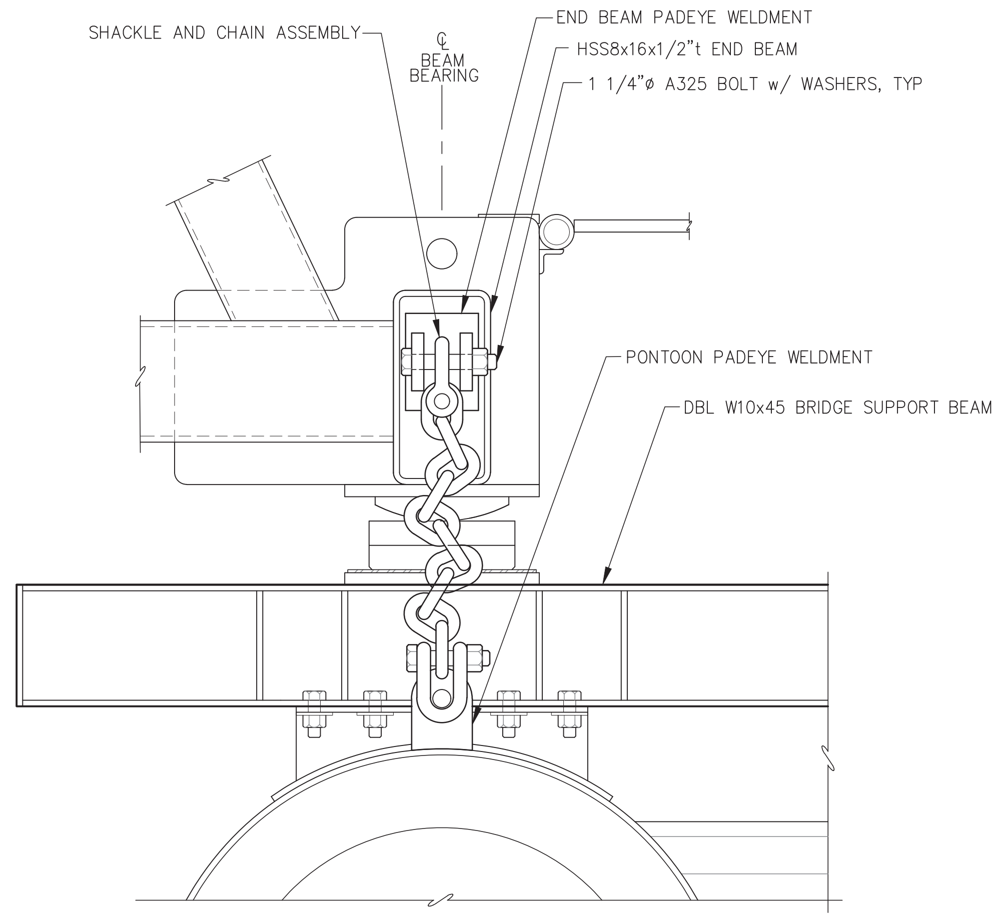
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

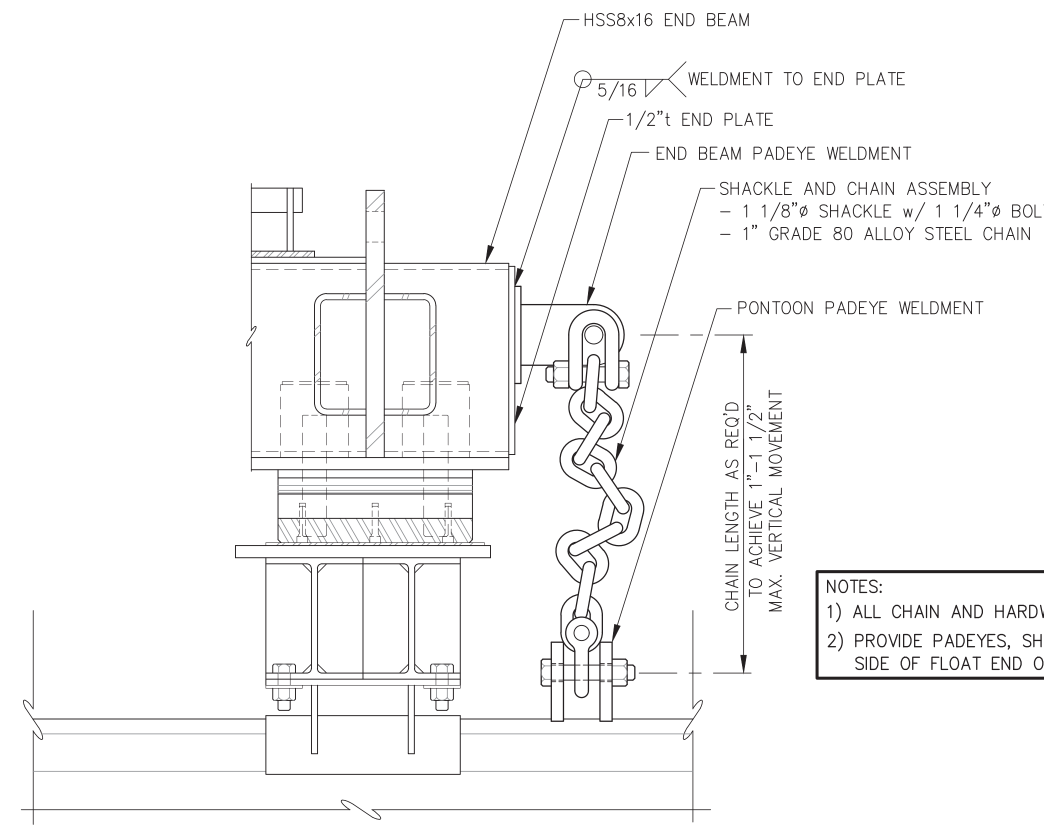
SHEET TITLE: FLOAT BEARING DETAILS

PND PROJECT NO.: 202101
C.A.N. NO.: AECC250

S2.05

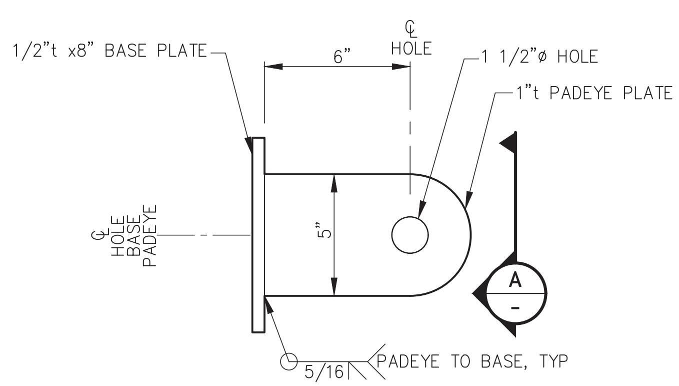


SLIDE BEARING - SIDE ELEVATION

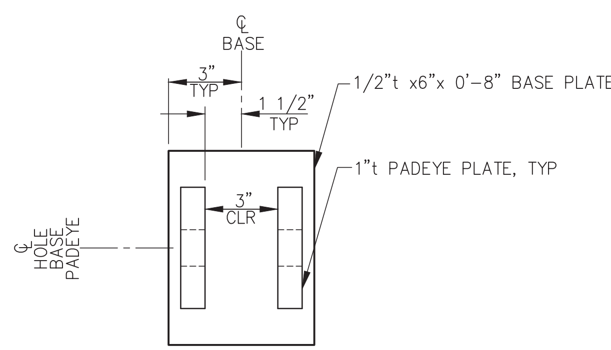


NOTES:
1) ALL CHAIN AND HARDWARE TO BE HOT-DIP GALVANIZED.
2) PROVIDE PADEYES, SHACKLES AND CHAIN EA. SIDE OF FLOAT END OF BRIDGE.

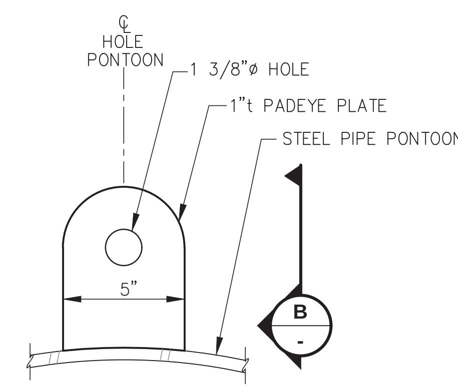
SLIDE BEARING - FRONT ELEVATION



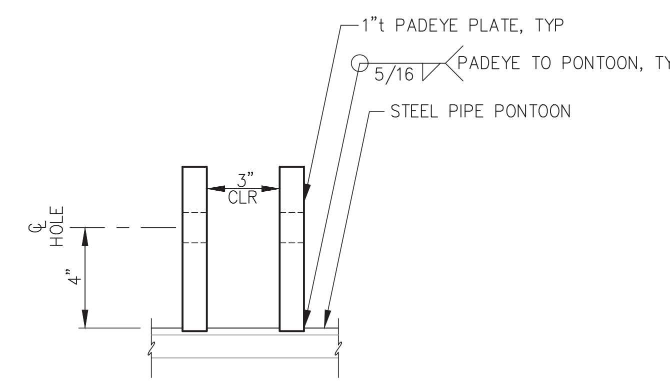
END BEAM PADEYE



A - PADEYE - ELEVATION



PONTOON PADEYE



B - PADEYE - ELEVATION

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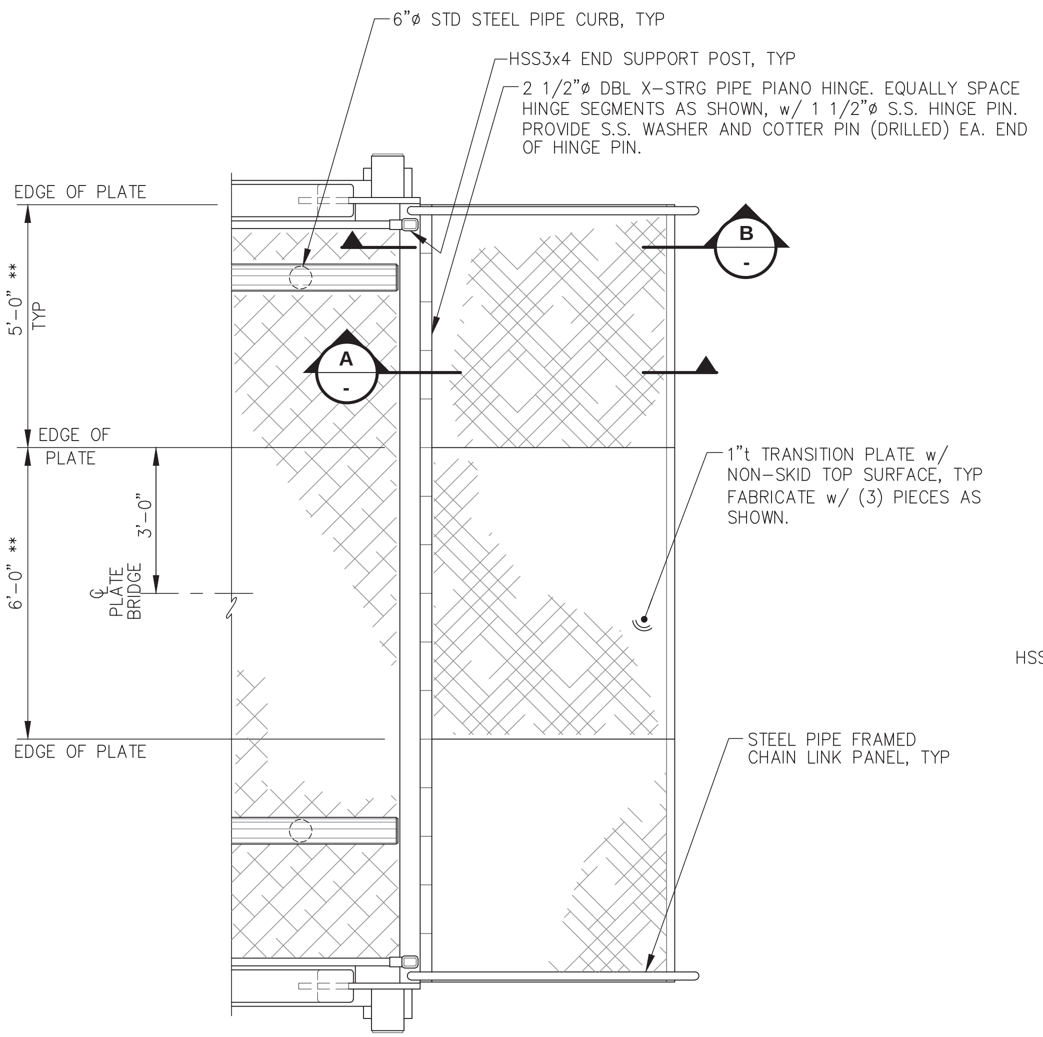
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: SAFETY CHAIN DETAILS

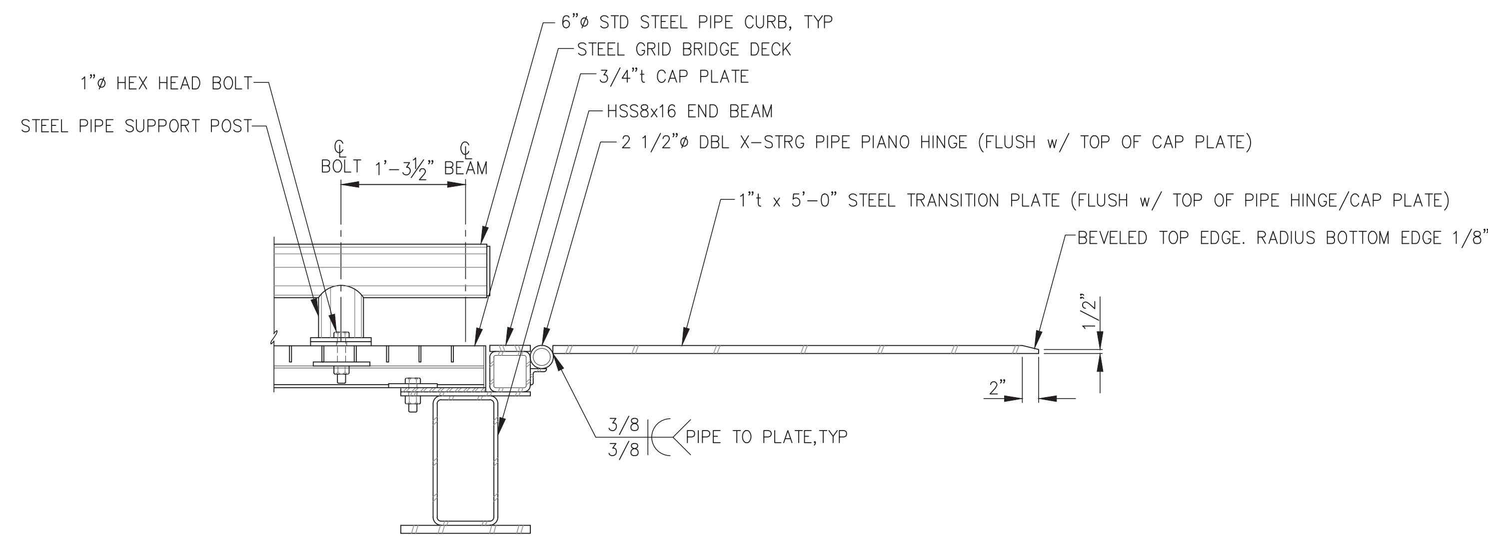
S2.06

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

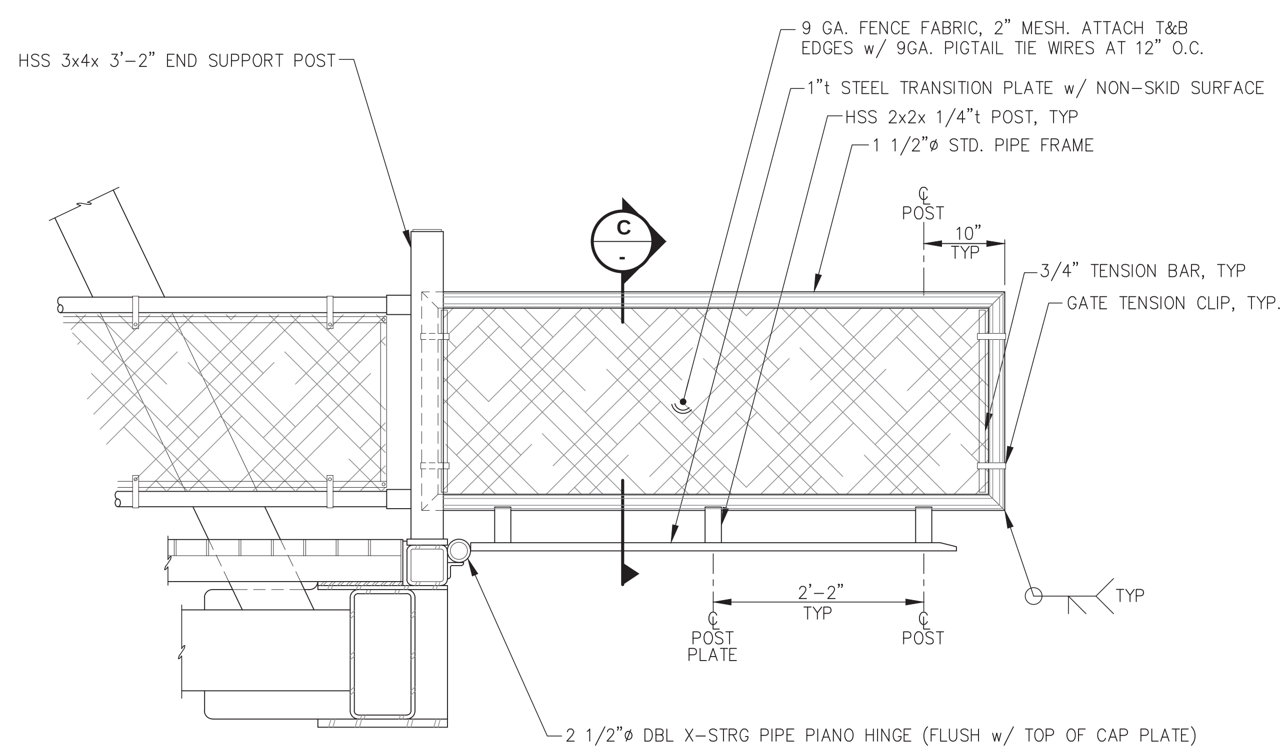


TRANSITION PLATE - PLAN

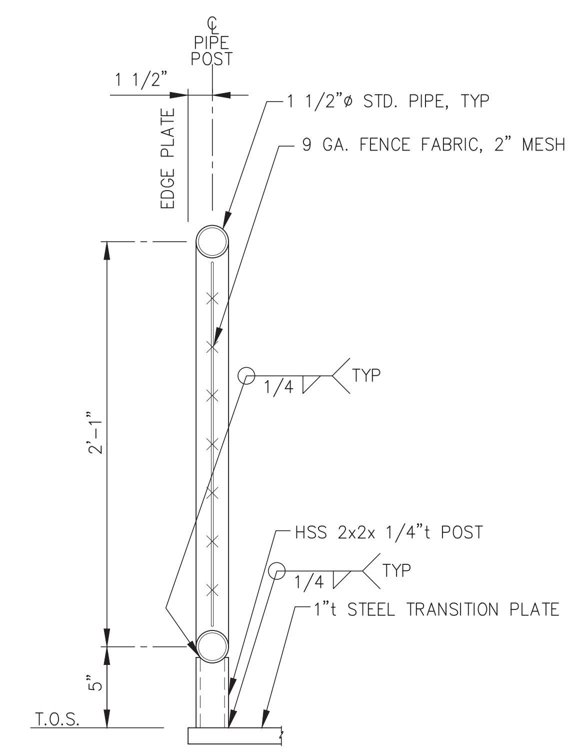
** NOTE: WIDTH OF PLATE AND/OR SPACE BETWEEN PLATES TO BE AS REQUIRED FOR PLATES TO ROTATE FREELY ABOUT PIANO HINGE.



A - SECTION



B - SECTION



C - SECTION

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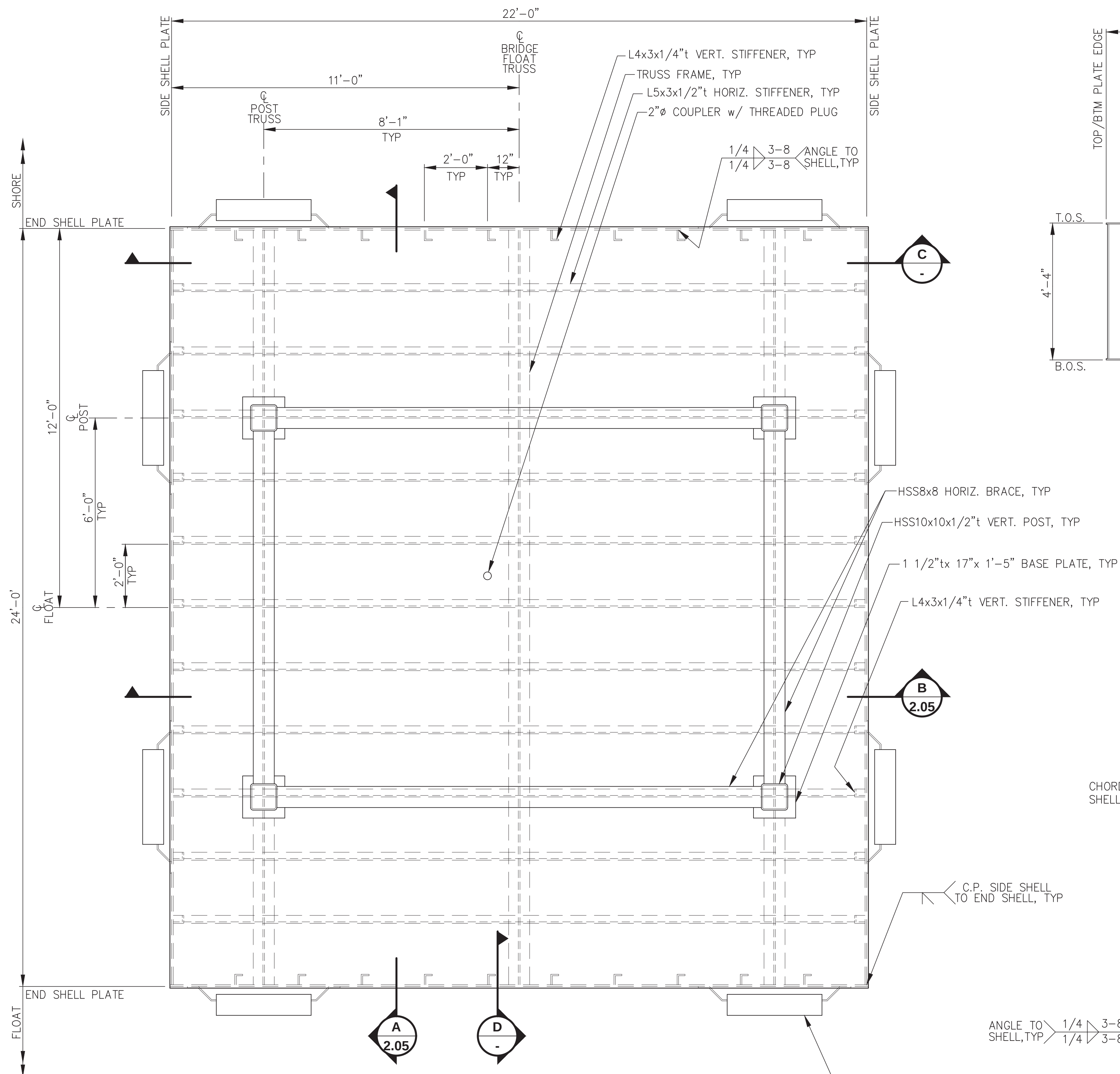
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

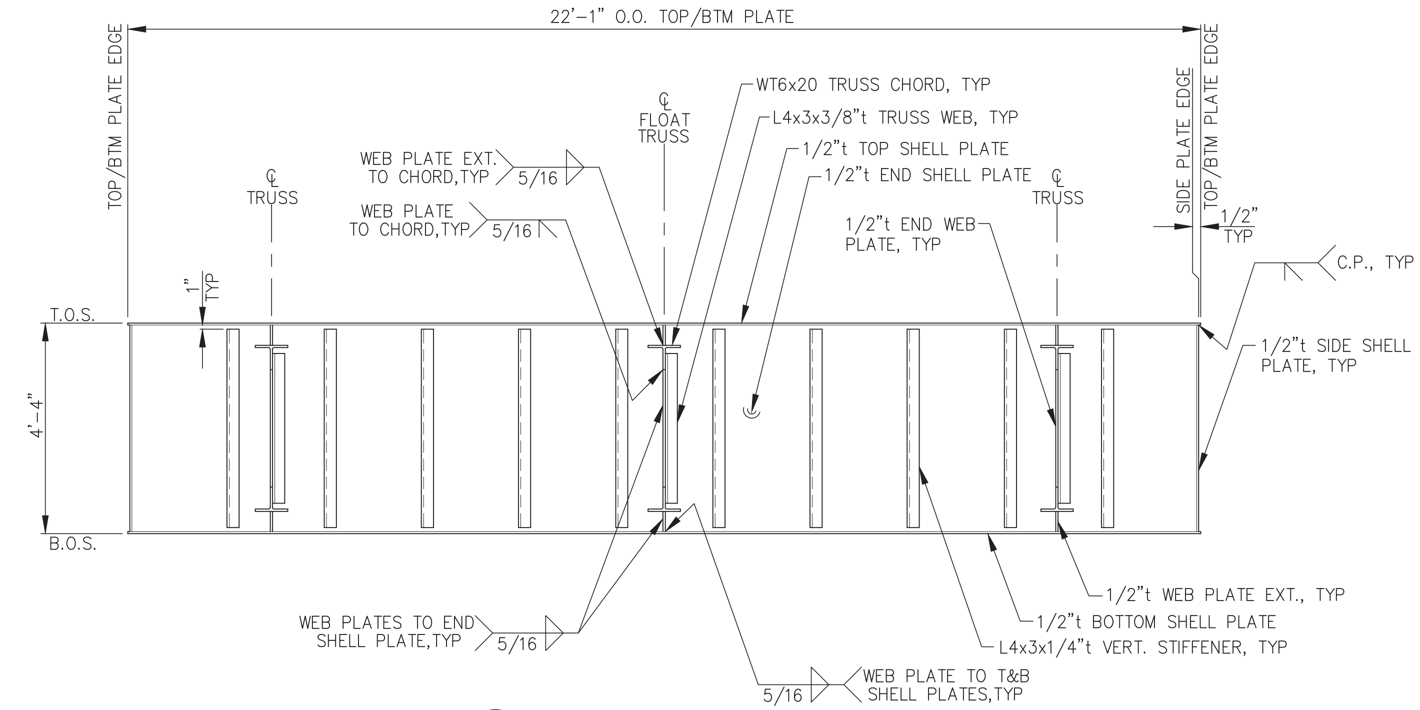
SHEET TITLE: TRANSITION PLATE DETAILS

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

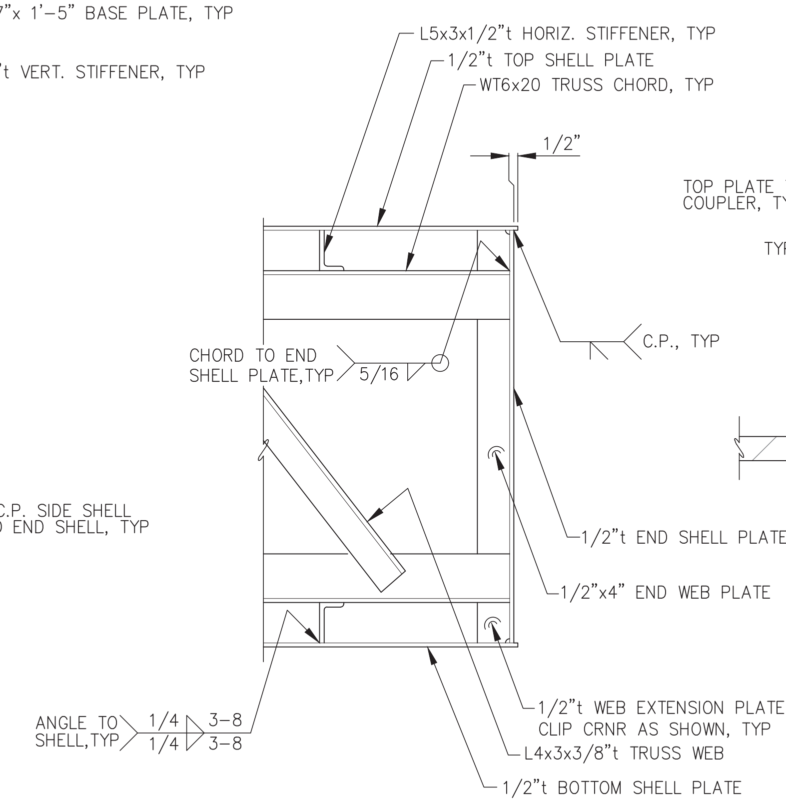
S2.07



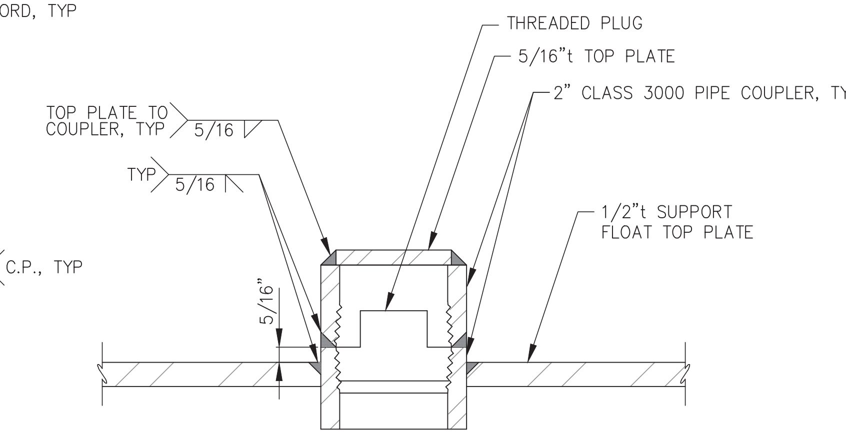
SUPPORT FLOAT - FRAMING PLAN



C
-
SECTION
(SECTION @ END WALL)



D
-
SECTION
(SECTION @ TRUSS FRAME END)



COUPLER - SECTION

NOTE: THREADED PLUG AND COUPLER COVER TO BE INSTALLED AFTER SUCCESSFUL PRESSURE TESTING OF SUPPORT FLOAT.

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SCALE: NTS

60% DESIGN SUBMITTAL

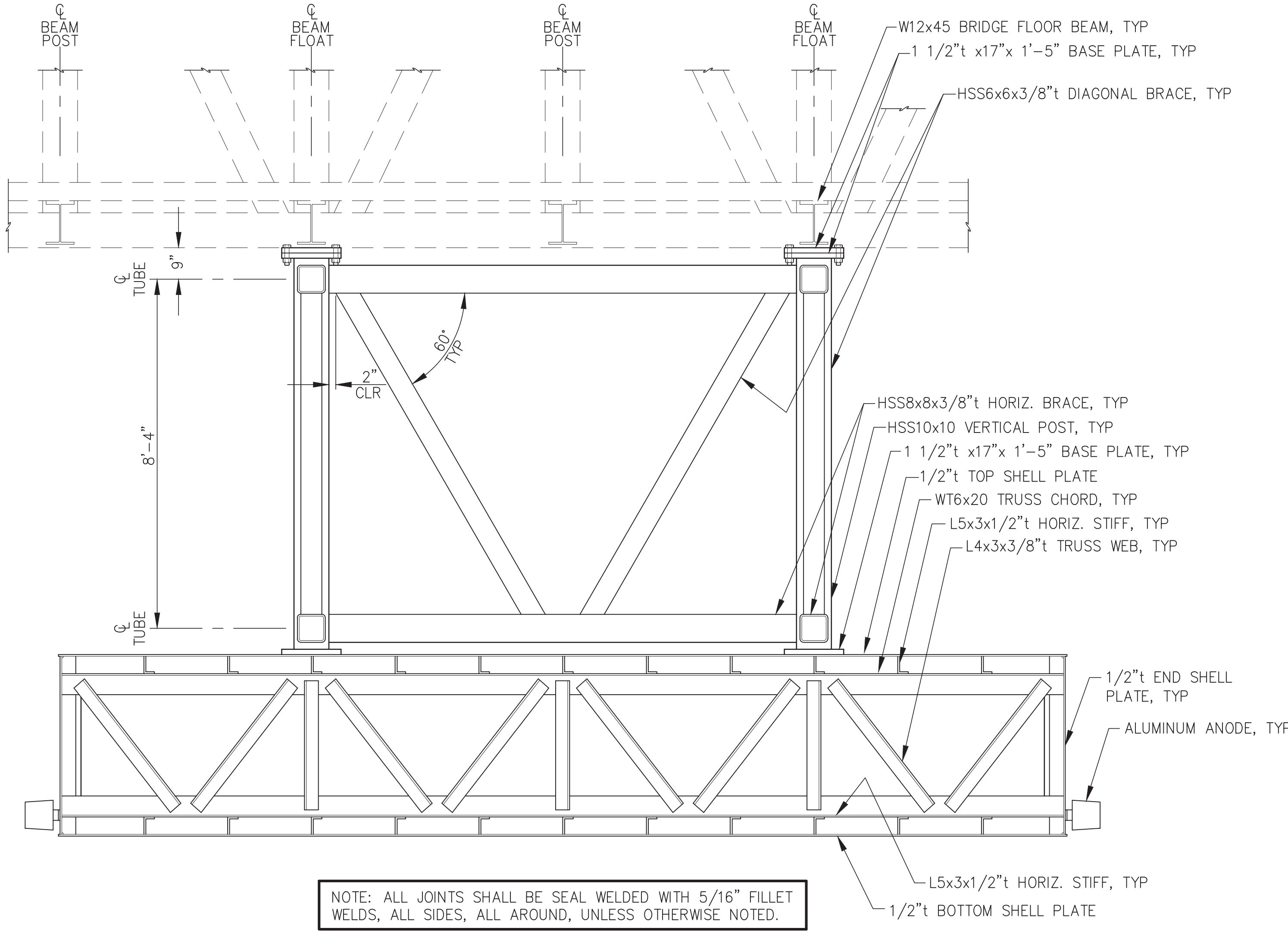
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: BRIDGE SUPPORT FLOAT

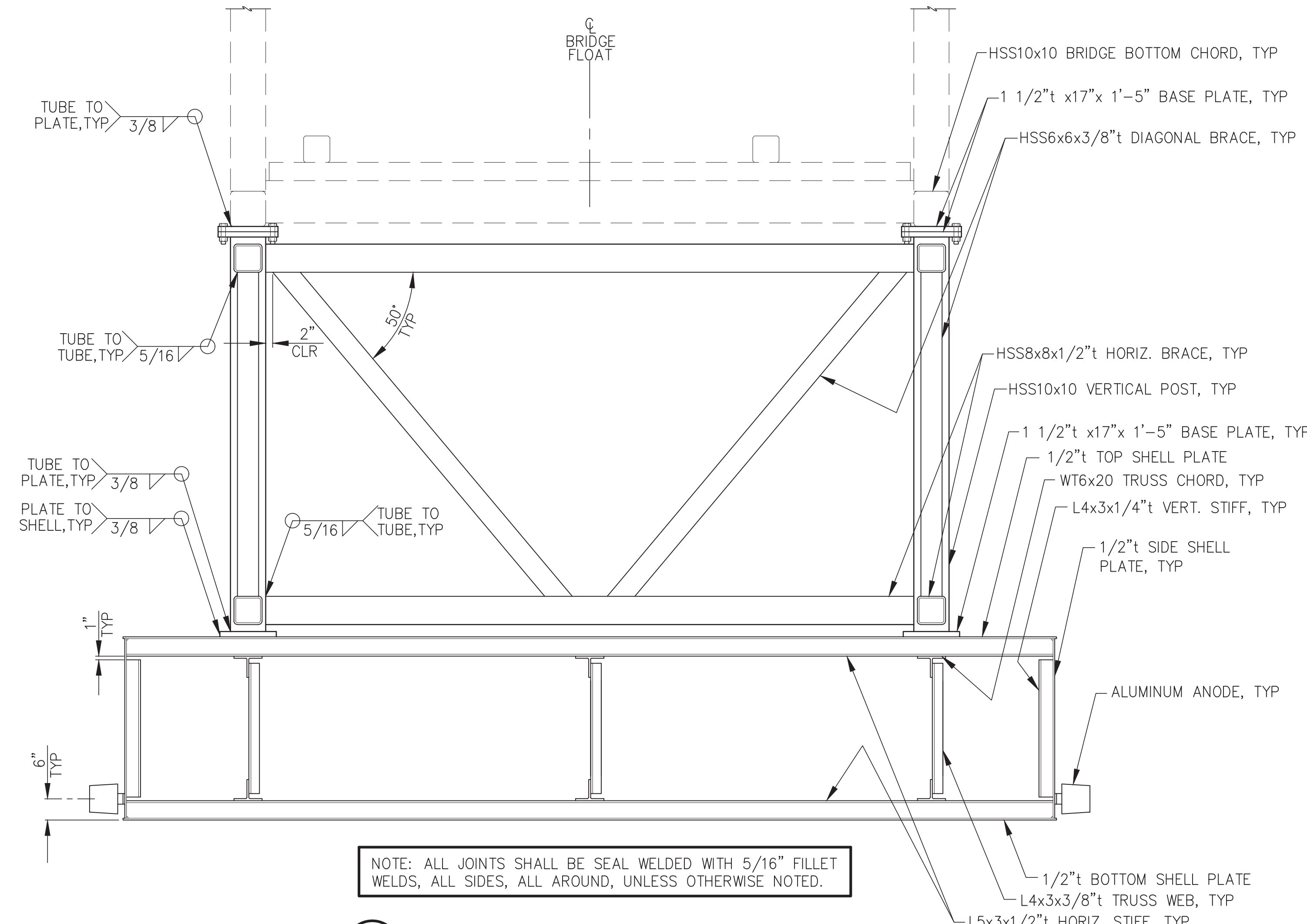
PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

S2.08



NOTE: ALL JOINTS SHALL BE SEAL WELDED WITH 5/16" FILLET WELDS, ALL SIDES, ALL AROUND, UNLESS OTHERWISE NOTED.

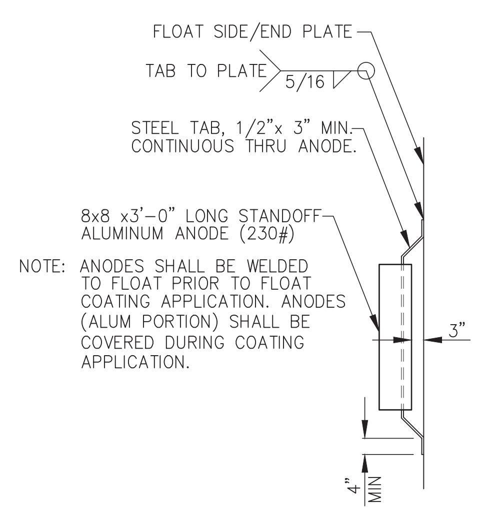
A 2.04 SECTION



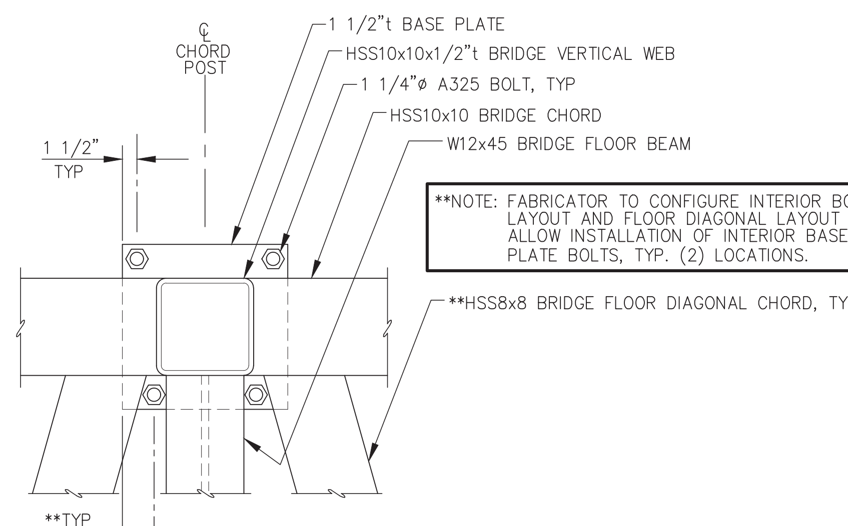
NOTE: ALL JOINTS SHALL BE SEAL WELDED WITH 5/16" FILLET WELDS, ALL SIDES, ALL AROUND, UNLESS OTHERWISE NOTED.

B 2.04 SECTION

GENERAL NOTES:
1) SUPPORT FLOAT AND BRIDGE MAY NOT BE STABLE PRIOR TO PLACEMENT AND CONNECTION TO DESIGNED BRIDGE ABUTMENT AND FLOAT BEARINGS. CONTRACTOR SHALL PROVIDE MEANS TO STABILIZE AS REQUIRED DURING CONSTRUCTION.
2) SUPPORT FLOAT SHALL BE LEAK TESTED PER SPECIFICATIONS. FABRICATOR SHALL SUBMIT WRITTEN PROCEDURE FOR ENGINEER APPROVAL.

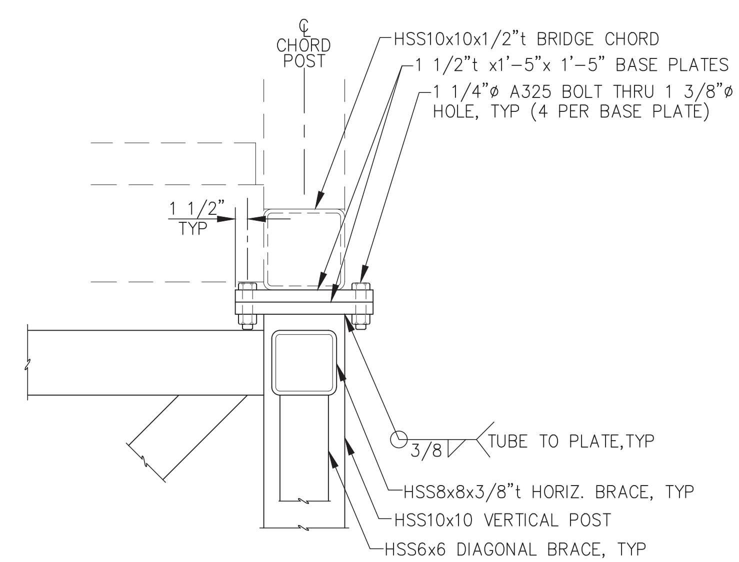


ANODE DETAIL
(8 TOTAL)



**NOTE: FABRICATOR TO CONFIGURE INTERIOR BOLT LAYOUT AND FLOOR DIAGONAL LAYOUT TO ALLOW INSTALLATION OF INTERIOR BASE PLATE BOLTS, TYP. (2) LOCATIONS.

BASE PLATE - PLAN



BASE PLATE - TYPICAL SECTION

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SCALE: NTS

60% DESIGN SUBMITTAL

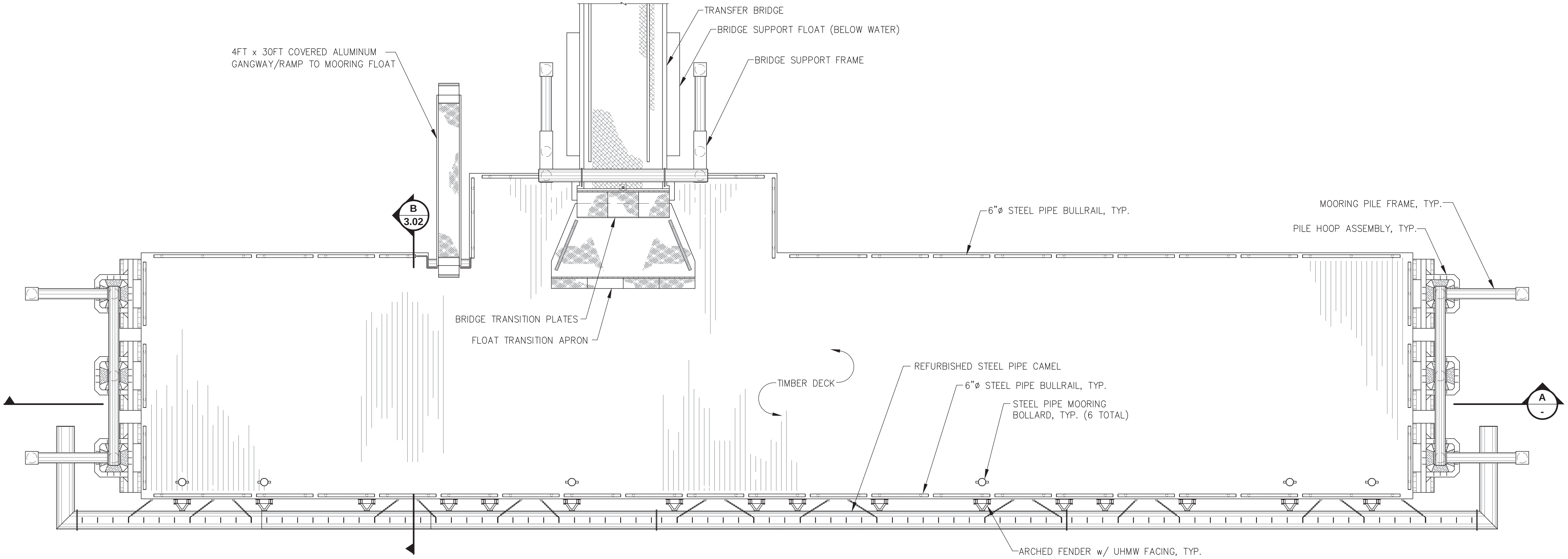
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

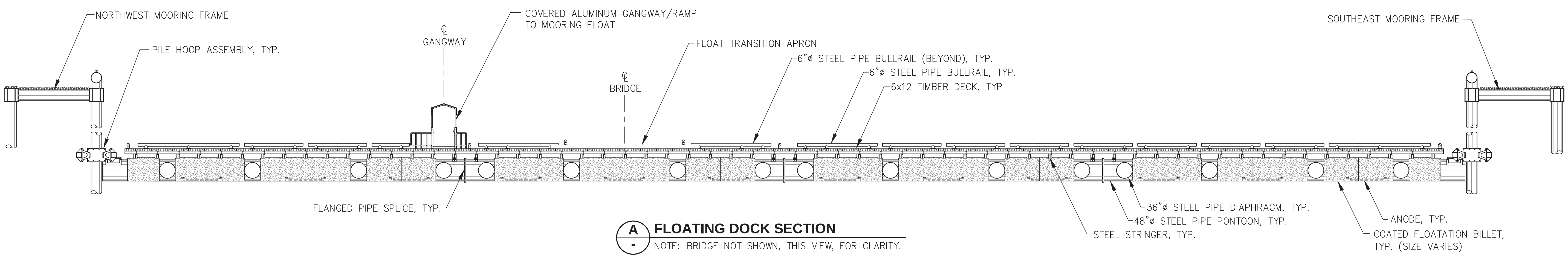
SHEET TITLE: BRIDGE SUPPORT FLOAT

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

S2.09



FLOATING DOCK PLAN



A / - FLOATING DOCK SECTION

NOTE: BRIDGE NOT SHOWN, THIS VIEW, FOR CLARITY.

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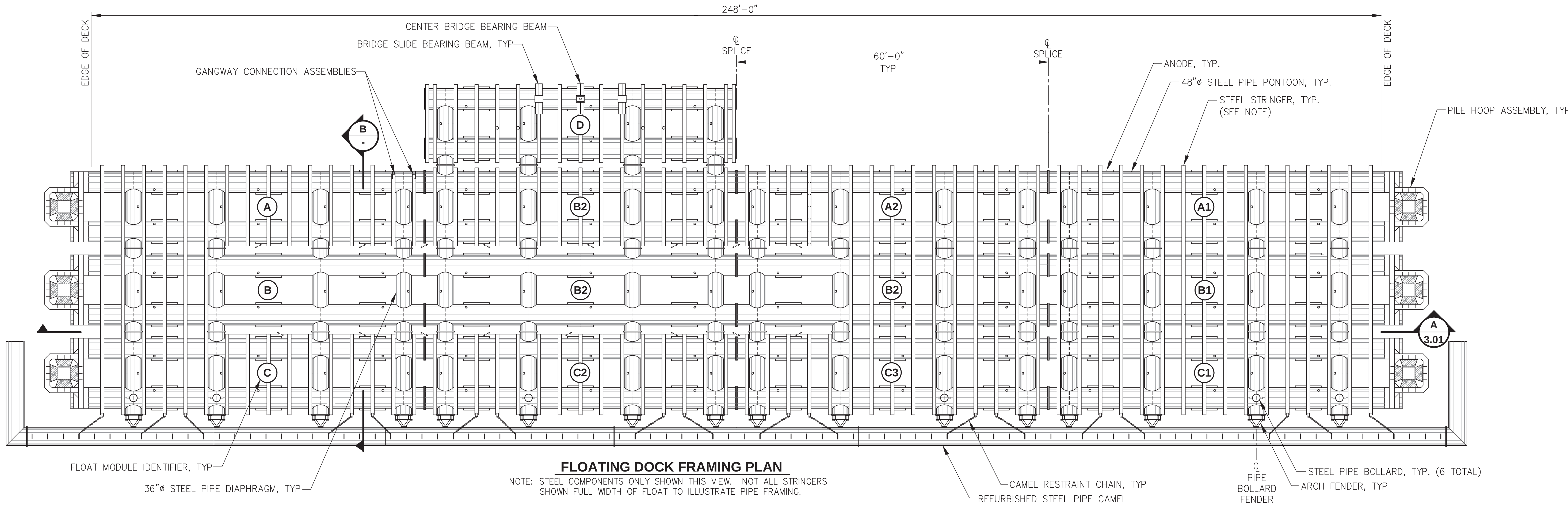
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: FLOATING DOCK PLAN AND SECTION

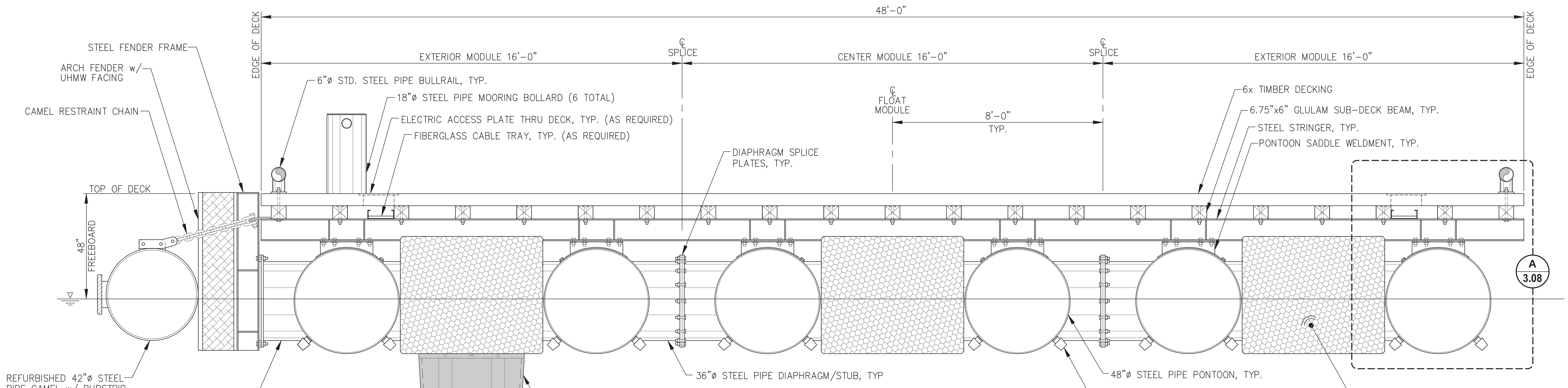
PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

S3.01



FLOATING DOCK FRAMING PLAN

NOTE: STEEL COMPONENTS ONLY SHOWN THIS VIEW. NOT ALL STRINGERS SHOWN FULL WIDTH OF FLOAT TO ILLUSTRATE PIPE FRAMING.



B - FLOATING DOCK SECTION

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SCALE: NTS

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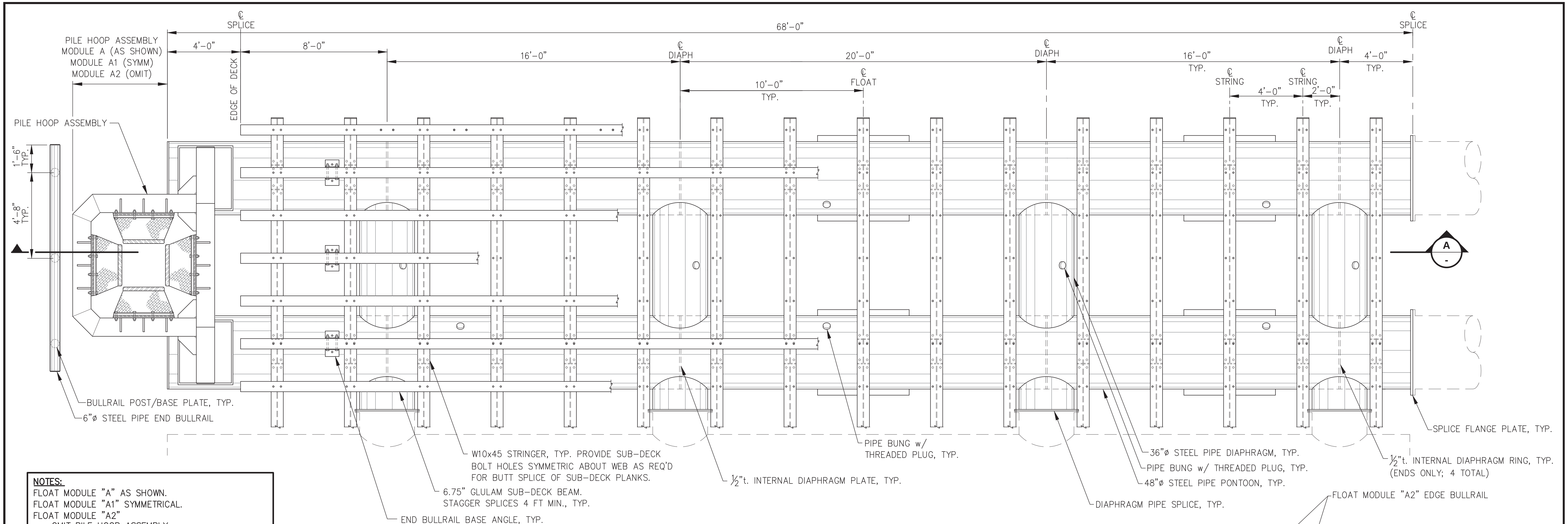
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: FLOATING DOCK FRAMING PLAN & TYPICAL SECTION

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

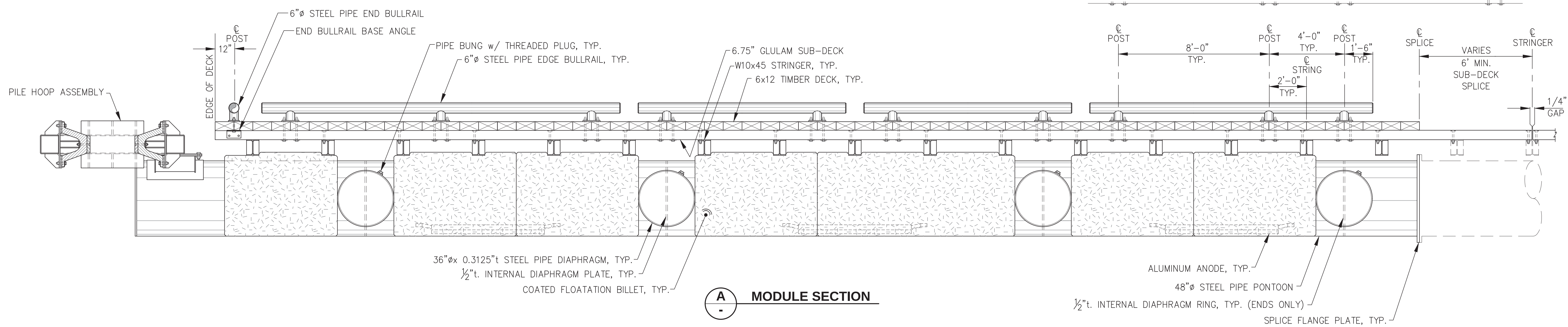
S3.02



MODULE "A", "A1" AND "A2" - PLAN

NOTE: TIMBER DECK, BULLRAIL AND FLOATATION BILLETS NOT SHOWN THIS VIEW FOR CLARITY.

NOTES:
FLOAT MODULE "A" AS SHOWN.
FLOAT MODULE "A1" SYMMETRICAL.
FLOAT MODULE "A2"
- OMIT PILE HOOP ASSEMBLY
- OMIT END BULLRAIL
- DIAPHRAGM PIPE BUNGS SYMMETRICAL
- EDGE BULLRAIL MODIFIED AS SHOWN ON SECTION



A - MODULE SECTION

REV.	DATE	DESCRIPTION	DWN.	CKD.	APP.

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SCALE: NTS

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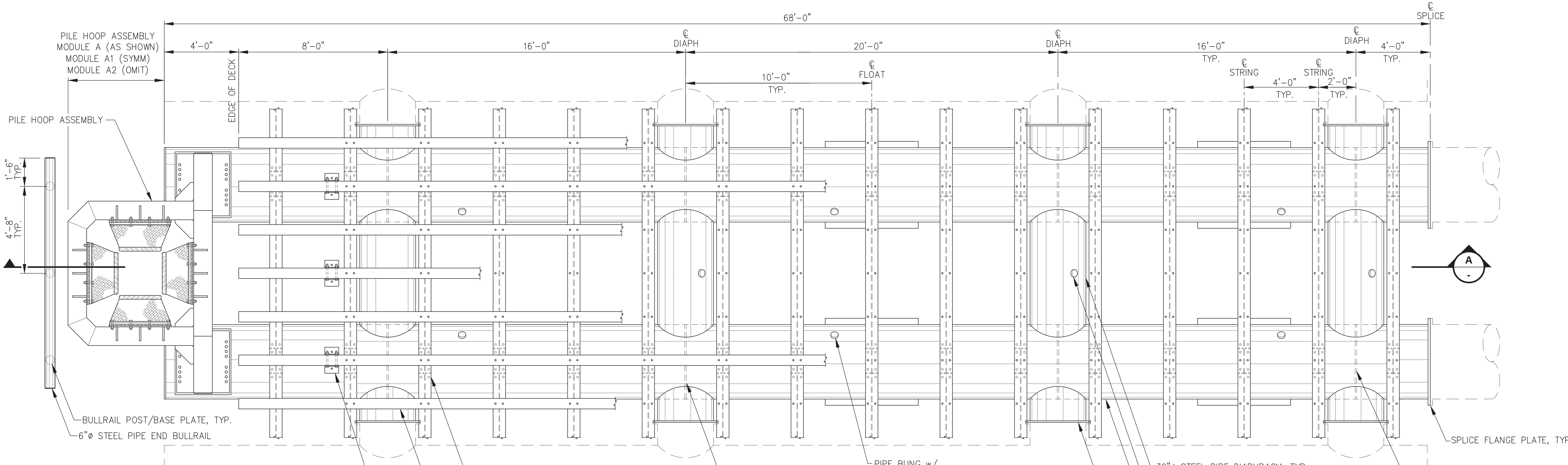
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: FLOAT MODULE "A", "A1" AND "A2"

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

S3.03



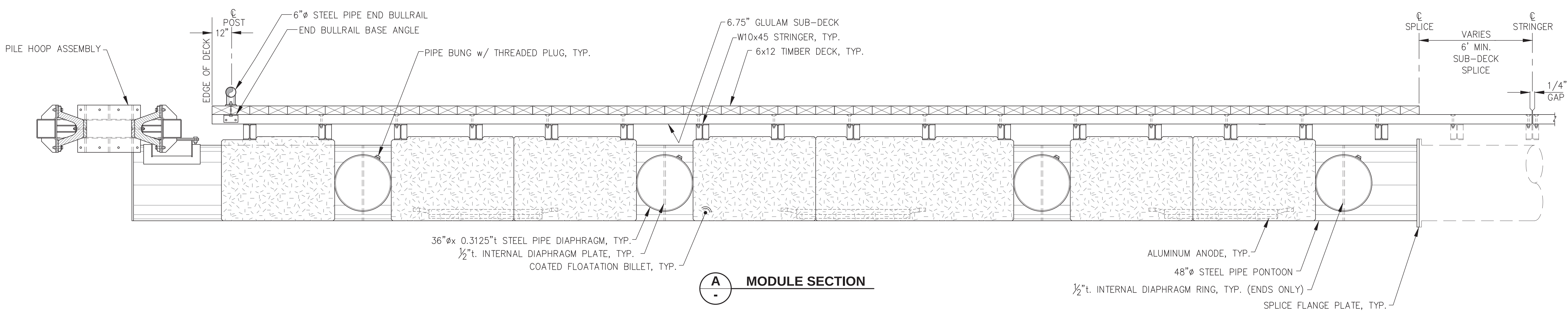
MODULE "B", "B1" AND "B2" - PLAN

NOTE: TIMBER DECK, BULLRAIL AND FLOATATION BILLETS NOT SHOWN THIS VIEW FOR CLARITY.

NOTES:

FLOAT MODULE "B" AS SHOWN.
FLOAT MODULE "B1" SYMMETRICAL.
FLOAT MODULE "B2"

- OMIT PILE HOOP ASSEMBLY
- OMIT END BULLRAIL
- DIAPHRAGM PIPE BUNGS SYMMETRICAL



A
-
MODULE SECTION

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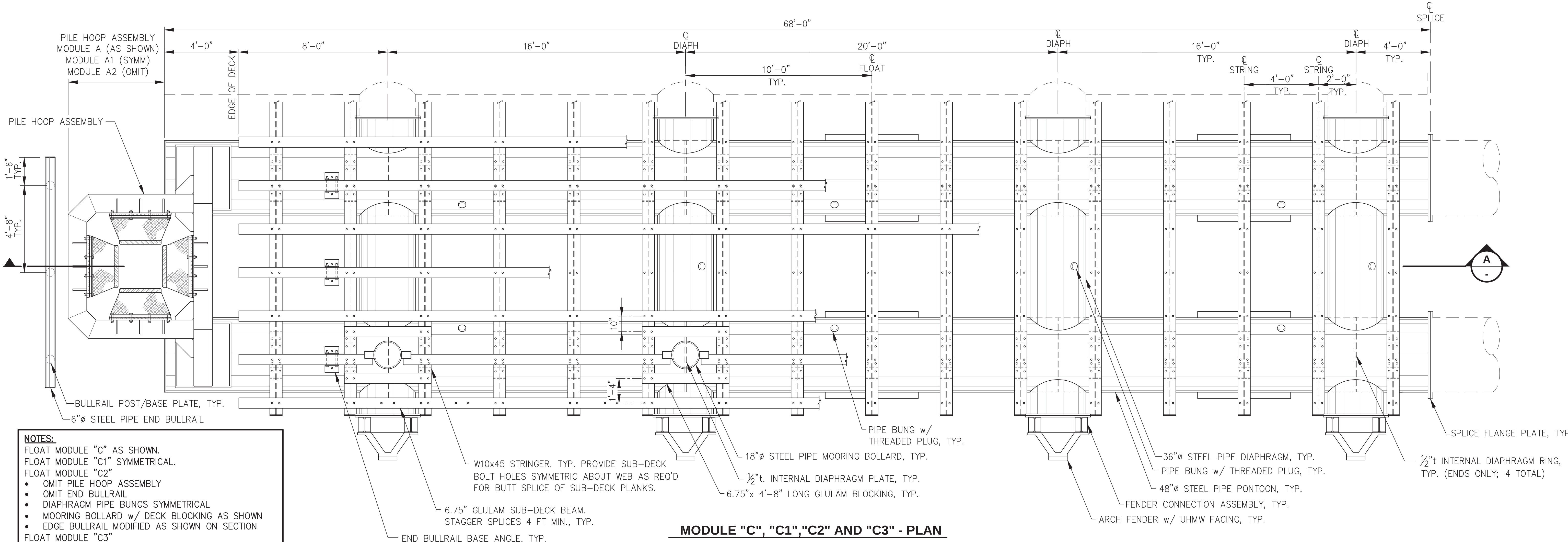
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: FLOAT MODULE "B", "B1", AND "B2"

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

S3.04



NOTES:

FLOAT MODULE "C" AS SHOWN.
FLOAT MODULE "C1" SYMMETRICAL.
FLOAT MODULE "C2"

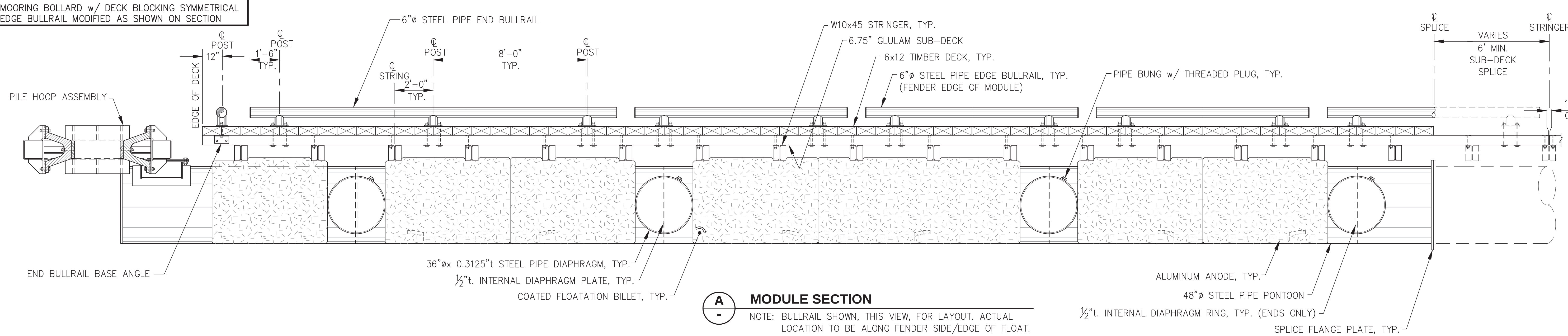
- OMIT PILE HOOP ASSEMBLY
- OMIT END BULLRAIL
- DIAPHRAGM PIPE BUNGS SYMMETRICAL
- MOORING BOLLARD w/ DECK BLOCKING AS SHOWN
- EDGE BULLRAIL MODIFIED AS SHOWN ON SECTION

FLOAT MODULE "C3"

- OMIT PILE HOOP ASSEMBLY
- OMIT END BULLRAIL
- DIAPHRAGM PIPE BUNGS SYMMETRICAL
- MOORING BOLLARD w/ DECK BLOCKING SYMMETRICAL
- EDGE BULLRAIL MODIFIED AS SHOWN ON SECTION

MODULE "C", "C1","C2" AND "C3" - PLAN

NOTE: TIMBER DECK, BULLRAIL AND FLOATATION BILLETS NOT SHOWN THIS VIEW FOR CLARITY.



A
-

MODULE SECTION

NOTE: BULLRAIL SHOWN, THIS VIEW, FOR LAYOUT. ACTUAL LOCATION TO BE ALONG FENDER SIDE/EDGE OF FLOAT.

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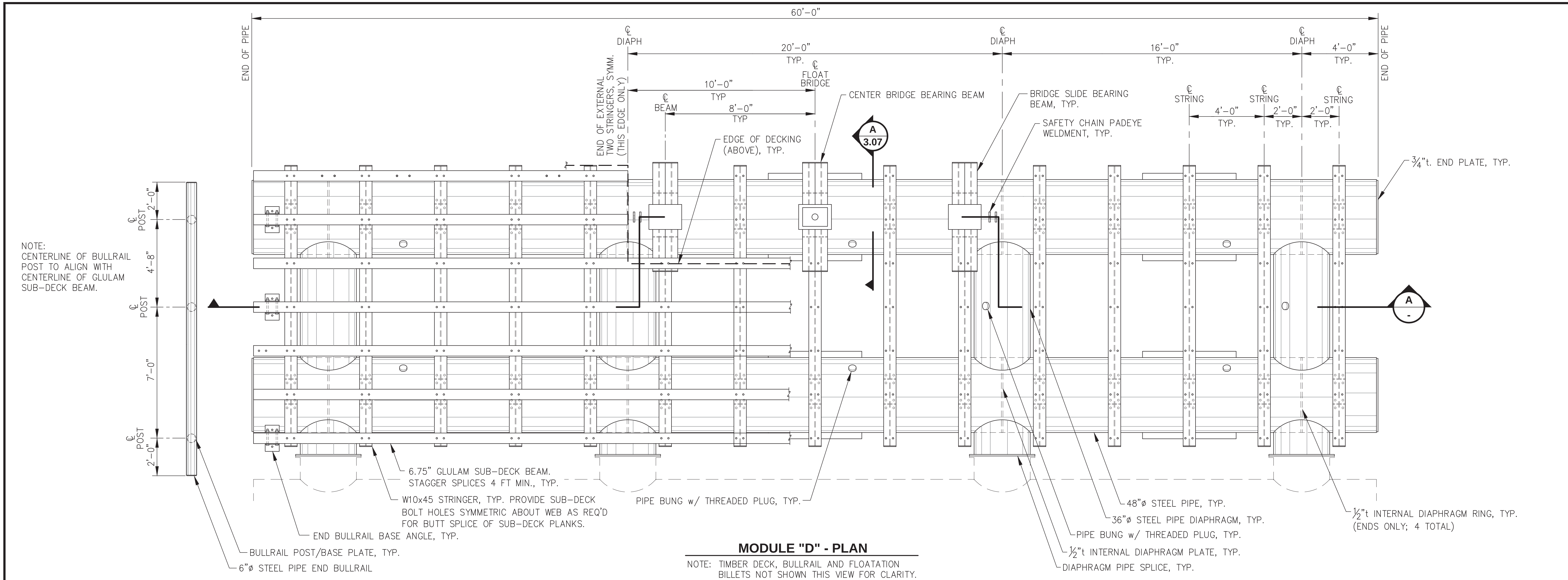
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: FLOAT MODULE "C", "C1", "C2" AND "C3"

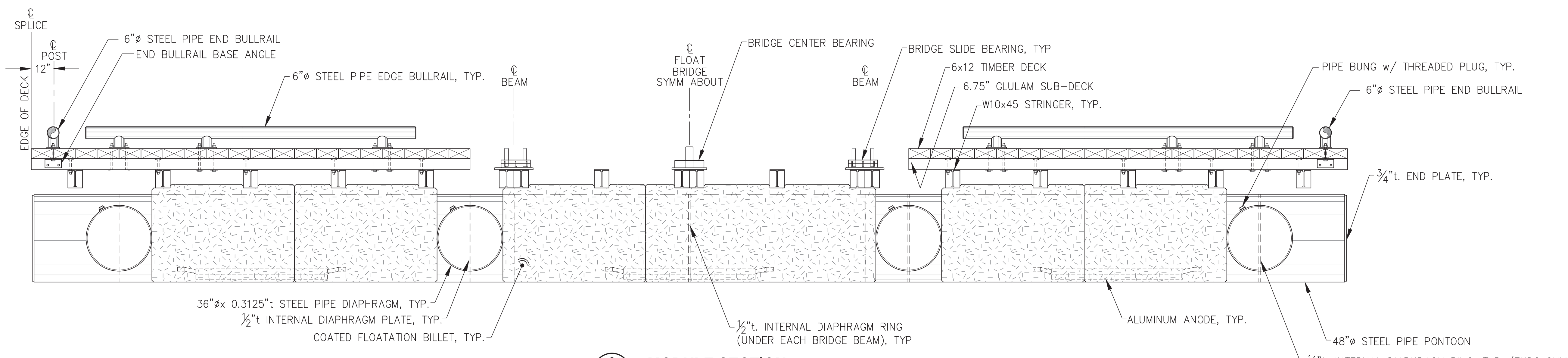
PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

S3.05



MODULE "D" - PLAN

NOTE: TIMBER DECK, BULLRAIL AND FLOATATION BILLETS NOT SHOWN THIS VIEW FOR CLARITY.



A - **MODULE SECTION**

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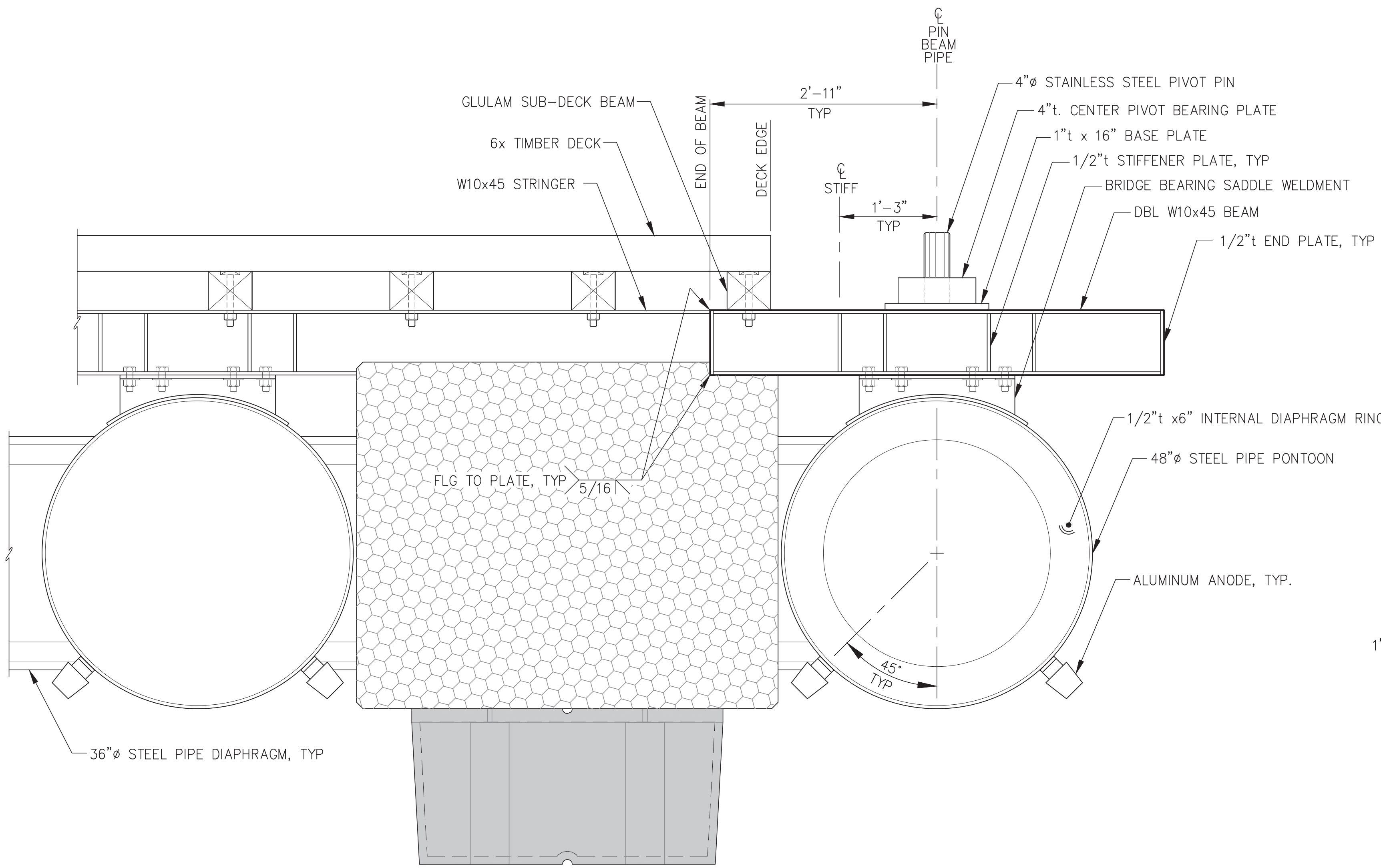
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

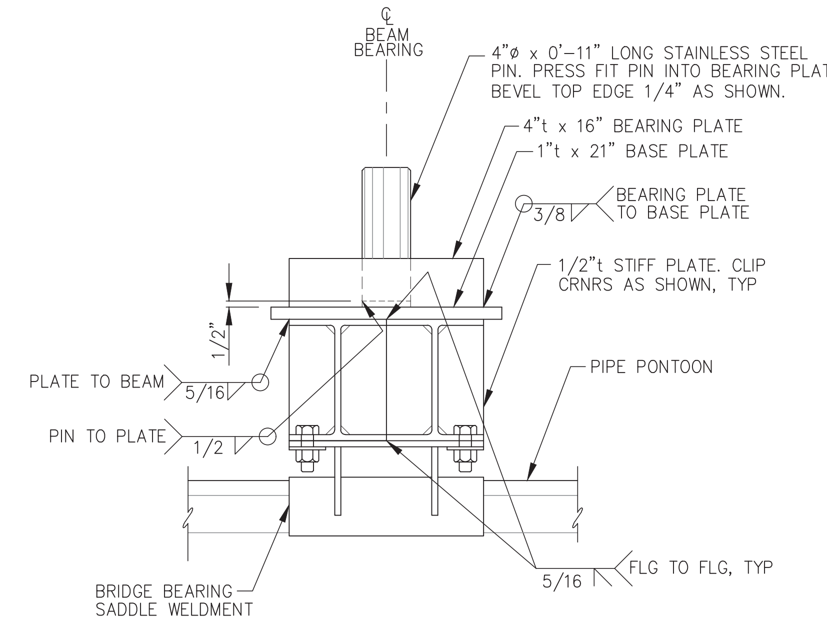
SHEET TITLE: FLOAT MODULE "D"

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

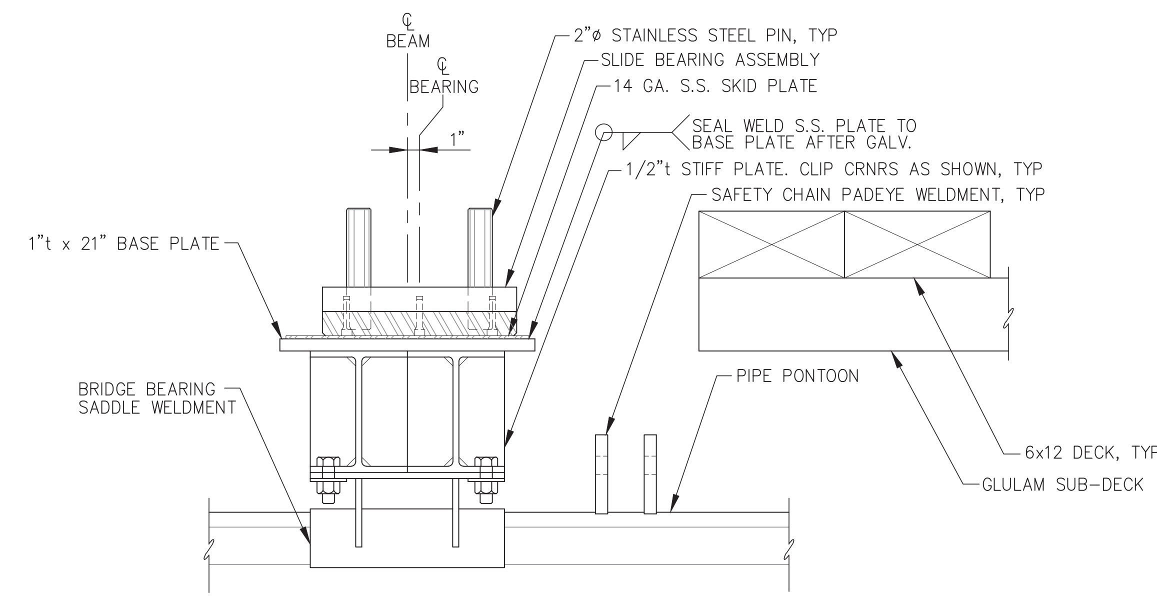
S3.06



A
-
SECTION AT CENTER BRIDGE SUPPORT BEAM
NOTE: SLIDE BEARING SECTION SIMILAR.



CENTER BEARING BEAM - SECTION



SLIDE BEARING BEAM - SECTION
NOTE: OPPOSITE SIDE SLIDE BEARING SYMMETRICAL ABOUT CENTER BEAM.

NOTE: ALL JOINTS SHALL BE SEAL WELDED w/ 5/16" FILLET WELDS, ALL SIDES, ALL AROUND, UNLESS OTHERWISE NOTED.

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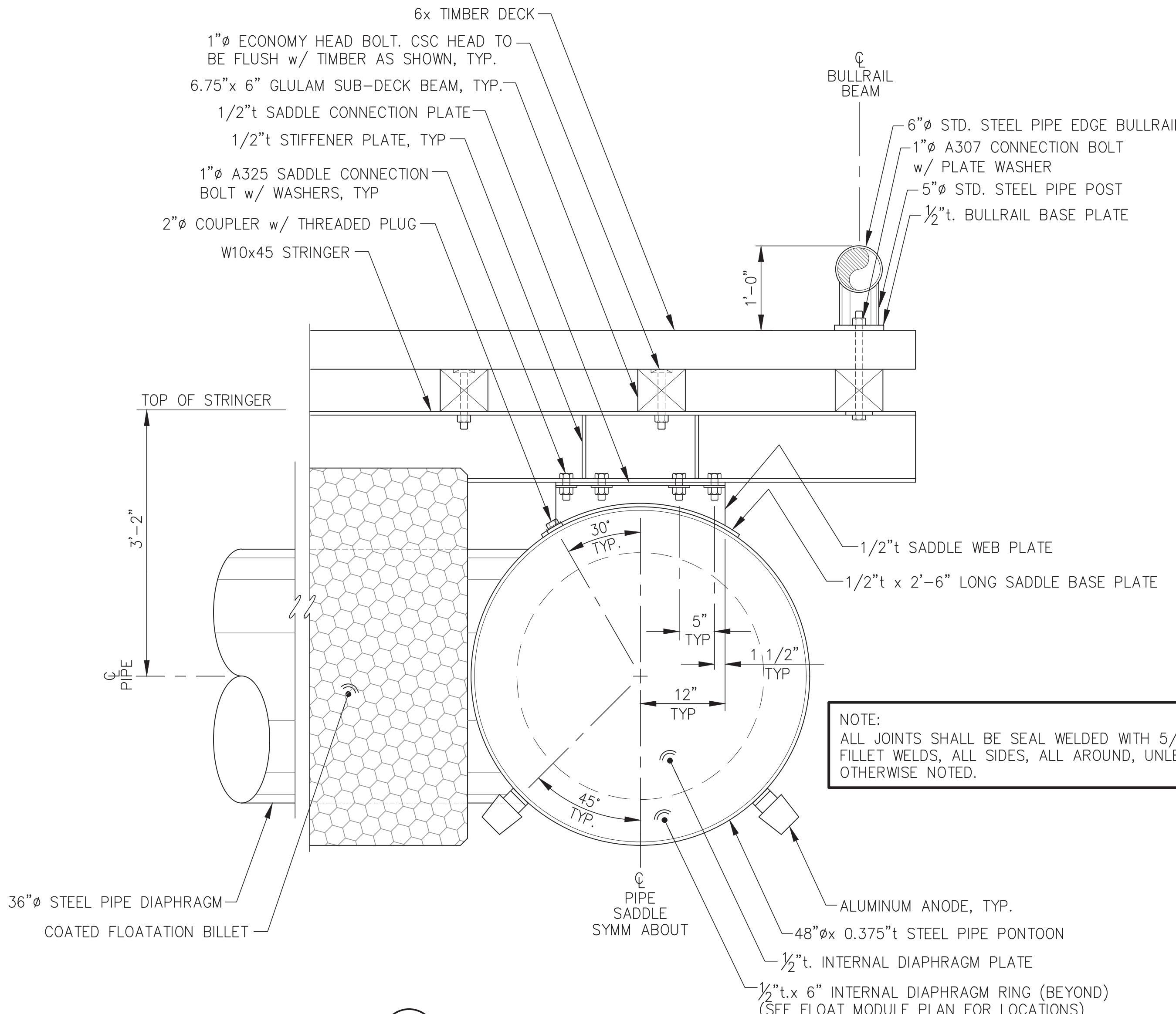
DRAWN: WRB APPROVED: CRS

60% DESIGN SUBMITTAL
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

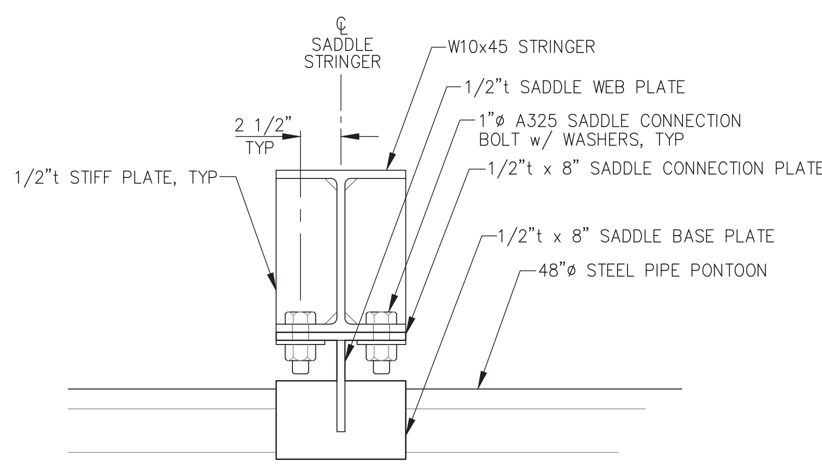
SHEET TITLE: BRIDGE SUPPORT BEAM
PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

S3.07

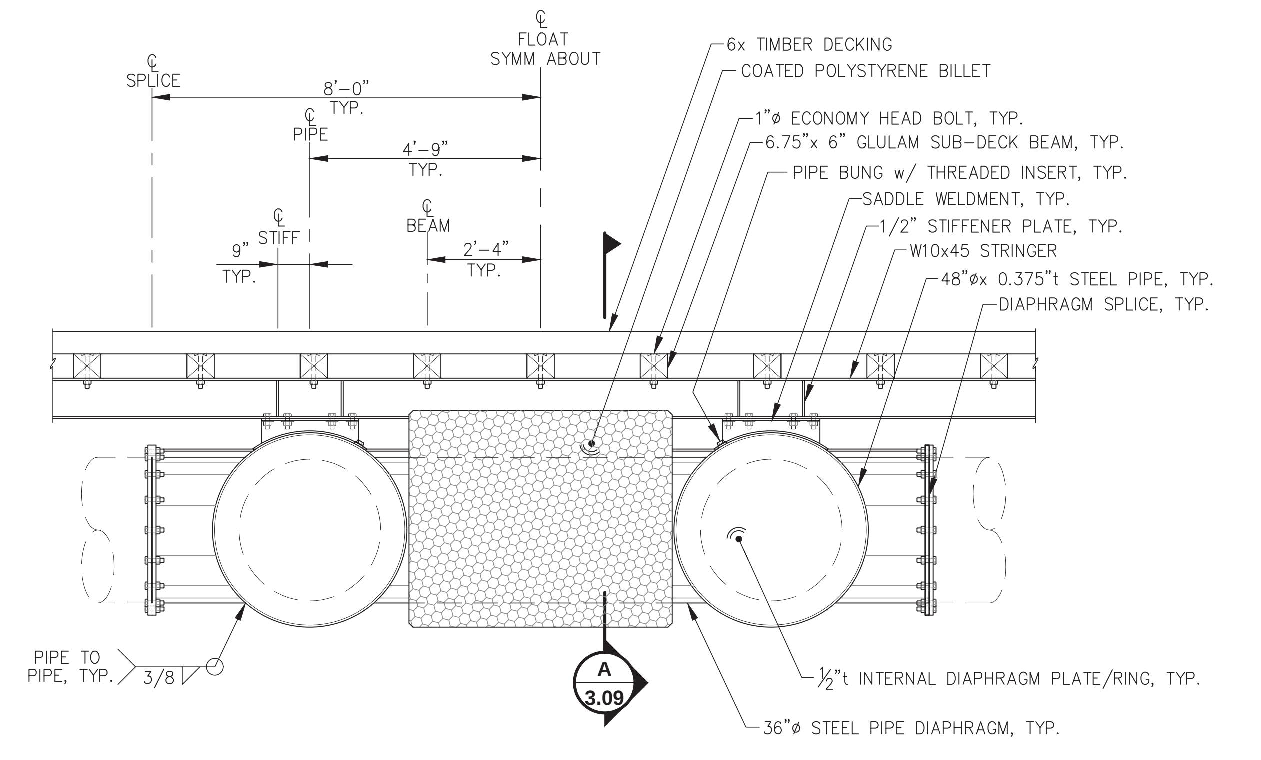


NOTE:
ALL JOINTS SHALL BE SEAL WELDED WITH 5/16" FILLET WELDS, ALL SIDES, ALL AROUND, UNLESS OTHERWISE NOTED.

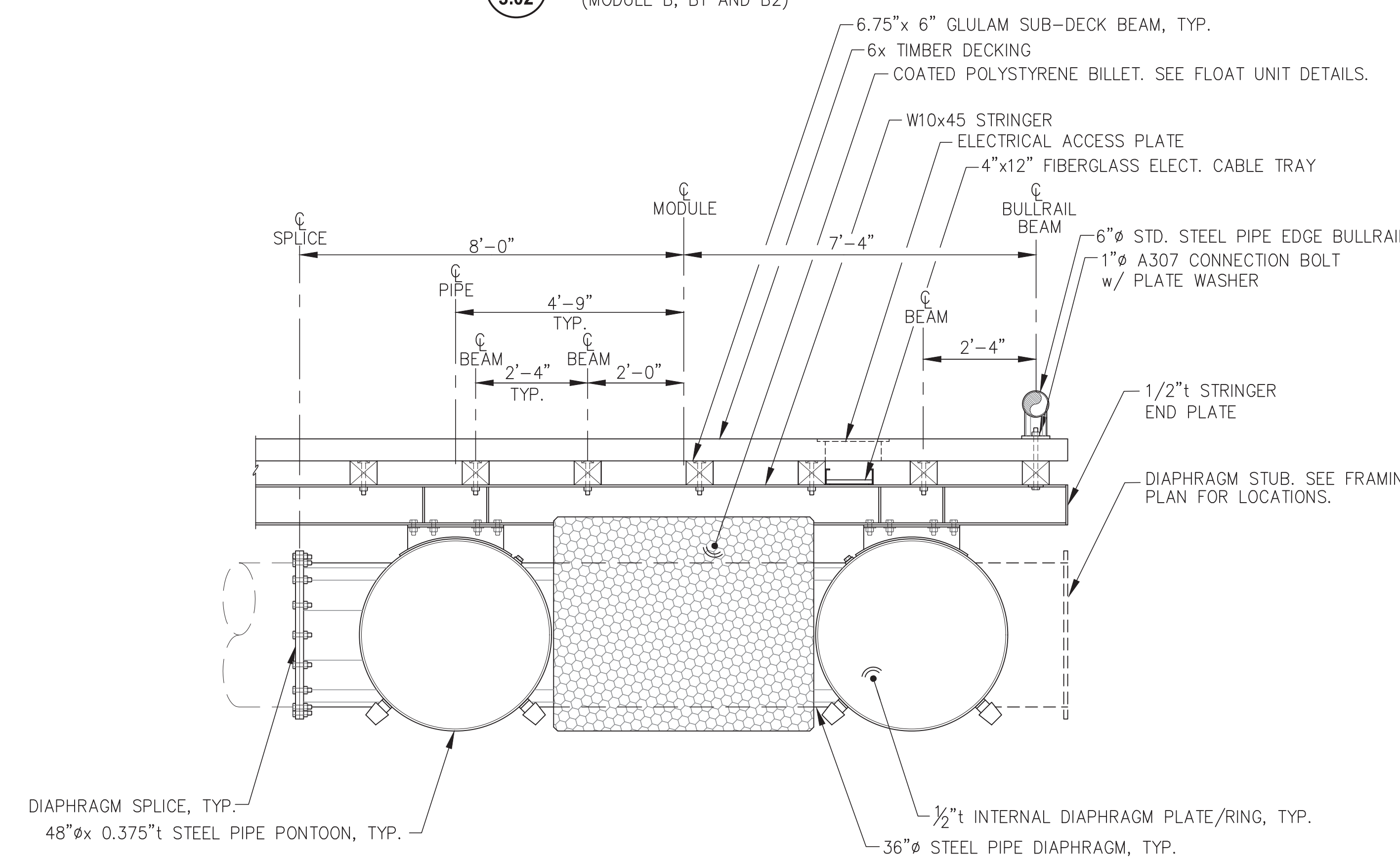
A / - TYPICAL SECTION
(EXTERIOR EDGE OF MODULES A, C AND D)



SADDLE WELDMENT



B / 3.02 TYPICAL SECTION
(MODULE B, B1 AND B2)



C / 3.02 TYPICAL SECTION
NOTE: DETAILS NOT SHOWN SIMILAR TO CENTER MODULE.

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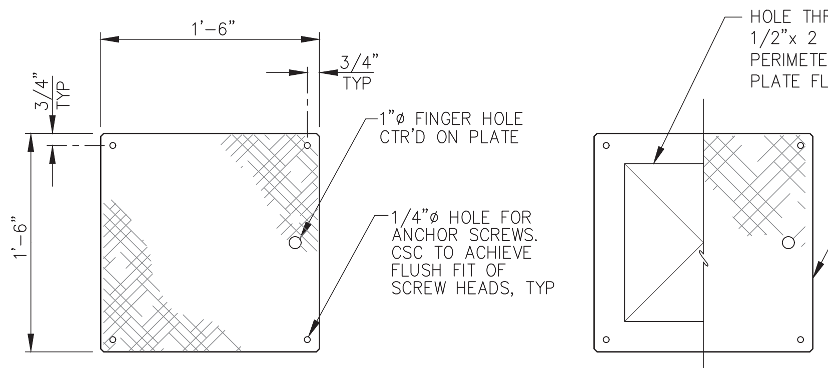
60% DESIGN SUBMITTAL
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: TYPICAL SECTIONS

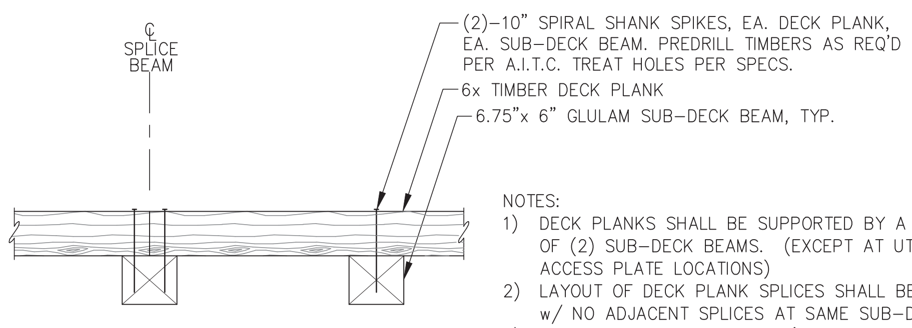
PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

S3.08



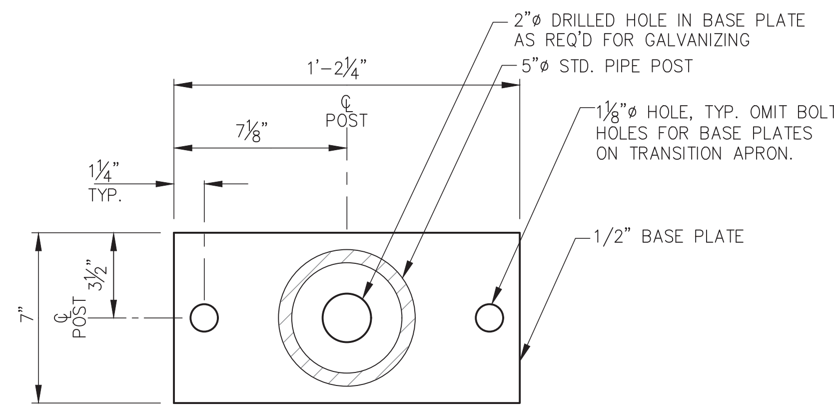
NOTE:
PLATE SHALL BE 1/2"t STEEL (ASTM A572, Fy = 50ksi) w/ NON-SKID COATING ON TOP SURFACE. CLIP CORNERS 1/4" AS SHOWN. LOCATE PER FLOAT PLAN. ATTACH w/ 14GA. x 3" LONG S.S. F.H. SCREWS (4 PER PLATE)

ELECTRICAL ACCESS PLATE - TYPE 1

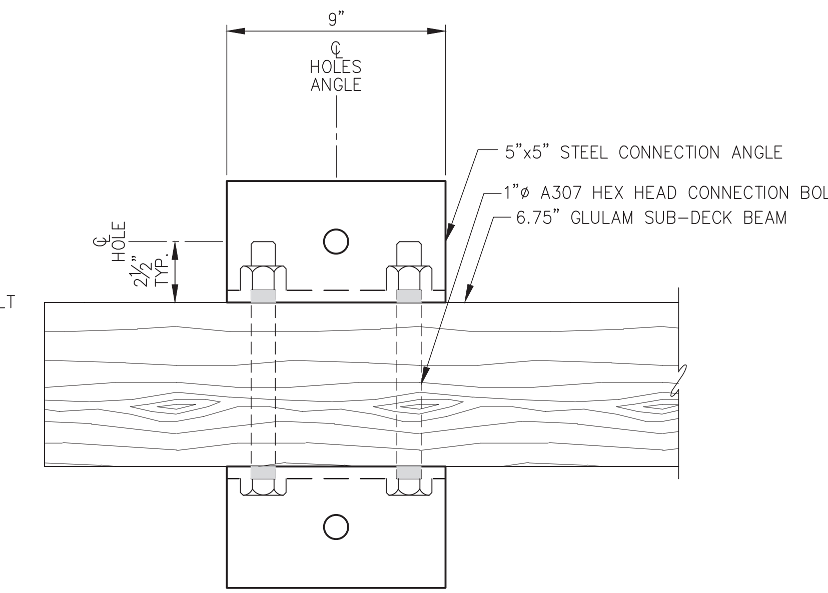


NOTES:
1) DECK PLANKS SHALL BE SUPPORTED BY A MINIMUM OF (2) SUB-DECK BEAMS. (EXCEPT AT UTILITY ACCESS PLATE LOCATIONS)
2) LAYOUT OF DECK PLANK SPLICES SHALL BE RANDOM w/ NO ADJACENT SPLICES AT SAME SUB-DECK BEAM.
3) OFFSET DECK SPIKES AS REQ'D TO MISS SUB-DECK CONNECTION BOLTS.

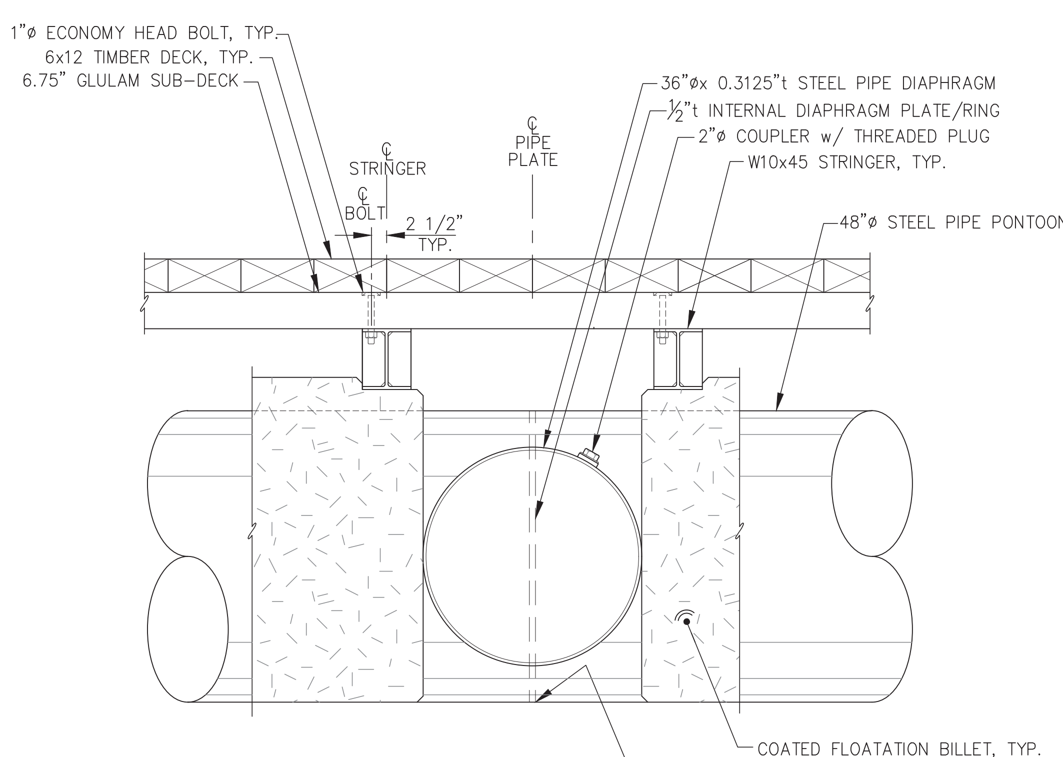
TYPICAL DECK CONNECTION



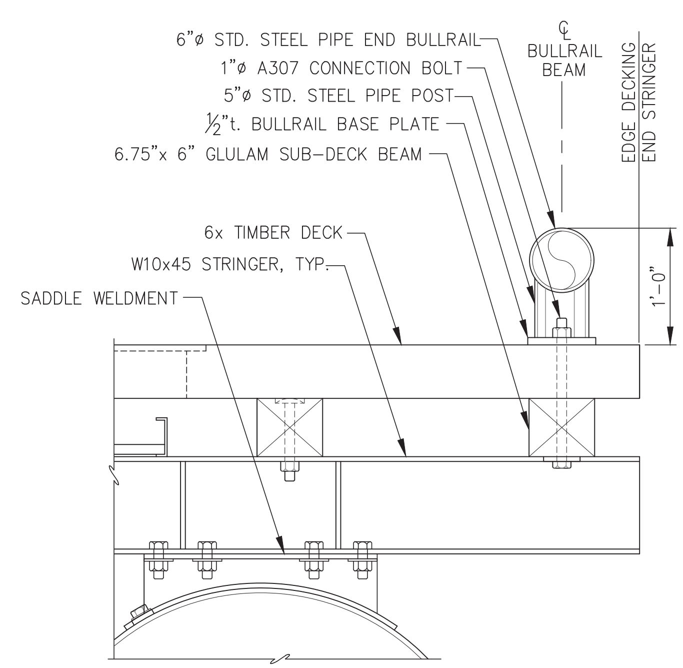
BULLRAIL BASE PLATE - PLAN



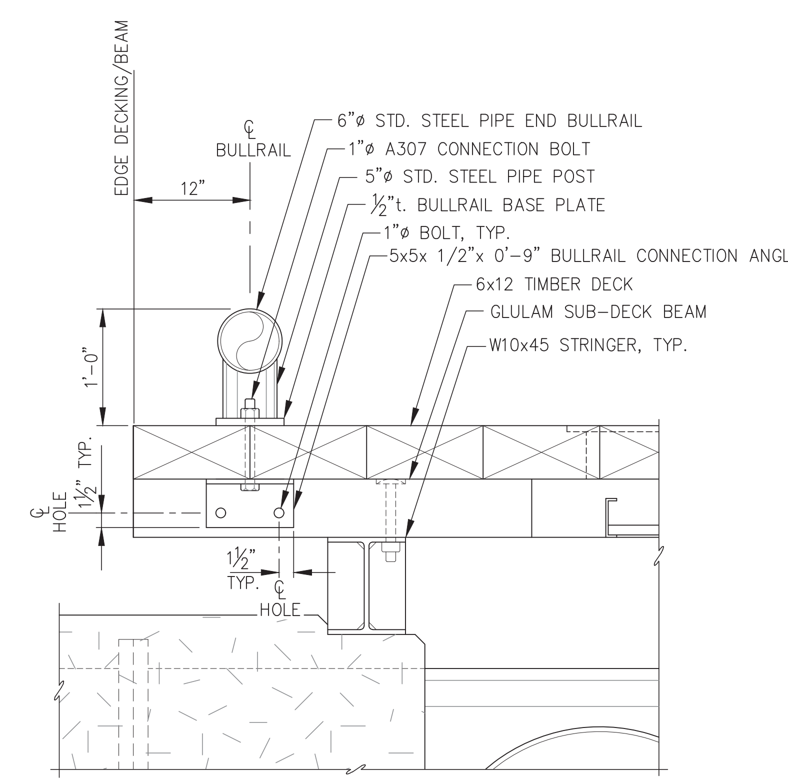
END BULLRAIL CONNECTION ANGLE - PLAN



A 3.08 SECTION



TYPICAL STEEL BULLRAIL - EDGE SECTION



TYPICAL STEEL BULLRAIL - END SECTION

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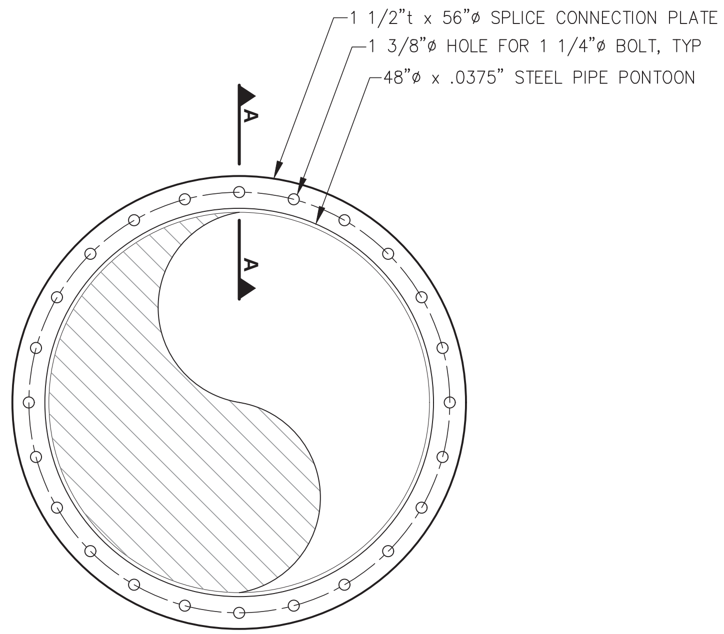
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: FLOATING DOCK DETAILS

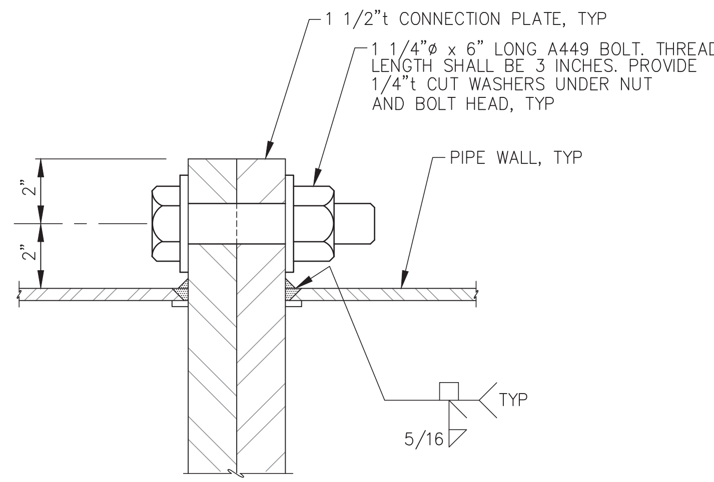
PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

S3.09

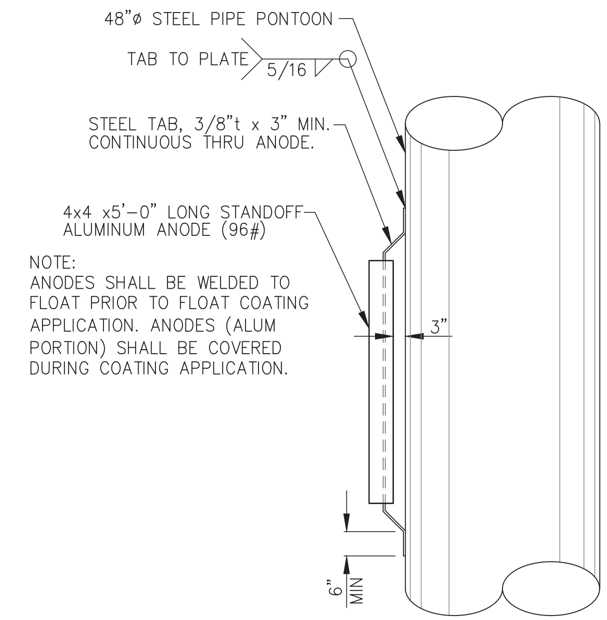


SPLICE CONNECTION PLATE

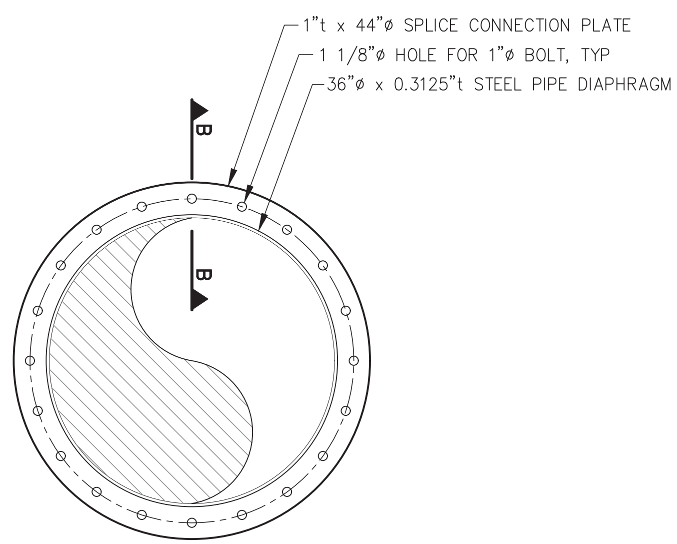
(BOLTED SPLICE CONNECTIONS FOR 48"ø PIPE PONTOONS)



SECTION AA

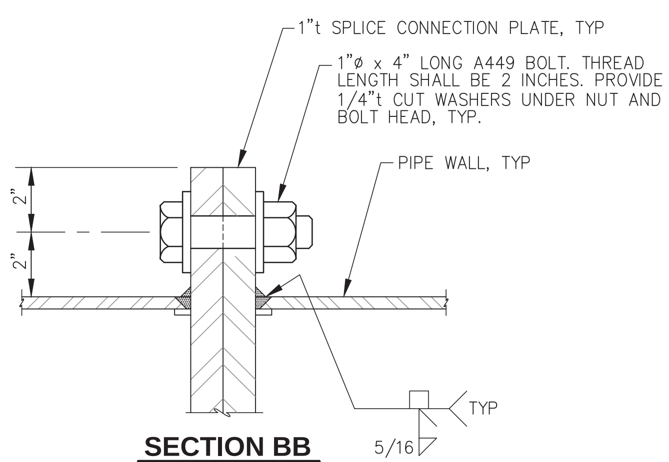


ANODE DETAIL

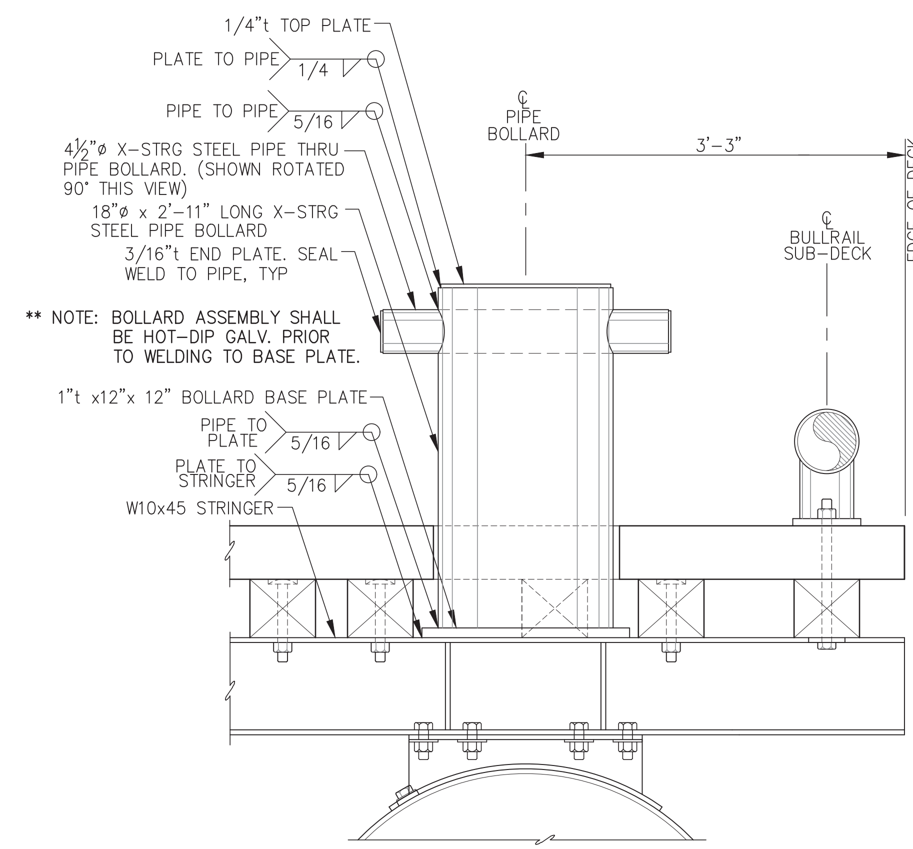


SPLICE CONNECTION PLATE

(BOLTED SPLICE CONNECTIONS FOR 36"ø PIPE DIAPHRAGMS)



SECTION BB



TYPICAL SECTION - BOLLARD

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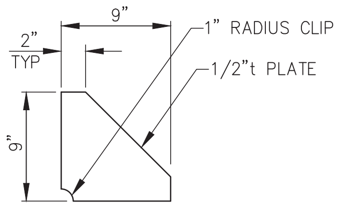
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: FLOATING DOCK DETAILS

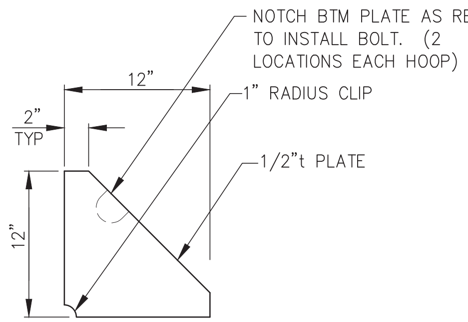
PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

S3.10

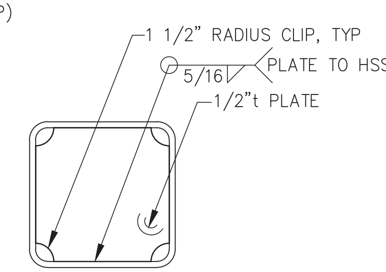
NOTE: ALL JOINTS SHALL BE SEAL WELDED WITH 5/16" FILLET WELDS, ALL SIDES, ALL AROUND, UNLESS OTHERWISE NOTED.



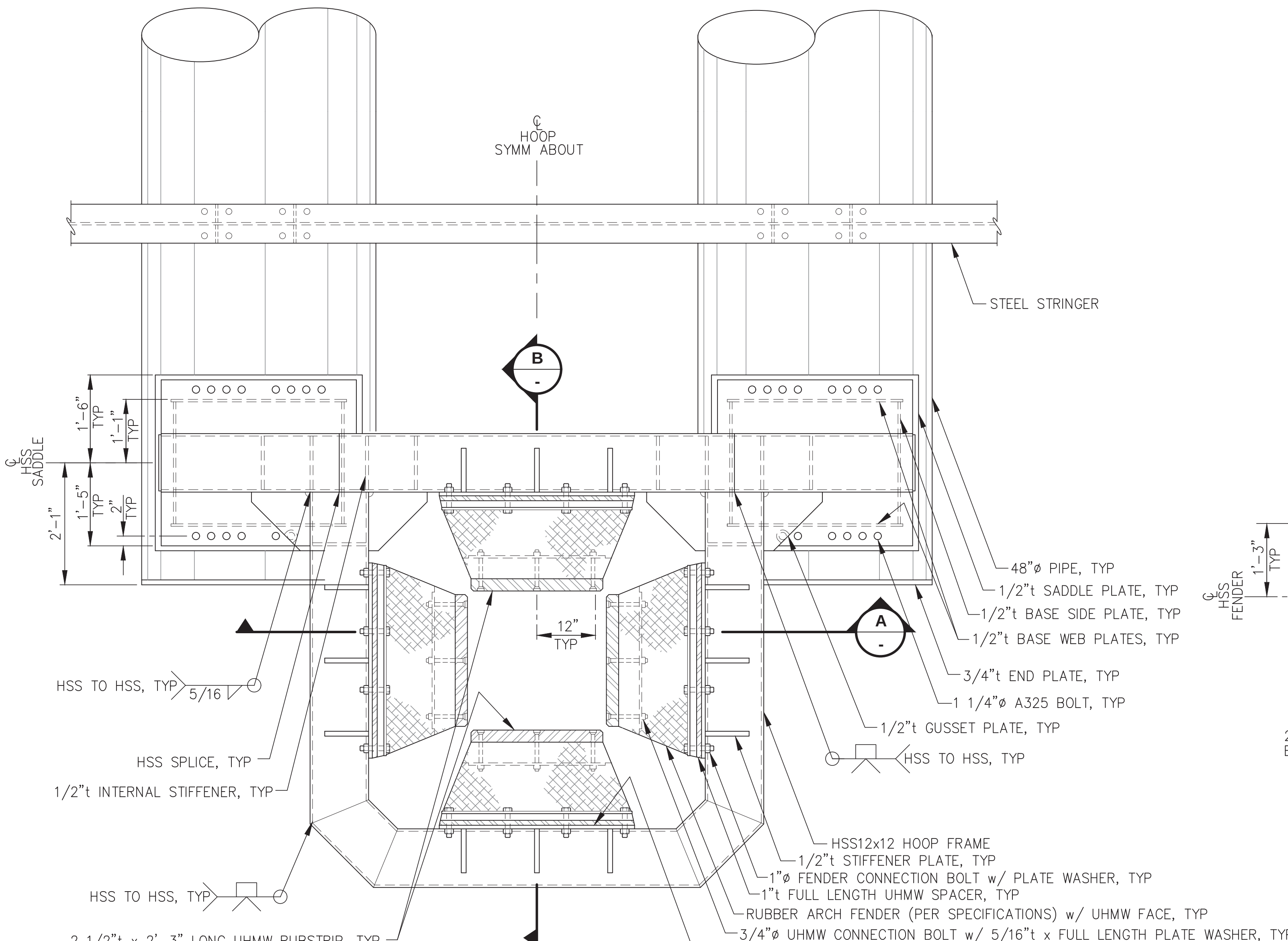
FENDER STIFFENER PLATE
(24 PER PILE HOOP)



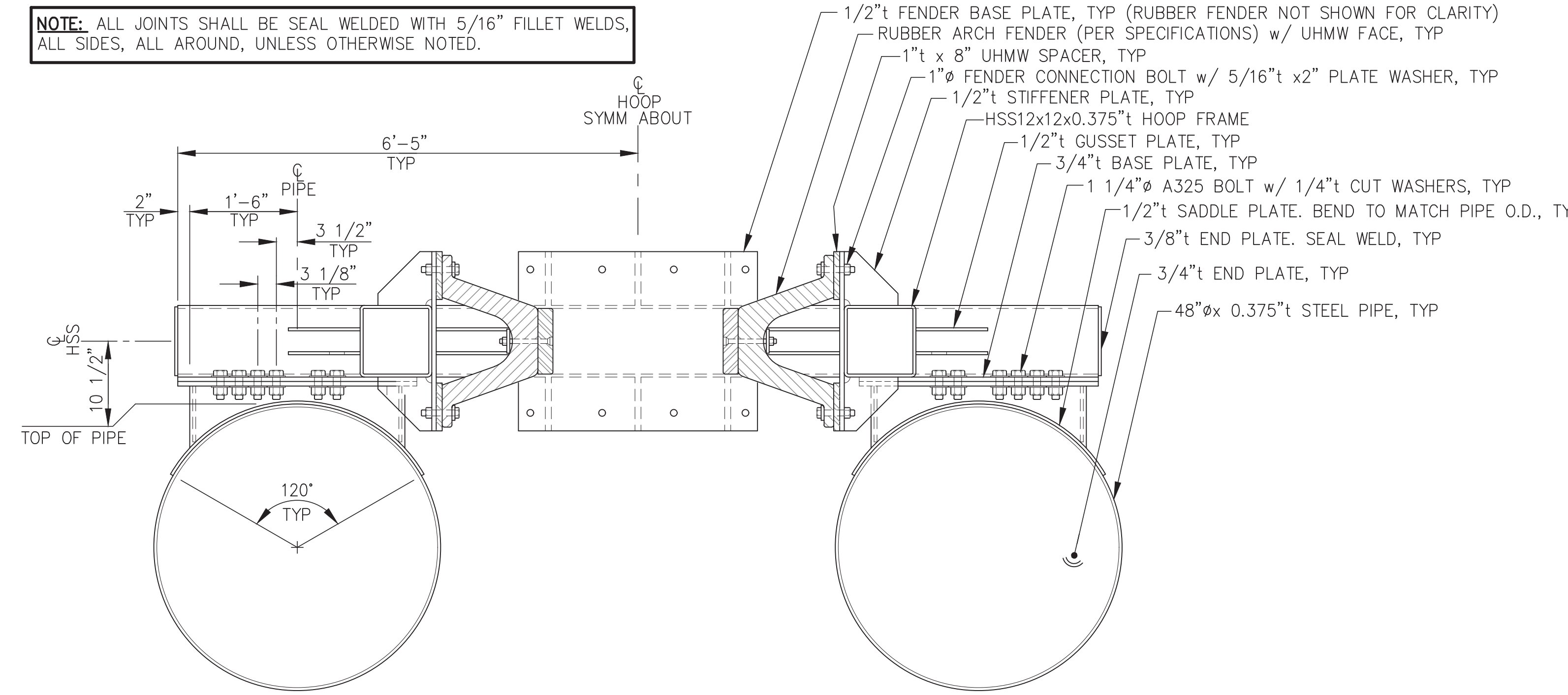
GUSSET PLATE
(8 PER PILE HOOP)



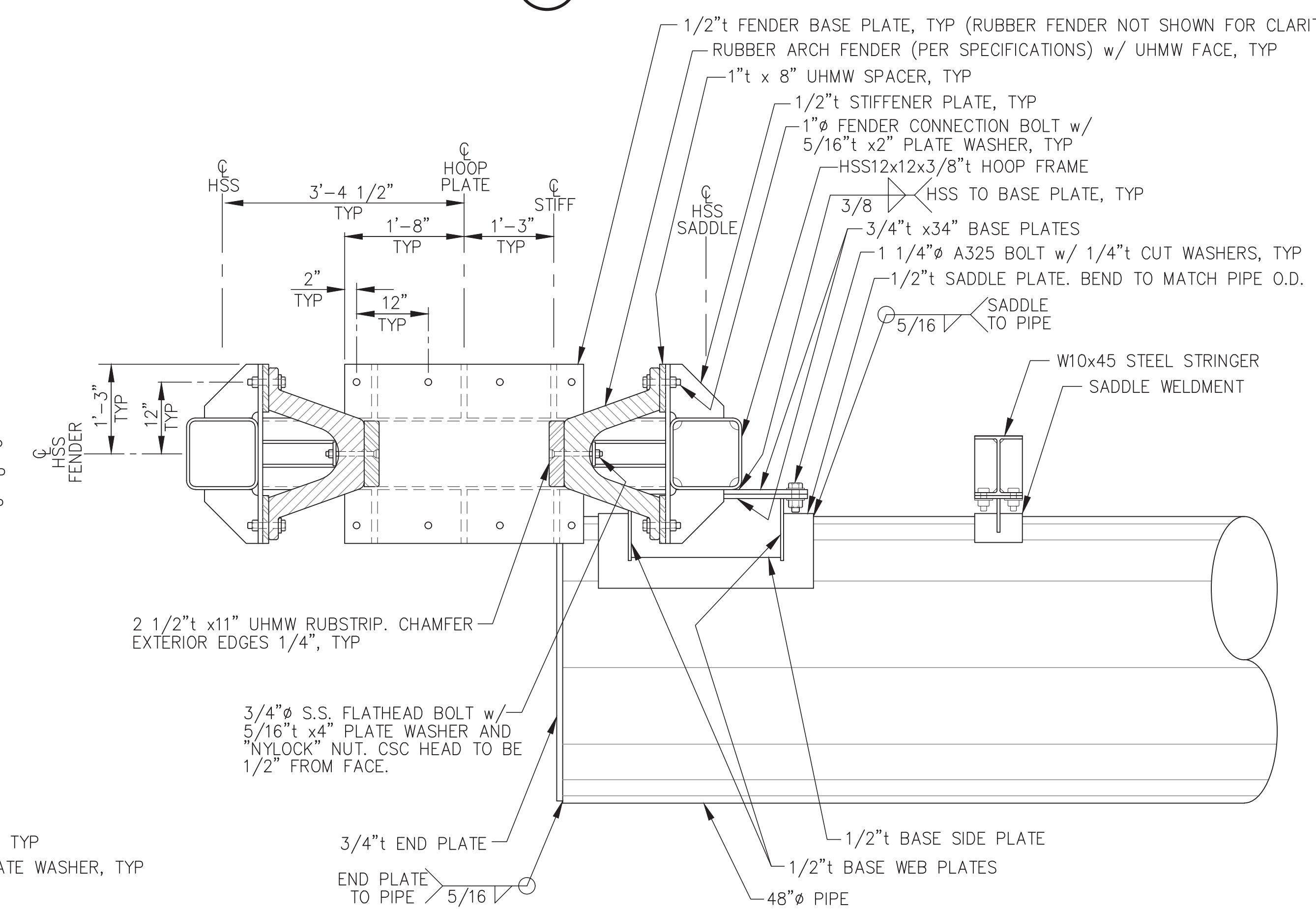
INTERNAL STIFFENER PLATE
(10 PER PILE HOOP)



PILE HOOP - PLAN



A - **SECTION**



B - **SECTION**

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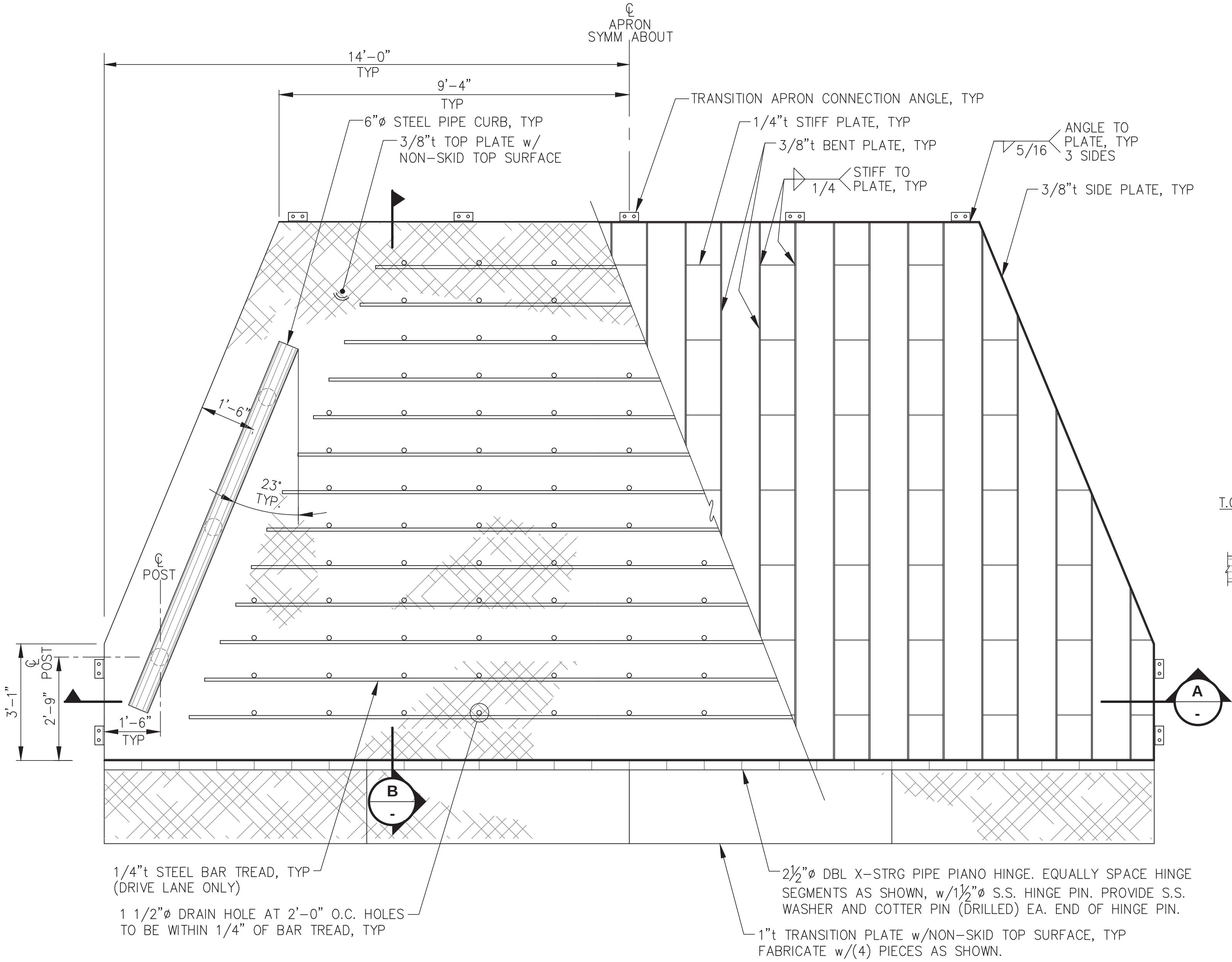
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

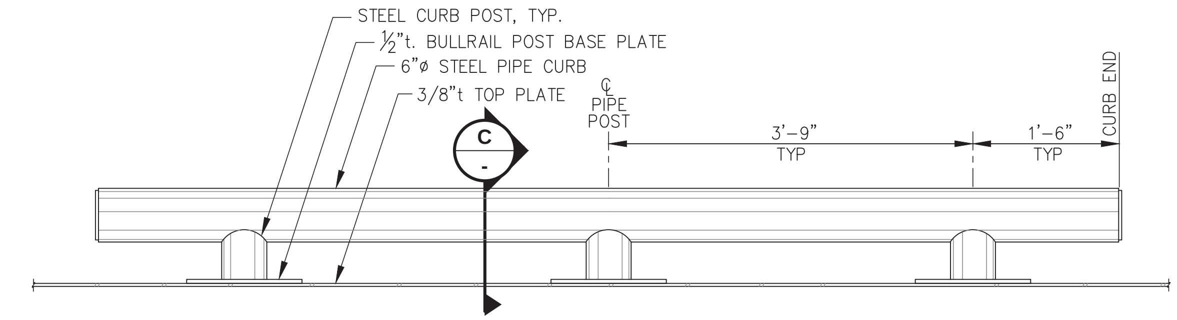
SHEET TITLE: PILE HOOPS

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

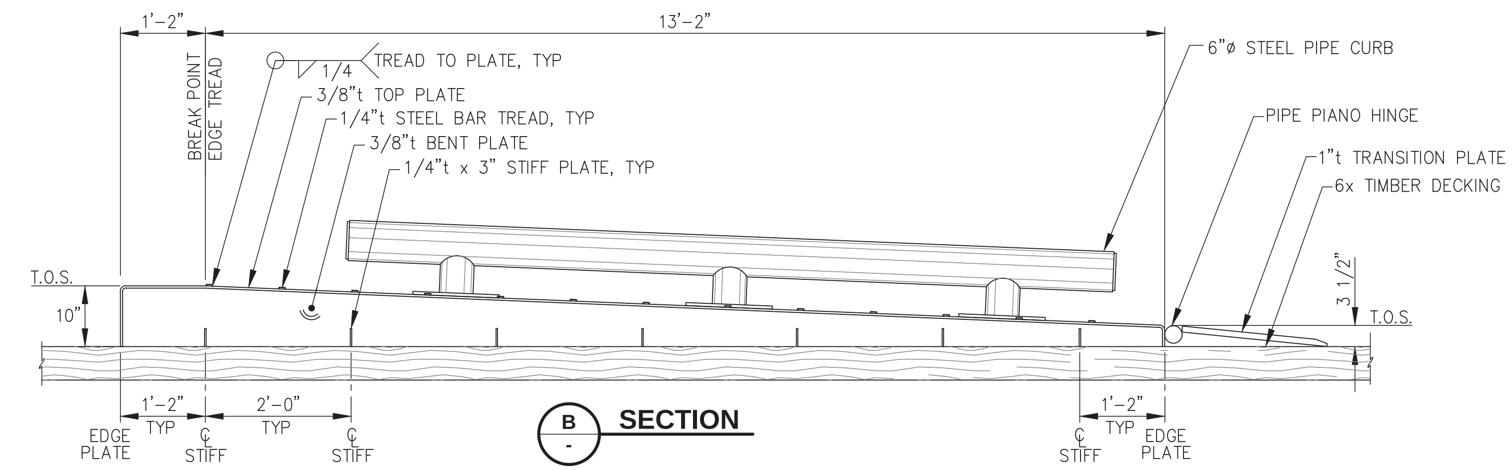
S3.11



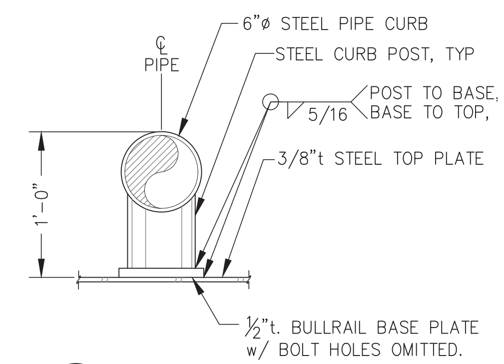
TRANSITION APRON - PLAN



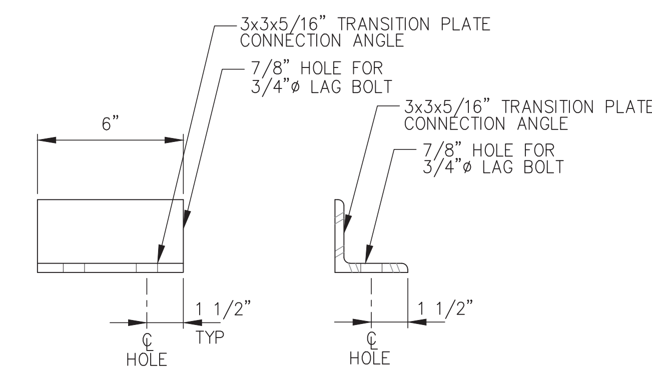
STEEL CURB



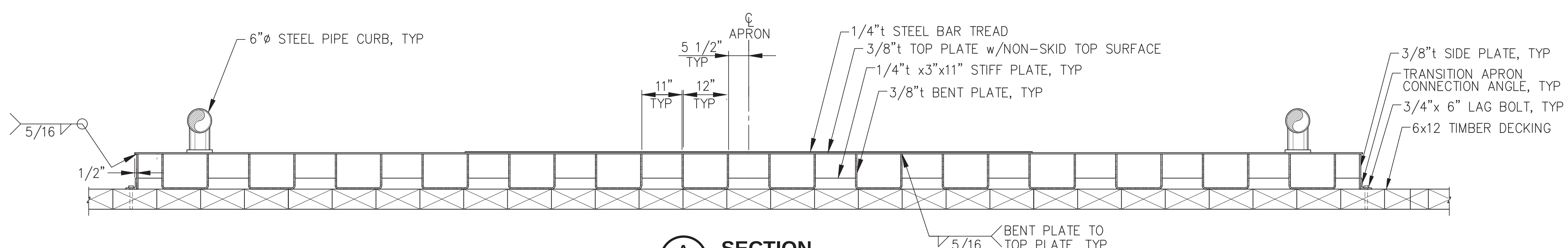
B SECTION



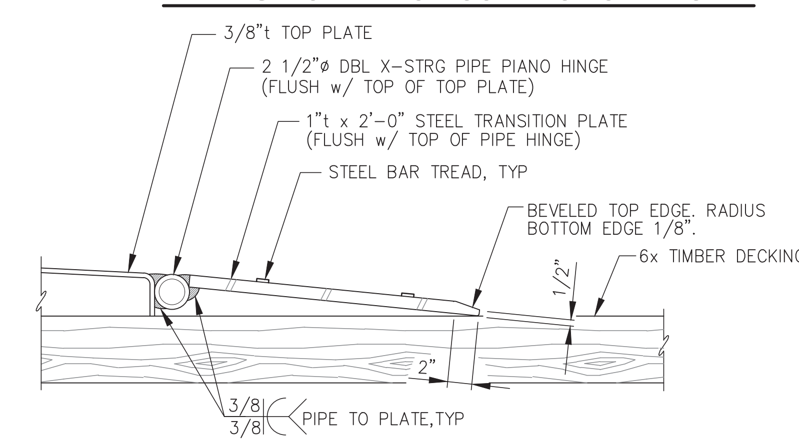
C SECTION



TRANSITION APRON CONNECTION ANGLE



A SECTION



TRANSITION PLATE

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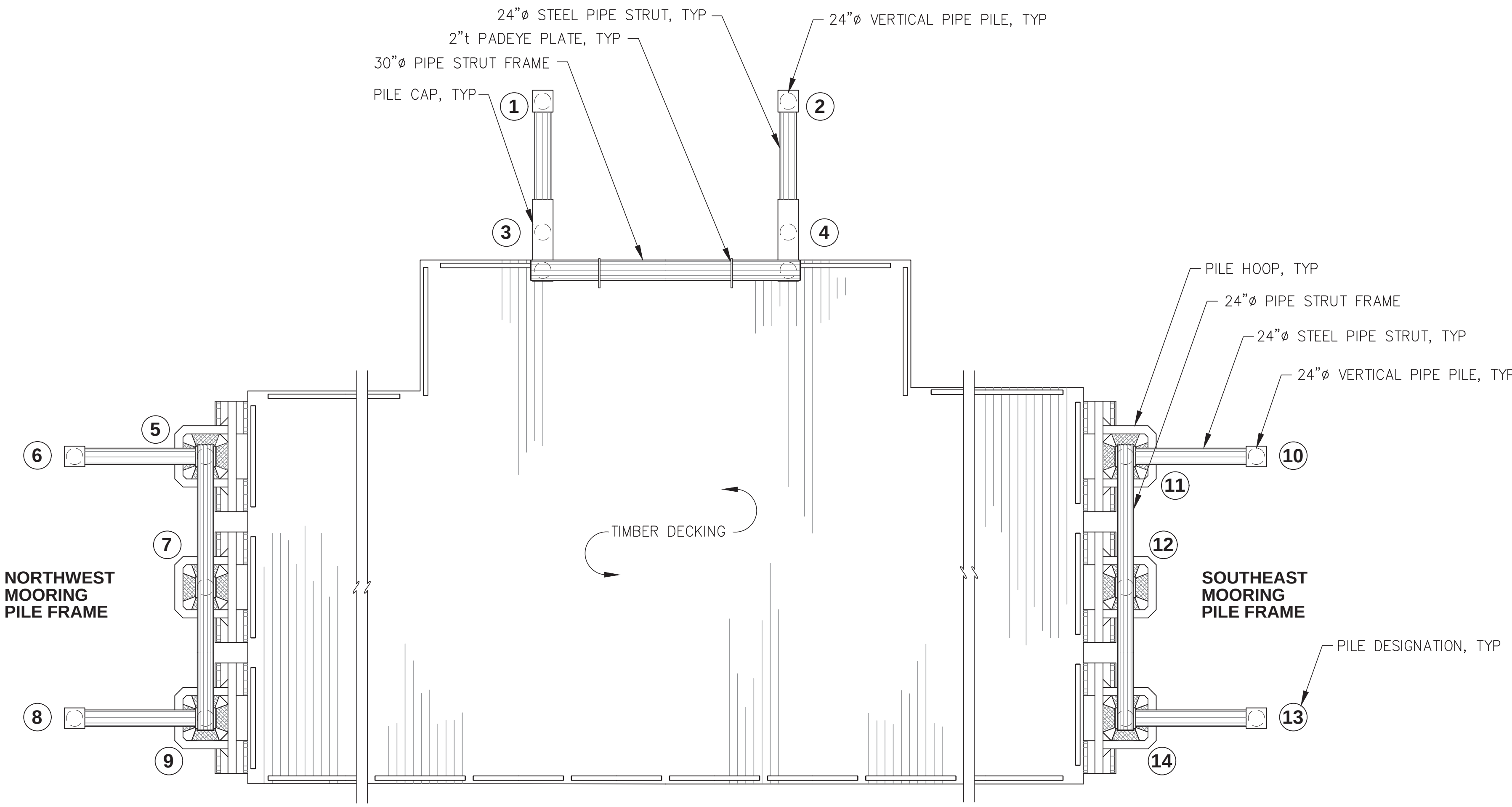
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: FLOATING DOCK TRANSITION APRON

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

S3.12

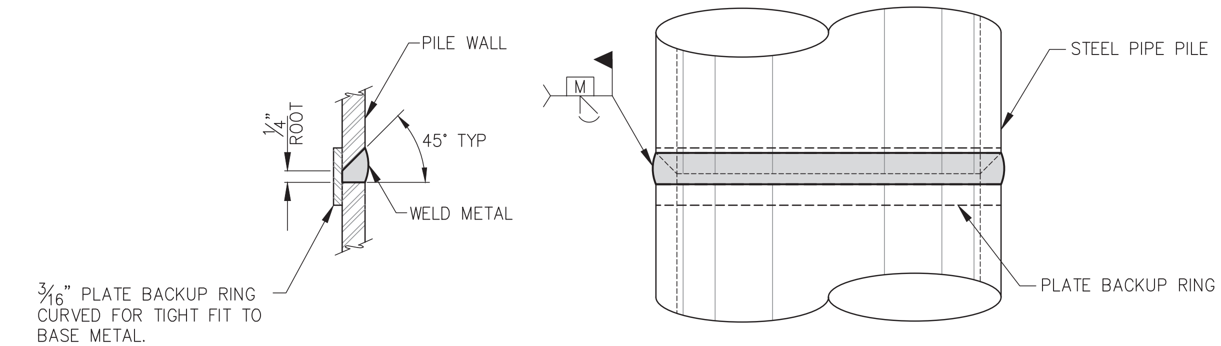


PILE LAYOUT - PLAN

NOTE: PARTIAL FLOAT PLAN SHOWN ABOVE FOR PILE LAYOUT ONLY. SEE FLOATING DOCK PLAN FOR COMPLETE DETAILS.

FLOATING DOCK PILE SCHEDULE								MIN.
PILE NO.	M.L. EL	B.R. EL	SOCKET	TIP EL.	C.O. EL.	LENGTH	CONTIN.	SUPPLY
1	-19	-29	20	-49	34	83	5	90
2	-18	-28	20	-48	34	82	5	90
3	-23	-33	20	-53	34	87	5	90
4	-22	-32	20	-52	34	86	5	90
5	-34	-44	20	-64	30	94	5	100
6	-34	-44	20	-64	30	94	5	100
7	-40	-50	20	-70	30	100	5	110
8	-46	-56	20	-76	30	106	5	110
9	-45	-55	20	-75	30	105	5	110
10	-27	-37	20	-57	30	87	5	90
11	-26	-36	20	-56	30	86	5	90
12	-32	-42	20	-62	30	92	5	100
13	-38	-48	20	-68	30	98	5	100
14	-36	-46	20	-66	30	96	5	100
				TOTAL PILE LENGTH (L.F.)				1,370

NOTE: PILE SCHEDULE SHOWN IS PRELIMINARY ONLY AND WILL BE UPDATED FOLLOWING GEOTECHNICAL INVESTIGATION.

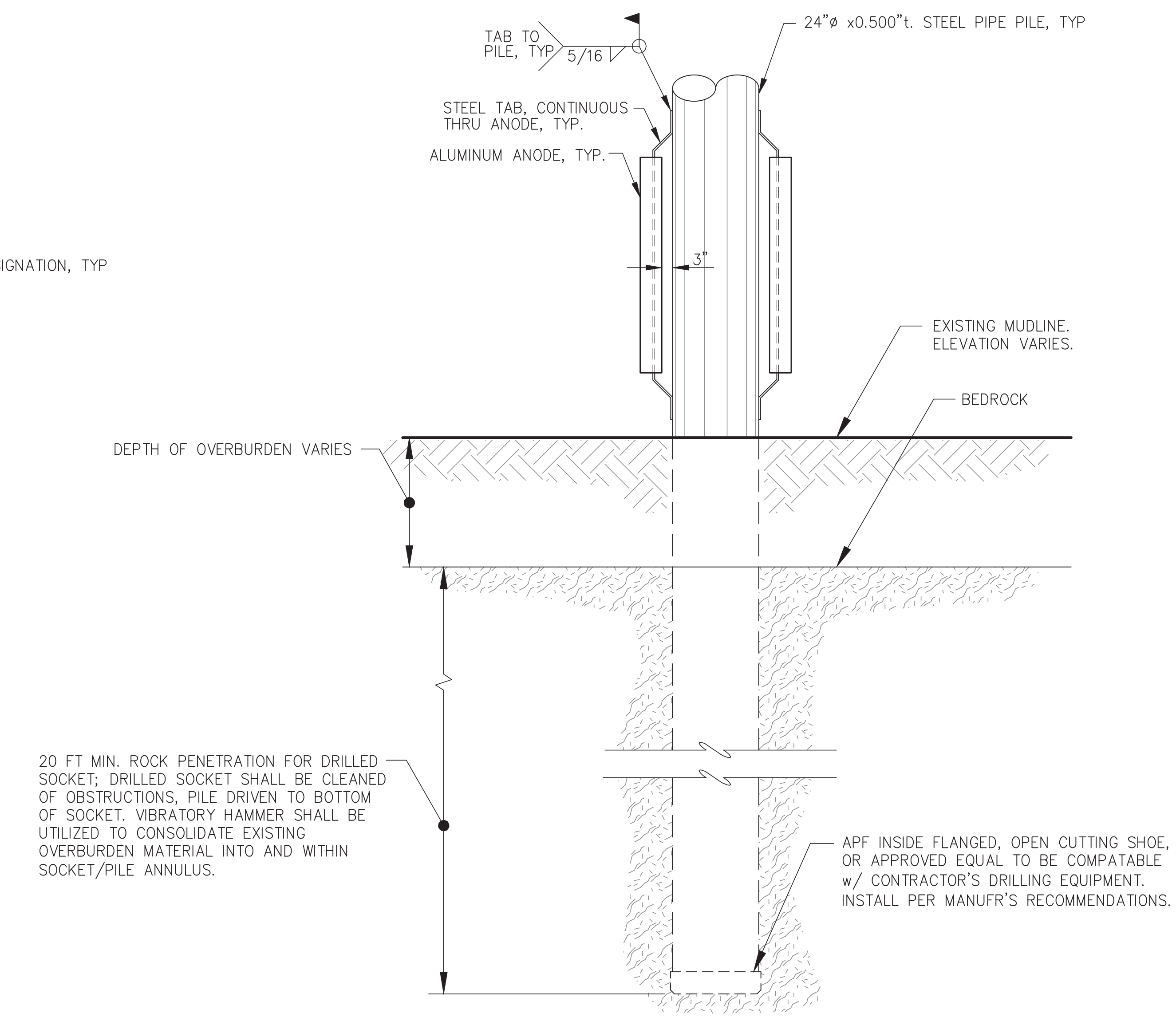


TYPICAL SECTION

ELEVATION

TYPICAL PILE SPLICE WELD

(TYPICAL FOR ALL PIPE PILE SPLICES)



SOCKETED MOORING PILE

(BEDROCK CONDITIONS)

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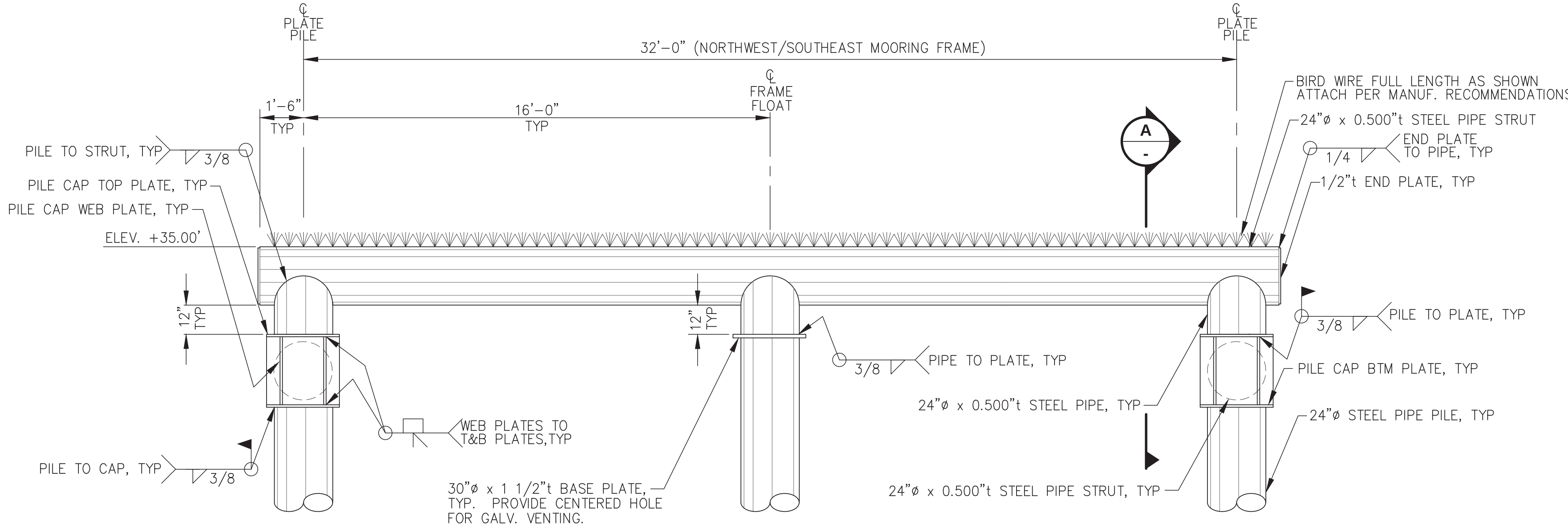
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

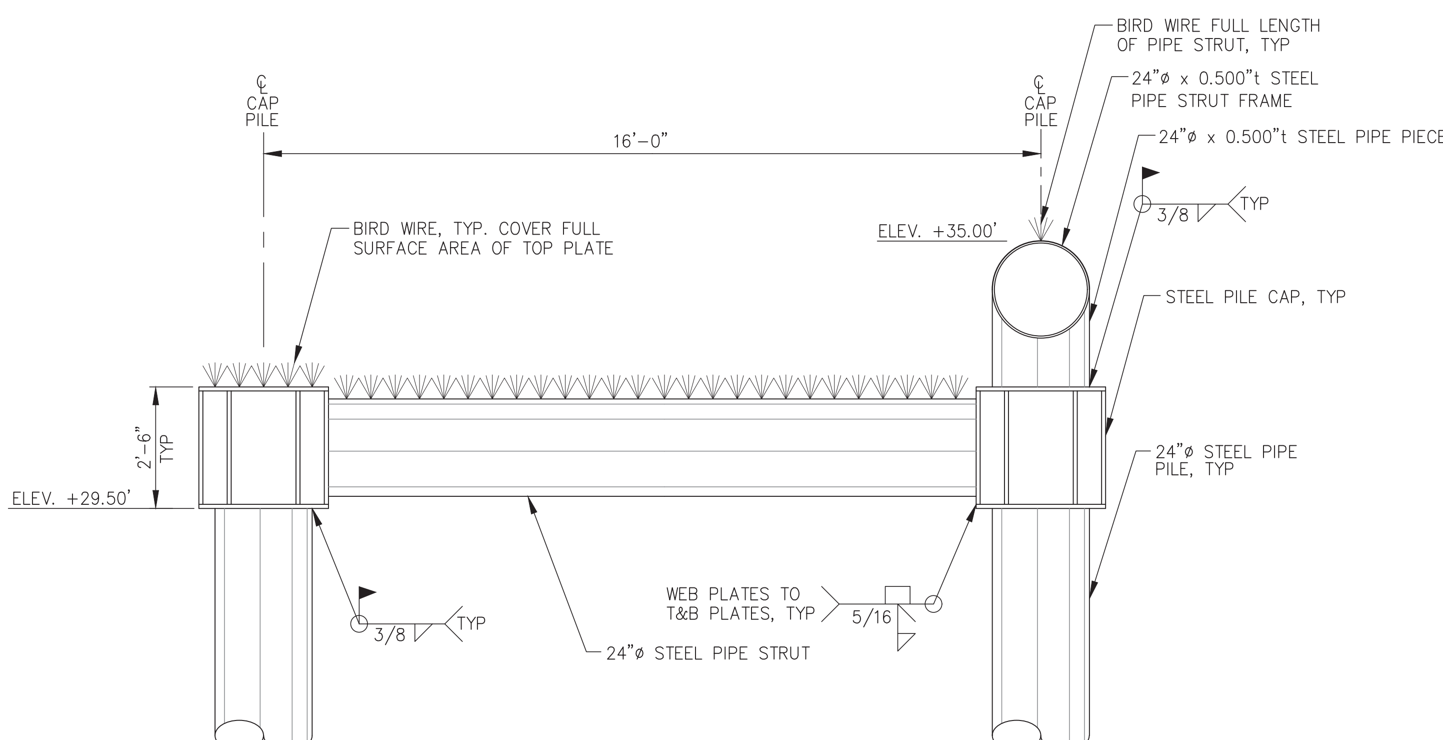
SHEET TITLE: PILE SCHEDULE AND PILE DETAILS

S3.13

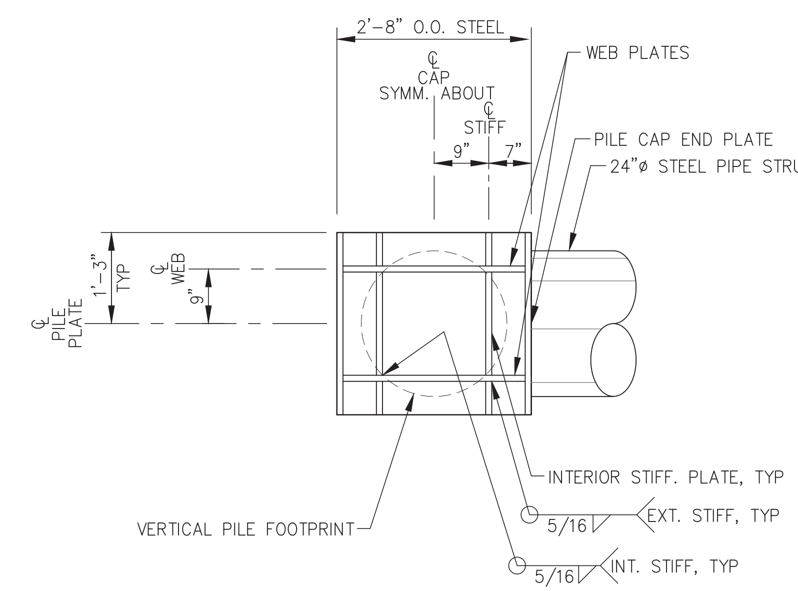
PND PROJECT NO.: 202101 C.A.N. NO.: AECC250



EAST/WEST MOORING FRAME - ELEVATION



A
-
SECTION



PILE CAP A - BOTTOM PLATE PLAN

NOTE: ALL PLATE t=1" UNLESS OTHERWISE NOTED.

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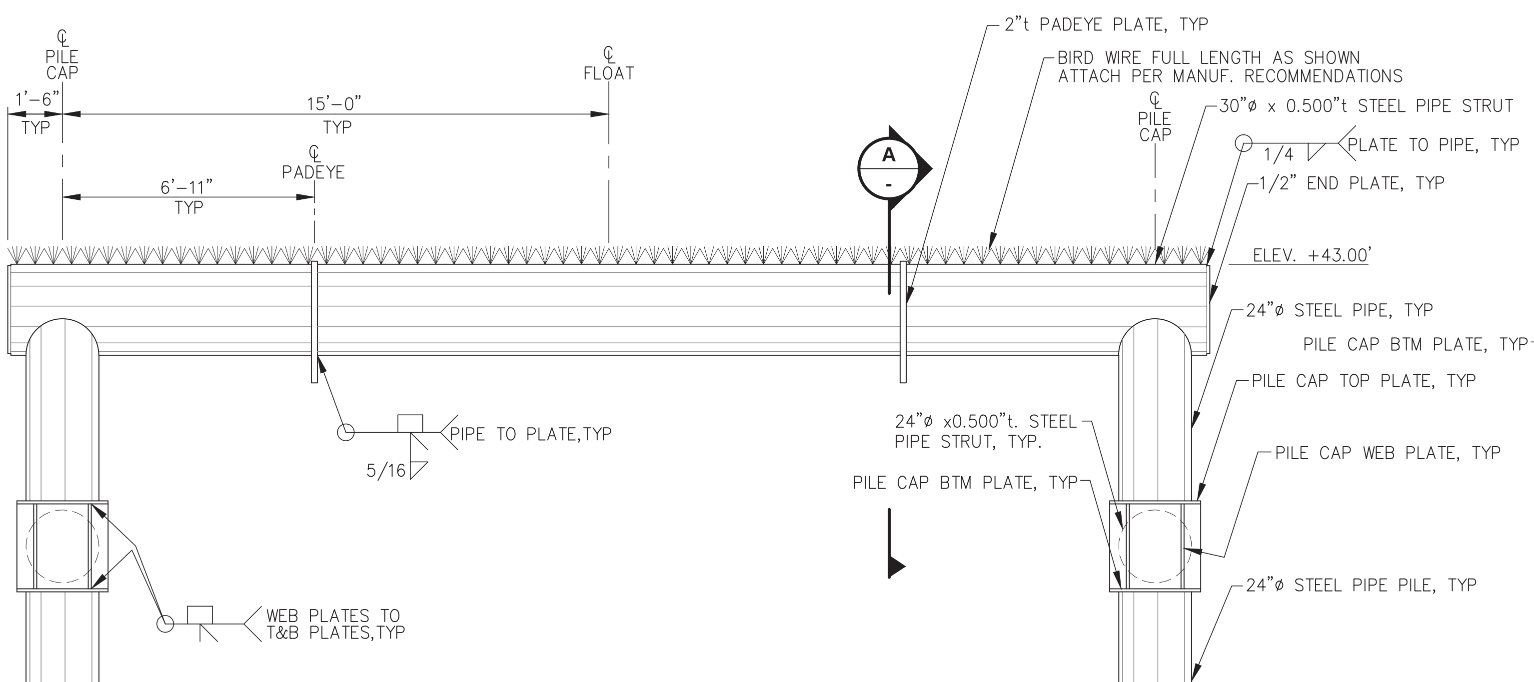
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: NW / SE MOORING FRAME DETAILS

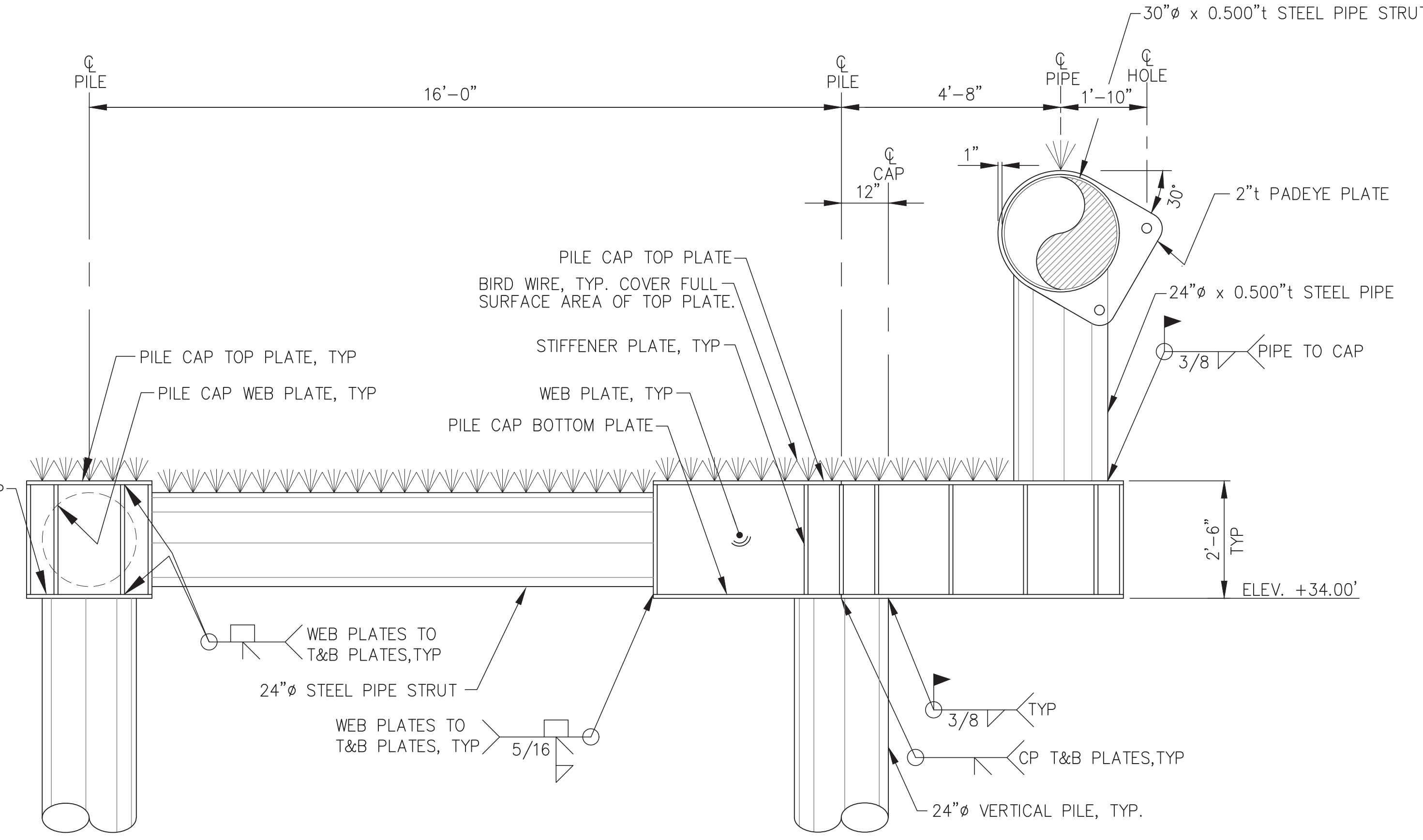
S3.14

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250



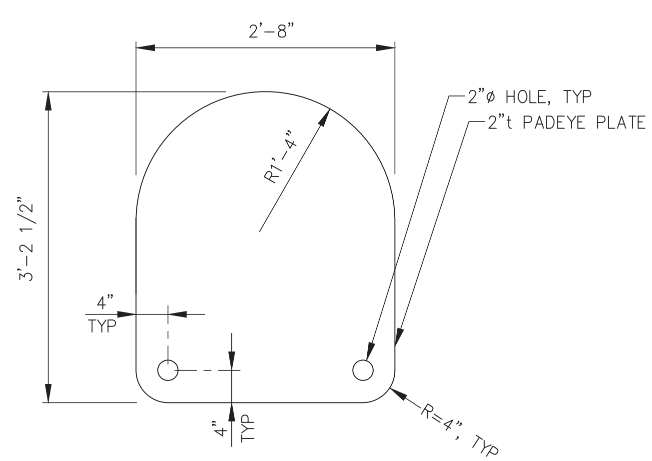
BRIDGE SUPPORT BEAM - ELEVATION

NOTE: BRIDGE SUPPORT CHAIN NOT SHOWN.

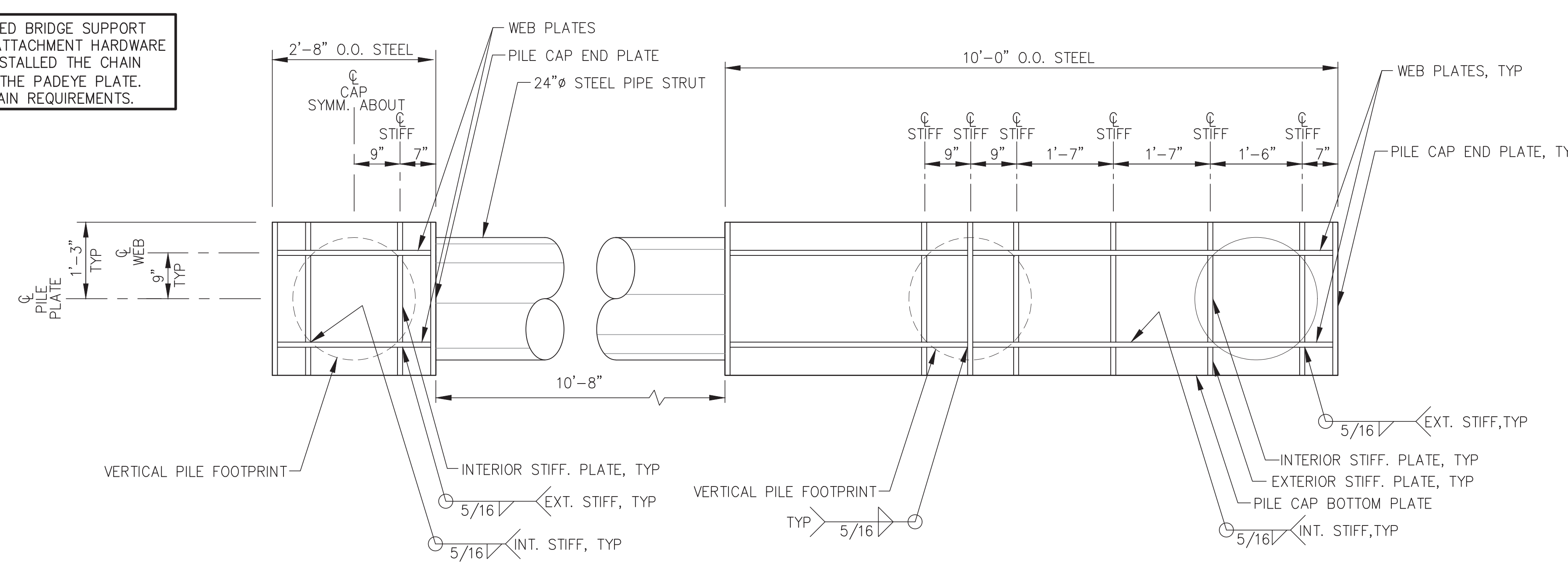


A SECTION

NOTE: SUPPLY AND INSTALL 20 LF OF HOT-DIP GALVANIZED BRIDGE SUPPORT CHAIN INCLUDING SHACKLES AND MISCELLANEOUS ATTACHMENT HARDWARE AT EACH MOORING FRAME PADEYE PLATE. WHEN INSTALLED THE CHAIN SHALL FORM A LOOP BETWEEN EACH 2"ø HOLE IN THE PADEYE PLATE. SEE SPECIFICATIONS SECTION 02894 FOR FINAL CHAIN REQUIREMENTS.



PADEYE PLATE - ELEVATION



PILE CAP - BOTTOM PLATE PLAN

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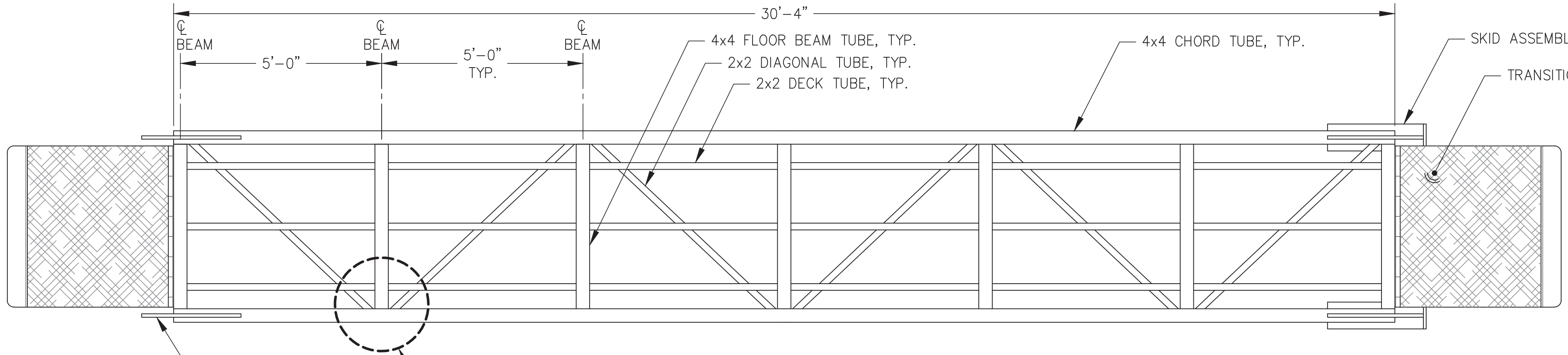
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: BRIDGE SUPPORT FRAME

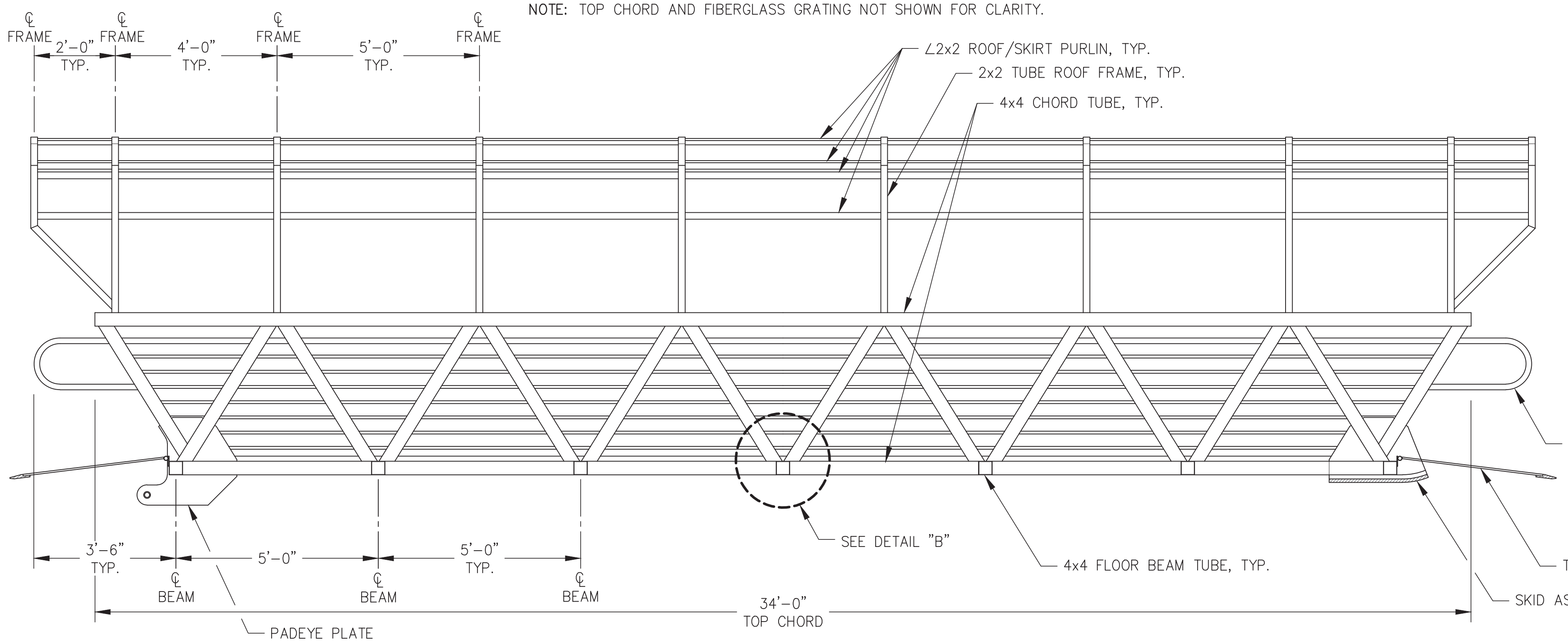
PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

S3.15

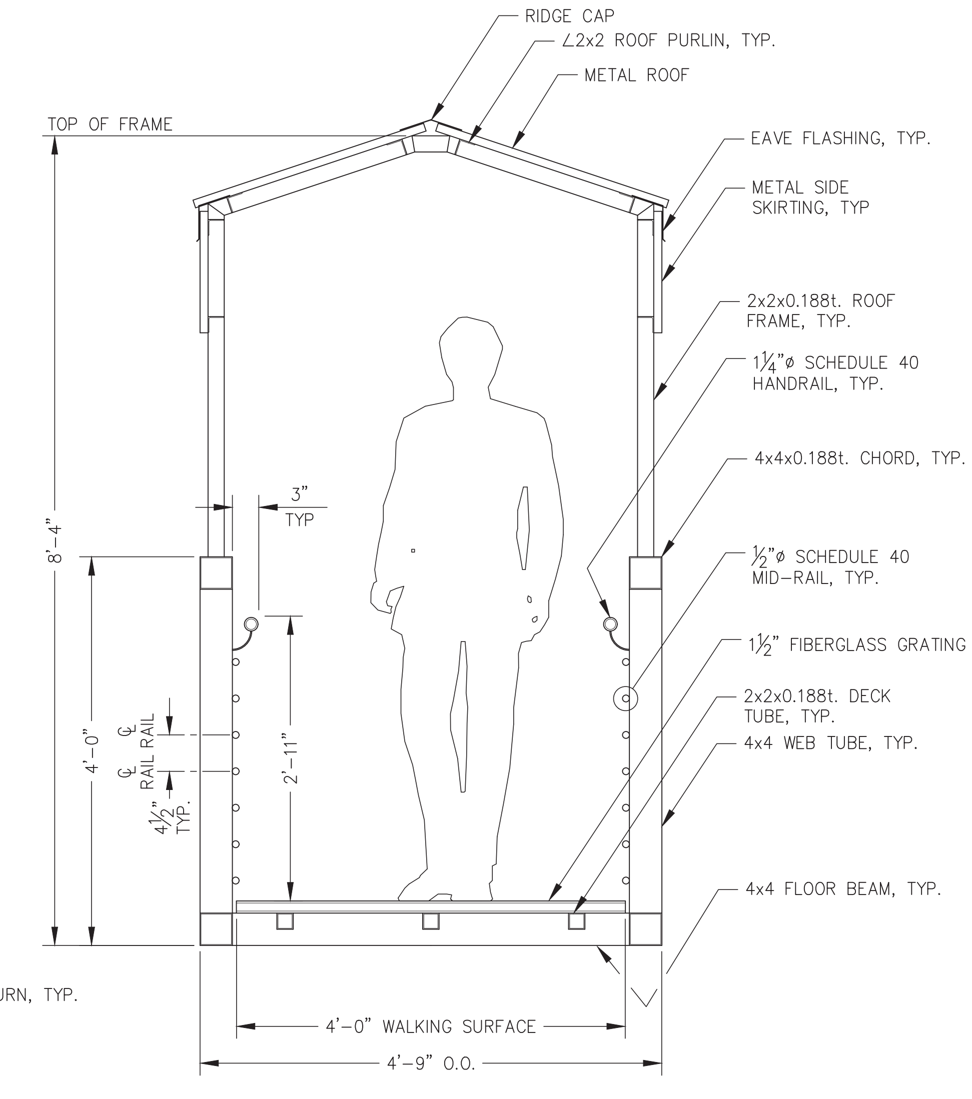


GANGWAY - PLAN

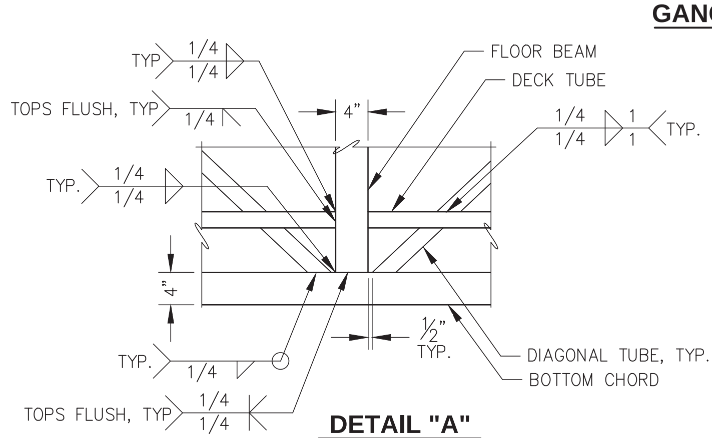
NOTE: TOP CHORD AND FIBERGLASS GRATING NOT SHOWN FOR CLARITY.



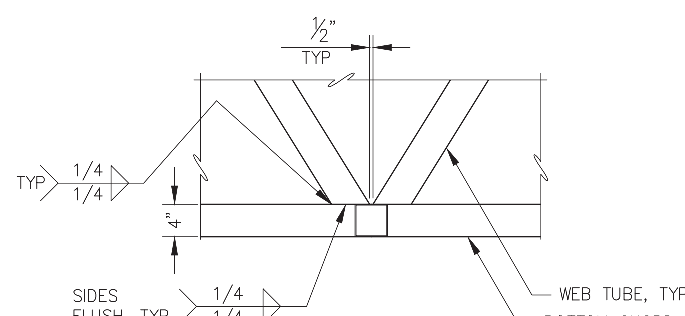
GANGWAY - ELEVATION



TYPICAL SECTION



DETAIL "A"



DETAIL "B"

GENERAL NOTES:
1. UNLESS OTHERWISE SPECIFIED:
- MATERIAL IS ALUMINUM
- WELD SIZE IS EQUAL TO THICKNESS OF THINNER PART WELDED.

2. APPLY FILLET WELD WHERE BOTTOM AND SIDE MEMBERS INTERSECT AT CHORD.

FABRICATION NOTES:
1. FABRICATOR TO PROVIDE CAMBER AT MID-SPAN. SUBMIT CAMBER FOR ENGINEER APPROVAL.
2. DIMENSIONS DO NOT INCLUDE END CAPS.
3. END CAPS TO BE THICKNESS OF CHORD.
4. PROVIDE ¼"ø DRAIN HOLES IN BOTTOM OF ALL CHORDS AND HANDRAILS AT BOTH ENDS.

STRUCTURAL NOTES:
1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE STRUCTURAL STABILITY DURING CONSTRUCTION. THE STRUCTURE SHOWN ON THE DRAWINGS HAS BEEN DESIGNED FOR STABILITY IN THE FINAL CONFIGURATION ONLY.
2. DESIGN LOADS:
- IN ADDITION TO THE DEAD LOADS, THE FOLLOWING LOADS AND ALLOWABLES WERE USED FOR THE DESIGN:
- UTILITY: 20 PLF
- LIVE LOAD: 60 PSF
- DEFLECTION: L/360

Ahtna Infrastructure & Technologies, LLC

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PND ENGINEERS, INC.
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Juneau, Alaska 99801
Phone: 907-586-2093
Fax: 907-586-2099
www.pndengineers.com

DESIGN: JLD CHECKED: ____ SCALE: NTS
DRAWN: WRB APPROVED: CRS

60% DESIGN SUBMITTAL

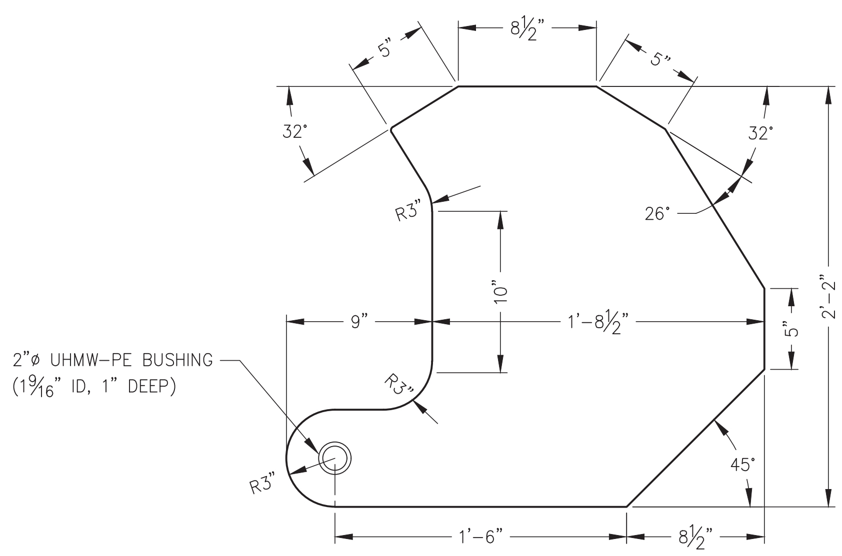
DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: GANGWAY PLAN, ELEVATION AND TYPICAL SECTION

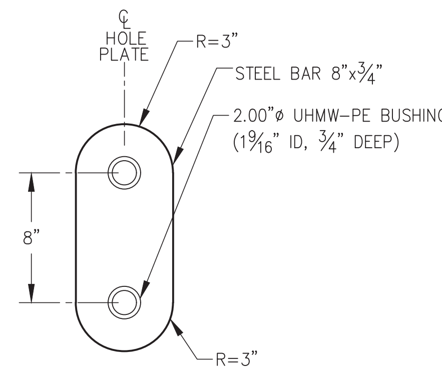
PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

S4.01



GANGWAY LUG

(2 TOTAL)
NOTE: PLATE t.=1¼"



LINK PLATE

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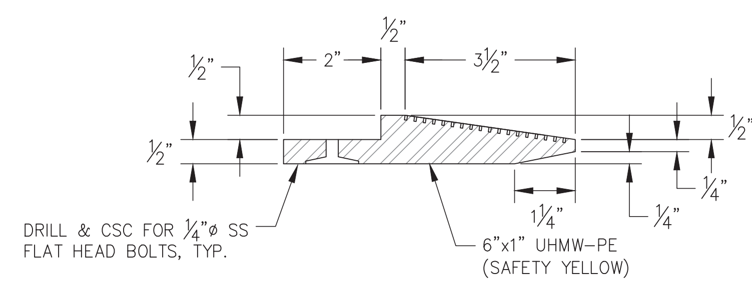

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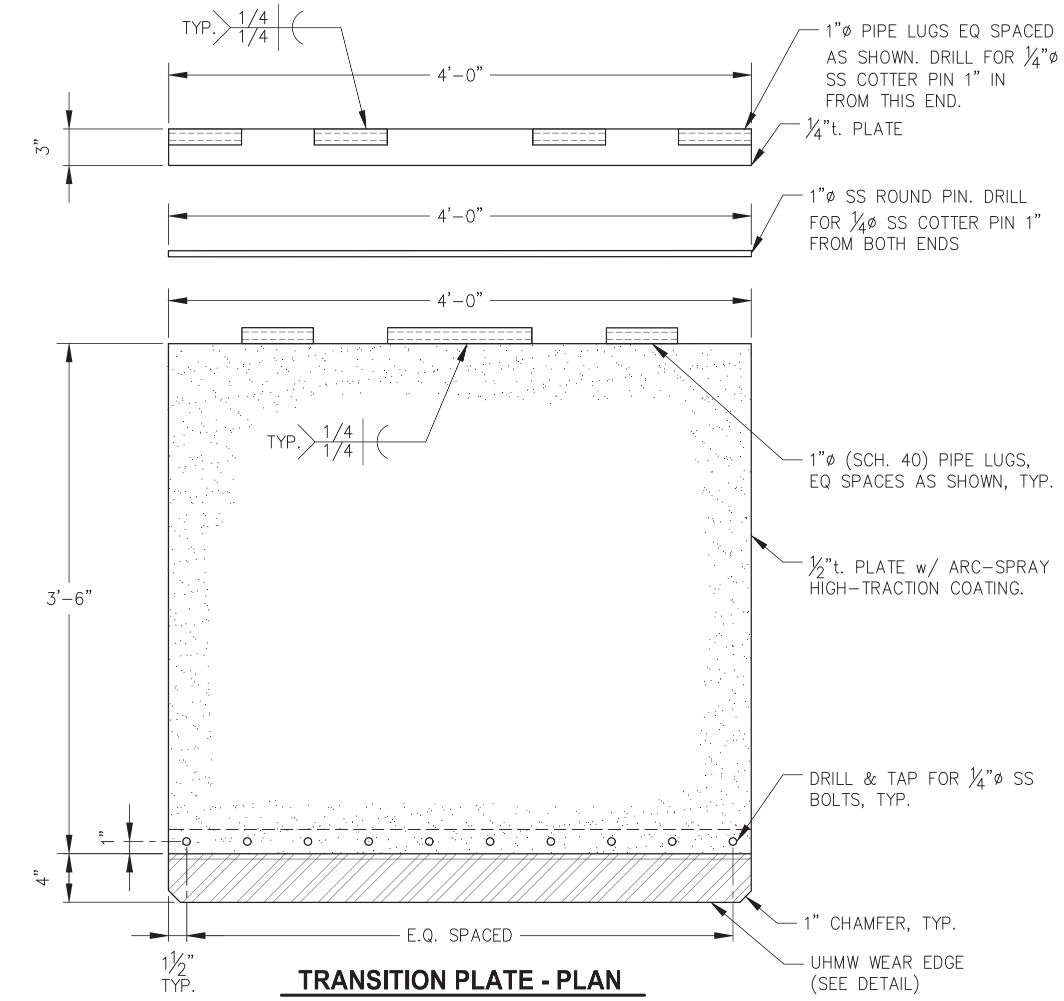

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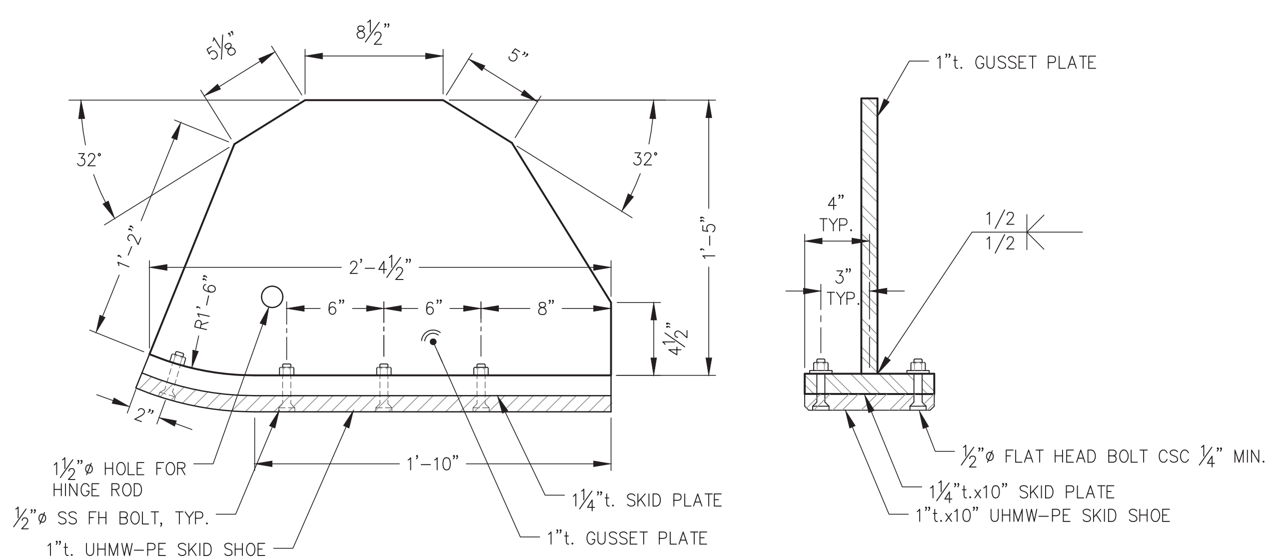

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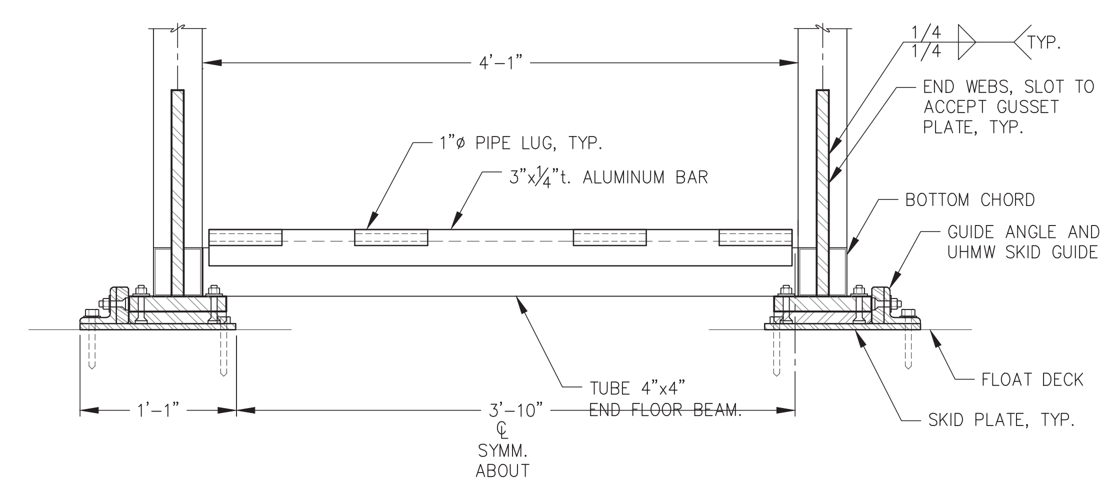

FLOAT END SECTION

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DESIGN: JLD CHECKED: SCALE: NTS
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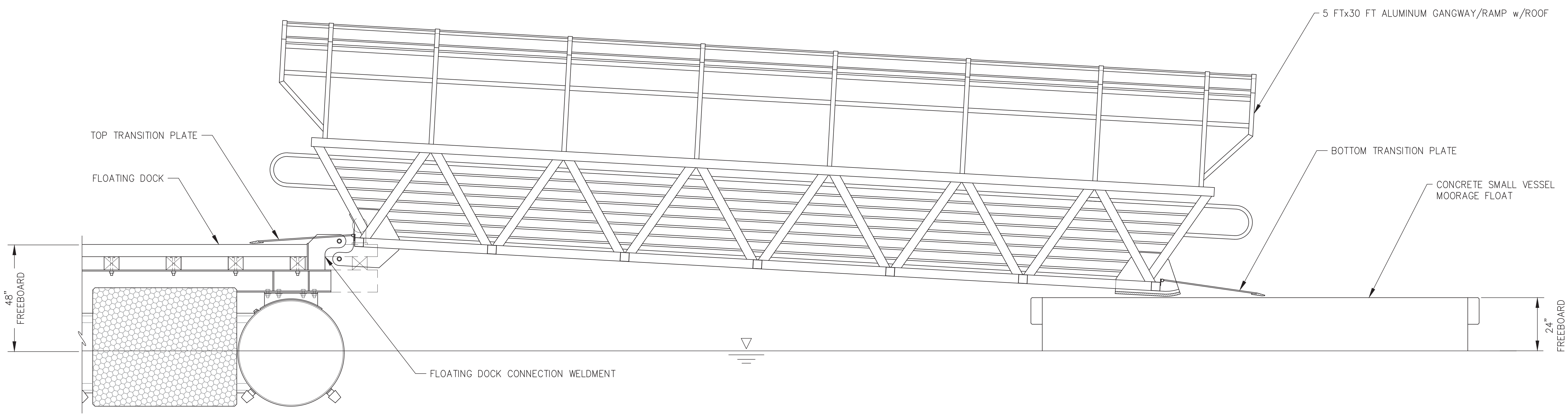
DATE: AUGUST 11, 2021

SHEET TITLE: GANGWAY DETAILS

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

S4.02



GANGWAY AND FLOAT ELEVATION

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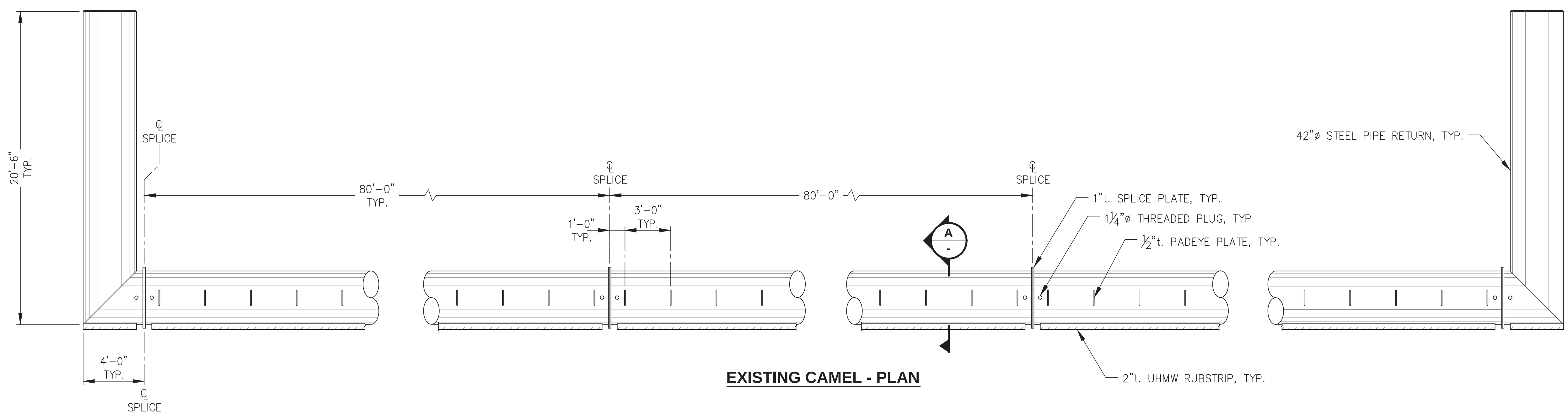
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE: GANGWAY DETAILS

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

S4.03



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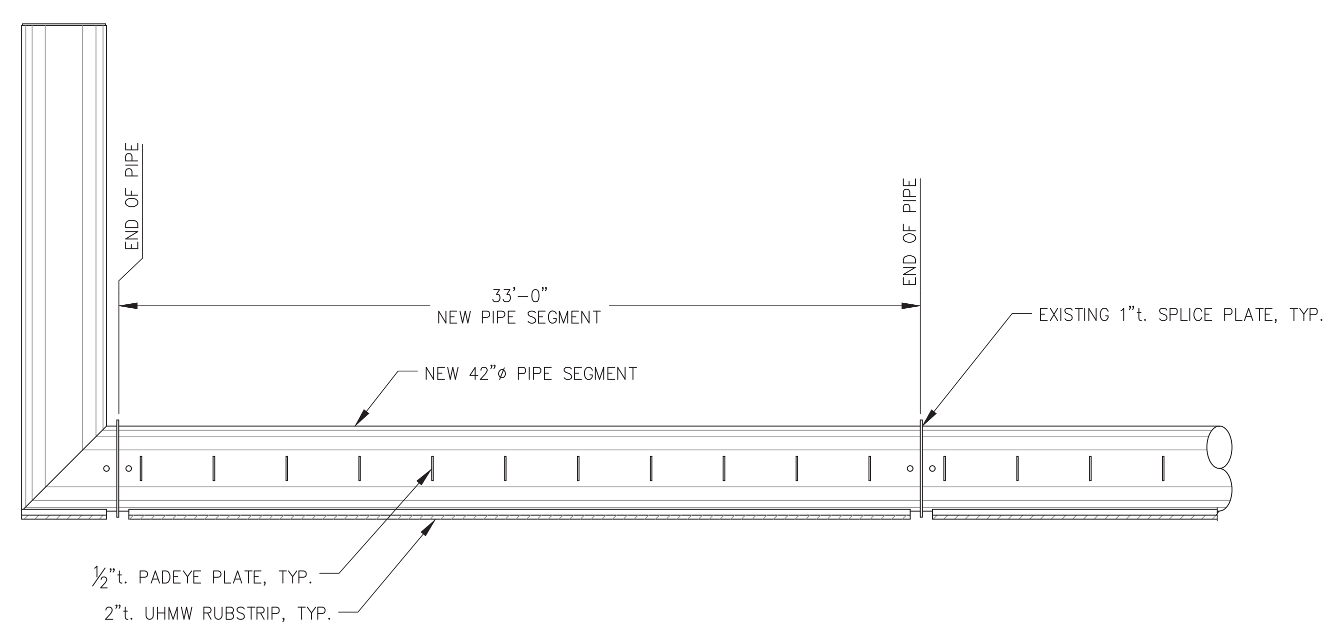

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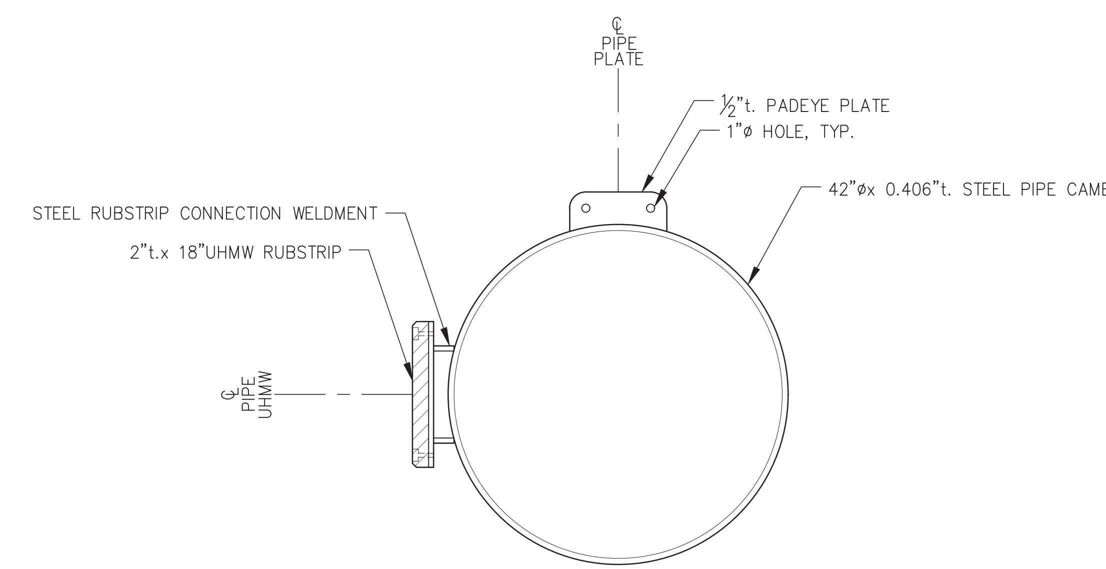

A - **TYPICAL SECTION**

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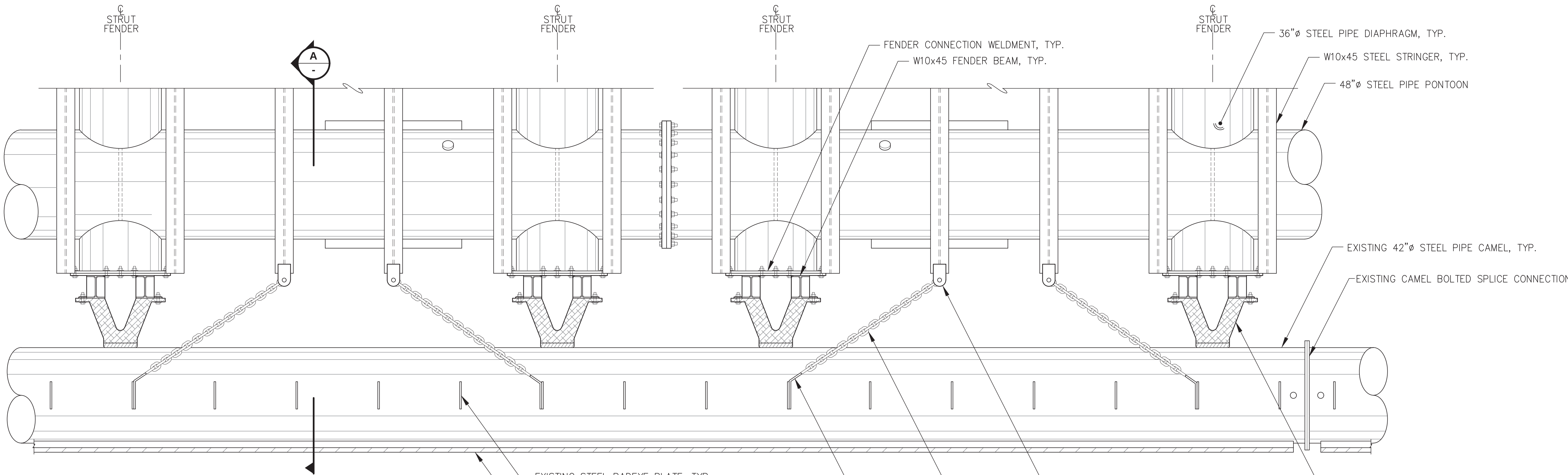
NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

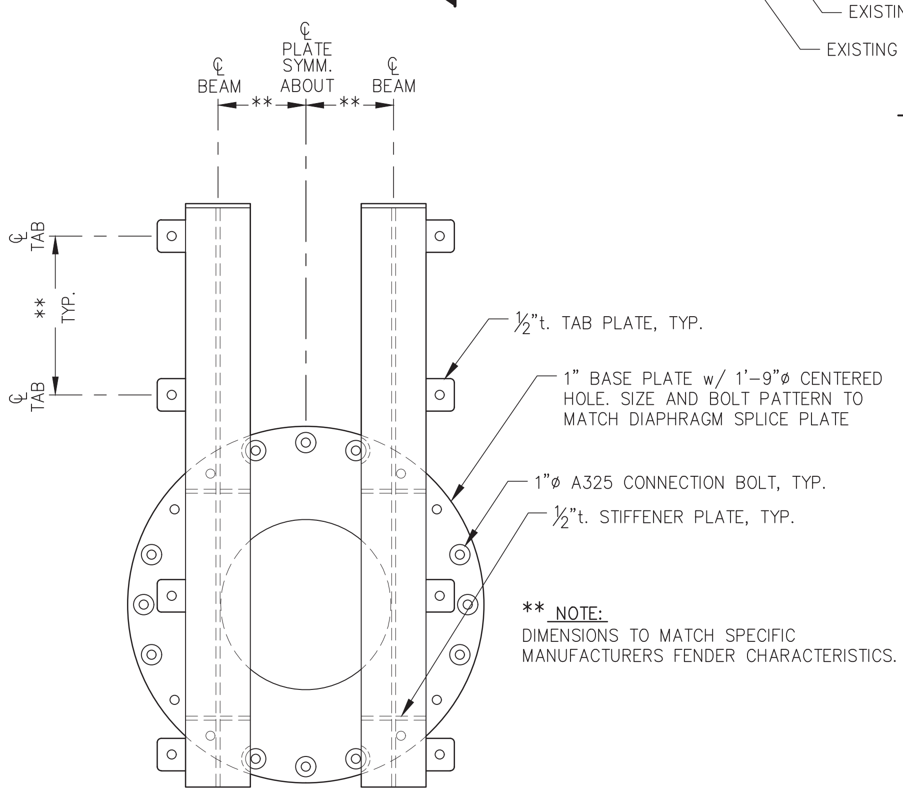
SHEET TITLE: EXISTING CAMEL MODIFICATIONS

PND PROJECT NO.: 202101 C.A.N. NO.: AECC250

S5.01



CAMEL AND FENDERING - PLAN



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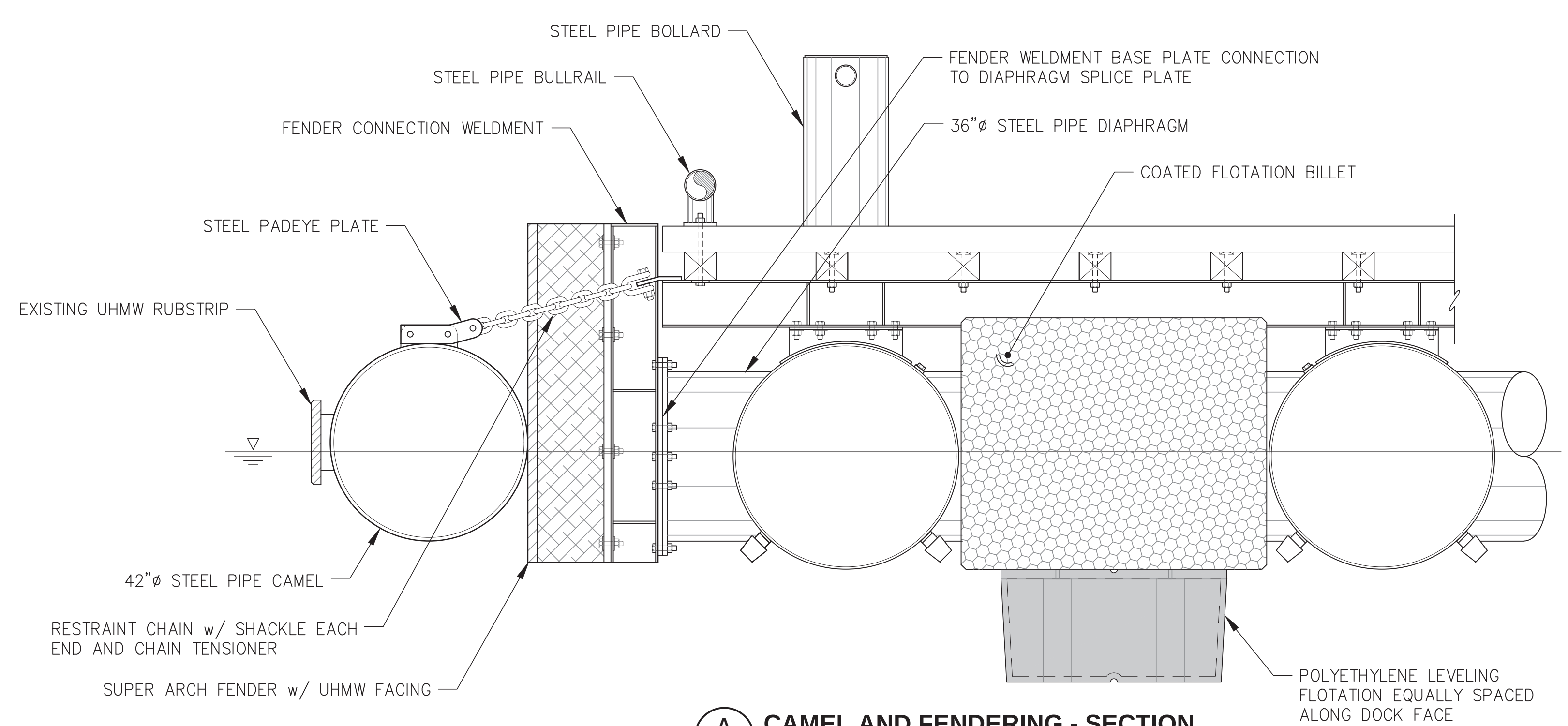

A - CAMEL AND FENDERING - SECTION

Ahtna Infrastructure & Technologies, LLC

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60% DESIGN SUBMITTAL

DATE: AUGUST 11, 2021

NOAA FAIRWEATHER HOMEPORT RECAPITALIZATION PROJECT

SHEET TITLE:
CAMEL AND FENDER DETAILS

PND PROJECT NO.: 202101
C.A.N. NO.: AECC250

S5.02

Appendix B: Underwater Noise Technical Memorandum

AECOM

Underwater Noise Technical Memo for Installation/Removal of Piles, Proposed Ketchikan Port Facility Recapitalization Project (Ketchikan, AK)

Prepared for:
Ahtna Engineering Services, LLC
110 West 38th Avenue, Suite 200A
Anchorage, AK 99503

Prepared by:
AECOM

Project No. 60640505 - NOAA OMAO Ketchikan EA 2020

July 2021 (updated October 21, 2021)

TABLE OF CONTENTS

TABLES

ACRONYMS AND ABBREVIATIONS

dB	decibel
dBA	A-weighted decibels
DON	Department of the Navy
DTH	down the hole
EEZ	Exclusive Economic Zone
FHWG	Fisheries Hydroacoustic Working Group
FTA	Federal Transit Administration
Hz	hertz
kHz	kilohertz
NOAA	National Oceanic and Atmospheric Administration
PTS	Permanent Threshold Shifts
rms	root mean square
SEL	Sound Exposure Level
SPL	Sound Pressure Level
μPa	micro Pascal

1. INTRODUCTION

This technical memorandum presents the results of modeling for underwater noise that would be generated from pile removal and pile driving during the construction of the proposed action, and which could affect fish species and marine mammals nearby. The proposed action involves the demolition of derelict structures and the construction of a dedicated pier and shore facilities to support the berthing of the NOAA Ship *Fairweather* on a long-term basis, including the addition of a small boat ramp. One-hundred to 200 14-inch diameter timber piles would be removed under the proposed project. The piles would be removed from the bedrock using a vibratory pile driver, assuming two minutes operation to loosen the pile by vibratory hammer and lift by a crane. Eighteen 24-inch-diameter steel pipe piles would be installed under the proposed project. The piles would be inserted into the bedrock at a depth of up to 20 feet. The piles would be placed into the bedrock using the down the hole (DTH) rock socket drilling method. Impact pile driving would be used to proof the last 12 inches of each pile. All three pile driving methods (DTH rock socket drilling, vibratory and impact pile driving) are assessed and the results are provided individually in this report.

Impact pile driving includes a piston system with weights that are usually raised by a power source (e.g., diesel, hydraulic, or steam) then dropped onto the pile, hammering the pile into the ground. The noise produced during impact pile driving is impulsive and with high intensity. Potential impacts to fish species as a result of impact pile driving are described below. However, a vibratory driver works by inducing particle motion to the substrate immediately below and around the pile, causing liquefaction and allowing the pile to sink downward (for this reason, vibratory pile driving is suitable only where soft substrates are present). The noise produced during vibratory driving is lower in intensity and can be considered continuous in comparison to the impulsive noise produced during impact pile driving. The DTH system uses a combination of vibratory and impact movements and are now considered to be both impulsive (from the hammer action) and non-impulsive (from the rotary action). Different source levels were used for each component. Rock sockets would be drilled and the piles would be set in the sockets and the piles would be mostly installed using this system. Potential impacts to marine mammal and fish species as a result of the pile driving are described below.

2. FUNDAMENTALS OF UNDERWATER NOISE

Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a liquid (e.g., water) or gaseous medium (e.g., air). Noise is generally defined as unwanted sound (i.e., loud, unexpected, or annoying sound). Acoustics is defined as the physics of sound. In acoustics, the fundamental scientific model consists of a sound (or noise) source, a receiver, and the propagation path between the two. The loudness of the noise source and obstructions or atmospheric factors affecting the propagation path to the receiver determines the sound level and characteristics of the noise perceived by the receiver. Sound typically is described by pitch and loudness. Pitch is the height or depth of a tone or sound, depending on the relative rapidity (frequency) of the vibrations by which it is produced. Loudness is the intensity of sound waves combined with the reception characteristics of the auditory system. Intensity may be compared with the height of an ocean wave because it is a measure of the amplitude of the sound wave. Acoustics addresses primarily the propagation and control of sound.

In addition to the concepts of pitch and loudness, several noise measurement scales are used to describe a sound. A dB is a unit of measurement describing the amplitude of sound; a dB is equal to 20 times the logarithm to base 10 of the ratio of the pressure of the sound measured to the reference pressure. For underwater sounds, a reference pressure of 1 micro pascal (µPa) commonly is used to describe sounds in terms of decibels. Therefore, 0 dB on the decibel scale would be a measure of a sound pressure of 1 µPa. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 decibels represents a ten-

fold increase in acoustic energy, while 20 decibels is 100 times more intense, and 30 decibels is 1,000 times more intense.

The number of sound pressure peaks traveling past a given point in a single second is referred to as the frequency, expressed in cycles per second or Hertz (Hz). The amplitude of pressure waves generated by a sound source determines the perceived loudness of that source. Sound pressure amplitude is measured in micro-Pascals (μPa). One μPa is approximately one hundred billionths (0.00000000001) of normal atmospheric pressure. Sound pressure amplitudes for different kinds of noise environments can range from less than 100 μPa to 100,000,000 μPa. Because of this huge range of values, sound is rarely expressed in terms of pressure. Instead, a logarithmic scale is used to describe the sound pressure level (SPL) in terms of decibels (dB). Sound intensity for underwater applications is typically expressed in dB referenced to 1 micro Pascal (μPa).

When a pile-driving hammer strikes a pile, a pulse is created that propagates through the pile and radiates sound into the water, the ground substrate, and the air. Sound pressure pulse as a function of time is referred to as the waveform. In terms of acoustics, these sounds are described by the peak pressure, the RMS, and the sound exposure level (SEL).

The peak pressure is the highest absolute value of the measured waveform and can be a negative or positive pressure peak. For pile-driving pulses, the root mean square (RMS) level is determined by analyzing the waveform and computing the average of the squared pressures over the time that makes up that portion of the waveform containing the vast majority of the sound energy (Richardson et al. 1995). The pulse RMS has been approximated in the field for pile-driving sounds, by measuring the signal with a precision sound level meter, set to the "impulse" RMS setting, and typically is used to assess effects on marine mammals. SEL is an acoustic metric that provides an indication of the amount of acoustical energy contained in a sound event. For pile driving, the typical event can be one pile-driving pulse or many pulses, such as pile driving for one pile or for one day of driving multiple piles. Typically, SEL is measured for a single strike and a cumulative condition.

Another measure of the pressure waveform that can be used to describe the pulse is the sound energy itself. The total sound energy in the pulse is referred to in many ways, such as the "total energy flux" (Finerran et al. 2002). The "total energy flux" is equivalent to the unweighted SEL for a plane wave propagating in a free field, a common unit of sound energy used in airborne acoustics to describe short-duration events, referred to as dB re 1μPa2-sec. Peak pressures and RMS sound pressure levels are expressed in dB re 1 μPa. The total sound energy in an impulse accumulates over the duration of that pulse. A common unit of total sound energy used in acoustics to describe short-duration events is the sound exposure level (SEL).

The cumulative SEL associated with the driving of a pile can be estimated using the single-strike SEL value and the number of pile strikes, using the following equation:

$$SEL_{CUMULATIVE} = SEL_{SINGLE\ STRIKE} + 10 \log (\#\ of\ pile\ strikes)$$

For example, if a single-strike SEL for a pile is 165 dB and it takes 1,000 strikes to drive the pile, the cumulative SEL is 195 dB (165 dB + 30 dB = 195 dB), where 10 * Log10 (1000) = 30.

Peak intensity, RMS, and SEL are used by resource agencies to assess the effects of underwater noise on fish.

3. PROJECT AREA PROTECTED SPECIES

Protected species that have a potential to occur in the project area and be affected by underwater noise that would be generated from pile removal and pile driving during the construction of the proposed action include: ESA-listed humpback whale; MMPA-protected minke whale, gray whale, killer whale, Pacific

white-sided dolphin, harbor porpoise, Dall's porpoise, Steller sea lion, and harbor seal; and EFH-managed Alaska stocks of Pacific salmon and the groundfish Dover sole.

To more accurately reflect marine mammal hearing capabilities, marine mammals are divided into functional hearing groups based on measured or estimated functional hearing ranges. NOAA modified the functional hearing groups as follows in Table 1 (NOAA 2018):

Table 1: Summary of the Five Functional Hearing Groups of Marine Mammals

Functional Hearing Group	Estimated Auditory Bandwidth	Species or Taxonomic Groups	Species Potentially in the Activity Area
Low frequency cetaceans (Mysticetes–Baleen whales)	7 Hz to 25 kHz (best hearing is generally below 1000 Hz, higher frequencies result from humpback whales)	All baleen whales	Humpback whale, gray whale, minke whale
Middle frequency Cetaceans (Odontocetes)	150 Hz to 160 kHz (best hearing is from approximately 10 to 120 kHz)	Includes species in the following genera: *Lagenorhynchus,Orcinus, Physeter, Delphinapterus, Monodon, Ziphius, Berardius, Mesoplodon*	Killer whale, Pacific white-sided dolphins
High frequency cetaceans (Odontocetes)	200 Hz to 180 kHz (best hearing is from approximately 10 to 150kHz)	Includes species in the following genera: *Phocoena, Phocoenoides*	Harbor porpoise, Dall's porpoise
Phocid pinnipeds (true seals)	75 Hz to 100 kHz (best hearing is from approximately 1 to 30 kHz)	All seals	Harbor seal
Otariid pinnipeds (sea lions and fur seals)	100 Hz to 48 kHz (best hearing is from approximately 1 to 16 kHz)	All fur seals and sea lions	Steller sea lion

Notes:
Hz = hertz
kHz = kilohertz
Source: Southall et al. 2007 and NOAA 2018

3.1 Humpback Whales

Acoustics and hearing: Humpback whales are known to produce three classes of vocalizations: 1) "songs" in the late fall, winter, and spring by solitary males; 2) sounds made within groups on the wintering (calving) grounds; and 3) social sounds made on the feeding grounds (Richardson et al. 1995). The main energy of humpback whale songs lies between 0.2 and 3.0 kHz, with frequency peaks at 4.7 kHz. Feeding calls, unlike song and social sounds, are highly stereotyped series of narrow-band trumpeting calls. They are 20 Hz to 2 kHz, less than 1 sec in duration, and have source levels of 175 to 192 dB re 1 μPa-m. The fundamental frequency of feeding calls is approximately 500 Hz (summarized in DON 2008b, and citations therein). Thus, humpback whales are in the low-frequency functional hearing group, with an estimated auditory bandwidth of 7 Hz to 22 kHz (Southall et al. 2007). Their vocal repertoire ranges from 20 Hz to greater than 10 kHz (DON 2008a) (Table 1).

3.2 Steller Sea Lions

Acoustics and hearing: Steller sea lions have similar hearing thresholds in-air and underwater to other otariids. Hearing in air ranges from 0.250–30 kHz, with a region of best hearing sensitivity from 5–14.1 kHz (Muslow and Reichmuth 2010). The underwater audiogram shows the typical mammalian U-shape.

The range of best hearing was from 1 to 16 kHz. Higher hearing thresholds, indicating poorer sensitivity, were observed for signals below 16 kHz and above 25 kHz (Kastelein et al. 2005). Like other otariids, Steller sea lions have an estimated auditory bandwidth of 100 Hz to 40 kHz (Southall et al. 2007, NOAA 2013). Vocalizations range from <4 to 120 kHz (DON 2008a) (Table 1).

3.3 Harbor Seals

Acoustics and hearing: Harbor seals are assigned to functional hearing group that includes phocid pinnipeds, or true seals, with an estimated auditory bandwidth of 75 Hz to 100 kHz (Southall et al. 2007, NOAA 2013). Vocalizations range from 25 Hz to 4 kHz (DON 2008a) (Table 1).

3.4 Killer Whales

Acoustics and hearing: Killer whales, like most cetaceans, are highly vocal and use sound for social communication and to find and capture prey. The sounds include a variety of clicks, whistles, and pulsed calls (Ford 2009). As summarized in DON (2008b, and citations therein), the peak to peak source levels of echolocation signals range between 195 and 224 dB re 1 µPa-m. The source level of social vocalizations ranges between 137 to 157 dB re 1 µPa-m. Acoustic studies of resident killer whales in British Columbia have found that there are dialects, in their highly stereotyped, repetitive discrete calls, which are group-specific and shared by all group members (Ford 2009). These dialects likely are used to maintain group identity and cohesion and may serve as indicators of relatedness that help in the avoidance of inbreeding between closely related whales (Ford 2009). The killer whale has the lowest frequency of maximum sensitivity and one of the lowest high frequency hearing limits known among toothed whales. The upper limit of hearing is 100 kHz for this species.

In contrast to resident whales, transient killer whales appear to use passive listening as a primary means of locating prey, call less often, and use high-amplitude vocalizations only when socializing, communicating over long distances, or after a successful attack. This probably results from the ability of other marine mammal species (their prey) to “eavesdrop” on killer whale sounds (DON 2008b).

3.5 Dall’s Porpoise

Acoustics and hearing: Only short duration pulsed sounds have been recorded for Dall’s porpoise; this species apparently does not whistle often (Richardson et al. 1995). Dall’s porpoises produce short-duration (50 to 1,500 µs), high-frequency, narrow band clicks, with peak energies between 120 and 160 kHz. There are no published data on hearing ability of this species (DON 2008b).

3.6 Harbor Porpoise

Acoustics and hearing: The harbor porpoise has the highest upper-frequency limit of all odontocetes investigated. Kastelein et al. (2002) found that the range of best hearing was from 16 to 140 kHz, with a reduced sensitivity around 64 kHz. Maximum sensitivity (about 33 dB re 1 µPa) occurred between 100 and 140 kHz. This maximum sensitivity range corresponds with the peak frequency of echolocation pulses produced by harbor porpoises (120–130 kHz). Harbor porpoises are in the high-frequency functional hearing group, whose estimated auditory bandwidth is 200 Hz to 180 kHz (Southall et al. 2007). Their vocalizations range from 110 to 150 kHz (DON 2008a) (Table 1).

3.7 Gray Whale

Acoustics and hearing: As summarized in Jones and Swartz (2009) and DON (2008b, and references therein), gray whales produce broadband signals ranging from 100 Hz to 4 kHz (and up to 12 kHz). The most common sounds on the breeding and feeding grounds are knocks which are broadband pulses from about 100 Hz to 2 kHz and most energy at 327 to 825 Hz (Richardson et al. 1995). The source level for knocks is approximately 142 dB re 1 µPa-m. During migration, individuals most often produce low-frequency moans. The structure of the gray whale ear is evolved for low-frequency hearing. Gray whale responses to noise include changes in swimming speed and direction to move away from the sound source; abrupt behavioral changes from feeding to avoidance, with a resumption of feeding after exposure; changes in calling rates and call structure; and changes in surface behavior, usually from traveling to milling.

3.8 Pacific White-Sided Dolphin

Acoustics and hearing: The Pacific white sided dolphin belong under the Mid-frequency Cetacean hearing group, which includes all dolphins (NMFS 2018). The dolphin has a U-shaped audiometric curve. similar to other mammals with best sensitivities from 2 kHz to 128 kHz. Low-frequency noise can interrupt their normal behavior by potentially hindering their ability to use sound, which the species relies on to communicate, mate, forage, avoid predators, and navigate (NMFS 2021).

3.9 Fish

There are no ESA-listed fish species occurring in the project area. Five species of Pacific salmon, pink (*Oncorhynchus gorbuscha*), chum *(O. keta*), sockeye (*O. nerka*), coho (*O. kisutch*), and Chinook salmon (*O. tshawytscha*), occur within the project area. The bays and coves of the area provide a protected habitat for Dungeness crabs (*Cancer magister*), Red king crab (*Paralithodes camtschaticus*), and tanner crab (*Chionoecetes bairdi*). Other invertebrates found in the area include shrimp, abalone, and shellfish species including geoduck clams (*Panopea generosa*).

Essential Fish Habitat (EFH) for species occurring within the project area includes Alaska stocks of Pacific salmon, and the ground fish Dover Sole (Table 2). Additional information on EFH can be found at: https://alaskafisheries.noaa.gov/habitat/efh.

Table 2: EFH in the Project Area

Species	Life stages	Habitat Description
Chinook Salmon	Marine juveniles, marine immature and maturing adults	Marine juveniles: Marine juveniles: all marine waters off the coast of Alaska from the mean higher tide line to the 200-nm limit of the U.SEEZ, including the Gulf of Alaska. Marine immature and maturing adults: marine waters off the coast of Alaska to depths of 200 m and ranging from the mean higher tide line to the 200-nm limit of the EEZ, including the Gulf of Alaska.
Chum Salmon	Marine juveniles, marine immature and maturing adults	Marine juveniles: all marine waters off the coast of Alaska to approximately 50 m in depth from the mean higher tide line to the 200-nm limit of the EEZ, including the Gulf of Alaska. Marine immature and maturing adults: Same as Chinook salmon
Coho Salmon	Marine juveniles, marine immature and maturing adults	Marine juveniles: same as Chinook salmon. Marine immature and maturing adults: same as Chinook salmon.
Dover Sole	Late juveniles, adults	Late juveniles: lower portion of the water column along the middle (50 to 100 m), and outer (100 to 200 m) shelf and upper slope (200 to 500 m)

Table 2: EFH in the Project Area

Species	Life stages	Habitat Description
		throughout the Gulf of Alaska wherever there are substrates consisting of sand and mud. Adults: same as above late juveniles.
Pink Salmon	Marine juveniles, marine immature and maturing adults	Marine juveniles: same as Chinook salmon. Marine immature and maturing adults: same as Chinook salmon
Sockeye Salmon	Marine juveniles, marine immature and maturing adults	Marine juveniles: same as chum salmon Marine immature and maturing adults: same as Chinook salmon

Notes:
EEZ = Exclusive Economic Zone
m = meter(s)
nm = nautical mile(s)
Source: NPFMC 2012; 2015

4. APPLICABLE NOISE CRITERIA

NOAA issued Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (NOAA 2018). NOAA has compiled, interpreted, and synthesized the best available science, including a recent Navy Technical Report (Finneran 2015), to produce updated acoustic threshold levels for the onset Permanent Threshold Shifts (PTS) and replace those currently in use by NOAA for determining PTS. Updates include a protocol for estimating PTS onset threshold levels for impulsive (e.g., airguns, impact pile drivers) and non-impulsive (e.g., sonar, vibratory pile drivers) sound sources, the formation of marine mammal functional hearing groups (low-, mid-, and high-frequency cetaceans, and otariid and phocid pinnipeds), and the incorporation of marine mammal auditory weighting functions into the calculation of PTS threshold levels. These acoustic threshold levels are presented using dual metrics of cumulative sound exposure level and peak sound pressure level.

The underwater acoustic threshold levels for onset of PTS are provided in Table 3. Dual metrics of SEL_{cum} and peak sound pressure level have been recommended as most appropriate for establishing PTS onset acoustic threshold levels for marine mammals (NOAA 2018).

Table 3: Summary of PTS onset dual metric acoustic threshold levels*

Hearing Group	PTS Onset Threshold Levels (Received Level)	
	Impulsive	Non-impulsive
Low-Frequency (LF) Cetaceans	219 dBpeak & 183 dB SELcum	199 dB SELcum
Mid-Frequency (MF) Cetaceans	230 dBpeak & 185 dB SELcum	198 dB SELcum
High-Frequency (HF) Cetaceans	202 dBpeak & 155 dB SELcum	173 dB SELcum
Phocid Pinnipeds (Underwater) (PW)	218 dBpeak & 185 dB SELcum	201 dB SELcum
Otariid Pinnipeds (Underwater) (OW)	232 dBpeak & 203 dB SELcum	219 dB SELcum

Notes:
> = greater than; dB = decibel; SEL = sound exposure level; SPL = sound pressure level.
* Dual metric acoustic threshold levels: Use whichever level [dBpeak or dB SELcum] exceeded first. All SELcum acoustic threshold levels (re: 1 µPa2-s) incorporate marine mammal auditory weighting functions, while peak pressure thresholds should not be weighted. Note: Acoustic threshold levels for impulsive or non-impulsive sources are based on temporal characteristics at the source and not the receiver.
The SELcum could be exceeded in multitude of ways (i.e., varying exposure levels and durations, duty cycle). It is valuable for action proponents, if possible, to indicate under what conditions these acoustic threshold levels will be exceeded.
Note: In this Table, dB peak, is equivalent to the ANSI abbreviation of Lpk and SELcum is equivalent to the ANSI abbreviation of LE (ANSI 2013).
Source: NOAA 2018. https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance.

NMFS assumes animals will be behaviorally disturbed (Level B harassment) by impulsive sounds (like impact hammer pile driving) with SPL above 160 dB re 1 µPa and by continuous sounds (like vibropiling and drilling) above 120 dB re 1 µPa. The sound level from vibratory pile driving at any point in time is lower than that generated by impact pile driving, but the exposure is continuous. Therefore, the threshold for Level B harassment—SPL 120 dB instead of 160 dB—is set lower than that for impulses. Due to the 40 dB difference between the two thresholds, behavioral disturbances from vibratory pile driving could occur at much greater distances than from impact driving.

Also, in June 2008, the Fisheries Hydroacoustic Working Group (FHWG) — whose members include the Southwest and Northwest Divisions of the NMFS; the California, Washington, and Oregon Departments of Transportation; the CDFW; and the U.S. Federal Highway Administration — issued interim threshold criteria, based on the best available science, for the onset of injury to fish from pile driving noise (FHWG 2008). This is a dual criterion including an SPL of 206 dB (peak) and a cumulative SEL of 187 dB for fish 2 grams and heavier or a cumulative SEL of 183 dB for fish smaller than 2 grams (Table 4). The FHWG has determined that noise at or above the 206 dB (peak) SPL can cause barotrauma to auditory tissues, the swim bladder, or other sensitive organs. Noise levels above the accumulated SEL may cause temporary hearing-threshold shifts in fish. Behavioral effects are not covered under these criteria but could occur at these levels or lower. Behavioral effects may include fleeing the area and the temporary cessation of feeding or spawning behaviors.

Table 4: Interim Threshold Criteria for the Onset of Injury in Fish

Fish Size	Peak Noise (SPL) (dB)	Accumulated Noise (SEL) (dB)
Less than 2 grams	>206	>183
Greater than or equal to 2 grams	>206	>187

Notes: > = greater than; dB = decibel; SEL = sound exposure level; SPL = sound pressure level.
Source: Fisheries Hydroacoustic Working Group (FHWG) 2008.

5. ESTIMATION OF PILE DRIVING NOISE

Pile driving would be mostly conducted using down the hole (DTH) rock socket drilling and impact pile driving would be used to install the last foot of the piles. DTH rock socket drilling would be used for longer periods (i.e., to drive all but the last foot of the pile into the substrate) than the impact pile driving (which would only be used to proof the last 12 inches of each pile). A vibratory pile driver would also be used to remove existing timber piles. Therefore, three scenarios (vibratory pile driving, impact pile driving, and down the hole (DTH) rock socket drilling) were evaluated in this report.

To estimate underwater noise levels from pile removing activities, measurements from the Caltrans Guidance for Hydroacoustic Analysis (Caltrans 2020 Table I.2-1) were used for similar piles, and underwater pile driving conducted under similar circumstances (i.e., similar water depths in areas of similar substrate) was reviewed for source-level data at 10 meters. Reference level for DTH rock socket drilling was provided by NOAA (Dwayne Meadows, 2021). For installing the last foot of the pile using impact pile driving, reference noise levels from the Alaska DOT Hydroacoustic Pile Driving Noise Study (Denes et. al. 2016) were used.

Rock sockets would be drilled and the piles would be set in the sockets. This would occur over a duration of up to 45 minutes. The vibratory hammer would be used for pile removal and for up to two minutes per pile. The number of strikes for DTH pile driving was provided based on the length of 10 to 20 feet driven into bedrock, and conservatively assuming approximately four strikes/second for each inch of the pile to be driven. The number of strikes for impact hammer was, therefore, assumed to be approximately 50 in order to proof the last 12 inches of each pile. These analyses assumed that fish and marine mammals would be stationary during pile driving (i.e., would not relocate away from the source) and that all pile strikes would

produce noise at the maximum peak SPL and SEL. Therefore, these calculations provided in Table 5 (based on Mean Reference Levels) and Table 6 (based on 90th percentile Reference Levels), represent the worst-case scenario for accumulated sound effects over a 24-hour period. User spreadsheets for noise calculations are provided in Attachment A.

Table 5: Expected Pile Driving Noise Levels and Distances of Criteria Level Exceedance Based on Mean Reference Levels

Input Data														Fish					Marine Mammals									
															Onset of Physical Injury Threshold			Fish Behavior Threshold	Underwater							Air		
Pile Driving/ Removal Method	Pile Size (inches)	Max. Quantity	Piles Per Day	Water Depth (m)	Distance from Pile (meter)	Transmission Loss Constant (F Value)	Attenuation	Reference Levels, dB			Pile Depth below substrate		Number of Strikes (Impact) or Seconds (Vibratory) per Pile	SEL Accumulated, dB	Peak	Cumulative SEL dB**			Hearing Group ->	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds	Behavioral Harassment	Injury	Behavior	
								Mean							dB	Fish ≥ 2 g	Fish < 2 g	dB	SELcumulative Threshold, dB ->	183	185	155	185	203			Harbor Seal	Seal Lions
															206	187	183	150	Peak Threshold, dB ->	219	230	202	218	232	160	120	90	100
								Peak	SEL	RMS	(ft)	Inches			Distance to threshold (meters)				Level A Distance to threshold (meters)						Level B Distance	Distance (m) to Air Noise Threshold		
Impact[1]	24	18	1.5	3 to 5	10	15	0	208.6	180.7	194.7	1	12	48	199	15	66	122	9,550	SELc ->	121	4	145	65	5	2,057	2	54	17
																			Peak ->	2	NA	28	2	NA				
DTH[1]	24	18	1.5	3 to 5	10	15	0	179.0	154.0	164.0	20	240	25,000	200	0	18	18	86	SELc ->	130	5	155	70	5	NA	1	38	12
																			Peak ->	NA	NA	NA	NA	NA				
																			Level A Distance to threshold (meters)						Level B Distance	Distance (m) to Air Noise Threshold		
																			Threshold ->	199	198	173	201	219	120	120	90	100
DTH Vibratory[1]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	SELc ->	NA	NA	NA	NA	NA	11,659	NA	NA	NA
Timber Piles Vibratory Removal[2]	14	200	10	3 to 5	10	15	0	184.0	145.0	157.0	50	600	120	176	0	2	3	29	SELc ->	2	0	3	1	0	2,929	1	27	9

Sources: NOAA E-mails 2021, Denes 2016, Caltrans 2015
[1]Pontoon Restraint, Transfer Bridge Support, Moorage Float
[2]Trestle
.

Table 6: Expected Pile Driving Noise Levels and Distances of Criteria Level Exceedance Based on 90th Percentile Reference Levels

Input Data														Fish					Marine Mammals									
															Onset of Physical Injury				Underwater							Air		
Pile Driving/ Removal Method	Pile Size (inches)	Max. Quantity	Piles Per Day	Water Depth (m)	Distance from Pile (meter)	Transmission Loss Constant (F Value)	Attenuation	Reference Levels, dB			Pile Depth below substrate		Number of Strikes (Impact) or Seconds (Vibratory) per Pile	SEL Accumulated, dB	Peak	Cumulative SEL dB**		Fish Behavior	Hearing Group ->	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds	Behavioral Harassment	Injury	Behavior	
								90th Percentile							dB	Fish ≥ 2 g	Fish < 2 g	dB	SELcumulative Threshold	183	185	155	185	203			Harbor Seal	Seal Lions
															206	187	183	150	Peak Threshold ->	219	230	202	218	232	160	120	90	100
								Peak	SEL	RMS	(ft)	Inches			Distance to threshold (meters)				Level A Distance to threshold (meters)						Level B Distance	Distance (m) to Air Noise Threshold		
Impact[1]	24	18	1.5	3 to 5	10	15	0	211.2	183.2	197.0	1	12	48	201	18	82	151	12,023	SELc ->	151	5	179	81	6	2,590	2	54	17
																			Peak ->	2	NA	33	3	NA				
DTH[1]	24	18	1.5	3 to 5	10	15	0	179.0	154.0	164.0	20	240	25,000	200	0	18	18	86	SELc ->	130	5	155	70	5	NA	1	38	12
																			Peak ->	NA	NA	NA	NA	NA				
																			Level A Distance to threshold (meters)						Level B Distance	Distance (m) to Air Noise Threshold		
																			Threshold ->	199	198	173	201	219	120	120	90	100
DTH[1]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	SELc ->	NA	NA	NA	NA	NA	11,659	NA	NA	NA
Timber Piles Vibratory Removal[2]	14	50	10	3 to 5	10	12	0	184.0	145.0	157.0	50	600	120	176	0	2	3	29	SELc ->	2	0	3	1	0	2,929	1	27	9

Sources: NOAA E-mails 2021, Denes 2016, Caltrans 2015.
[1]Pontoon Restraint, Transfer Bridge Support, Moorage Float
[2]Trestle

6. POTENTIAL EFFECTS OF PILE DRIVING NOISE ON MARINE MAMMALS AND FISH

Sound and acoustic pressure resulting from pile driving could affect special-status species listed above by causing behavioral avoidance of the construction area and/or injury. This would apply to both fish species and marine mammal species listed and described above.

6.1.1 Impact Pile Driving (Last 1-Foot Portion of the Pile)

With respect to fish, the 206 dB (peak) SPL noise criteria for injury to fish would not be exceeded by project activities beyond 18 meters (59 feet). The 187 dB and 183 dB cumulative SEL criteria for fish smaller than 2 grams would be exceeded up to 82 meters or 269 feet; and for fish greater than or equal to 2 grams would be exceeded up to 151 meters or 496 feet, as provided in Table 6. Similarly, with respect to marine mammals, the cumulative SELs of 183 dB, 185 dB, 155 dB, 185 dB, and 203 dB criteria for various types of marine mammals listed above, would be exceeded up to 179 meters or 588 feet, as provided in Table 6. Behavioral impact distance would reach up to 12,023 meters or 39,444 feet for fish species, and up to 2,590 meters or 8,498 feet for marine. Air noise impact distance due to pile driving to harbor seal species would reach up to 2 meters (6.6 feet) to injury threshold (Table 6), and up to 54 meters (177 feet) to behavioral impact threshold.

Implementing mitigation measures described below (MM BIO: Underwater Noise Mitigation Measures due to Pile Driving) would reduce the pile driving underwater noise impact distance. The cessation of pile driving at the end of each workday would allow cumulative noise levels to reset before driving continues the following day.

6.1.2 Rock Socket Drilling with Installing the Pile Using Impact Pile Driving Thresholds

With respect to fish, the 206 dB (peak) SPL noise criteria for injury to fish would not be exceeded beyond one meter (3.3 feet) by Project activities. The 187 dB and 183 dB cumulative SEL criteria for fish smaller than 2 grams and for fish greater than or equal to 2 grams would be exceeded, up to 18 meters or 61 feet, as shown in Table 6. Similarly, with respect to marine mammals, the cumulative SELs of 183 dB, 185 dB, 155 dB, 185 dB, and 203 dB criteria for various types of marine mammals listed above would be exceeded up to 155 meters or 509 feet, as provided in Table 6. Similarly, behavioral impact distance would reach up to 86 meters or 281 feet for fish species, and up to 11,659 meters or 152,284 feet for marine mammals during pile driving. Air noise impact distance due to pile driving to harbor seal species, as provided in Table 6, would reach up to 1 meter (3.3 feet) to injury threshold, and up to 38 meters (125 feet) to behavioral impact threshold.

Implementing mitigation measures described below (MM BIO: Underwater Noise Mitigation Measures due to Pile Driving) would enable agreed upon impact distances to remain static and would reduce the pile driving underwater noise impact distance, when necessary. The cessation of pile driving at the end of each workday would allow cumulative noise levels to reset before driving continues the following day.

6.1.3 Pile Removal

With respect to pile removal, as shown in Tables 5 and 6, the 206 dB (peak) SPL noise criteria for injury to fish would not be exceeded beyond 1 meter (3.3 feet). The 187 dB and 183 dB cumulative SEL criteria for fish smaller than 2 grams and for fish greater than or equal to 2 grams would be exceeded, up to three meters or 10 feet. The cumulative SELs of 183 dB, 185 dB, 155 dB, 185 dB, and 203 dB criteria for various

types of marine mammals listed above, would be exceeded up to three meters or 10 feet. Similarly, behavioral impact distance would reach up to 29 meters or 96 feet for fish species, and up to 2,929 meters or 9,608 feet for marine mammals. Air noise impact distance due to pile driving to harbor seal species, as shown in Table 6, would reach up to 1 meter (3.3 feet) to injury threshold, and up to 27 meters (89 feet) to behavioral impact threshold.

Implementing mitigation measures described below (MM BIO: Underwater Noise Mitigation Measures due to Pile Driving) would enable agreed upon impact distances to remain static and would reduce the pile driving underwater noise impact distance, when necessary. The cessation of pile driving at the end of each workday would allow cumulative noise levels to reset before driving continues the following day.

7. MM BIO: UNDERWATER NOISE MITIGATION MEASURES DUE TO PILE DRIVING

Depending on the rate at which the piles are installed and removed, pile driving is expected to occur for at least 33 days (assuming one pile per day, a total of 14 piles to be installed and 10 piles per day removed, with a total of 50 piles to be removed) during the construction period. In areas where the SEL threshold would be exceeded, fish and marine mammals could experience temporary shifts in hearing thresholds and behavioral effects. These behavioral effects could result in the temporary cessation of feeding or movement out of the area during active pile driving. Following the cessation of pile driving, fish are expected to resume use of the area. Because of the shallow water depths in the vicinity (approximately 20 feet or less), attenuation rates likely would be higher than modeled in this analysis, which would decrease the affected area. To ensure that potential impacts to special-status fish species and marine mammals would be avoided or mitigated to less than significant, the following MM would be implemented to allow fish species and marine mammals to move away from the area before full power pile driving commences:

- Bio-observers will monitor some the impacted zones to ensure a shutdown can be prepared for when observers see a species get close. For non-ESA species the shutdown zone is set at the Level A isopleth distance rounded up to the next largest 10m. For ESA species to have zero take the shutdown would need to be at the full extent of the Level B isopleths. The observers also help to count the take that is occurring. The observers also gather data that meets the other monitoring requirements under the MMPA that are distinct from mitigation.
- Hydroacoustic monitoring will be conducted to determine the extent at which certain thresholds would be met, and to alert responsible parties of the need to further mitigate underwater noise.

Should reductions in noise levels below thresholds not be sustained, NOAA would implement the following noise attenuation method in order to sustain project-related noise below threshold levels:

- A soft start for impact drivers requires contractors to provide an initial set of strikes at reduced energy followed by a 30-second waiting period; this procedure is then repeated two additional times. A soft start would be implemented before pile driving begins each day and any time following the cessation of pile driving for a period of 30 minutes or longer.

8. STATEMENT OF LIMITATIONS

This technical report is for the sole use and benefit of AECOM, Ahtna Engineering Services, LLC, NOAA and their authorized representatives. The scope of services performed in execution of this effort may not be appropriate to satisfy the needs of other users, and any use or reuse of this document or the findings, conclusions, or recommendations presented herein is at the sole risk of said user. No expressed or implied representation or warranty is included or intended in this document except that the work was performed with the customary thoroughness and competence of professionals working in the same area on similar projects.

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ATTACHMENT A: USER SPREADSHEETS

90th Percentile - Reference Level

Project Title	Ketchikan
Pile information (size, type, number, pile strikes, etc.)	Impact (Pontoon Restraint)

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric				
	Peak	SEL	RMS	Effective Quiet	
Measured single strike level (dB)	**210**	**182**	**196**	**150**	101
Distance (m)	**10**	**10**	**10**		15.24
					20

Estimated number of strikes	**72**

Cumulative SEL at measured distance
201

	Distance (m) to threshold							
	Onset of Physical Injury			Behavior	**Behavioral Harassment**	**Injury**	**Behavior, in Air, dB**	
	Peak	Cumulative SEL dB**		RMS			**Harbor Seal**	**Seal Lions**
	dB	Fish ≥ 2 g	Fish < 2 g	dB				
Transmission loss constant (15 if unknown)	206	187	183	150	160	120	90	100
15	**18**	**82**	**151**	**12023**	**2590**	**2**	**54**	**17**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

90th Percentile - Reference Level

Project Title	Ketchikan
Pile information (size, type, number, pile strikes, etc.)	Impact (Transfer Bridge)

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric				
	Peak	SEL	RMS	Effective Quiet	
Measured single strike level (dB)	**210**	**182**	**196**	**150**	101
Distance (m)	**10**	**10**	**10**		15.24
					20

Estimated number of strikes	**72**

Cumulative SEL at measured distance
201

	Distance (m) to threshold							
	Onset of Physical Injury			Behavior	Behavioral Harassment	Injury	Behavior, in Air, dB	
	Peak	Cumulative SEL dB**		RMS			Harbor Seal	Seal Lions
	dB	Fish ≥ 2 g	Fish < 2 g	dB				
Transmission loss constant (15 if unknown)	206	187	183	150	160	120	90	100
15	**18**	**82**	**151**	**12023**	**2590**	**2**	**54**	**17**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

90th Percentile - Reference Level

Project Title	Ketchikan
Pile information (size, type, number, pile strikes, etc.)	Impact (Moorage Float)

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**210**	**182**	**196**	**150**
Distance (m)	**10**	**10**	**10**	

101
15.24
20

Estimated number of strikes	**72**

Cumulative SEL at measured distance
201

	Distance (m) to threshold							
	Onset of Physical Injury			Behavior	Behavioral Harassment	Injury	Behavior, in Air, dB	
	Peak dB	Cumulative SEL dB** Fish ≥ 2 g	Cumulative SEL dB** Fish < 2 g	RMS dB			**Harbor Seal**	**Seal Lions**
Transmission loss constant (15 if unknown)	206	187	183	150	160	120	90	100
15	**18**	**82**	**151**	**12023**	**2590**	**2**	**54**	**17**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

90th Percentile - Reference Level

Project Title	Ketchikan
Pile information (size, type, number, pile strikes, etc.)	DTH (Pontoon Restraint)

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric				
	Peak	SEL	RMS	Effective Quiet	
Measured single strike level (dB)	**179**	**154**	**164**	**150**	98
Distance (m)	**10**	**10**	**10**		15.24
					20

Estimated number of strikes	**37500**

Cumulative SEL at measured distance
200

	Distance (m) to threshold							
	Onset of Physical Injury			Behavior	Behavioral Harassment	Injury	Behavior, in Air, dB	
	Peak	Cumulative SEL dB**		RMS			Harbor Seal	Seal Lions
	dB	Fish ≥ 2 g	Fish < 2 g	dB				
Transmission loss constant (15 if unknown)	206	187	183	150	160	120	90	100
15	**0**	**18**	**18**	**86**	**18**	**1**	**38**	**12**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

90th Percentile - Reference Level

Project Title	Ketchikan
Pile information (size, type, number, pile strikes, etc.)	DTH (Transfer Bridge)

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**179**	**154**	**164**	**150**
Distance (m)	**10**	**10**	**10**	

98
15.24
20

Estimated number of strikes	**37500**

Cumulative SEL at measured distance
200

	Distance (m) to threshold							
	Onset of Physical Injury			Behavior	Behavioral Harassment	Injury	**Behavior, in Air, dB**	
	Peak	Cumulative SEL dB**		RMS			**Harbor Seal**	**Seal Lions**
	dB	Fish ≥ 2 g	Fish < 2 g	dB				
Transmission loss constant (15 if unknown)	206	187	183	150	160	120	90	100
15	**0**	**18**	**18**	**86**	**18**	**1**	**38**	**12**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

90th Percentile - Reference Level

Project Title	Ketchikan
Pile information (size, type, number, pile strikes, etc.)	DTH (Moorage Float)

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**179**	**154**	**164**	**150**
Distance (m)	**10**	**10**	**10**	

98
15.24
20

Estimated number of strikes	**37500**

Cumulative SEL at measured distance
200

	Distance (m) to threshold							
	Onset of Physical Injury			Behavior	Behavioral Harassment	Injury	Behavior, in Air, dB	
	Peak dB	Cumulative SEL dB** Fish ≥ 2 g	Cumulative SEL dB** Fish < 2 g	RMS dB			Harbor Seal	Seal Lions
Transmission loss constant (15 if unknown)	206	187	183	150	160	120	90	100
15	**0**	**18**	**18**	**86**	**18**	**1**	**38**	**12**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

90th Percentile - Reference Level

Project Title	Ketchikan
Pile information (size, type, number, pile strikes, etc.)	DTH Vibratory (Pontoon Restraint)

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric				
	Peak	SEL	RMS	Effective Quiet	
Measured single strike level (dB)	**181**	**156**	**166**	**150**	95
Distance (m)	**10**	**10**	**10**		15.24
					20

Estimated number of strikes	**37500**

Cumulative SEL at measured distance
202

	Distance (m) to threshold							
	Onset of Physical Injury			Behavior	Behavioral Harassment	Injury	Behavior, in Air, dB	
	Peak	Cumulative SEL dB**		RMS			Harbor Seal	Seal Lions
	dB	Fish ≥ 2 g	Fish < 2 g	dB				
Transmission loss constant (15 if unknown)	206	187	183	150	120	120	90	100
15	**0**	**25**	**25**	**117**	**11659**	**1**	**27**	**9**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

90th Percentile - Reference Level

Project Title	Ketchikan
Pile information (size, type, number, pile strikes, etc.)	DTH Vibratory (Transfer Bridge)

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**181**	**156**	**166**	**150**
Distance (m)	**10**	**10**	**10**	

95
15.24
20

Estimated number of strikes	**37500**

Cumulative SEL at measured distance
202

	Distance (m) to threshold							
	Onset of Physical Injury			Behavior	Behavioral Harassment	Injury	**Behavior, in Air, dB**	
	Peak dB	Cumulative SEL dB**		RMS dB			**Harbor Seal**	**Seal Lions**
		Fish ≥ 2 g	Fish < 2 g					
Transmission loss constant (15 if unknown)	206	187	183	150	120	120	90	100
15	**0**	**25**	**25**	**117**	**11659**	**1**	**27**	**9**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

90th Percentile - Reference Level

Project Title	Ketchikan
Pile information (size, type, number, pile strikes, etc.)	DTH Vibratory (Moorage Float)

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric				
	Peak	SEL	RMS	Effective Quiet	
Measured single strike level (dB)	**181**	**156**	**166**	**150**	95
Distance (m)	**10**	**10**	**10**		15.24
					20

Estimated number of strikes	**37500**

Cumulative SEL at measured distance
202

	Distance (m) to threshold							
	Onset of Physical Injury			Behavior	**Behavioral Harassment**	**Injury**	**Behavior, in Air, dB**	
	Peak dB	Cumulative SEL dB**		RMS dB			**Harbor Seal**	**Seal Lions**
		Fish ≥ 2 g	Fish < 2 g					
Transmission loss constant (15 if unknown)	206	187	183	150	120	120	90	100
15	**0**	**25**	**25**	**117**	**11659**	**1**	**27**	**9**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

90th Percentile - Reference Level

Project Title	Ketchikan
Pile information (size, type, number, pile strikes, etc.)	Timber Piles Vibratory Removal (Trestle)

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**184**	**145**	**157**	**150**
Distance (m)	**10**	**10**	**10**	

95 Sonic Pile
15.24 Distance
20 Transmission Loss Constant

Estimated number of strikes	**1200**

Cumulative SEL at measured distance
176

	Distance (m) to threshold							
	Onset of Physical Injury			Behavior	Behavioral Harassment	Injury	Behavior, in Air, dB	
	Peak dB	Cumulative SEL dB**		RMS dB			Harbor Seal	Seal Lions
		Fish ≥ 2 g	Fish < 2 g					
Transmission loss constant (15 if unknown)	206	187	183	150	120	120	90	100
15	**0**	**2**	**3**	**29**	**2929**	**1**	**27**	**9**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

90th Percentile - Reference Level

A.1: Vibratory Pile Driving (STATIONARY SOURCE: Non-Impulsive, Continuous)

VERSION 2.2: 2020

KEY

(grey)	**Action Proponent Provided Information**
(orange)	**NMFS Provided Information (Technical Guidance)**
(blue)	**Resultant Isopleth**

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Ketchikan 2021
PROJECT/SOURCE INFORMATION	Timber piles (trestle)
Please include any assumptions	
PROJECT CONTACT	Project Manager

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)[¥]	2.5	

[¥] Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 48), and enter the new value directly However, they must provide additional support and documentation supporting this modification

90th Percentile - Reference Level

STEP 3: SOURCE-SPECIFIC INFORMATION

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B30)	157
Number of piles within 24-h period	10
Duration to drive a single pile (minutes)	2
Duration of Sound Production within 24-h period (seconds)	1200
10 Log (duration of sound production	30.79
Transmission loss coefficient	15
Distance of sound pressure level (L_{rms}) measurement (meters)	10

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	199	198	173	201	219
PTS Isopleth to threshold (meters)	**1.8**	**0.2**	**2.6**	**1.1**	**0.1**

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	**-0.05**	**-16.83**	**-23.50**	**-1.29**	**-0.60**

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

90th Percentile - Reference Level

E.1: IMPACT PILE DRIVING (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.2: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Ketchikan 2021
PROJECT/SOURCE INFORMATION	Impact (Transfer Bridge)
Please include any assumptions	
PROJECT CONTACT	Project Manager

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)¥	2	

¥ Broadband: 95% frequency contour percentile (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 73), and enter the new value directly However, they must provide additional support and documentation supporting this modificatior

STEP 3: SOURCE-SPECIFIC INFORMATION

NOTE: METHOD E.1-1 is PREFERRED method when SEL-based source levels are available (because pulse duration is not required). Only use method E.1-2 if SEL-based source levels are not available.

E.1-1: METHOD TO CALCULATE PK AND SEL_{cum} (SINGLE STRIKE EQUIVALENT) **PREFERRED METHOD (pulse duration not needed)**

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	**200.7**

SEL_{cum}

Single Strike SEL_{ss} ($L_{E,p,\ single\ strike}$) specified at "x" meters (Cell B32)	182
Number of strikes per pile	48
Number of piles per day	1.5
Transmission loss coefficient	15
Distance of single strike SEL_{ss} ($L_{E,p,\ single\ strike}$) measurement (meters)	10

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G29)	210
Distance of $L_{p,0\text{-}pk}$ measurement (meters)*	10
$L_{p,0\text{-}pk}$ Source level	224.8

90th Percentile - Reference Level

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	150.5	5.4	179.3	80.6	5.9
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	2.4	NA	33.1	2.8	NA

"NA": PK source level is < to the threshold for that marine mammal hearing group.

E.1-2: METHOD TO CALCULATE PK AND SEL_{cum} (USING RMS SPL SOURCE LEVEL)

SEL_{cum}

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B53)	
Number of piles per day	
Strike (pulse) Duration$^{\Delta}$ (seconds)	
Number of strikes per pile	
Duration of Sound Production (seconds)	0
10 Log (duration of sound production)	#NUM!
Transmission loss coefficient	
Distance of sound pressure level (L_{rms}) measurement (meters)	

$^{\Delta}$Window that makes up 90% of total cumulative energy (5%-95%) based on Madsen 2005

PK

$L_{p,0-pk}$ specified at "x" meters (Cell G47)	
Distance of $L_{p,0-pk}$ measurement (meters)*	
$L_{p,0-pk}$ Source level	#NUM!

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet too

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!

"NA": PK source level is < to the threshold for that marine mammal hearing group.

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	-0.01	-19.74	-26.87	-2.08	-1.15

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

E.1: IMPACT PILE DRIVING (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.2: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Ketchikan 2021
PROJECT/SOURCE INFORMATION	Impact (Transfer Bridge)
Please include any assumptions	
PROJECT CONTACT	Project Manager

STEP 2: WEIGHTING FACTOR ADJUSTMENT

Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value

Weighting Factor Adjustment (kHz)¥	2	

¥ Broadband: 95% frequency contour percentile (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 73), and enter the new value directly However, they must provide additional support and documentation supporting this modificatior

STEP 3: SOURCE-SPECIFIC INFORMATION

NOTE: METHOD E.1-1 is PREFERRED method when SEL-based source levels are available (because pulse duration is not required). Only use method E.1-2 if SEL-based source levels are not available.

E.1-1: METHOD TO CALCULATE PK AND SEL_{cum} (SINGLE STRIKE EQUIVALENT) **PREFERRED METHOD (pulse duration not needed)**

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	**200.7**

SEL_{cum}

Single Strike SEL_{ss} ($L_{E,p,\ single\ strike}$) specified at "x" meters (Cell B32)	182
Number of strikes per pile	48
Number of piles per day	1.5
Transmission loss coefficient	15
Distance of single strike SEL_{ss} ($L_{E,p,\ single\ strike}$) measurement (meters)	10

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G29)	210
Distance of $L_{p,0\text{-}pk}$ measurement (meters)*	10
$L_{p,0\text{-}pk}$ Source level	224.8

90th Percentile - Reference Level

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	150.5	5.4	179.3	80.6	5.9
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	2.4	NA	33.1	2.8	NA

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

E.1-2: METHOD TO CALCULATE PK AND SEL_{cum} (USING RMS SPL SOURCE LEVEL)

SEL_{cum}

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B53)	
Number of piles per day	
Strike (pulse) Duration[Δ] (seconds)	
Number of strikes per pile	
Duration of Sound Production (seconds)	0
10 Log (duration of sound production)	#NUM!
Transmission loss coefficient	
Distance of sound pressure level (L_{rms}) measurement (meters)	

[Δ]Window that makes up 90% of total cumulative energy (5%-95%) based on Madsen 2005

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G47)	
Distance of $L_{p,0\text{-}pk}$ measurement (meters)*	
$L_{p,0\text{-}pk}$ Source level	#NUM!

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring

requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet too

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	-0.01	-19.74	-26.87	-2.08	-1.15

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

90th Percentile - Reference Level

E.1: IMPACT PILE DRIVING (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.2: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Ketchikan 2021
PROJECT/SOURCE INFORMATION	Impact (Moorage Float)
Please include any assumptions	
PROJECT CONTACT	Project Manager

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)¥	2	

¥ Broadband: 95% frequency contour percentile (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 73), and enter the new value directly However, they must provide additional support and documentation supporting this modification

STEP 3: SOURCE-SPECIFIC INFORMATION

NOTE: METHOD E.1-1 is PREFERRED method when SEL-based source levels are available (because pulse duration is not required). Only use method E.1-2 if SEL-based source levels are not available.

E.1-1: METHOD TO CALCULATE PK AND SEL_{cum} (SINGLE STRIKE EQUIVALENT) **PREFERRED METHOD (pulse duration not needed)**

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	**200.7**

SEL_{cum}

Single Strike SEL_{ss} ($L_{E,p,\ single\ strike}$) specified at "x" meters (Cell B32)	182
Number of strikes per pile	48
Number of piles per day	1.5
Transmission loss coefficient	15
Distance of single strike SEL_{ss} ($L_{E,p,\ single\ strike}$) measurement (meters)	10

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G29)	210
Distance of $L_{p,0\text{-}pk}$ measurement (meters)*	10
$L_{p,0\text{-}pk}$ Source level	224.8

90th Percentile - Reference Level

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	150.5	5.4	179.3	80.6	5.9
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	2.4	NA	33.1	2.8	NA

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

E.1-2: METHOD TO CALCULATE PK AND SEL_{cum} (USING RMS SPL SOURCE LEVEL)

SEL_{cum}

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B53)	
Number of piles per day	
Strike (pulse) Duration[Δ] (seconds)	
Number of strikes per pile	
Duration of Sound Production (seconds)	0
10 Log (duration of sound production)	#NUM!
Transmission loss coefficient	
Distance of sound pressure level (L_{rms}) measurement (meters)	

[Δ]Window that makes up 90% of total cumulative energy (5%-95%) based on Madsen 2005

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G47)	
Distance of $L_{p,0\text{-}pk}$ measurement (meters)[+]	
$L_{p,0\text{-}pk}$ Source level	#NUM!

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring

requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	-0.01	-19.74	-26.87	-2.08	-1.15

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

E.2: DTH PILE DRIVING/INSTALLATION (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.2: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Ketchikan 2021
PROJECT/SOURCE INFORMATION	Impact (Transfer Bridge)
Please include any assumptions	
PROJECT CONTACT	Project Manager

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)¥	2	

¥ Broadband: 95% frequency contour percentile (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 50), and enter the new value directly However, they must provide additional support and documentation supporting this modificatior

90th Percentile - Reference Level

STEP 3: SOURCE-SPECIFIC INFORMATION

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	**199.7**

SEL_{cum}

Single Strike SEL_{ss} ($L_{E,p,\ single\ strike}$) specified at "x" meters (Cell B30)	154
Strike rate (average strikes per second)	25
Duration to drive pile (minutes)	16.66666667
Number of piles per day	1.5
Transmission loss coefficient	15
Distance of single strike SEL_{ss} ($L_{E,p,\ single\ strike}$) measurement (meters)	10
Total number of strikes in a 24-h period	37500

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G26)	179
Distance of $L_{p,0\text{-}pk}$ measurement (meters)*	10
$L_{p,0\text{-}pk}$ Source level	194.0

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**130.4**	**4.6**	**155.4**	**69.8**	**5.1**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**NA**	**NA**	**NA**	**NA**	**NA**

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	**-0.01**	**-19.74**	**-26.87**	**-2.08**	**-1.15**

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

E.2: DTH PILE DRIVING/INSTALLATION (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.2: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Ketchikan 2021
PROJECT/SOURCE INFORMATION	Impact (Transfer Bridge)
Please include any assumptions	
PROJECT CONTACT	Project Manager

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)[¥]	2	

¥ Broadband: 95% frequency contour percentile (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 50), and enter the new value directly However, they must provide additional support and documentation supporting this modificatior

90th Percentile - Reference Level

STEP 3: SOURCE-SPECIFIC INFORMATION

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	**199.7**

SEL_{cum}

Single Strike SEL_{ss} ($L_{E,p,\text{single strike}}$) specified at "x" meters (Cell B30)	154
Strike rate (average strikes per second)	25
Duration to drive pile (minutes)	16.66666667
Number of piles per day	1.5
Transmission loss coefficient	15
Distance of single strike SEL_{ss} ($L_{E,p,\text{single strike}}$) measurement (meters)	10
Total number of strikes in a 24-h period	37500

PK

$L_{p,0\text{-pk}}$ specified at "x" meters (Cell G26)	179
Distance of $L_{p,0\text{-pk}}$ measurement (meters)*	10
$L_{p,0\text{-pk}}$ Source level	194.0

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**130.4**	**4.6**	**155.4**	**69.8**	**5.1**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**NA**	**NA**	**NA**	**NA**	**NA**

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	**-0.01**	**-19.74**	**-26.87**	**-2.08**	**-1.15**

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a\,[1+(f/f_2)^2]^b}\right\}$$

E.2: DTH PILE DRIVING/INSTALLATION (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.2: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Ketchikan 2021
PROJECT/SOURCE INFORMATION	Impact (Moorage Float)
Please include any assumptions	
PROJECT CONTACT	Project Manager

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)[¥]	2	

[¥] Broadband: 95% frequency contour percentile (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 50), and enter the new value directly However, they must provide additional support and documentation supporting this modificatior

90th Percentile - Reference Level

STEP 3: SOURCE-SPECIFIC INFORMATION

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	**199.7**

SEL_{cum}

Single Strike SEL_{ss} ($L_{E,p,\ single\ strike}$) specified at "x" meters (Cell B30)	154
Strike rate (average strikes per second)	25
Duration to drive pile (minutes)	16.66666667
Number of piles per day	1.5
Transmission loss coefficient	15
Distance of single strike SEL_{ss} ($L_{E,p,\ single\ strike}$) measurement (meters)	10
Total number of strikes in a 24-h period	37500

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G26)	179
Distance of $L_{p,0\text{-}pk}$ measurement (meters)*	10
$L_{p,0\text{-}pk}$ Source level	194.0

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**130.4**	**4.6**	**155.4**	**69.8**	**5.1**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**NA**	**NA**	**NA**	**NA**	**NA**

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	**-0.01**	**-19.74**	**-26.87**	**-2.08**	**-1.15**

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

Introduction

DISCLAIMER: This spreadsheet was developed by NMFS as an in-house tool for assessing the potential effect to fishes exposed to elevated levels of underwater sound produced during pile driving. NMFS assumes no responsibility for interpretation of the results of these models by non-NMFS users.

Please contact the following NMFS staff to report errors or submit questions:
John Stadler, NMFS Northwest Region, 360-753-9576, John.Stadler@noaa.gov
Jacqueline Meyer, NMFS Southwest Region, 707-575-6057, Jacqueline.Pearson-Meyer@noaa.gov

This model is used to estimate the levels of underwater sound (peak and RMS pressure, as well as accumulated Sound Exposure Level [SEL]) received by fishes that are exposed to elevated levels of underwater sound produced during pile driving. It calculates the distance from the pile that the sound attenuates to threshold levels.

The criteria used for the onset of physical injury and adverse behavioral effects are listed in the table below. The onset of physical injury uses dual criteria - peak pressure and SEL. The onset of physical injury is expected if either of these criteria are exceeded. The criterion for accumulated SEL is based upon the mass of the fishes under consideration. If fishes smaller than 2 grams are present, then the more conservative 183 dB SEL criterion may be required.

Effect	Metric	Fish mass	Threshold
Onset of physical injury	Peak pressure	N/A	206 dB (re: 1 μPa)
	Accumulated Sound Exposure Level (SEL)	≥ 2 g	187 dB (re: 1μPa^2•sec)
		< 2 g	183 dB (re: 1μPa^2•sec)
Adverse behavioral effects	Root Mean Square Pressure (RMS)	N/A	150 dB (re: 1 μPa)

Assumptions

1) Estimates of underwater sound are based on measured levels from similar size and type of pile. Please refer to Caltrans' compendium (http://www.dot.ca.gov/hq/env/bio/files/pile_driving_snd_comp9_27_07.pdf).

2) Fish are assumed to remain stationary and the single strike SEL does not vary in magnitude between strikes. Cumulative SEL = single-strike SEL + 10*log(# strikes).

3) Currently there are no data to support a tissue recovery allowance between pile strikes. Therefore, all strikes in any given day are counted, regardless of time between strikes. However, generally the accumulated SEL can be reset to zero overnight (or after a 12 hour period), especially in a river or tidally-influenced waterway when the fish should be moving.

4) Effective Quiet. When the received SEL from an individual pile strike is below a certain level, then the accumulated energy from multiple strikes would not contribute to injury, regardless of how many pile strikes occur. This SEL is referred to as "effective quiet", and is assumed, for the purposes of this spreadsheet, to be 150 dB (re: 1 μPa^2*sec). Effective quiet establishes a limit on the maximum distance from the pile where injury to fishes is expected – the distance at which the single-strike SEL attenuates to 150 dB. Beyond this distance, no physical injury is expected, regardless of the number of pile strikes. However, the severity of the injury can increase within this zone as the number of strikes increases.

5) NMFS recommends using the Practical Spreading Loss model (TL = 15*log($_1$/R_0)), unless data are available to support a different model.

Worksheet Calculator

Input: Fill in the green colored cells - NOTE: THERE ARE NO DEFAULT VALUES FOR THE GREEN CELLS

B10 is the estimated single strike peak pressure (dB re: 1µPa)

B11 is the distance (m) from the pile where peak pressure was measured

C10 is the estimated single strike SEL (dB re: $1\mu Pa^2$s). If no direct measurement available, then SEL = peak pressure minus 25.

C11 is the distance (m) from the pile where SEL was measured

D10 is the estimated single strike RMS pressure (dB re: 1µPa). If no direct measurement available, then RMS = peak pressure minus 15

D11 is the distance (m) from the pile where RMS pressure was measured

B13 is the expected number of pile strikes

A22 is the Transmission Loss Constant. Default is 15 unless site-specific transmission loss information is available.

A28 is for comments on assumptions, sources of estimates of metrics, pile size, etc.

Preset Values

E10 is the SEL for "effective quiet" (current set at 150 dB)

B21 is the peak pressure criteria (see table above)

C21 is the SEL criteria for when all fish are 2 grams or larger (see table above)

D21 is the SEL criteria for when fish smaller than 2 grams are present (see table above)

E21 is the RMS criteria for adverse behavioral disruption (see table above)

Output: Read the blue cells

A16 is the calculated cumulative SEL, in dB (re: $1\mu Pa^2$*s), at measured distance from pile

B22 is the distance (m) at which 206 dB peak is expected to be exceeded

C22 is the distance (m) at which 187 dB accumulated SEL is expected to be exceeded

D22 is the distance (m) at which 183 dB accumulated SEL is expected to be exceeded

E22 is the distance (m) at which 150 dB rms is expected to be exceeded

Cells in light green are for project identification, project specifics, and comments.

Project Title	Ketchikan
Pile information (size, type, number, pile strikes, etc.)	Impact (Pontoon Restraint)

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**209**	**181**	**195**	**150**
Distance (m)	**10**	**10**	**10**	

Level	101
Dist.	15.24
R	20

Estimated number of strikes	**72**

Cumulative SEL at measured distance
199

	Distance (m) to threshold							
	Onset of Physical Injury			Behavior	**Behavioral Harassment**	**Injury**	**Behavior, in Air, dB**	
	Peak	Cumulative SEL dB**		RMS			**Harbor Seal**	**Seal Lions**
	dB	Fish ≥ 2 g	Fish < 2 g	dB				
Transmission loss constant (15 if unknown)	206	187	183	150	160	120	90	100
15	**15**	**66**	**122**	**9550**	**2057**	**2**	**54**	**17**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

Project Title	Ketchikan
Pile information (size, type, number, pile strikes, etc.)	Impact (Transfer Bridge)

Fill in green cells: estimated sound levels and distances at which they were measured, estimated numbe of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB	**209**	**181**	**195**	**150**
Distance (m)	**10**	**10**	**10**	

Level	101
Dist.	15.24
R	20

Estimated number of strikes	**72**

Cumulative SEL at measured distance
199

	Distance (m) to threshold							
	Onset of Physical Injury			Behavior	**Behavioral Harassment**	**Injury**	**Behavior, in Air, dB**	
	Peak dB	Cumulative SEL dB**		RMS dB			**Harbor Seal**	**Seal Lions**
		Fish ≥ 2 g	Fish < 2 g					
Transmission loss constant (15 if unknown	206	187	183	150	160	120	90	100
15	**15**	**66**	**122**	**9550**	**2057**	**2**	**54**	**17**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

Project Title	Ketchikan
Pile information (size, type, number, pile strikes, etc.)	Impact (Moorage Float)

Fill in green cells: estimated sound levels and distances at which they were measured, estimated numbe of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB	**209**	**181**	**195**	**150**
Distance (m)	**10**	**10**	**10**	

Level	101
Dist.	15.24
R	20

Estimated number of strikes	**72**

Cumulative SEL at measured distance
199

	Distance (m) to threshold							
	Onset of Physical Injury			Behavior	**Behavioral Harassment**	**Injury**	**Behavior, in Air, dB**	
	Peak dB	Cumulative SEL dB** Fish ≥ 2 g	Cumulative SEL dB** Fish < 2 g	RMS dB			**Harbor Seal**	**Seal Lions**
Transmission loss constant (15 if unknown	206	187	183	150	160	120	90	100
15	**15**	**66**	**122**	**9550**	**2057**	**2**	**54**	**17**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

Project Title	Ketchikan
Pile information (size, type, number, pile strikes, etc.)	DTH (Pontoon Restraint)

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**179**	**154**	**164**	**150**
Distance (m)	**10**	**10**	**10**	

Level	98
Dist.	15.24
R	20

Estimated number of strikes	**37500**

Cumulative SEL at measured distance
200

	Distance (m) to threshold							
	Onset of Physical Injury			Behavior	Behavioral Harassment	Injury	**Behavior, in Air, dB**	
	Peak	Cumulative SEL dB**		RMS			**Harbor Seal**	**Seal Lions**
	dB	Fish ≥ 2 g	Fish < 2 g	dB				
Transmission loss constant (15 if unknown)	206	187	183	150	160	120	90	100
15	**0**	**18**	**18**	**86**	**18**	**1**	**38**	**12**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

Mean - Reference Level

Project Title	Ketchikan
Pile information (size, type, number, pile strikes, etc.)	DTH (Transfer Bridge)

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**179**	**154**	**164**	**150**
Distance (m)	**10**	**10**	**10**	

Level	98
Dist.	15.24
R	20

Estimated number of strikes	**37500**

Cumulative SEL at measured distance
200

	Distance (m) to threshold							
	Onset of Physical Injury			Behavior	Behavioral Harassment	Injury	**Behavior, in Air, dB**	
	Peak	Cumulative SEL dB**		RMS			**Harbor Seal**	**Seal Lions**
	dB	Fish ≥ 2 g	Fish < 2 g	dB				
Transmission loss constant (15 if unknown)	206	187	183	150	160	120	90	100
15	**0**	**18**	**18**	**86**	**18**	**1**	**38**	**12**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

Project Title	Ketchikan
Pile information (size, type, number, pile strikes, etc.)	DTH (Moorage Float)

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**179**	**154**	**164**	**150**
Distance (m)	**10**	**10**	**10**	

Level	98
Dist.	15.24
R	20

Estimated number of strikes	**37500**

Cumulative SEL at measured distance
200

	Distance (m) to threshold							
	Onset of Physical Injury			Behavior	Behavioral Harassment	Injury	**Behavior, in Air, dB**	
	Peak	Cumulative SEL dB**		RMS			**Harbor Seal**	**Seal Lions**
	dB	Fish ≥ 2 g	Fish < 2 g	dB				
Transmission loss constant (15 if unknown)	206	187	183	150	160	120	90	100
15	**0**	**18**	**18**	**86**	**18**	**1**	**38**	**12**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

Project Title	Ketchikan
Pile information (size, type, number, pile strikes, etc.)	DTH Vibratory (Pontoon Restraint)

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**181**	**156**	**166**	**150**
Distance (m)	**10**	**10**	**10**	

Level	95
Dist.	15.24
R	20

Estimated number of strikes	**37500**

Cumulative SEL at measured distance
202

	Distance (m) to threshold							
	Onset of Physical Injury			Behavior	Behavioral Harassment	Injury	Behavior, in Air, dB	
	Peak	Cumulative SEL dB**		RMS			Harbor Seal	Seal Lions
	dB	Fish ≥ 2 g	Fish < 2 g	dB				
Transmission loss constant (15 if unknown)	206	187	183	150	120	120	90	100
15	**0**	**25**	**25**	**117**	**11659**	**1**	**27**	**9**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

Project Title	Ketchikan
Pile information (size, type, number, pile strikes, etc.)	DTH Vibratory (Moorage Float)

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**181**	**156**	**166**	**150**
Distance (m)	**10**	**10**	**10**	

Level	95
Dist.	15.24
R	20

Estimated number of strikes	**37500**

Cumulative SEL at measured distance
202

	Distance (m) to threshold							
	Onset of Physical Injury			Behavior	**Behavioral Harassment**	**Injury**	**Behavior, in Air, dB**	
	Peak	Cumulative SEL dB**		RMS			**Harbor Seal**	**Seal Lions**
	dB	Fish ≥ 2 g	Fish < 2 g	dB				
Transmission loss constant (15 if unknown)	206	187	183	150	120	120	90	100
15	**0**	**25**	**25**	**117**	**11659**	**1**	**27**	**9**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

Project Title	Ketchikan
Pile information (size, type, number, pile strikes, etc.)	DTH Vibratory (Moorage Float)

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**181**	**156**	**166**	**150**
Distance (m)	**10**	**10**	**10**	

Level	95
Dist.	15.24
R	20

Estimated number of strikes	**37500**

Cumulative SEL at measured distance
202

	Distance (m) to threshold							
	Onset of Physical Injury			Behavior	Behavioral Harassment	Injury	**Behavior, in Air, dB**	
	Peak	Cumulative SEL dB**		RMS			**Harbor Seal**	**Seal Lions**
	dB	Fish ≥ 2 g	Fish < 2 g	dB				
Transmission loss constant (15 if unknown)	206	187	183	150	120	120	90	100
15	**0**	**25**	**25**	**117**	**11659**	**1**	**27**	**9**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

Project Title	Ketchikan
Pile information (size, type, number, pile strikes, etc.)	Timber Piles Vibratory Removal (Trestle)

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**184**	**145**	**157**	**150**
Distance (m)	**10**	**10**	**10**	

Sonic Pile	95
Distance	15.24
Transmission Loss Constant	20

Estimated number of strikes	**1200**

Cumulative SEL at measured distance
176

	Distance (m) to threshold							
	Onset of Physical Injury			Behavior	**Behavioral Harassment**	**Injury**	**Behavior, in Air, dB**	
	Peak dB	Cumulative SEL dB** Fish ≥ 2 g	Cumulative SEL dB** Fish < 2 g	RMS dB			**Harbor Seal**	**Seal Lions**
Transmission loss constant (15 if unknown)	206	187	183	150	120	120	90	100
15	**0**	**2**	**3**	**29**	**2929**	**1**	**27**	**9**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

A.1: Vibratory Pile Driving (STATIONARY SOURCE: Non-Impulsive, Continuous)

VERSION 2.2: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Ketchikan 2021
PROJECT/SOURCE INFORMATION	Timber Piles Vibratory Removal (Trestle)
Please include any assumptions	
PROJECT CONTACT	Project Manager

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)[¥]	2.5	

[¥] Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 48), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B30)	157
Number of piles within 24-h period	10
Duration to drive a single pile (minutes)	2
Duration of Sound Production within 24-h period (seconds)	1200
10 Log (duration of sound production)	30.79
Transmission loss coefficient	15
Distance of sound pressure level (L_{rms}) measurement (meters)	10

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring

requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	199	198	173	201	219
PTS Isopleth to threshold (meters)	**1.8**	**0.2**	**2.6**	**1.1**	**0.1**

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	**-0.05**	**-16.83**	**-23.50**	**-1.29**	**-0.60**

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

E.1: IMPACT PILE DRIVING (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.2: 2020

KEY

(grey)	**Action Proponent Provided Information**
(orange)	**NMFS Provided Information (Technical Guidance)**
(blue)	**Resultant Isopleth**

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Ketchikan 2021
PROJECT/SOURCE INFORMATION	Impact (Transfer Bridge)
Please include any assumptions	
PROJECT CONTACT	Project Manager

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)[¥]	2	

[¥] Broadband: 95% frequency contour percentile (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 73), and enter the new value direct However, they must provide additional support and documentation supporting this modificat

STEP 3: SOURCE-SPECIFIC INFORMATION

NOTE: METHOD E.1-1 is PREFERRED method when SEL-based source levels are available (because pulse duration is not required). Only use method E.1-2 if SEL-based source levels are not available.

E.1-1: METHOD TO CALCULATE PK AND SEL_{cum} (SINGLE STRIKE EQUIVALENT) **PREFERRED METHOD (pulse duration not needed)**

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	**199.3**

SEL_{cum}

Single Strike SEL_{ss} ($L_{E,p,\ single\ strike}$) specified at "x" meters (Cell B32)	181
Number of strikes per pile	48
Number of piles per day	1.5
Transmission loss coefficient	15
Distance of single strike SEL_{ss} ($L_{E,p,\ single\ strike}$) measurement (meters)	10

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G29)	209
Distance of $L_{p,0\text{-}pk}$ measurement (meters)[+]	10
$L_{p,0\text{-}pk}$ Source level	223.6

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**121.4**	**4.3**	**144.6**	**65.0**	**4.7**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**2.0**	**NA**	**27.5**	**2.4**	**NA**

"NA": PK source level is≤ to the threshold for that marine mammal hearing group.

E.1-2: METHOD TO CALCULATE PK AND SEL_{cum} (USING RMS SPL SOURCE LEVEL)

SEL_{cum}

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B53)	
Number of piles per day	
Strike (pulse) Duration[Δ] (seconds)	
Number of strikes per pile	
Duration of Sound Production (seconds)	0
10 Log (duration of sound production)	#NUM!
Transmission loss coefficient	
Distance of sound pressure level (L_{rms}) measurement (meters)	

[Δ]Window that makes up 90% of total cumulative energy (5%-95%) based on Madsen 2005

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G47)	
Distance of $L_{p,0\text{-}pk}$ measurement (meters)⁺	
$L_{p,0\text{-}pk}$ Source level	#NUM!

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring

requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet to

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**

"NA": PK source level is≤ to the threshold for that marine mammal hearing group.

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	**-0.01**	**-19.74**	**-26.87**	**-2.08**	**-1.15**

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

E.1: IMPACT PILE DRIVING (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.2: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Ketchikan 2021
PROJECT/SOURCE INFORMATION	Impact (Transfer Bridge)
Please include any assumptions	
PROJECT CONTACT	Project Manager

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)[¥]	2	

[¥] Broadband: 95% frequency contour percentile (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 73), and enter the new value direc However, they must provide additional support and documentation supporting this modificatio

STEP 3: SOURCE-SPECIFIC INFORMATION

NOTE: METHOD E.1-1 is PREFERRED method when SEL-based source levels are available (because pulse duration is not required). Only use method E.1-2 if SEL-based source levels are not available.

E.1-1: METHOD TO CALCULATE PK AND SEL_{cum} (SINGLE STRIKE EQUIVALENT) **PREFERRED METHOD (pulse duration not needed)**

Unweighted SEL $_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	**199.3**

SEL_{cum}

Single Strike SEL_{ss} ($L_{E,p,\ single\ strike}$) specified at "x" meters (Cell B32)	181
Number of strikes per pile	48
Number of piles per day	1.5
Transmission loss coefficient	15
Distance of single strike SEL_{ss} ($L_{E,p,\ single\ strike}$) measurement (meters)	10

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G29)	209
Distance of $L_{p,0\text{-}pk}$ measurement (meters)[+]	10
$L_{p,0\text{-}pk}$ Source level	223.6

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**121.4**	**4.3**	**144.6**	**65.0**	**4.7**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**2.0**	**NA**	**27.5**	**2.4**	**NA**

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

E.1-2: METHOD TO CALCULATE PK AND SEL_{cum} (USING RMS SPL SOURCE LEVEL)

SEL_{cum}

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B53)	
Number of piles per day	
Strike (pulse) Duration[Δ] (seconds)	
Number of strikes per pile	
Duration of Sound Production (seconds)	0
10 Log (duration of sound production)	#NUM!
Transmission loss coefficient	
Distance of sound pressure level (L_{rms}) measurement (meters)	

[Δ]Window that makes up 90% of total cumulative energy (5%-95%) based on Madsen 2005

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G47)	
Distance of $L_{p,0\text{-}pk}$ measurement (meters)[+]	
$L_{p,0\text{-}pk}$ Source level	#NUM!

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring

requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet to

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	**-0.01**	**-19.74**	**-26.87**	**-2.08**	**-1.15**

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

E.1: IMPACT PILE DRIVING (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.2: 2020

KEY

(grey)	**Action Proponent Provided Information**
(orange)	**NMFS Provided Information (Technical Guidance)**
(blue)	**Resultant Isopleth**

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Ketchikan 2021
PROJECT/SOURCE INFORMATION	Impact (Moorage Float)
Please include any assumptions	
PROJECT CONTACT	Project Manager

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)¥	2	

¥ Broadband: 95% frequency contour percentile (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 73), and enter the new value directly However, they must provide additional support and documentation supporting this modification

STEP 3: SOURCE-SPECIFIC INFORMATION

NOTE: METHOD E.1-1 is PREFERRED method when SEL-based source levels are available (because pulse duration is not required). Only use method E.1-2 if SEL-based source levels are not available.

E.1-1: METHOD TO CALCULATE PK AND SEL_{cum} (SINGLE STRIKE EQUIVALENT) **PREFERRED METHOD (pulse duration not needed)**

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	**199.3**

SEL_{cum}

Single Strike SEL_{ss} ($L_{E,p,\ single\ strike}$) specified at "x" meters (Cell B32)	181
Number of strikes per pile	48
Number of piles per day	1.5
Transmission loss coefficient	15
Distance of single strike SEL_{ss} ($L_{E,p,\ single\ strike}$) measurement (meters)	10

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G29)	209
Distance of $L_{p,0\text{-}pk}$ measurement (meters)+	10
$L_{p,0\text{-}pk}$ Source level	223.6

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	121.4	4.3	144.6	65.0	4.7
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	2.0	NA	27.5	2.4	NA

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

E.1-2: METHOD TO CALCULATE PK AND SEL_{cum} (USING RMS SPL SOURCE LEVEL)

SEL_{cum}

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B53)	
Number of piles per day	
Strike (pulse) Duration[Δ] (seconds)	
Number of strikes per pile	
Duration of Sound Production (seconds)	0
10 Log (duration of sound production)	#NUM!
Transmission loss coefficient	
Distance of sound pressure level (L_{rms}) measurement (meters)	

[Δ]Window that makes up 90% of total cumulative energy (5%-95%) based on Madsen 2005

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G47)	
Distance of $L_{p,0\text{-}pk}$ measurement (meters)[+]	
$L_{p,0\text{-}pk}$ Source level	#NUM!

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring

requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	-0.01	-19.74	-26.87	-2.08	-1.15

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

E.2: DTH PILE DRIVING/INSTALLATION (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.2: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Ketchikan 2021
PROJECT/SOURCE INFORMATION	Impact (Transfer Bridge)
Please include any assumptions	
PROJECT CONTACT	Project Manager

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)[¥]	2	

[¥] Broadband: 95% frequency contour percentile (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 50), and enter the new value directly. However, they must provide additional support and documentation supporting this modificatio

STEP 3: SOURCE-SPECIFIC INFORMATION

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	**199.7**

SEL_{cum}

Single Strike SEL_{ss} ($L_{E,p,\ single\ strike}$) specified at "x" meters (Cell B30)	154
Strike rate (average strikes per second)	25
Duration to drive pile (minutes)	16.66666667
Number of piles per day	1.5
Transmission loss coefficient	15
Distance of single strike SEL_{ss} ($L_{E,p,\ single\ strike}$) measurement (meters)	10
Total number of strikes in a 24-h period	37500

PK

$L_{p,0-pk}$ specified at "x" meters (Cell G26)	179
Distance of $L_{p,0-pk}$ measurement (meters)[+]	10
$L_{p,0-pk}$ Source level	194.0

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	130.4	4.6	155.4	69.8	5.1
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	NA	NA	NA	NA	NA

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	-0.01	-19.74	-26.87	-2.08	-1.15

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

E.2: DTH PILE DRIVING/INSTALLATION (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.2: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Ketchikan 2021
PROJECT/SOURCE INFORMATION	Impact (Transfer Bridge)
Please include any assumptions	
PROJECT CONTACT	Project Manager

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz) ¥	2	

¥ Broadband: 95% frequency contour percentile (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 50), and enter the new value directly. However, they must provide additional support and documentation supporting this modification

STEP 3: SOURCE-SPECIFIC INFORMATION

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	**199.7**

SEL_{cum}

Single Strike SEL_{ss} ($L_{E,p,\ single\ strike}$) specified at "x" meters (Cell B30)	154
Strike rate (average strikes per second)	25
Duration to drive pile (minutes)	16.66666667
Number of piles per day	1.5
Transmission loss coefficient	15
Distance of single strike SEL_{ss} ($L_{E,p,\ single\ strike}$) measurement (meters)	10
Total number of strikes in a 24-h period	37500

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G26)	179
Distance of $L_{p,0\text{-}pk}$ measurement (meters)+	10
$L_{p,0\text{-}pk}$ Source level	194.0

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**130.4**	**4.6**	**155.4**	**69.8**	**5.1**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**NA**	**NA**	**NA**	**NA**	**NA**

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	**-0.01**	**-19.74**	**-26.87**	**-2.08**	**-1.15**

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

E.2: DTH PILE DRIVING/INSTALLATION (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.2: 2020

KEY

(grey)	**Action Proponent Provided Information**
(orange)	**NMFS Provided Information (Technical Guidance)**
(blue)	**Resultant Isopleth**

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Ketchikan 2021
PROJECT/SOURCE INFORMATION	Impact (Moorage Float)
Please include any assumptions	
PROJECT CONTACT	Project Manager

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz) ¥	2	

¥ Broadband: 95% frequency contour percentile (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 50), and enter the new value directly. However, they must provide additional support and documentation supporting this modification

STEP 3: SOURCE-SPECIFIC INFORMATION

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	199.7

SEL_{cum}

Single Strike SEL_{ss} ($L_{E,p,\ single\ strike}$) specified at "x" meters (Cell B30)	154
Strike rate (average strikes per second)	25
Duration to drive pile (minutes)	16.66666667
Number of piles per day	1.5
Transmission loss coefficient	15
Distance of single strike SEL_{ss} ($L_{E,p,\ single\ strike}$) measurement (meters)	10
Total number of strikes in a 24-h period	37500

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G26)	179
Distance of $L_{p,0\text{-}pk}$ measurement (meters)+	10
$L_{p,0\text{-}pk}$ Source level	194.0

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**130.4**	**4.6**	**155.4**	**69.8**	**5.1**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**NA**	**NA**	**NA**	**NA**	**NA**

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	**-0.01**	**-19.74**	**-26.87**	**-2.08**	**-1.15**

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

Appendix C: Biological Assessment

Biological Assessment

Introduction

This Biological Assessment (BA) evaluates potential effects to Endangered Species Act (ESA)-listed species and critical habitats from National Oceanic and Atmospheric Administration's (NOAA's) proposal to recapitalize property and facilities operated by its Office of Marine and Aviation Operations (OMAO) at their Marine Operations Center-Pacific Ketchikan Port Facility in Ketchikan, Alaska (see Figure 1-1 of the Incidental Harassment Authorization [IHA] application package). This BA has been prepared pursuant to the Endangered Species Act (ESA) of 1973 (16 United States Code [U.S.C.] 1531 *et seq.*), as amended.

To streamline the consultation process and avoid duplication, this BA is combined with other environmental review procedures, including the project's request for Incidental Harassment Authorization (IHA), required under the Marine Mammal Protection Act, as well as documentation to support compliance with National Environmental Policy Act and the Magnuson-Stevens Fishery Conservation and Management Act. This abbreviated BA is not intended to be a stand-alone document and uses information embedded in the IHA application package. References to various sections in the IHA application package are included in the BA as appropriate.

Project Description

The Proposed Action at the Ketchikan Port Facility would require demolition, disposal, and replacement of key structures and infrastructure within portions of a 77,000-square-foot (1.8-acre) upland area and a 102,000-square-foot (2.3-acre) in-water area owned by NOAA. Nearly all the existing OMAO facilities and assets at its Ketchikan Port Facility would be affected. A detailed description of the Proposed Action is provided in Section 1 of the IHA application package. In-water work including pile removal and placement is anticipated to occur for approximately 47 days on an intermittent basis between February 2022 and December 2022. Proposed minimization and avoidance measures are provided in Section 11 of the IHA application package.

Project and Action Areas

The project area is defined as the geographic extent of proposed activities and where direct effects to species and critical habitats may occur (see Figure 1-2 of IHA application package). The action area includes all areas affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 Code of Federal Regulations [CFR] § 402.02). The action area encompasses the project area as well as the estimated maximum spatial extent for underwater noise (12 kilometers) and airborne noise (1 kilometer). The complete action area, including terrestrial and aquatic portions, is shown in Figure C-1. The action area limits were established based on a review of underwater noise propagation from the project that could affect marine mammals. Marine mammal injury and disturbance threshold criteria are provided in Section 6 of the IHA application package. An Underwater Noise Technical Memorandum prepared for removal/installation of piles at Ketchikan Port Facility is provided in Appendix B of the IHA application package.

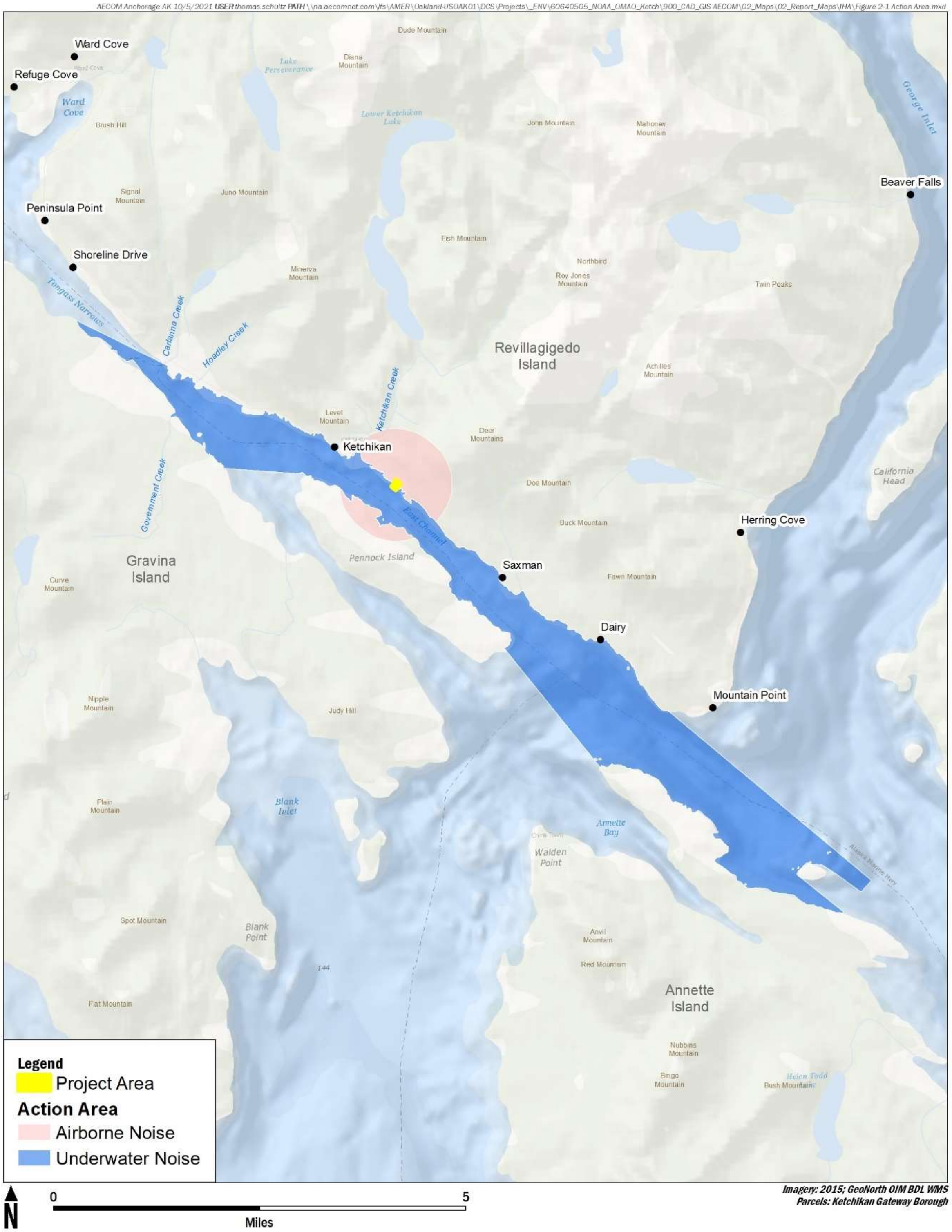

Figure C-1. Action Area

Description of ESA-Listed Species and their Habitats

This BA only addresses the Mexico distinct population segment (DPS) of humpback whale (*Megaptera novaeangliae*). The Proposed Action would have no effect on ESA-listed fin whale (*Balaenoptera physalus*) or Steller sea lion (*Eumetopias jubatus*), as they are not expected to be present within the action area. No critical habitat for any listed species has been designated within the action area.

Fin Whale

While the fin whale is mapped as having a range extending into the action area, there are no known sightings in Tongass Narrows, and recent IHAs issued by the National Marine Fisheries Service (NMFS) in the Ketchikan area have not included the fin whale (Dalheim et al. 2009; HDR 2019). It would be unlikely for a fin whale to enter the action area, as they are generally associated with deeper, "intermediate offshore waters" (NMFS 2010). Based on this information, the fin whale is not considered further in this BA.

Steller Sea Lion

The Western DPS (wDPS) of Steller sea lion generally occurs west of Cape Suckling, with the centers of abundance and distribution located in the Gulf of Alaska and Aleutian Islands. While there is some mixing of the wDPS east of the 144°W line, Hastings et al. 2020 considered the Ketchikan area to be outside of the mixing zone; there are no known occurrences of wDPS animals in Tongass Narrows. As such, the wDPS is not considered further in this BA.

Humpback Whale

Status and Management

In 1970, the humpback whale was listed as endangered under the Endangered Species Conservation Act (35 Federal Register [FR] 18319). In 2015, NMFS conducted a global status review and reassessed the status of humpback whales under the ESA (Bettridge et al. 2015).[1] Based on that review, 14 DPSs of humpback whales were identified, and listing status was revised (81 FR 62260).

In the North Pacific, five DPSs that breed in subtropical and tropical waters from Asia to Central America and migrate north to feed in highly productive North Pacific feeding grounds were identified (Bettridge et al. 2015). Whales from three of these DPSs migrate to Alaskan waters: the Mexico DPS (ESA-listed as threatened), the Western North Pacific DPS (ESA-listed as endangered), and the Hawaii DPS (delisted) (81 FR 62260). These DPSs generally represent the California/Oregon/Washington, Western North Pacific, and Central North Pacific stocks, respectively.

Distribution

The humpback whale is distributed worldwide in all ocean basins. Relatively high densities of humpback whales are found in feeding grounds in Southeast Alaska and northern British Columbia, particularly during summer months. Based on extensive photo identification data, NMFS has determined that individual humpback whales encountered in Southeast Alaska and northern British Columbia have a 98 percent probability of being from the recovered (delisted) Hawaii DPS and a 2 percent probability of being from the currently threatened (ESA-listed) Mexico DPS (coefficient of variation [CV] = 0.03) (Wade 2021). There is a zero percent probability that humpback whales in Southeast Alaska are from the endangered Western North Pacific DPS (Wade 2021). Intermixed DPSs are not visually distinguishable; their identity can only be determined by DNA or photo identification. Therefore, we will use Wade (2021) DPS ratio that assumes 98 percent of humpbacks in Southeast Alaska are from the Hawaii DPS and 2 percent are from the Mexico DPS.

Humpback whales migrate to Alaska to feed after months of fasting in the low latitude breeding grounds. The timing of migration varies among individuals; most begin returning to Alaska in spring, and most

[1] The Endangered Species Conservation Act was replaced by the ESA in 1973.

depart Alaska for southern breeding grounds in fall or winter. Numbers of humpbacks in Southeast Alaska peak during late summer to early fall, but because there is significant overlap between departing and returning whales, humpbacks can be found in Alaska feeding grounds in every month of the year (Baker et al. 1985; Straley 1990; Witteveen and Wynne 2009). There is also an apparent increase in the number of humpback whales overwintering in feeding grounds in Alaska, including reports in Ketchikan during some years in the winter (Straley et al. 2017; Liddle 2015; 84 FR 36891).

Whales in the Mexico DPS typically breed off of Mexico and migrate to northern feeding grounds ranging from British Columbia to the western Gulf of Alaska. Given their widespread range and their opportunistic foraging strategies, Mexico DPS humpback whales may be in the vicinity during the proposed project activities. In the final rule changing the status of humpback whales under the ESA (81 FR 62260), the abundance of the Mexico DPS was estimated to be 2,900 individuals (CV = 0.06), with an unknown trend. Note that only a portion of the Mexico DPS migrates to Alaska for feeding; the probability that a whale encountered in Southeast Alaska and northern British Columbia is from the Mexico DPS is—as noted earlier—2 percent (Wade 2021).

Site-Specific Occurrence

Humpback whales occur frequently in Tongass Narrows and the adjacent Clarence Strait during summer and fall months to feed. Data on the distribution suggest that both the Mexico DPS and Hawaii DPS of humpback whales may be present in the Tongass Narrows area. Because humpback whale individuals of different DPS (natal) origin are generally visually indistinguishable, the frequency of occurrence is estimated using the DPS ratio (noted above) (Wade 2021). Local anecdotal reports indicate that humpback whales are becoming more common and abundant in Tongass Narrows during August and September, which is consistent with research in Southeast Alaska.

Dahlheim et al. (2009) found significant differences in the mean group size of humpback whales in Southeast Alaska from year to year and also found that the average group size was largest in the fall (September through October). Numbers of humpback whales peak in the summer and fall and are more uniformly distributed throughout the region. Humpback whales were observed in Clarence Strait every year, although less frequently than other areas of Southeast Alaska (Dahlheim et al. 2009).

The average group size during the fall surveys was two whales. During the spring months, humpback whales tend to congregate in areas outside of the Ketchikan area, such as Lynn Canal and Fredrick Sound (Dahlheim et al. 2009). Local reports of humpback whale group size in Tongass Narrows is similar, with the typical size being between one and three whales. Local residents report humpback whales in Tongass Narrows anywhere from once a month to several times weekly. There have also been several instances where whales have been observed more frequently, including a single whale that was observed by a ferry terminal employee every few days for several months (85 FR 673).

The City of Ketchikan Rock Pinnacle project reported one humpback whale sighting of one individual during the project (December 2019 through January 2020) in the Level B behavioral harassment zone.[2] The sighting was 55 minutes post-blast and not recorded as a take (Sitkiewicz 2020).

Marine mammal monitoring and sighting data in the Tongass Narrows for the Alaska Department of Transportation's Gravina Access project from October 2020 to February 2021 and May 2021 to July 2021 reported a mean group size of 1.3, with a range of one to four humpback whales. Sightings at the Alaska Department of Transportation's Ward Cove project resulted in similar data, with a mean group size of 1.7 and range of one to six humpback whales.

In the Biological Opinion issued for the Alaska Department of Transportation's ferry terminal project IHA application, NMFS determined that up to two humpback whales may be present twice per week, based on a year-round project and the fluctuating seasonal abundance (NMFS 2019). Given that the action area for this project encompasses a similar portion of Tongass Narrows and is consistent with local anecdotal and

[2] The Level B behavioral harassment zone is the area in which underwater noise generated from pile installation is greater than the sound thresholds established for marine mammal behavioral disturbance. The different zones of impact for this project are described in Section 6 of the IHA application package.

survey observations together with the NMFS determination, this estimate of up to two humpback whales twice per week is a conservative estimate of humpback whale presence in the action area.

Humpback Whale Critical Habitat

The final rule to designate critical habitat for the endangered Western North Pacific DPS, the endangered Central America DPS, and the threatened Mexico DPS of humpback whales was published on April 21, 2021, (86 FR 21082) and became effective on May 21, 2021. The final rule excludes Southeast Alaska Unit 10, which includes the proposed action area.

Environmental Baseline

The “environmental baseline” refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the Proposed Action. The environmental baseline includes the past and present impacts of all federal, state, or private actions and other human activities in the action area; the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation; and the impact of state or private actions that are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency’s discretion to modify are part of the environmental baseline (50 CFR § 402.02).

The geographic setting of the project area is described in Section 2.2 of the IHA application package. The project area and vicinity has been subject to high human use and habitat alteration for many years. Ongoing human activity in the action area that impacts marine mammals includes marine vessel activity, pollution, climate change, noise (e.g., aircraft, vessel, pile-driving, etc.), and coastal zone development and has been described by NMFS in a number of biological opinions for construction projects in Tongass Narrows in recent years, including the following:

- City of Ketchikan Berth III Mooring Dolphins Project (AKRO-2020-02183), City of Ketchikan, February 2021
- Tongass Narrows (Gravina Access) Project (AKRO-2019-03432), Alaska Department of Transportation and Public Facilities, December 2019

These biological opinions are available on the NMFS Alaska Region website at: https://www.fisheries.noaa.gov/alaska/consultations/section-7-biological-opinions-issued-alaska-region.

Effects of the Action

“Effects of the action” are all consequences to listed species or critical habitat that are caused by the Proposed Action, including the consequences of other activities that are caused by the Proposed Action. A consequence is caused by the proposed action if it would not occur but for the Proposed Action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR § 402.02).

As described in the IHA application package, the Proposed Action may cause the following effects to listed humpback whale:

- Vessel interactions
- Underwater noise produced by impulsive and continuous noise sources related to pile driving activities including vibratory pile driving and removal, impact pile driving, and down-the-hole drilling
- Disturbance to benthic and pelagic habitat, and prey species

Vessel Interactions

The project area is expected to experience a slight increase in the amount of vessel traffic within marine mammal habitat; however, due to the substantial amount of existing vessel traffic in the area coupled with the continued use of the habitat by marine mammals, the effects on Mexico DPS humpback whales from project vessel interactions are expected to be negligible.

Underwater Noise

Because Mexico DPS humpback whales may be present within the action area when in-water work is conducted (particularly from May through September), they could be exposed to temporarily elevated underwater noise levels resulting in harassment. Possible responses by Mexico DPS humpback whales to underwater noise include temporary hearing impairment; auditory interference; change in dive, respiration, or feeding behavior; change in vocalization; and avoidance or displacement. Pile placement and removal would generate in-air noise, which is not expected to impact humpback whales.

As described in Section 6 of the IHA application package, temporarily elevated underwater noise during pile driving activities has the potential to result in Level B (behavioral) harassment of humpback whales. Level A harassment (resulting in injury) is not expected to occur as a result of the Proposed Action because shutdown zones would be implemented, and proposed mitigation measures proposed in Section 11 of the IHA application package would reduce the potential for exposure to levels of underwater noise above the injury thresholds. Exposure estimate and take requested for Mexico DPS humpback whale is one animal and represents 0.03 percent of the stock (Table 6-9 of the IHA application package).

The nearshore and intertidal habitat where the project would occur is an area of relatively high marine vessel traffic, industrial noise, and float plane activity. Although Mexico DPS humpback whales are not expected to occur in the project footprint, temporary and intermittent habitat avoidance may result from increased noise levels within the action area.

Habitat and Prey

Construction of the project would involve pile and pier removal work and placement of structures in the Tongass Narrows, which would result in direct impacts to aquatic habitat. A summary of direct impacts to aquatic habitats associated with new project structures based on 30-percent design documents is provided in Table C-1.

Table C-1: Direct Impacts

Structures	Fill Material	Pile Quantity	Seafloor Footprint (square feet)	Over-Water Footprint (square feet)
Floating Pier	Steel piles, 24-inch diameter,	10	31	12,000
Transfer Bridge	N/A	N/A	N/A	2,448
Transfer Bridge Support Frame and Float	Steel piles, 24-inch diameter,	4	13	528[1]
Transfer Bridge Abutment	Concrete, shot rock, armor rock, base course	N/A	620	N/A
Small Boat Dock	Steel piles	N/A	13	1,264
Small Boat Dock Suspended Gangway	N/A	4	N/A	150
Suspended Gangway/Catwalk Mooring Dolphins	N/A	N/A	N/A	N/A
Small Boat Launch Ramp	Concrete, shot rock, armor rock, base course	N/A	11,190	N/A
Total		18	11,867 (0.27 acre)	16,390 (0.38 acre)

Notes:
[1]The bridge support float would overlap with that of the bridge itself, therefore the support float area is excluded from the calculation of total over-water footprint.
N/A = not applicable

Data in this table are AECOM estimates and were calculated using maximum quantities and dimensions so they provide a conservative estimate of project impacts.

Construction of the project would involve installation of 18 piles and in-water fill associated with the transfer bridge abutment and the small boat launch ramp, which would modify approximately 0.27 acre of marine substrate. Proposed in-water infrastructure would have an estimated over-water footprint of approximately 0.38 acre. These structures would remain present through operations of the NOAA Ketchikan port (20 to 50 years) and would be removed according to industry standards at the time of decommissioning, unless continued for future use. These direct impacts would be partially offset by removal of existing dilapidated in-water structures; approximately 100 to 200 pilings (approximately 0.009 to 0.014 acre, depending on exact number and diameter of removed piles) and approximately 0.36 acre of over-water infrastructure would be removed. Therefore, the net increase in seafloor footprint at the project site would be approximately 0.27 acre, whereas the net increase in over-water footprint would be approximately 0.02 acre.

The Proposed Action would result in temporary and intermittent changes to water quality (increases in turbidity levels) and on prey species distribution. Pile installation and removal may cause temporary and localized turbidity through sediment disturbance; any turbidity plumes are expected to be localized to the immediate vicinity of the pile. Due to temporary, localized, and low levels of turbidity increases, turbidity would not result in long-term effects to the Mexico DPS humpback whale or their prey.

Interdependent actions are actions having no independent utility apart from the project. Interrelated actions are actions that are part of a larger action and depend on the larger action for their justification (50 CFR § 402.02). Future operation and maintenance of the facility are considered interdependent. NOAA is required to follow federal, state, and local laws, many of which require implementation of best management practices to avoid and minimize potential impacts on aquatic habitats when maintenance is needed.

Effects Determination

The effects determinations for ESA-listed species and critical habitats are summarized in Table C-2.

Table C-2: Effects Determination for ESA-listed Species and Critical Habitats

Common Name Scientific Name DPS	ESA Status	Listing	Effects Determination for Species	Effects Determination for Critical Habitat
Humpback Whale *Megaptera novaeangliae* (Mexico DPS)	Threatened	81 FR 62260	May affect, likely to adversely affect	No effect, not designated in action area.

Notes: DPS = Distinct Population Segment; ESA = Endangered Species Act; FR = Federal Register.

A **may affect, likely to adversely affect** determination is warranted for Mexico DPS humpback whale because:

- Humpback whales have been documented in the action area and may be present during pile removal or placement activities at the Ketchikan Port Facility, and
- Humpback whales may be exposed to acoustic harassment from pile removal or placement activities if they are present in the action area during project activities

Underwater noise from pile driving activities is the primary reason why the Proposed Action is likely to adversely affect Mexico DPS humpback whales. This is the appropriate conclusion because these effects cannot conclusively be classified as “discountable, insignificant, or beneficial” (USFWS and NMFS 1998). However, no injury or mortality is anticipated or authorized as part of the Proposed Action. Exposure could temporarily disrupt one or more behavioral patterns but is not expected to affect overall Mexico DPS humpback whale fitness, reproduction, or survival. Incidental take (Level B harassment) of one Mexico DPS humpback whale has been requested in the IHA application package.

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Appendix D: Essential Fish Habitat Assessment

Essential Fish Habitat Assessment

Introduction

This Essential Fish Habitat (EFH) assessment evaluates potential effects on EFH as defined by the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), as amended by the Sustainable Fisheries Act of 1996 (16 United States Code [U.S.C.] 1801 et seq.).

The Magnuson-Stevens Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires federal agencies to consult with National Marine Fisheries Service (NMFS) on activities that may adversely affect EFH. EFH is defined as “those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity.”

The objective of this EFH assessment is to determine whether the proposed action(s) “may adversely affect” designated EFH for commercially relevant, federally managed fisheries species within the proposed action area. The EFH Guidelines, 50 Code of Federal Regulations (CFR) §§ 600.05 – 600.930, outline procedures that federal agencies must follow to satisfy Magnuson-Stevens Act consultation requirements. Federal agencies must provide NMFS with an EFH Assessment if the federal action may adversely affect EFH. An EFH Assessment is to include the following contents (50 CFR § 600.920[e]): (1) a description of the action; (2) an analysis of the potential adverse effects of the action on EFH and the managed species; (3) the federal agency’s conclusions regarding the effects of the action on EFH; and (4) proposed mitigation, if necessary.

To streamline requirements and avoid duplication, this EFH assessment is combined with existing environmental review procedures required under the Marine Mammal Protection Act and the project’s request for Incidental Harassment Authorization (IHA), in additional to National Environmental Policy Act and Endangered Species Act. This abbreviated EFH assessment is not intended to be a stand-alone document and uses information embedded in the IHA application package. References to various sections in the IHA application package are included in this EFH assessment as appropriate.

Project Description

The Proposed Action at the Ketchikan Port Facility would require demolition, disposal, and replacement of key structures and infrastructure within portions of a 77,000-square-foot (1.8-acre) upland area and a 102,000-square foot (2.3-acre) in-water area owned by the National Oceanic and Atmospheric Administration (NOAA). Nearly all the existing NOAA Office of Marine and Aviation Operations facilities and assets at its Ketchikan Port Facility would be affected. A detailed description of the Proposed Action is provided in Section 1 of the IHA application package. In-water work including pile removal and placement is anticipated to occur for approximately 47 days on an intermittent basis between February 2022 and December 2022. Proposed minimization and avoidance measures are provided in Section 11 of the IHA application package.

Project and Action Areas

The project area is defined as the geographic extent of proposed activities and where direct effects to species and critical habitats may occur (see Figure 1-2 of IHA application package). The action area includes all areas affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR § 402.02). The action area encompasses the project area as well as the estimated maximum spatial extent for underwater noise (12 kilometers) and airborne noise (1 kilometer). The complete action area, including terrestrial and aquatic portions, is shown in IHA application package Figure 2-1. The action area limits were established based on a review of underwater noise propagation from the project that could affect marine mammals. Marine mammal injury and disturbance threshold criteria are provided in Section 6 of the IHA application package. An Underwater Noise Technical Memorandum prepared for removal/installation of piles at Ketchikan Port Facility is provided in Appendix B of the IHA application package.

Essential Fish Habitat in the Action Area

EFH in Alaska is identified in Fishery Management Plans developed by the North Pacific Fishery Management Council (NPFMC) and approved by the Secretary of Commerce. EFH for species occurring in the action area (Tongass Narrows and Revillagigedo Channel) includes Alaska stocks of Pacific salmon and the groundfish Dover sole (*Microstomus pacificus*) (NMFS 2021) (Table D-1). Within the action area, there are 10 anadromous fish streams listed in the Alaska Department of Fish and Game (ADF&G 2021) Anadromous Waters Catalog (Figure D-1; Table D-2).

Table D-1: EFH in the Action Area

Species	Life Stages	Habitat Description
Chinook Salmon	Marine juveniles, marine immature and maturing adults	• Marine juveniles: all marine waters off the coast of Alaska from the mean higher tide line to the 200-nm limit of the EEZ, including the GOA. • Marine immature and maturing adults: marine waters off the coast of Alaska to depths of 200 m and ranging from the mean higher tide line to the 200-nm limit of the EEZ including the GOA.
Chum Salmon	Marine juveniles, marine immature and maturing adults	• Marine juveniles: all marine waters off the coast of Alaska to approximately 50 m in depth from the mean higher tide line to the 200-nm limit of the EEZ, including the GOA. • Marine immature and maturing adults: Same as Chinook salmon.
Coho Salmon	Marine juveniles, marine immature and maturing adults	• Marine juveniles: same as Chinook salmon. • Marine immature and maturing adults: same as Chinook salmon.
Pink Salmon	Marine juveniles, marine immature and maturing adults	• Marine juveniles: same as Chinook salmon. • Marine immature and maturing adults: same as Chinook salmon.
Sockeye Salmon	Marine juveniles, marine immature and maturing adults	• Marine juveniles: same as chum salmon. • Marine immature and maturing adults: same as Chinook salmon.
Dover Sole	Late juveniles, adults	• Late juveniles: lower portion of the water column along the middle (50 to 100 m) and outer (100 to 200 m) shelf and upper slope (200 to 500 m) throughout the GOA wherever there are substrates consisting of sand and mud. • Adults: same as for late juveniles.

Notes: EEZ = Exclusive Economic Zone; GOA = Gulf of Alaska; m = meter(s); nm = nautical mile.

Source: NPFMC 2015, 2018; ADF&G 2021

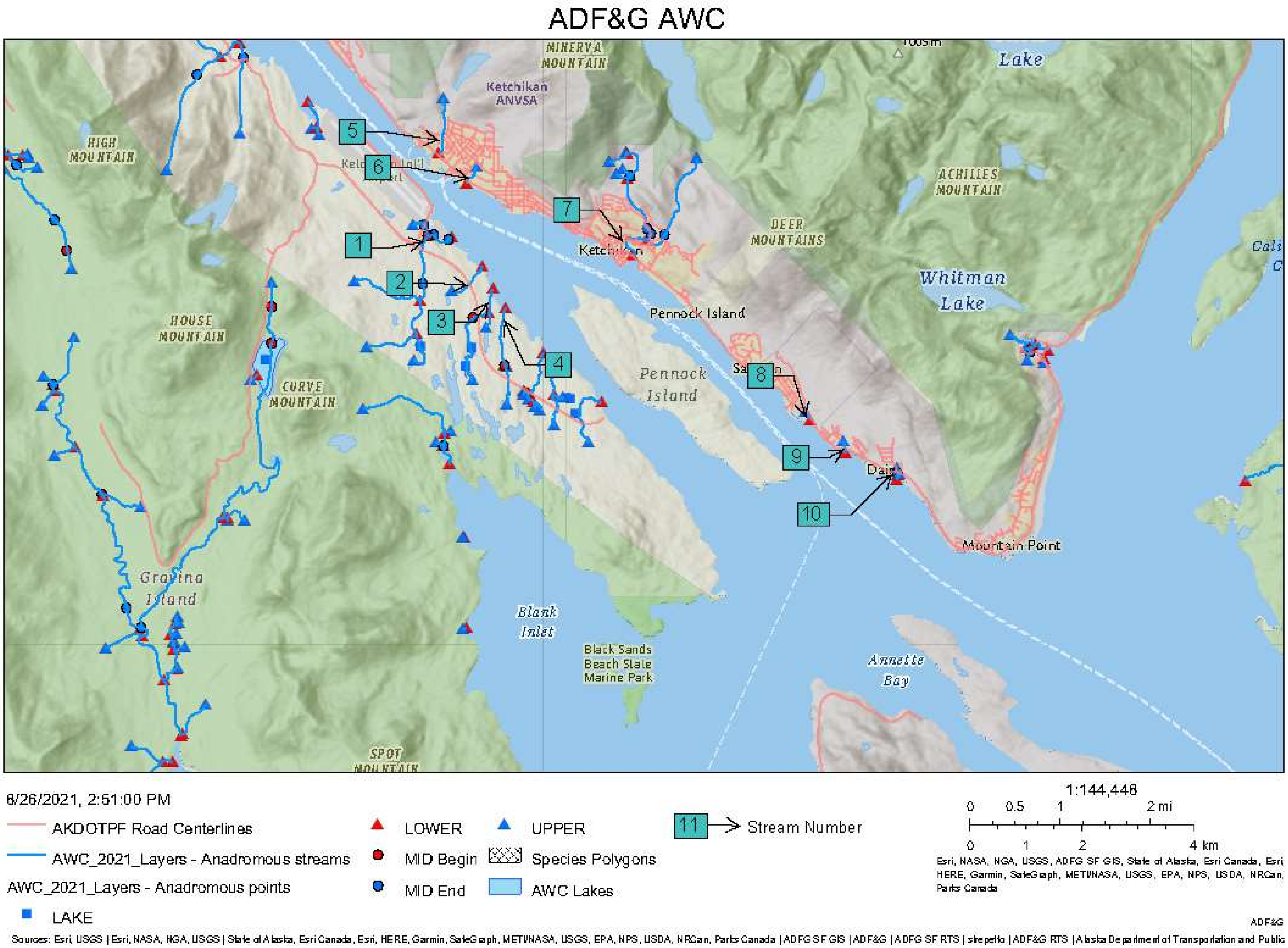

Figure D-1: Anadromous Waters in the Action Area

Table D-2. Anadromous Waters in the Action Area

Map ID (Stream Number)	AWC Code	Species	Habitat Use
1	101-47-10400 (Government Creek)	Chum, Coho, and Pink Salmon	Present (Chum and Coho); Spawning and Rearing (Pink Only)
2	101-47-10380 (Unnamed)	Coho Salmon	Present
3	101-47-10350 (Long Lake Creek)	Coho Salmon	Present
4	101-47-10340 (Unnamed)	Coho Salmon	Present
5	101-47-10180 (Carlanna Creek)	Chum, Coho, and Pink Salmon	Present
6	101-47-10200 (Hoadley Creek)	Coho and Pink Salmon	Present (Coho); Spawning (Pink)
7	101-47-10250 (Ketchikan Creek)	Chum, Coho, Chinook, Pink and Sockeye Salmon; Steelhead and Cutthroat Trout	Present
8	101-47-10300 (Unnamed)	Chum and Pink Salmon	Present
9	101-41-10005 (Adams Creek)	Pink Salmon	Spawning
10	101-41-10010 (Unnamed)	Coho and Pink Salmon	Rearing (Coho); Spawning (Pink)

Notes: AWC = Anadromous Waters Catalog; ID = unique identifier

Source: ADF&G 2021

Potential Adverse Effects of Proposed Action

Construction of the project would involve pile and pier removal work and placement of structures in the Tongass Narrows, which would result in direct impacts to EFH. A summary of direct impacts to aquatic habitats associated with new project structures from the 30 percent design is provided in Table D-3.

Table D-3. Estimate of Direct Impacts to Aquatic Habitats from Proposed Structures

Structures	Fill Material	Pile Quantity	Seafloor Footprint (square feet)	Over-Water Footprint (square feet)
Floating Pier	Steel piles, 24-inch diameter,	10	31	12,000
Transfer Bridge	N/A	N/A	N/A	2,448
Transfer Bridge Support Frame and Float	Steel piles, 24-inch diameter,	4	13	528[1]
Transfer Bridge Abutment	Concrete, shot rock, armor rock, base course	N/A	620	N/A
Small Boat Dock	Steel piles	N/A	13	1,264

Structures	Fill Material	Pile Quantity	Seafloor Footprint (square feet)	Over-Water Footprint (square feet)
Small Boat Dock Suspended Gangway	N/A	4	N/A	150
Suspended Gangway/Catwalk Mooring Dolphins	N/A	N/A	N/A	N/A
Small Boat Launch Ramp	Concrete, shot rock, armor rock, base course	N/A	11,190	N/A
Total		18	11,867 (0.27 acre)	16,390 (0.38 acre)

Notes:
[1]The bridge support float would overlap with that of the bridge itself, therefore the support float area is excluded from the calculation of total over-water footprint.
N/A = not applicable
Data in this table are AECOM estimates and were calculated using maximum quantities and dimensions so they provide a conservative estimate of project impacts.

Construction of the project would involve installation of 18 piles and in-water fill associated with the transfer bridge abutment and the small boat launch ramp, which would modify approximately 0.27 acre of marine substrate. Proposed in-water infrastructure would have an estimated over-water footprint of approximately 0.38 acre. These structures would remain present through operations of the NOAA Ketchikan port (20 to 50 years) and would be removed according to industry standards at the time of decommissioning, unless continued for future use. These direct impacts would be partially offset by removal of existing dilapidated in-water structures; approximately 100 to 200 pilings (approximately 0.009 to 0.014 acre, depending on exact number and diameter of removed piles) and approximately 0.36 acre of over-water infrastructure would be removed. Therefore, the net increase in seafloor footprint at the project site would be approximately 0.27 acre, whereas the net increase in over-water footprint would be approximately 0.02 acre. However, no spawning habitat occurs at the site, and EFH-managed fish are expected to only use the habitat for migration.

The Proposed Action would have temporary impacts on water quality (increases in turbidity levels) and on EFH-managed species distribution. Pile driving may cause temporary and localized turbidity through sediment disturbance. Turbidity plumes during pile installation and removal would be localized around the pile. Due to temporary, localized, and low levels of turbidity increases, turbidity would not result in long-term effects to EFH or EFH-managed species.

Potential indirect effects, as defined for EFH consultations under 50 CFR § 600.810, include the short-term (i.e., hours to weeks) disturbance of benthic food organisms. The disturbances caused by the Proposed Action would be limited to specific in-water work areas and would not have a significant adverse effect on EFH over the long term.

Effects Determination

The effects determinations for EFH are summarized in Table D-4.

Table D-4: Effects Determination for Essential Fish Habitat

Essential Fish Habitat Designation	Species or Resource in Essential Fish Habitat	Effects Determination
Pacific Coast Salmon EFH	Chinook, Chum, Coho, Pink, and Sockeye Salmon	May adversely affect
Groundfish EFH	Dover Sole	May adversely affect

Notes: EFH = Essential Fish Habitat.

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North Pacific Fishery Management Council (NPFMC). 2015. Fishery Management Plan for Groundfish of the Gulf of Alaska. Prepared by the North Pacific Fishery Management Council. Anchorage, AK. 152 pp.

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Appendix E: List of Invited Parties

Ketchikan Section 106
Alaska Native Corporations/Communities

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