

NEW CARGO EXPORT PROJECT HABITAT ASSESSMENT – BERTH 2

September 2021



Prepared for.

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Delta, British Columbia

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AMENDMENT RECORD

This report has been issued and amended as follows:

Issue	Description	Date	Approved by		
1	First version of Habitat Assessment for New Cargo Export Project	20210330	Stewart Wright Project Director	Karen McMillan Project Manager	Francine Beaujot Marine Biologist RPBio
2	Second version of Habitat Assessment for New Cargo Export Project	20210413	Stewart Wright Project Director	Karen McMillan Project Manager	Francine Beaujot Marine Biologist RPBio
3	Third version of Habitat Assessment for New Cargo Export Project	20210512	Stewart Wright Project Director	Karen McMillan Project Manager	Francine Beaujot Marine Biologist RPBio
4	Fourth version of Habitat Assessment for New Cargo Export Project	20210830	Angus Johnston on behalf of Stewart Wright Project Director	Karen McMillan Project Manager	Francine Beaujot Marine Biologist RPBio
5	Fifth version of Habitat Assessment for New Cargo Export Project	20210902	Angus Johnston on behalf of Stewart Wright Project Director	Karen McMillan Project Manager	Francine Beaujot Marine Biologist RPBio
6	Sixth version of Habitat Assessment for New Cargo Export Project	20210915	Stewart Wright Project Director	Karen McMillan Project Manager	Francine Beaujot Marine Biologist RPBio
7	Seventh version of Habitat Assessment for New Cargo Export Project	20210917	 Stewart Wright Project Director	 Karen McMillan Project Manager	 Francine Beaujot Marine Biologist RPBio

1.0 PROJECT OVERVIEW

Westshore Terminals Ltd. Partnership (Westshore) is planning to diversify the products shipped to market through their existing Westshore coal export terminal in Delta, British Columbia (BC). Hatfield Consultants (Hatfield) was retained to support the permitting for the proposed New Cargo Export Project.

The New Cargo Export Project involves modifications to the existing facility to use a portion of the site for potash export. The majority of the New Cargo Export Project involves land-based modifications such as the construction of a new enclosed railcar dumper, new enclosed conveyors and transfer towers, a new potash storage building and associated on-site road, rail and civil infrastructure modifications within the existing facility (the Project). In-water works include retrofitting the existing Berth 2 marine foundations and the installation of two spout changeout towers and associated structural supports at Berth 2 (Appendix A1). The retrofitting works will include installing new concrete-filled steel piles, reinforcing existing concrete pile caps and pile to pile cap connections, and infilling existing piles with concrete. The shiploaders at Berth 2 will be used to load both coal and potash, requiring different loading spouts for each product, and therefore storage platforms are required to store the spouts that are not in use. The storage platforms will be elevated above the water on piled structures at Berth 2.

This habitat assessment has been prepared by Hatfield in support of a Fisheries and Oceans Canada (DFO) Request for Review under the *Fisheries Act* and the *Species at Risk Act*, and as part of the Vancouver Fraser Port Authority (VFPA) Project and Environmental Review (PER) Category C permit application. This habitat assessment has been developed in accordance with VFPA PER Guidelines for Habitat Assessment (2015).

The *Fisheries Act* requires that Project works, undertakings or activities (WUA) avoid causing;

1. the death of fish by means other than fishing; and
2. Harmful Alteration, Disruption and Destruction (HADD) unless authorized by the Minister of Fisheries and Oceans Canada.

This habitat assessment includes a desktop review of existing conditions and environmental data for the Project Area (Figure 1). Based on the information reviewed and collected, Hatfield has assessed the value of the habitat with the potential to be affected by Project works. Hatfield has assessed the potential for the death of fish and HADD and defined avoidance and mitigation measures for the Project. This includes construction methodology inputs, Best Management Practices (BMPs), environmental monitoring and mitigation measures to be implemented during the construction phase.

Hatfield has evaluated the proposed Project WUA to confirm if applicable Measures to Protect Fish and Fish Habitat (DFO 2019a) can be implemented. Hatfield has prepared this habitat assessment on behalf of Westshore in accordance with the application information requirements of a Request for Review pursuant to the *Fisheries Act*.

The Request for Review application for the Project will be submitted to DFO following the VFPA PER application submission. Given the similar nature and location of the Project works with a recent previous Request for Review by Westshore for the Berth 2 Mooring Dolphin Replacement, Hatfield anticipates similar mitigation measures and requirements as those provided by DFO on September 17, 2020 (file number 20-HPAC-00516; Attachment A2).

1.1 PROJECT LOCATION AND SETTING

The in-water works are located at Berth 2 on the southeast side of the Westshore terminal at 1 Roberts Bank, Delta, BC, in the Strait of Georgia (Figure 1). The Project is on VFPA property for which Westshore has an existing lease agreement. Westshore terminal is on Roberts Bank, a shallow offshore estuarine area located south of the Fraser River South Arm. Westshore terminal sits between this South Arm of the Fraser River and the Tsawwassen Ferry Terminal.

The fish habitat has been altered during the creation of the terminal, which sits on a layer of dredged sand placed directly overtop native intertidal mud flats. A rip rap slope protects the terminal from erosion (Figure 2), and a 22 m dredge pocket has been created about 50 m from the terminal to accommodate cargo ships (Braun Geotechnical Ltd. 2020). The steel piles that will support the spout changeout towers and berth structures will be installed in soft sediment near the berthing dolphins at approximately -15 m Chart Datum.

1.2 PROPOSED PROJECT WORKS

The shiploaders at Berth 2 will be used to load both coal and potash, requiring different spouts for each product. Two elevated spout changeout towers will be required for the spouts that are not in use. These storage platforms will require installing approximately three (3) to four (4) piles per tower with an approximate pile diameter of 1 to 1.5 m. The piles will have concrete pile caps and will support the expansion of the existing concrete decking by about 1.2-by-2.6 m on each tower. Two steel beams will be installed underneath the existing structure at two locations using a barge-based crane. These beams will be used to support the additional loads from the storage platforms to the existing wharf structure. The newly installed piles will support these beams.

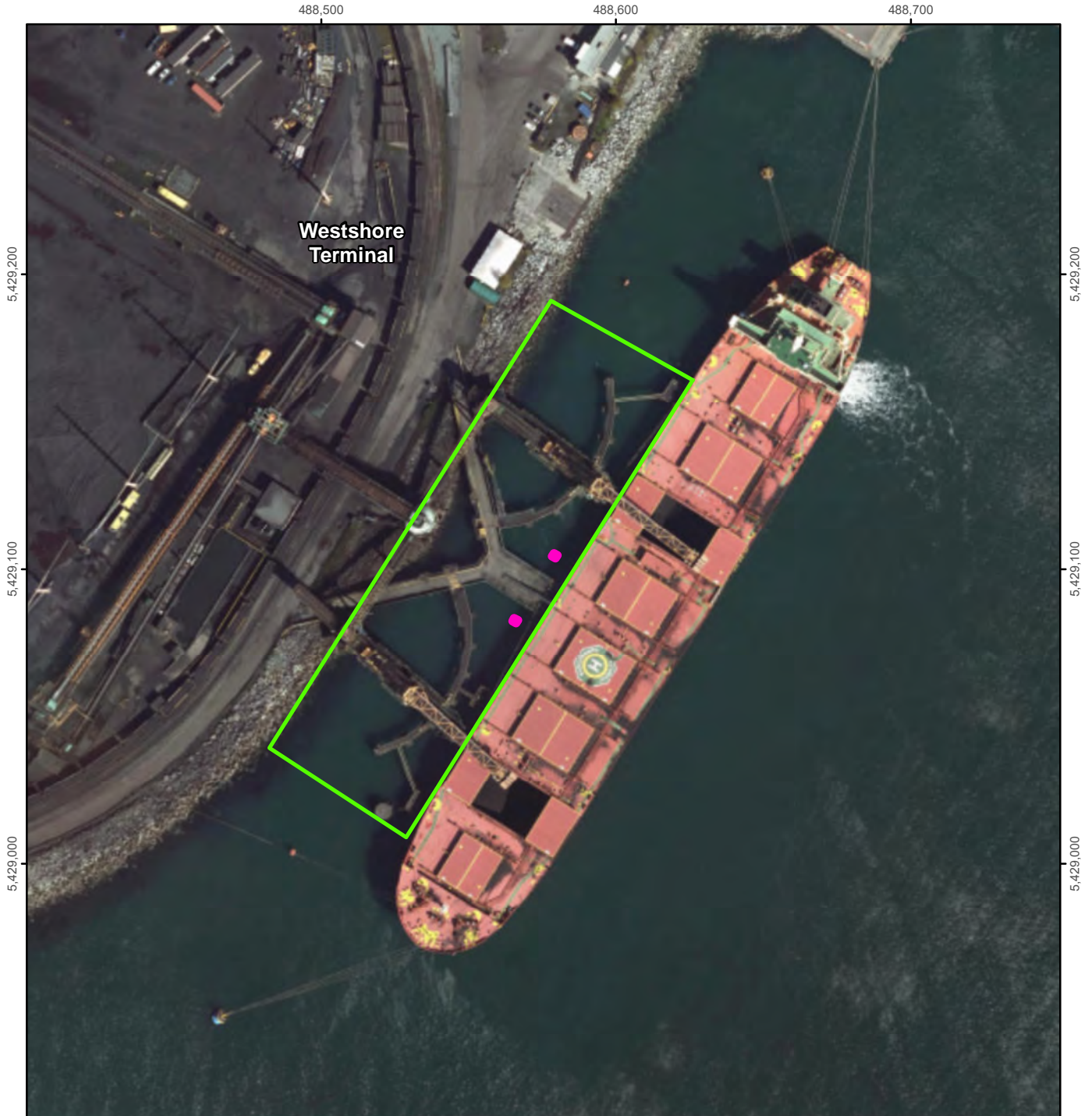
No existing marine structures will be removed or relocated as part of the Project. However, to meet Project seismic design requirements, retrofits will be undertaken on the existing Berth 2 marine foundations. This includes installing 36 new concrete-filled steel piles with an approximate diameter of 1 to 1.5 m, reinforcement of existing concrete pile caps and pile to pile cap connections, and infill of existing piles with concrete.

In total, approximately 42 piles will be installed (6 for the spout changeout towers and 36 for the retrofitting work). Piles will be installed using a vibratory hammer from a barge. An impact hammer will only be used if necessary. Both hammers will be used in accordance with the mitigation in Section 5.0. No in-water rock placement or infilling is required for the Project. Design drawings for Berth 2 can be found in Appendix A1.

1.3 PROJECT SCHEDULE

The foundation retrofit pile installation is currently scheduled over three years for 2022, 2023 and 2024 and the spout changeout tower work in 2025, during the least risk timing window for fish and fish habitat in the Vancouver Area Inlet (i.e., August 16 to February 28). Pile driving and associated works are scheduled to occur in September, during advantageous weather conditions. Pile installation works during these timing windows are anticipated to take 15 to 20 days to complete.

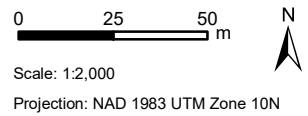
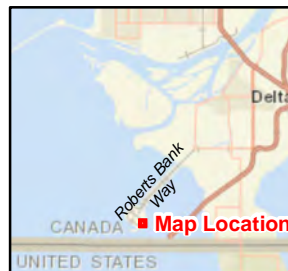
Figure 1 Berth 2 Overview.



Legend

- Project Area
- Approximate Locations of Spout Changeout Towers

Data Sources:
 a) Project data, Hatfield 2020 and 2021.
 b) City of Delta Orthophoto 0.075 cm, April 26, 2018, Esri Online Service.



New Cargo Export Project

2.0 EXISTING CONDITIONS

A desktop review of environmental resources has been completed. The results of the desktop review are summarized based on the habitat that could potentially be affected, fish presence, and the potential for species at risk within the Project Area. Sources of information reviewed as part of the desktop study included:

- BC Conservation Data Centre (CDC):
 - BC Species & Ecosystems Explorer: <http://a100.gov.bc.ca/pub/eswp/>
 - CDC iMap: <http://maps.gov.bc.ca/ess/hm/cdc/>
- BC Fish Inventories Data Queries (FIDQ): <http://a100.gov.bc.ca/pub/fidq/welcome.do>
- DFO Aquatic Species at Risk Map:
<https://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html>
- Fisheries Information Summary System (FISS):
https://cmnbc.ca/atlas_gallery/fisheries-information-summary-system-data-entry-tool
- FREMP-BIEAP Habitat Atlas: <https://www.cmnbc.ca/atlasgallery/frempe-bieap-habitat-atlas/>
- Important Bird Areas (IBA) Canada: <https://www.ibacanada.com/mapviewer.jsp?lang=EN>
- Sensitive Habitat Information Mapping (SHIM):
https://cmnbc.ca/atlas_gallery/shim-sensitive-habitat-inventory-and-mapping

2.1 FISH AND FISH HABITAT

The Strait of Georgia supports a diversity of fish species, including Pacific salmon, Pacific herring, flatfish, rockfish, lingcod, and sand lance. Some fish, for example, adult chinook salmon, are important prey for other species such as Southern Resident Killer Whale (SRKW). Eulachon, a culturally valued food source for many coastal Indigenous people, were historically abundant in the Fraser River Estuary every spring; however, current populations are severely reduced. Two species of sturgeon, green sturgeon and white sturgeon, were also historically abundant but now have been depleted.

Eelgrass and macroalgae are commonly observed on Roberts Bank and provide habitat for fish and invertebrates. However, no eelgrass or marine algae is expected in the Project area as the substrate is too soft for algae to anchor to and the area is too deep for eelgrass to grow; further, the use of the berth already likely prohibits the growth of eelgrass and algae. Due to the expected lack of eelgrass and macroalgae in the Project Area, potential effects of shading from the concrete decking are not anticipated.

Figure 2 Berth 2 shoreline of Westshore Terminal.



Photo source: Westshore 2021

2.2 MARINE MAMMALS

Marine mammals are common in the Strait of Georgia and are observed in Roberts Bank. The most commonly observed marine mammal is the harbour seal, and the most abundant cetacean is the harbour porpoise (Port Metro Vancouver 2015). Habitat use by SRKW is seasonal, with most sightings occurring in late summer and fall to coincide with the return of adult Pacific salmon to the Fraser River (DFO 2011a). SRKW are considered at risk by the federal government, and their critical habitat covers much of the southern region of the Strait of Georgia, including the Project Area.

2.3 INVERTEBRATES

Invertebrates such as Dungeness crabs and bivalves are common on Roberts Bank. Juvenile Dungeness crabs prefer vegetated habitats in the intertidal areas, while adults tend to migrate to deeper waters and softer substrates (DFO 2011b). The Project Area contains adequate habitat for Dungeness crabs.

Sea pens are known to occupy deeper waters in the area, but in a 2012 survey of Roberts Bank, sea pens were not found in the Project Area (VFPA 2018a).

Concrete piles encrusted with abundant invertebrate life were recovered from Westshore Terminal Berth 1 trestle after damage in 2012 (Westshore Terminals LP 2013). Invertebrates observed growing on the salvaged piles included ochre sea star, plumose anemone, blue mussels, and acorn barnacles. It is likely that a similar community of invertebrates would colonize the spout changeout towers after installation. No invertebrates of conservation concern (e.g., Northern abalone) have been observed on Roberts Bank (Port Metro Vancouver 2015).

2.4 AQUATIC SPECIES AT RISK

Species at risk are identified by both provincial and federal governments following ranking systems. The provincial ranking system applies to species that have been assessed by CDC. The federal ranking system applies to species that have been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The CDC and COSEWIC publish lists of species at risk. A preliminary list of species was generated from the provincial database by querying the CDC Species and Ecosystem Explorer database to identify listed species that have the potential to occur within or in proximity to the Project Area. The Species at Risk Public Registry and DFO aquatic species at risk maps were also reviewed to identify potential aquatic species at risk within the Project Area. Aquatic species at risk that could potentially be found within a one-kilometre radius of the Project Area are summarized in Table 1.

Table 1 Listed aquatic species with the potential to occur within 1 km of the Project Area.

Scientific Name	Common Name	BC List ¹	SARA Status ²	COSEWIC Status ³
<i>Acipenser medirostris</i>	Green Sturgeon	Blue	Special Concern	Special Concern
<i>Cetorhinus maximus</i>	Basking Shark	-	Endangered	Endangered
<i>Dermochelys coriacea</i>	Leatherback Sea Turtle	Red	Endangered	Endangered
<i>Eschrichtius robustus</i>	Grey Whale	Blue	Special Concern	Special Concern / Endangered
<i>Eumetopias jubatus</i>	Steller Sea Lion	Blue	Special Concern	Special Concern
<i>Galeorhinus galeus</i>	Tope	-	Special Concern	Special Concern
<i>Haliotis kamtschatkana</i>	Northern Abalone	Red	Endangered	Endangered
<i>Hexanchus griseus</i>	Bluntnose Sixgill Shark	-	Special Concern	Special Concern
<i>Megaptera novaeangliae</i>	Humpback Whale	Blue	Special Concern	Special Concern
<i>Orcinus orca</i>	Killer Whale (Southern Resident population) ⁴	Red	Endangered	Endangered
<i>Orcinus orca</i>	Killer Whale (Transient population)	Red	Threatened	Threatened
<i>Phocoena phocoena vomerina</i>	Harbour Porpoise	Blue	Special Concern	Special Concern
<i>Sebastes</i> sp. type I	Rougheye Rockfish type I	-	Special Concern	Special Concern
<i>Sebastes</i> sp. type II	Rougheye Rockfish type II	-	Special Concern	Special Concern
<i>Sebastolobus altivelis</i>	Longspine Thornyhead	-	Special Concern	Special Concern

¹ BC List: Red = species that are extirpated, endangered, or threatened; Blue = species that are of special concern.

² Schedule 1 of SARA is the official list of species at risk in Canada. It includes species that are extirpated, endangered, threatened, and of special concern; however, the general prohibitions do not apply to species of special concern.

³ COSEWIC is an independent advisory panel to the Minister of Environment and Climate Change Canada that meets twice a year to assess the status of wildlife species at risk of extinction. It includes species that are extirpated, endangered, threatened, and of special concern.

⁴ The Project is within SRKW Critical habitat.

3.0 HABITAT QUALITY SUMMARY

The natural habitat within the Project Area is highly disturbed and modified from ongoing industrial use. The quality of the habitat for fish, other marine fauna, algae and eelgrass is considered very low. Marine fauna that could occur in the Project Area includes Dungeness crabs, which are highly mobile.

4.0 ASSESSMENT OF IMPACTS

Potential adverse effects have been considered in the design of the elevated towers and retrofits at the berth, and the footprint has been designed to occupy minimal space on the seabed (between 33 and 78 m², depending on final pile configuration). The installation of the piles, towers and supporting structures are not expected to cause permanent adverse effects to the aquatic habitat if the mitigation measures and BMP in Section 5.0 are followed.

Potential temporary and short-term adverse effects could arise from:

- Accidental spills to water (e.g., fuel and oil for machinery) during works;
- Changes in habitat use by fish or species at risk during construction; and
- Increased noise during construction, especially during pile driving activities.

Fish habitat use may be temporarily altered during piling activities. A slight increase in turbidity and noise may occur during piling, which will likely deter fish from using the area. Given the limited duration and footprint of in-water works and existing noise and turbidity levels, the potential for fish mortality is considered very low.

5.0 AVOIDANCE AND MITIGATIONS

A Construction Environmental Management Plan (CEMP) has been developed for the Project according to the VFPA CEMP Guideline (VFPA 2018b). The CEMP incorporates construction mitigations and environmental specifications in the areas of air quality, noise and vibration, machinery and equipment management, erosion and sediment control, invasive species management, soil and groundwater management, concrete works and grouting management, fuel management, waste management, and plans pertaining to construction communications, environmental emergencies and spill response. The CEMP will include sections specific to the in-water works covered in the current assessment, including monitoring for underwater noise and marine mammals.

Design mitigations were reviewed, and Westshore attempted, through design, to store the shiploaders' coal and potash loading spouts, when not in use, on existing structures to avoid in-water works. It was determined, however, that the existing and planned structures under the Berth 2 Mooring Upgrades project, would not be suitable to accommodate the loading spouts.

The following list outlines construction mitigation measures and BMPs that will be included in the CEMP to avoid or reduce the potential for adverse effects. These mitigations generally follow those recommended by DFO on September 17, 2020 (file number 20-HPAC-00516) for the replacement of mooring dolphins directly adjacent to the proposed spout towers. The CEMP includes, but is not limited to, the following mitigations:

- Conduct pile driving works only between August 16 and February 28 to account for the least risk timing window for fish and fish habitat in the Vancouver Area Inlet (unless otherwise agreed upon by DFO and VFPA);
- Conduct full time environmental monitoring for all pile driving or concrete activities. The Environmental Monitor (EM) is required to monitor for compliance with regulations and to ensure appropriate implementation of environmental best management practices. The EM will be a Qualified Environmental Professional (QEP) or work under the direct supervision of a QEP;
- An experienced and qualified Marine Mammal Observer (MMO) is to be present at all times during in-water pile driving activities and shall monitor marine mammal presence;
- Pile driving activities are to be conducted during daylight hours in good visibility and weather conditions that permit visual observations;
- Water-based equipment shall not ground upon the seabed except for the use of anchors or spuds needed to keep the water-based equipment in place;
 - Ensure there is enough clearance between the seabed and the vessels to avoid/ minimize propeller wash and/or grounding of vessels; and
 - Minimize re-positioning of spuds and avoid placement of spuds on sensitive aquatic vegetation or habitat (e.g., kelp and/or eelgrass).
- Acoustic monitoring and sound source verification shall be conducted for all pile driving activities. The acoustic monitoring is to confirm that pile driving does not exceed acoustic thresholds;
 - To mitigate the potential for negative acoustic impacts, the following acoustic noise thresholds and mitigation measures for the protection of fish will be applied:
 - Underwater noise shall be monitored 10 m from the pile and shall not exceed 206 dB re 1 µPa during pile driving;
 - Continuous hydroacoustic monitoring shall be conducted by the EM during the first five (5) days of vibratory pile driving. Monitoring beyond the 5 days shall be at the discretion of the EM. Hydroacoustic monitoring shall be conducted full time during all impact pile driving; and
 - If monitoring indicates sound levels in excess of the above-mentioned thresholds, the activity will cease, mitigation measures reviewed, and additional mitigation implemented as required at the direction of the EM. Pile driving will resume at the discretion of the EM.
- Vibratory pile driving, rather than impact pile driving is preferred to reduce the potential impacts on fish and marine mammals. If impact pile driving is to occur, the following additional mitigation measures shall be implemented:
 - A sound attenuation device (e.g., bubble curtain and/or shell and containment system) around the full wetted length of the pile be installed to reduce sound levels. Bubble curtains, when used, shall extend from the seabed to water surface in a contiguous curtain surrounding the pile perimeter;

- The EM shall conduct daily inspection of the sound attenuation device (e.g., bubble curtain) to confirm functionality prior to pile driving works;
- All impact pile driving will require an increased bubble curtain run time prior to the start of piling activities. The bubble curtain will be run at full power for three (3) minutes prior to the first hammer strike. If a curtain utilizing multiple rings is employed, the rings shall be activated sequentially, one ring at a time starting from the top ring. Bubble curtains shall be operated in accordance with applicable BMPs; and
- The use of a soft start (ramp-up) procedure shall be implemented for all pile driving installations whereby energy is gradually increased over a period of 10 minutes.
- The EM will establish a cetacean exclusion zone (EZ). Hydrophone monitoring will be conducted at various distances from the pile to determine the distance from pile driving at which underwater noise falls below the root mean square (RMS) SPL of 160 dB re 1 μ Pa (i.e., the point of sound attenuation). This will define the EZ for marine mammal monitoring. Until the EZ is determined through the hydroacoustic monitoring, a precautionary EZ of 1000m shall apply. MMO activities shall be conducted according to the following:
 - The MMO shall be equipped with binoculars and monitor for marine mammals within the EZ for at least 30 minutes prior to the start of pile installation. The MMO must maintain visual observance of the full extent of the EZ to identify approaching marine mammals and halt work before a cetacean enters the EZ. This may require multiple MMOs;
 - If visibility is such that the MMO is unable to effectively monitor for marine mammals within the exclusion zone (e.g., in darkness or heavy fog), the MMO may delay the start of in-water works until visibility improves;
 - If acoustic monitoring indicates sound levels in excess of the above criteria at the boundary of the precautionary EZ (i.e., 1000m), the work must be immediately halted. The work will only resume after adaptive management measures (e.g., extending the EZ, implementing additional bubble curtains, etc.) are implemented to reduce sound levels below threshold levels;
 - Pile driving activities will cease if a cetacean is observed within the exclusion zone and will only resume once the animal has left the exclusion zone or has not been re-sighted for 30 minutes; and
 - Construction activities will cease if there is a risk of physical harm to any marine mammal from direct contact. Construction activities may only resume once there is no longer a risk of injury to marine mammals from direct contact.
- As the Project is located in critical habitat for SRKW, the MMO will be stationed at Berth 2 at a safe distance from the piling locations and scan the waters within the area of potential sound effects using binoculars and by making visual observations. Works shall be halted immediately if a killer whale is observed and notify the DFO Observe, Record and Report line at 1-800-465-4336. Re-initiate works only after killer whales have not been observed in the area for 30 minutes; and
- A spill response plan shall be implemented to avoid a spill of deleterious substances, including into the marine environment.

6.0 POTENTIAL FOR DEATH OF FISH AND HADD

In accordance with the Fish and Fish Habitat Protection Policy Statement (DFO 2019a), DFO interprets HADD as any temporary or permanent change to fish habitat that directly or indirectly impairs the habitat's capacity to support one or more life processes of fish.

The *Fisheries Act* requires that Project WUA avoid causing;

1. The death of fish by means other than fishing; and
2. HADD unless authorized by the Minister of Fisheries and Oceans Canada.

Fish habitat is defined in subsection 2(1) of the *Fisheries Act* to include all waters frequented by fish and any other areas upon which fish depend directly or indirectly to carry out their life processes. The types of areas that can directly or indirectly support life processes include but are not limited to spawning grounds and nursery, rearing, food supply and migration areas. DFO interprets HADD as any temporary or permanent change to fish habitat that directly or indirectly impairs the habitat's capacity to support one or more life processes of fish (DFO 2019b).

The placement of approximately 42 cylindrical piles will result in habitat alteration of between 33 and 78 m² in total, depending on the final pile configuration. Due to the ongoing operations at Berth 2, the size of the in-water Project footprint, timing, and the mitigation measures proposed, Hatfield does not believe that this habitat alteration will result in a change that will directly or indirectly impair the capacity of the habitat to support one or more life processes of fish.

The assessment aligns with DFO's risk-based approach considering the sensitivity of the fish and fish habitat in question, by preventing the death of fish through implementing protection measures such as respecting the least risk timing window, and not interfering with the migration of fish.

7.0 SUMMARY AND CONCLUSIONS

Westshore is planning to install elevated spout changeout towers and undertake marine foundation retrofits as part of the New Cargo Export Project, which will allow potash, as well as coal, to be exported from the terminal at Berth 2. The spout changeout towers are essential to switch between potash and coal exports and the retrofits are essential to meet seismic requirements.

The Project has been designed to avoid or minimize the potential for adverse environmental effects. The death of fish can be avoided through construction mitigation measures referenced in Section 5.0. Based on the in-water works footprint, duration, existing site conditions, and the application of mitigation and construction BMPs outlined in this report, and included in the New Cargo Export Project CEMP, it is Hatfield's opinion that adverse residual impacts to fish or the habitats that support their life functions will not occur. Specifically, the Project will not result in death of fish or HADD.

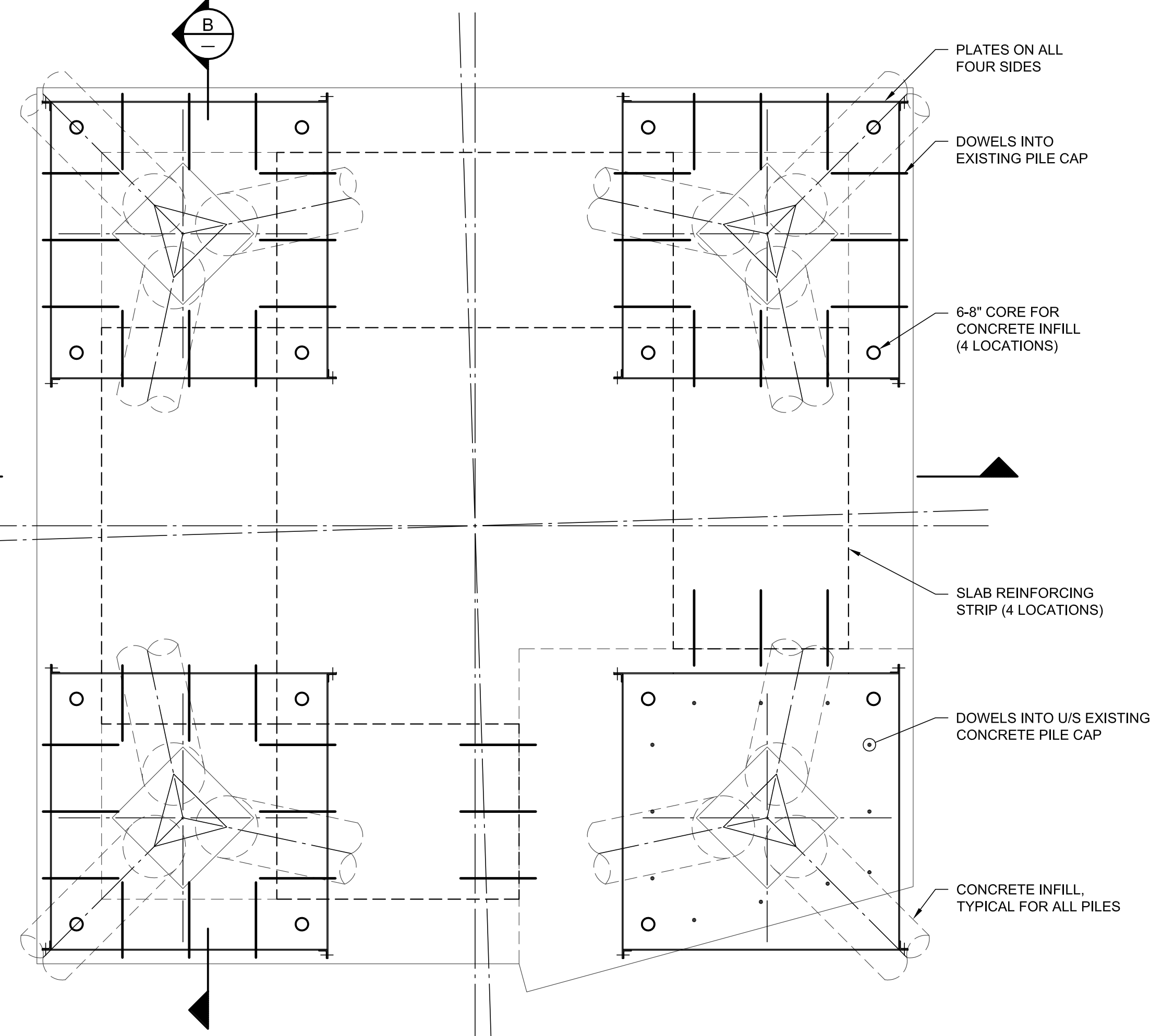
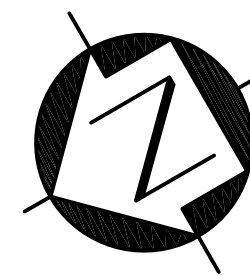
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APPENDICES

Appendix A1

**CWA Engineering
Spout Changeout System and Berth
2 Retrofit Drawings**



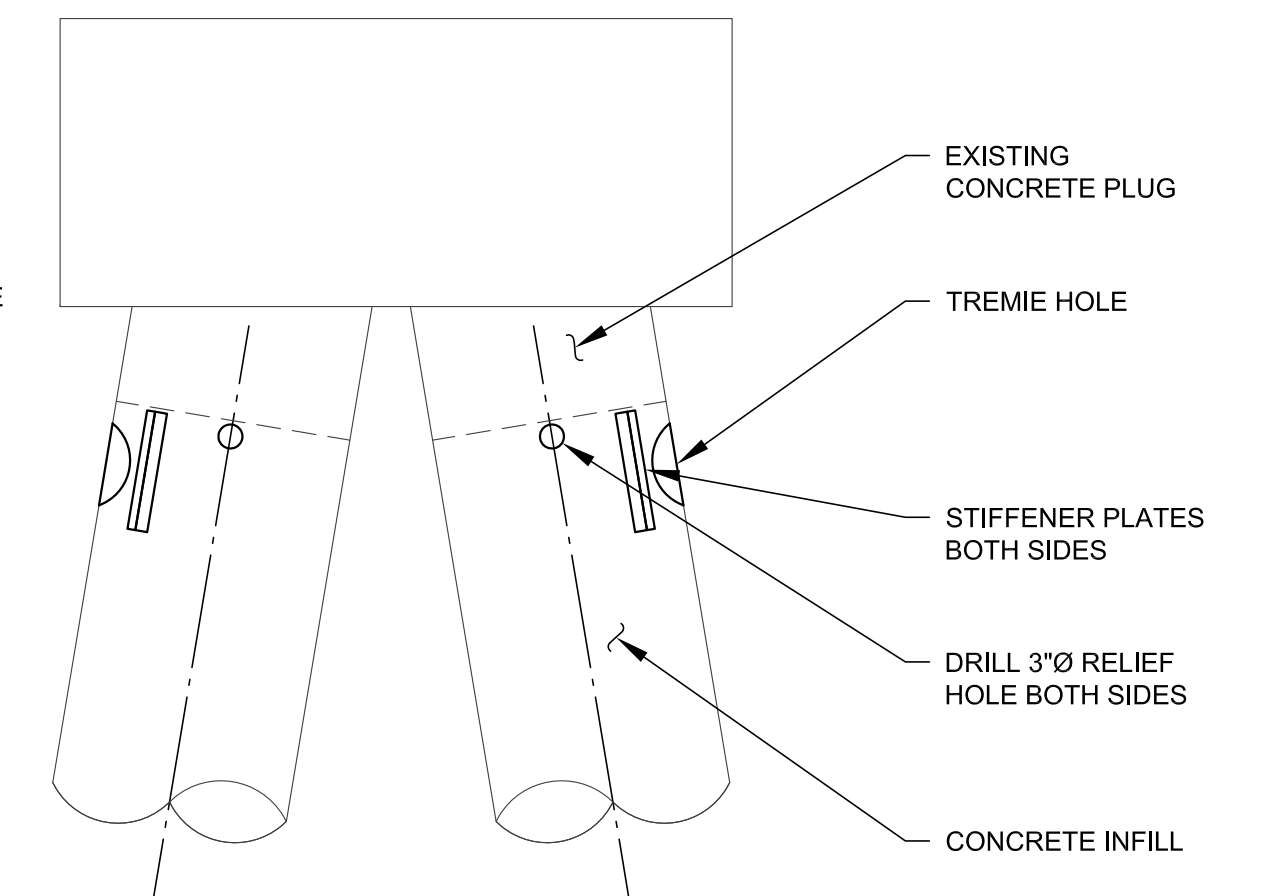
PLAN - SURGE BIN PILE CAP
1/4" = 1'-0"

CONSTRUCTION SEQUENCE

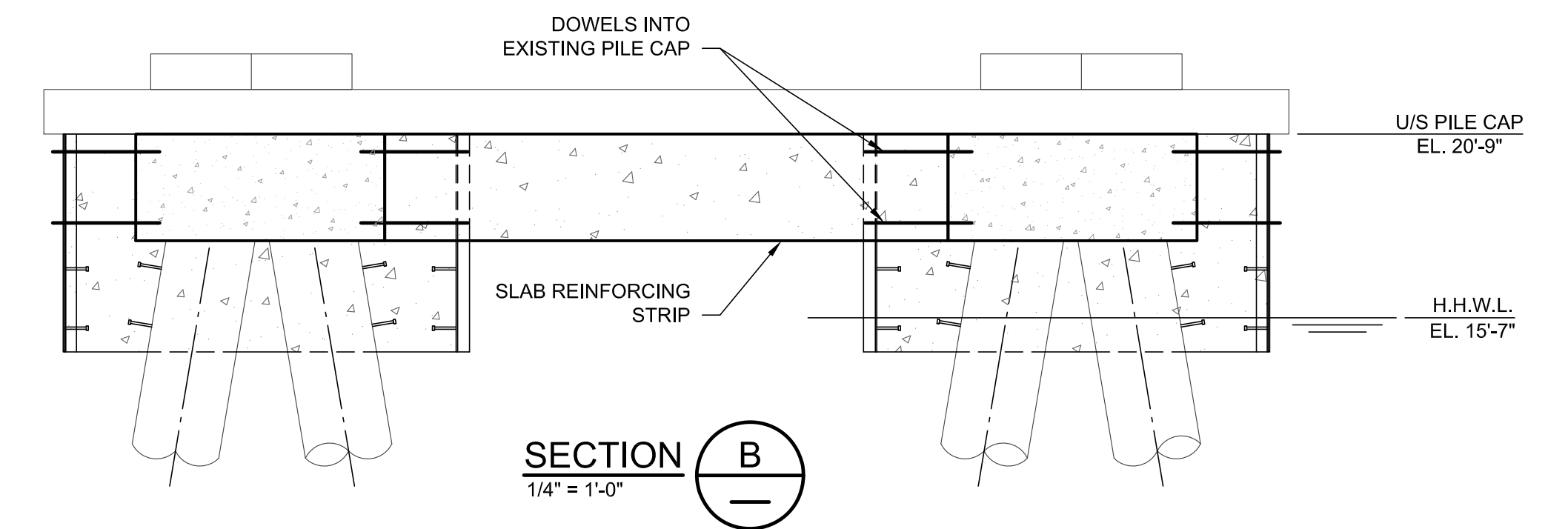
1. WELD NELSON STUDS TO PILES.
2. SCAN SURFACE FOR REINFORCEMENT. CORE 6-8" DIA HOLES IN BETWEEN REINFORCEMENT.
3. INSTALL DOWELS INTO SIDE FACES OF EXISTING PILE CAP AND U/S OF SLAB.
4. HANG REBAR CAGE FROM UNDERSIDE OF SLAB.
5. ERECT PLATEWORK BOX AND PROVIDE TEMPORARY SUPPORT. (DOWELS WILL NOT TAKE LOAD UNTIL CONCRETE HAS SET)
6. FORM UP UNDERSIDE OF BOX.
7. PUMP SELF CONSOLIDATING CONCRETE THROUGH CORED HOLES IN SLAB.
8. SEAL VENT HOLES ONCE BOX IS FULL.
9. FILL REMAINDER OF CORE HOLES AND FINISH FLUSH WITH SLAB SURFACE.

CONSTRUCTION SEQUENCE

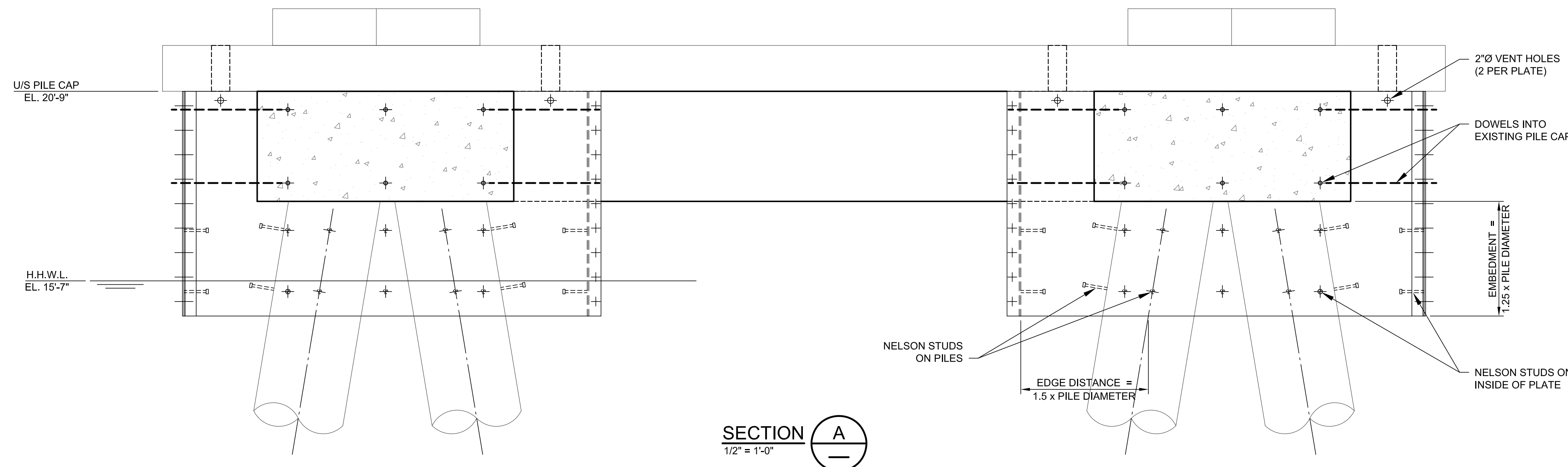
1. TAP/SCAN PILE TO DETERMINE EXTENT OF CONCRETE PLUG.
2. ADD STIFFENERS TO PILE ADJACENT TO HOLE LOCATIONS.
3. CUT 6"-8" HOLE FOR TREMIE PUMP BELOW CONCRETE PLUG. DRILL 3"Ø RELIEF HOLES NEAR TOP OF PILE.
4. PUMP CONCRETE INTO PILE UNTIL IT FLOWS FROM RELIEF HOLE.
5. WELD SEAL PLATES OVER OPENINGS.



TYPICAL CONCRETE INFILL FOR EXISTING PILES
1/2" = 1'-0"



SECTION B
1/4" = 1'-0"



SECTION A
1/2" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

REF.	DWG. NUMBER	DESCRIPTION	No.	YYYY-MM-DD	DESCRIPTION	ISSUES / REVISIONS	DRAWN	DWG. CHECK	DESIGN	DESIGN CHECK	DISC. APPROVAL	PROJ. APPROVAL	DRAWN BY: HRS	SCALE: AS NOTED	ACAD FILENAME: 19899-100-SK-1106	REV.
		REFERENCE DRAWINGS / DESIGN STANDARDS														
			P1	2021-06-28	ISSUED FOR VFPA REVIEW		CPL		DJC		AMG	AJK				



WestshoreTerminals

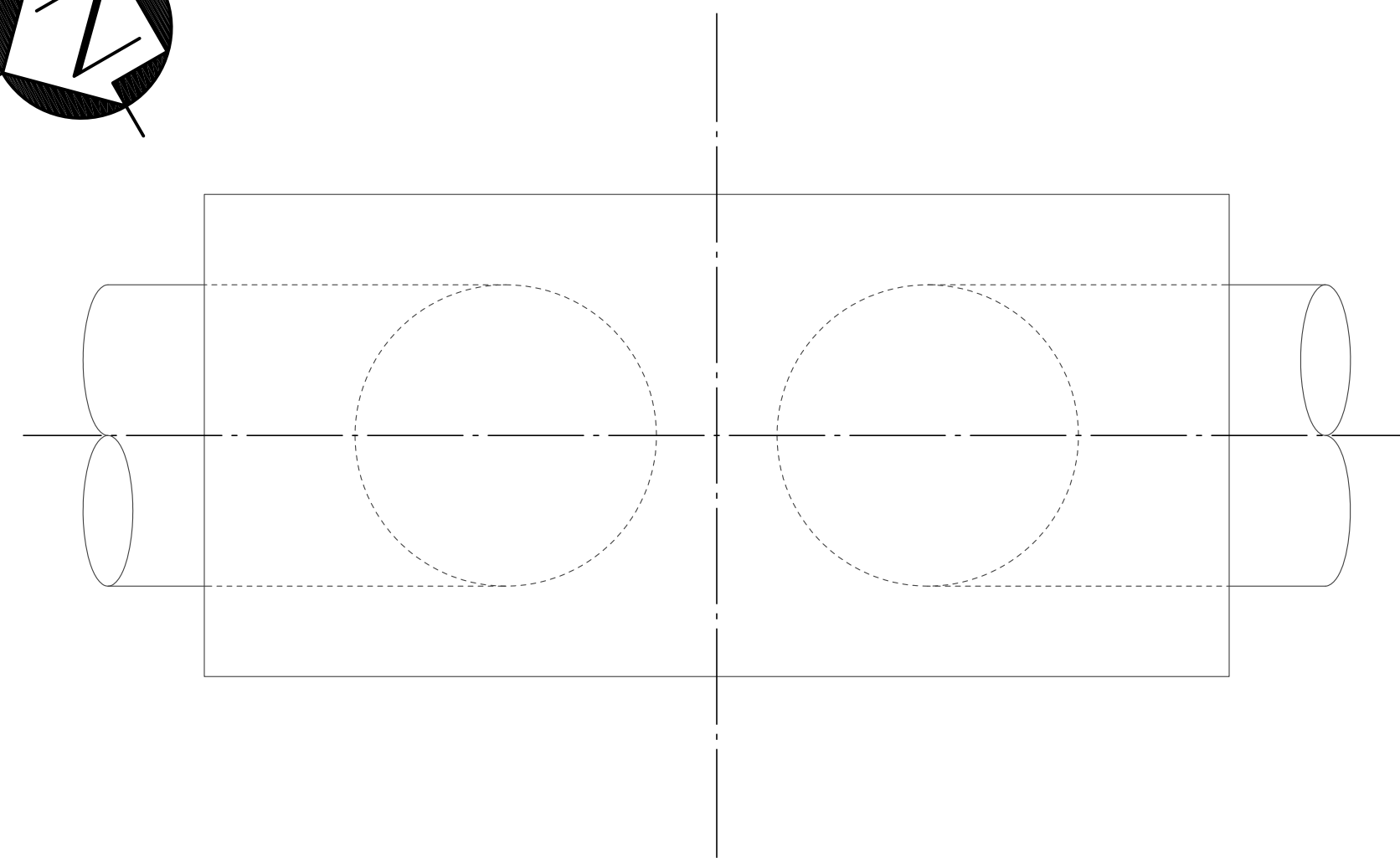
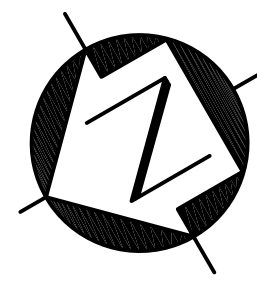
CWA PROJECT NUMBER: 19899

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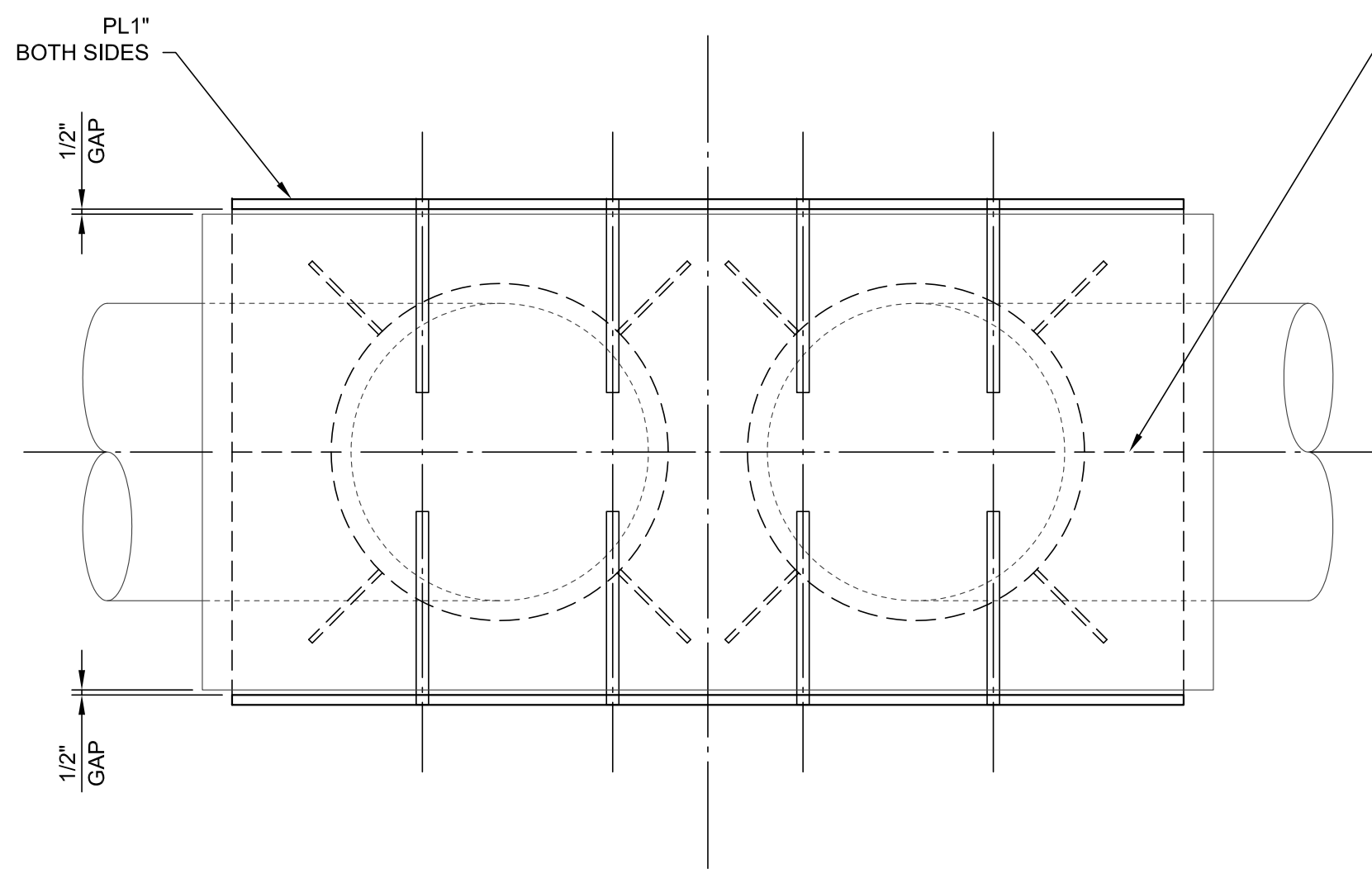
**NEW CARGO STUDY
BERTH 2 RETROFITS
SURGE BIN CONCEPTS**

19899-100-SK-1106

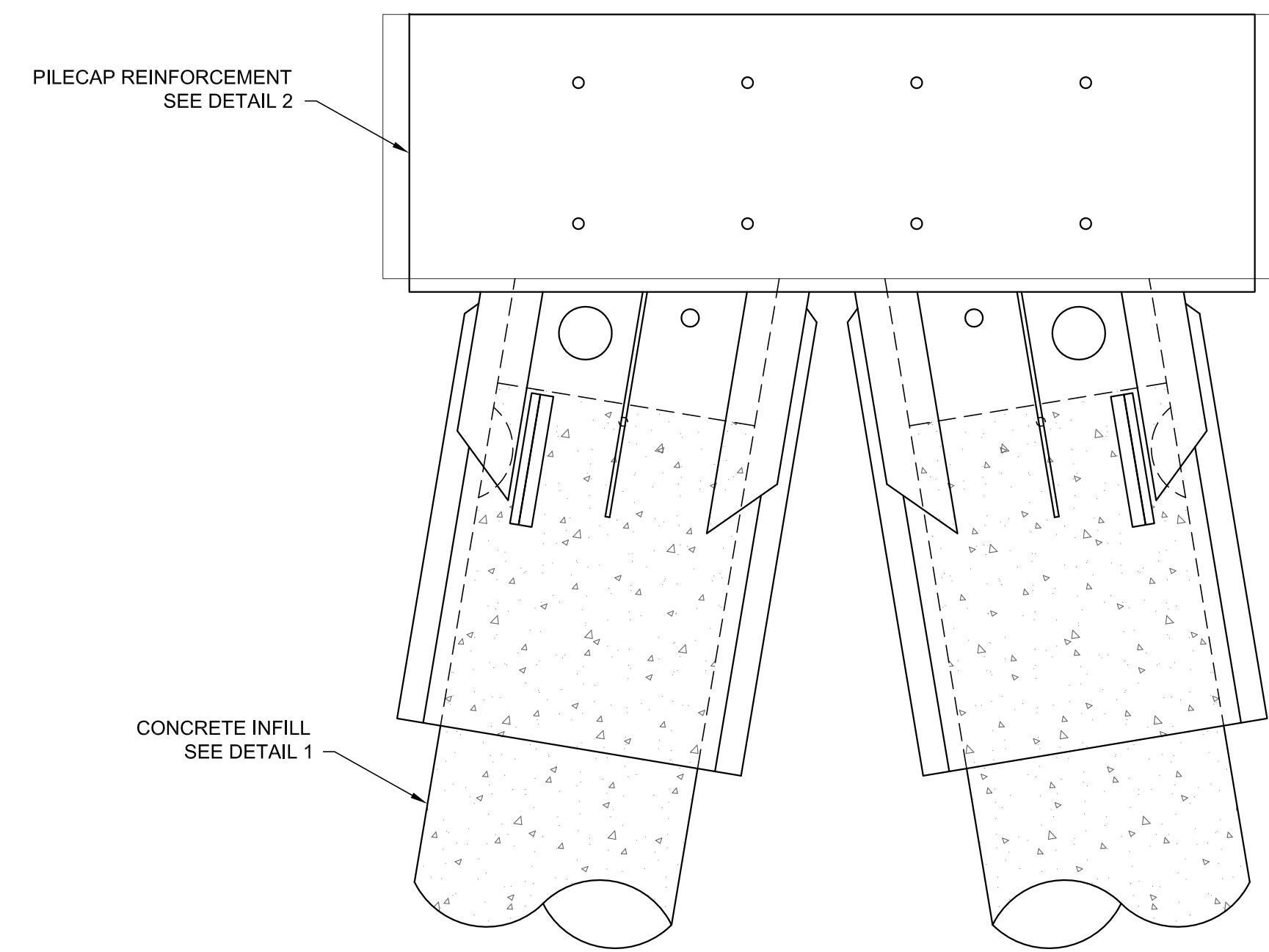
P1



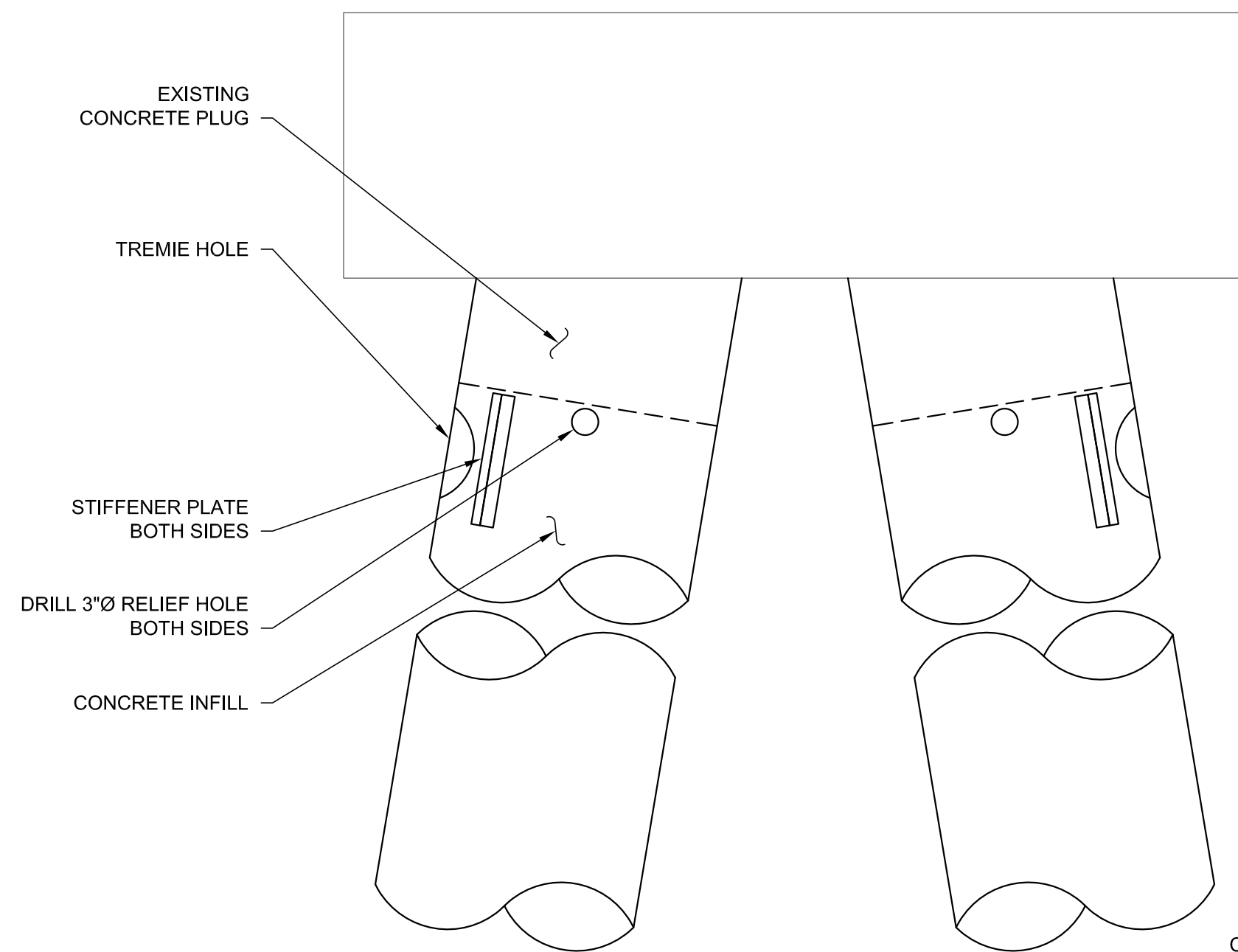
PLAN
3/4" = 1'-0"



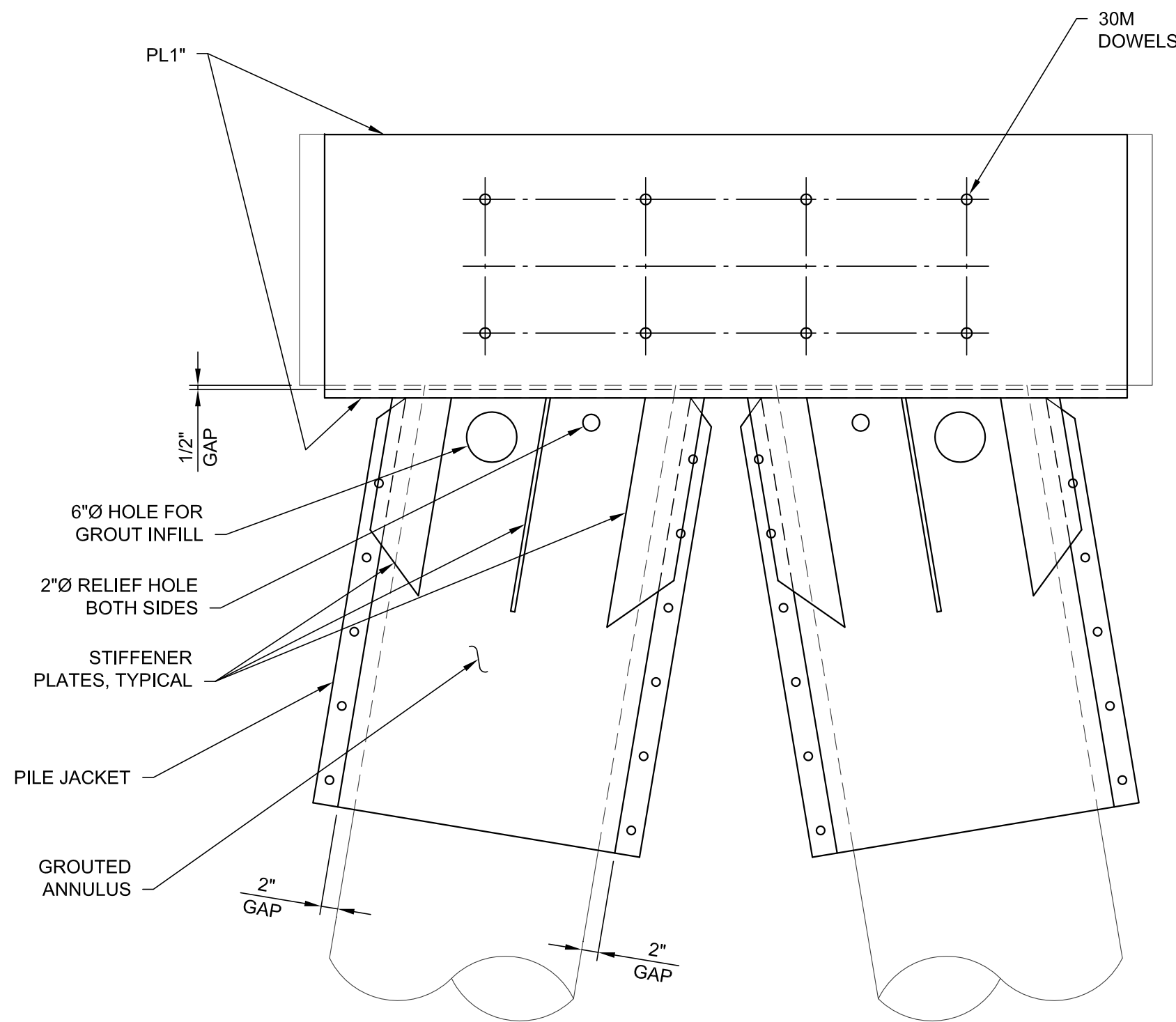
PLAN
3/4" = 1'-0"



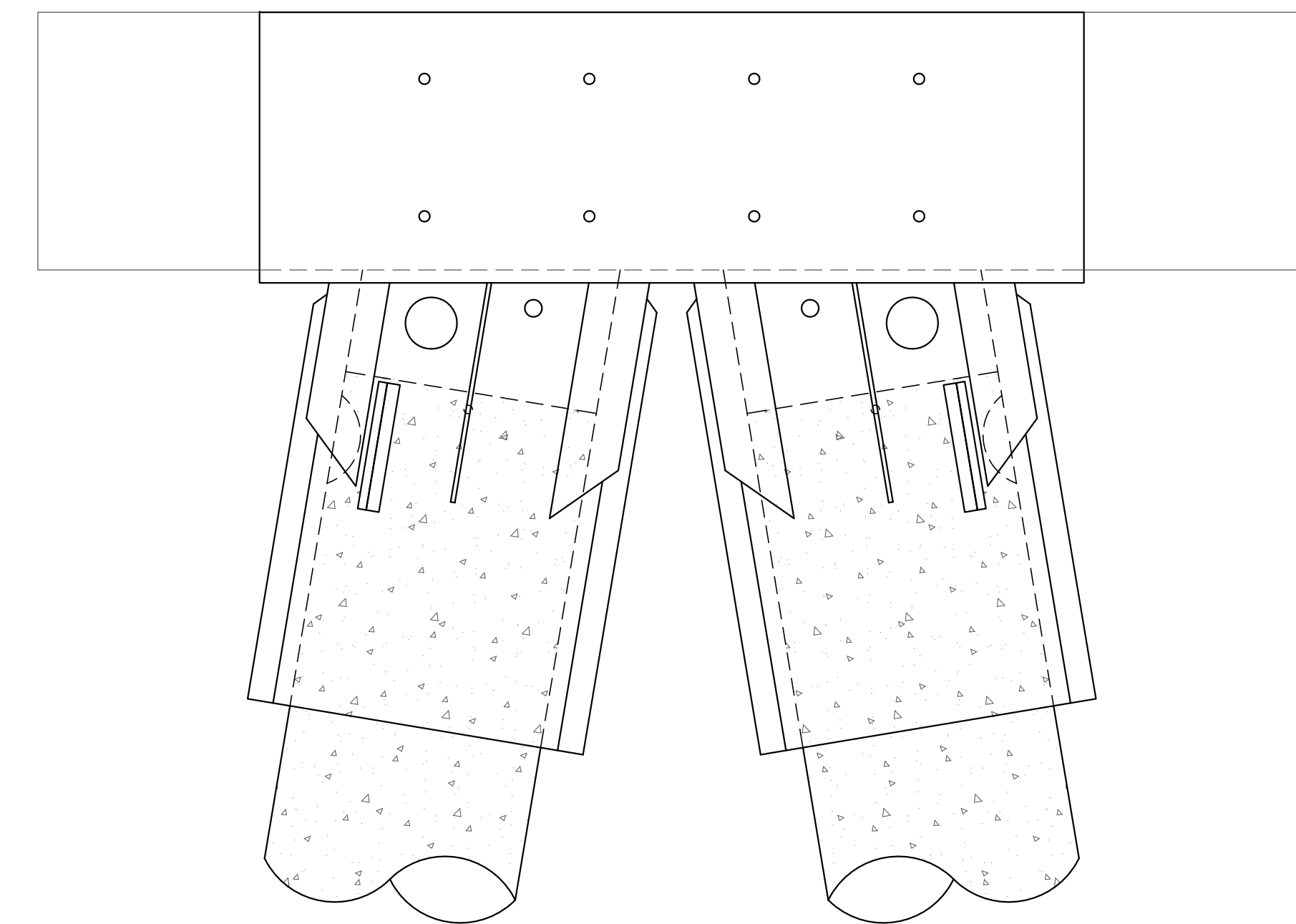
ELEVATION
CONVEYOR 12A/B PILECAP TYPE A
3/4" = 1'-0"



ELEVATION
DETAIL 1 - PILE CONCRETE INFILL
3/4" = 1'-0"



ELEVATION
DETAIL 2 - PILECAP REINFORCEMENT
3/4" = 1'-0"



ELEVATION
CONVEYOR 12A/B PILECAP TYPE B
3/4" = 1'-0"

CONSTRUCTION SEQUENCE:

1. TAP/SCAN PILE TO DETERMINE EXTENT OF CONCRETE PLUG.
2. ADD STIFFENERS TO PILE ADJACENT TO HOLE LOCATIONS.
3. CUT 6"-8"Ø HOLE FOR TREMIE PUMP BELOW CONCRETE PLUG. DRILL 3"Ø RELIEF HOLES NEAR TOP OF PILE.
4. PUMP CONCRETE INTO PILE UNTIL IT FLOWS FROM RELIEF HOLE.
5. WELD SEAL PLATES OVER OPENINGS.

CONSTRUCTION SEQUENCE:

1. INSTALL DOWELS USING REINFORCING PLATES AS TEMPLATE.
2. INSTALL PILE JACKET AND PLATE HALVES (EACH PILE JACKET HALF SHOP WELDED TO L-SHAPED PLATES).
3. BOLT UP PILE JACKET.
4. PUMP GROUT THROUGH OPENING TO FILL VOID BETWEEN PILE AND PILE JACKET (ANNULUS) UNTIL IT FLOWS FROM RELIEF HOLE.
5. WELD SEAL PLATES OVER OPENINGS.

PRELIMINARY
NOT FOR CONSTRUCTION

REF.	DWG. NUMBER	DESCRIPTION	P1	2021-06-28	ISSUED FOR VFPA REVIEW	CPL	DJC	AMG	AJK		
			No.	YYYY-MM-DD	DESCRIPTION	DRAWN	DWG. CHECK	DESIGN	DESIGN CHECK	DISC. APPROVAL	PROJ. APPROVAL
		REFERENCE DRAWINGS / DESIGN STANDARDS			ISSUES / REVISIONS						



CWA PROJECT NUMBER: 19899

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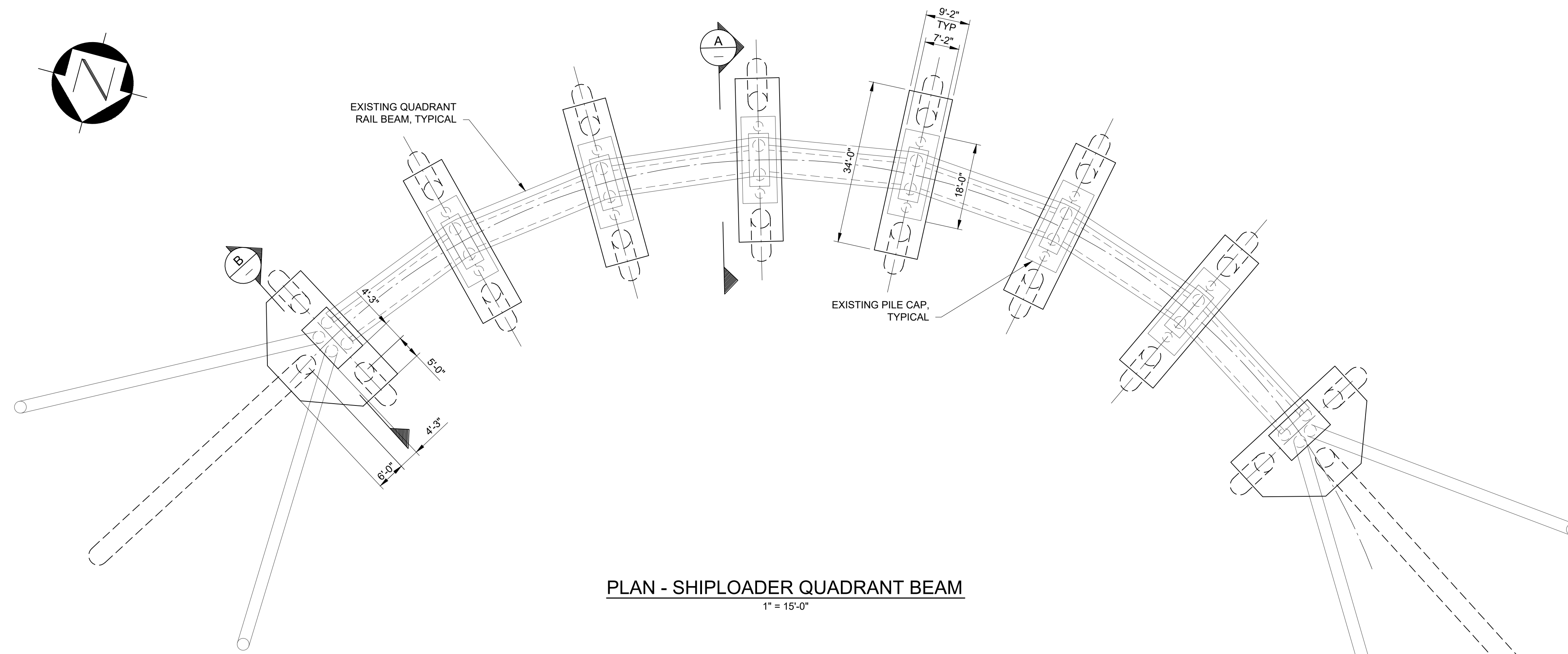
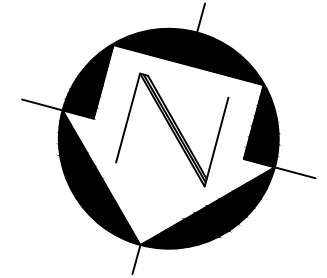
NEW CARGO STUDY
BERTH 2 RETROFITS
CONVEYOR 12A/B CONCEPTS

19899-100-SK-1107

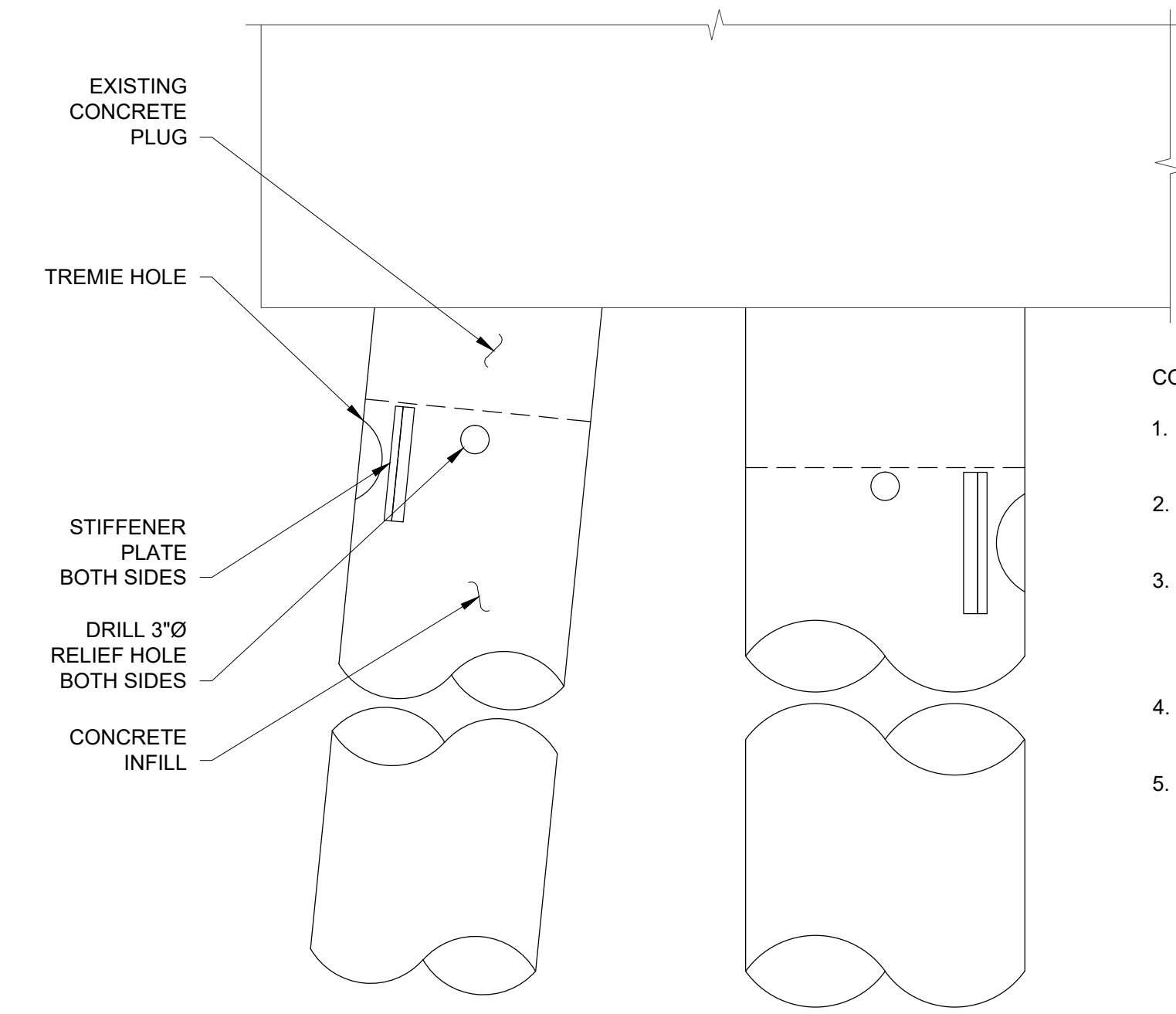
P1

DRAWN BY: CPL SCALE: AS NOTED ACAD FILENAME: 19899-100-SK-1107

REV.



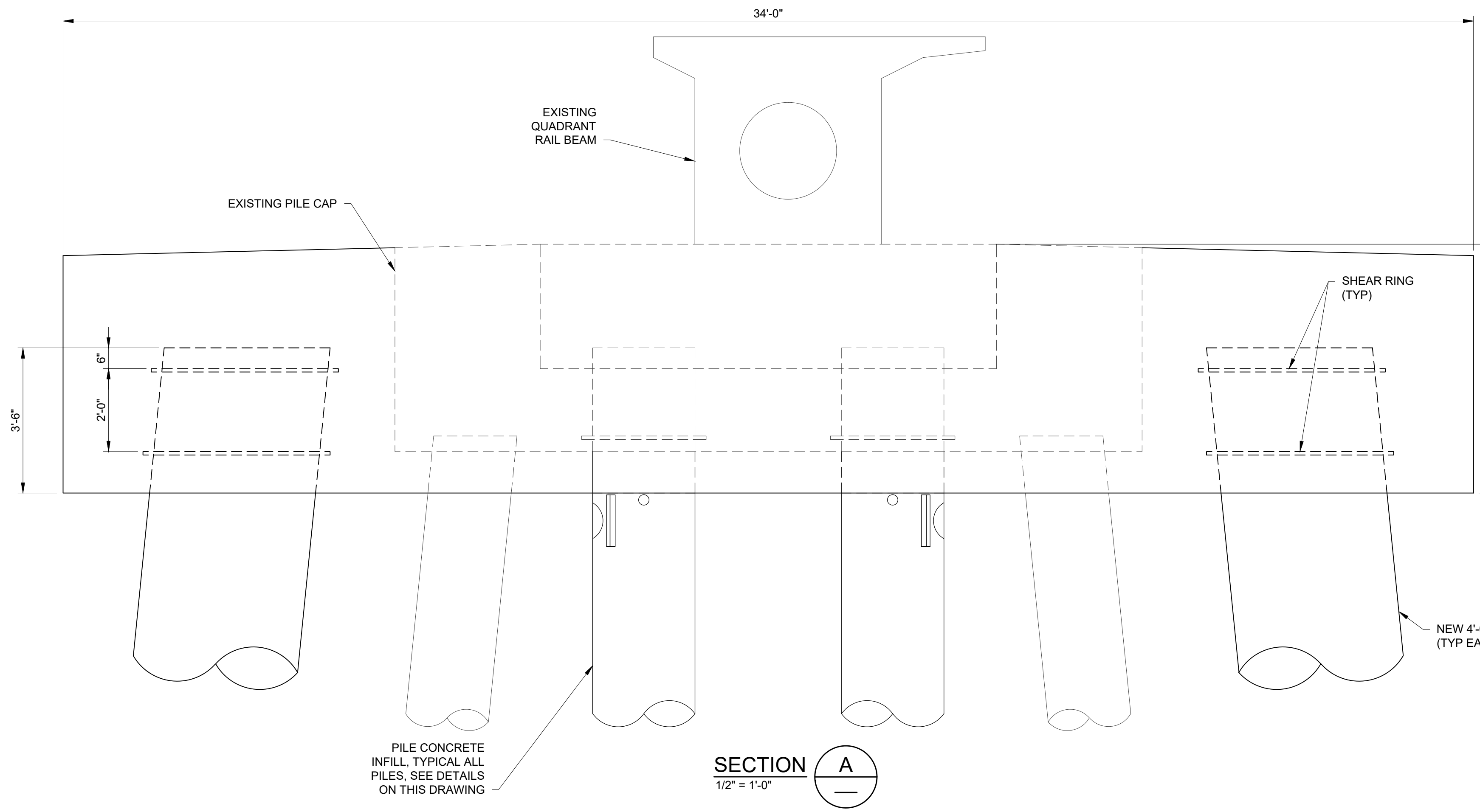
PLAN - SHIPLOADER QUADRANT BEAM
1" = 15'-0"



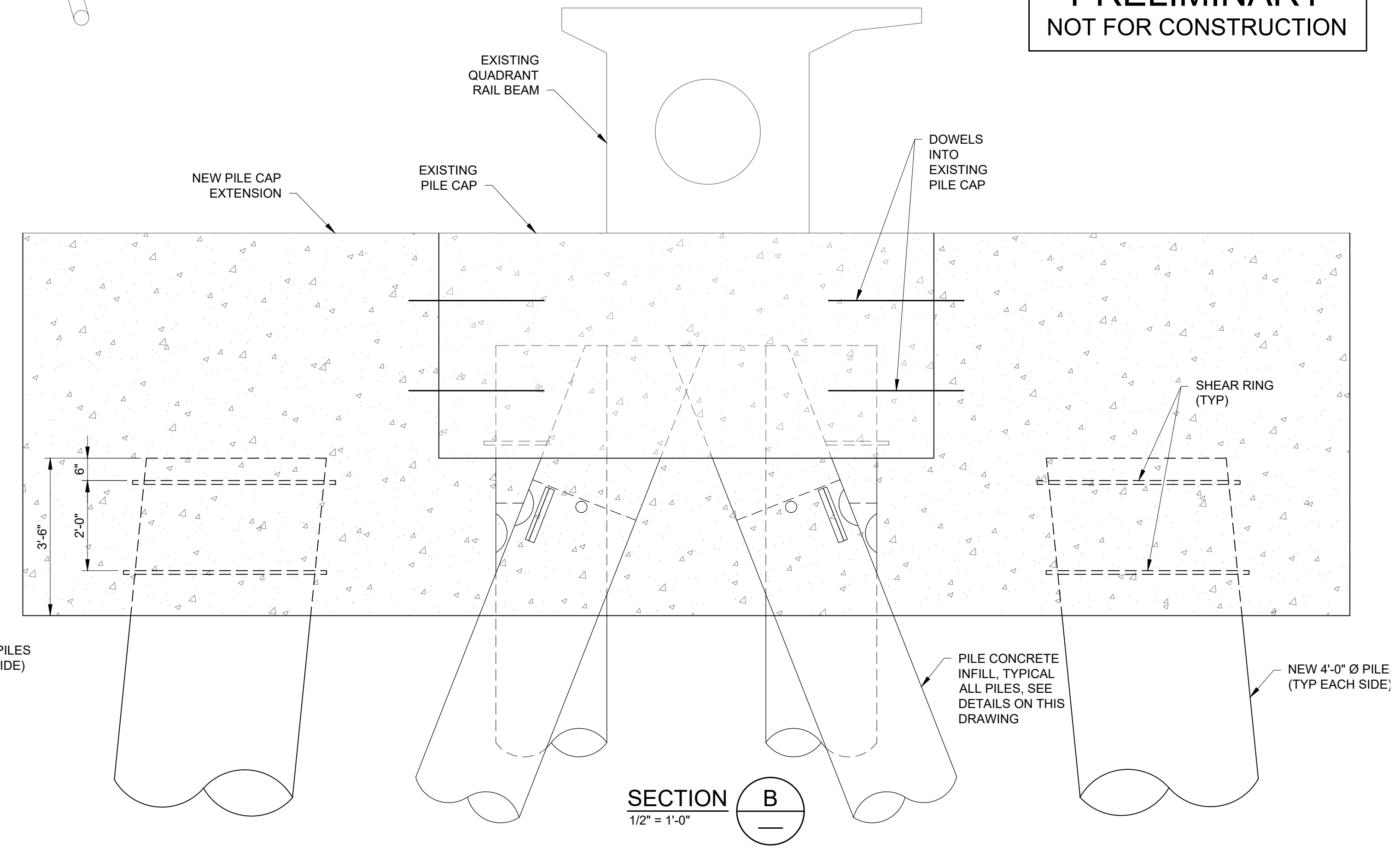
- CONSTRUCTION SEQUENCE:**
1. TAP/SCAN PILE TO DETERMINE EXTENT OF CONCRETE PLUG.
 2. ADD STIFFENERS TO PILE ADJACENT TO HOLE LOCATIONS.
 3. CUT 6"-8" Ø HOLE FOR TREMIE PUMP BELOW CONCRETE PLUG. DRILL 3" Ø RELIEF HOLES NEAR TOP OF PILE.
 4. PUMP CONCRETE INTO PILE UNTIL IT FLOWS FROM RELIEF HOLE.
 5. WELD SEAL PLATES OVER OPENINGS.

ELEVATION PILE CONCRETE INFILL DETAIL
3/4" = 1'-0"

**PRELIMINARY
NOT FOR CONSTRUCTION**

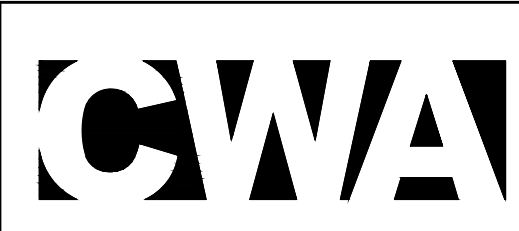


SECTION A
1/2" = 1'-0"



SECTION B
1/2" = 1'-0"

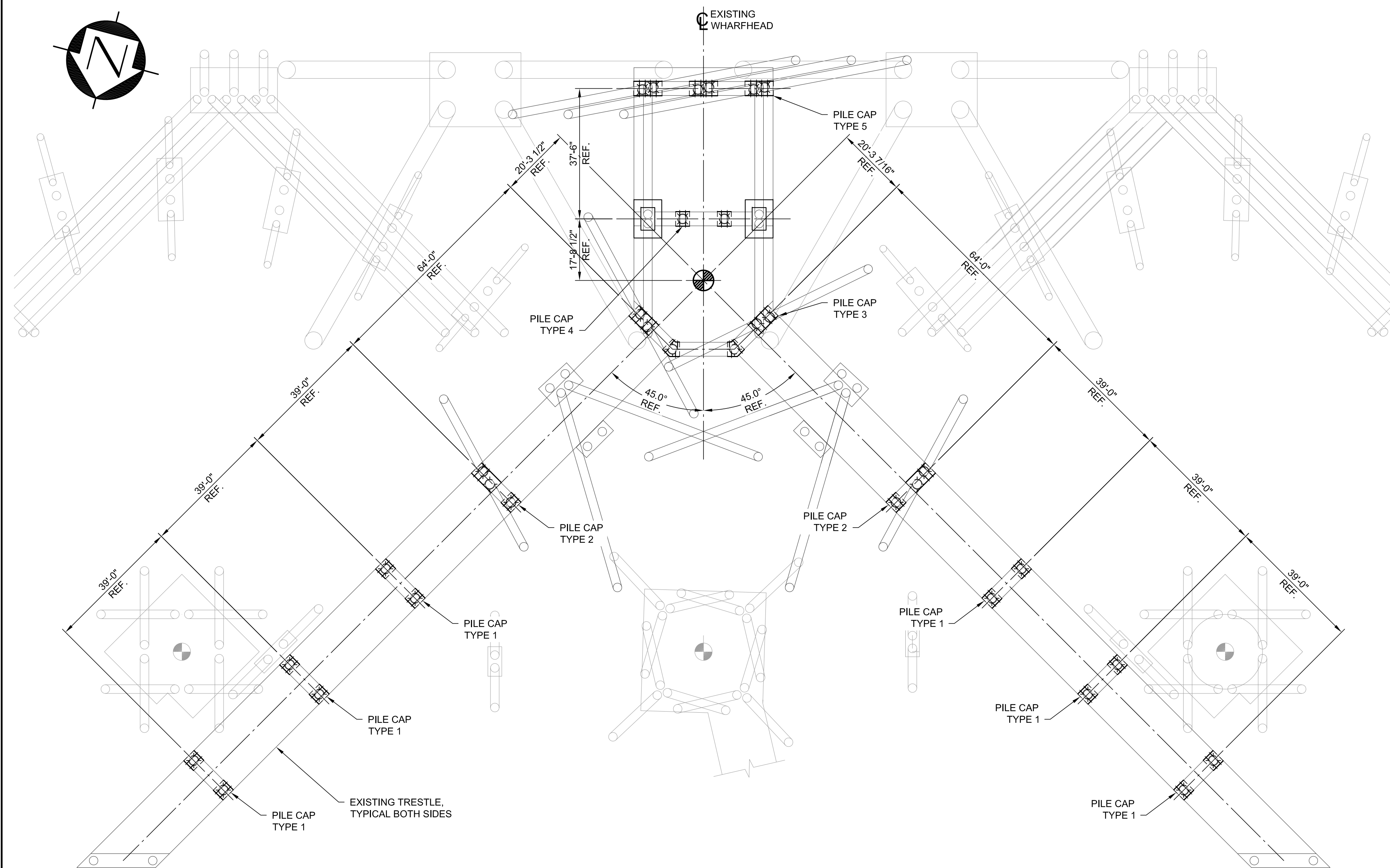
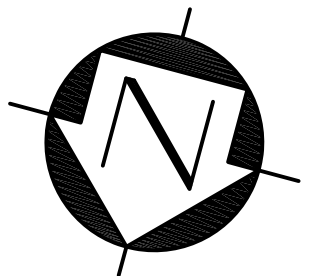
REF.	DWG. NUMBER	DESCRIPTION	P1	2021-06-28	ISSUED FOR VFPA REVIEW	CPL	DWG. CHECK	DJC	DESIGN CHECK	AMG	AJK
			No.	YYYY-MM-DD	DESCRIPTION	DRAWN				DISC. APPROVAL	PROJ. APPROVAL
		REFERENCE DRAWINGS / DESIGN STANDARDS			ISSUES / REVISIONS				* HAND INITIALS ON FILE		



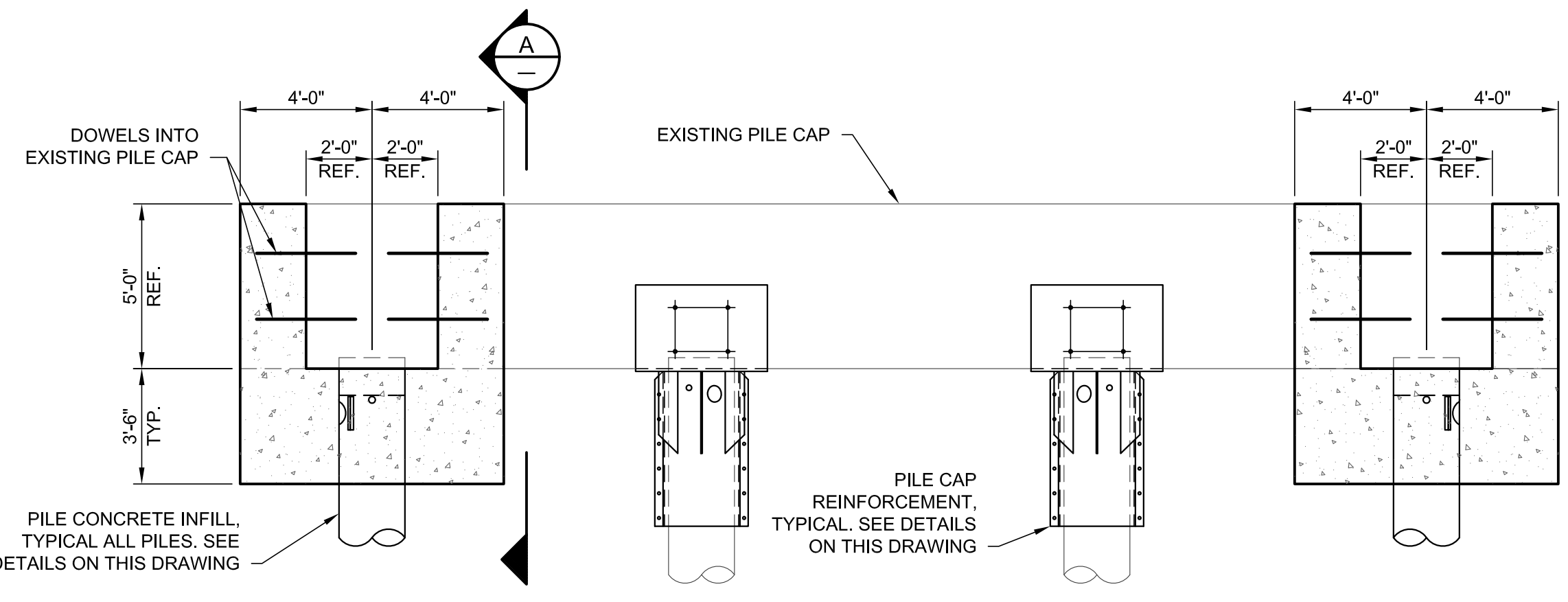
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**NEW CARGO STUDY
BERTH 2 RETROFITS
SHIPLOADER QUADRANT RAIL CONCEPTS**

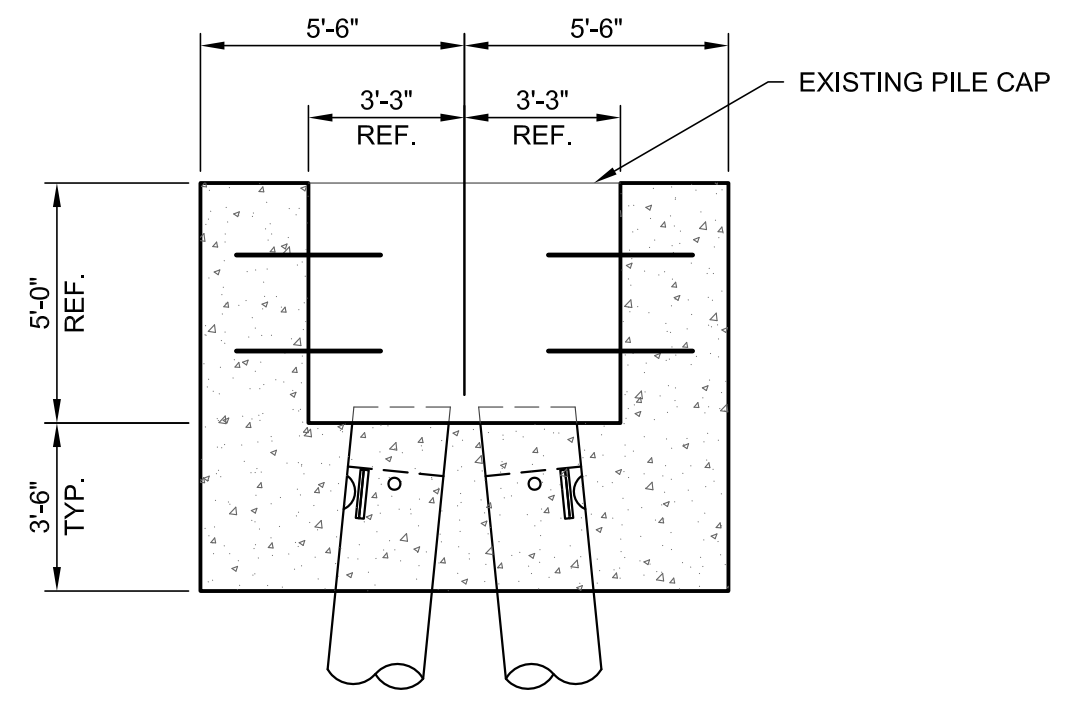
19899-100-SK-1109 P1



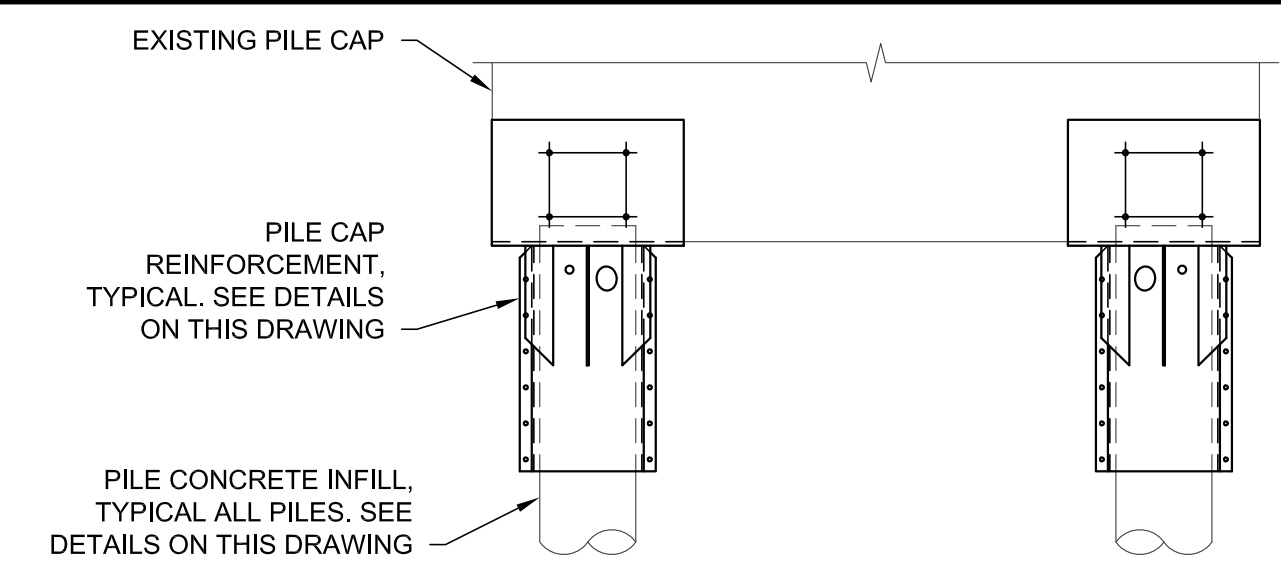
PLAN - TRESTLE AND WHARFHEAD
1" = 20'-0"



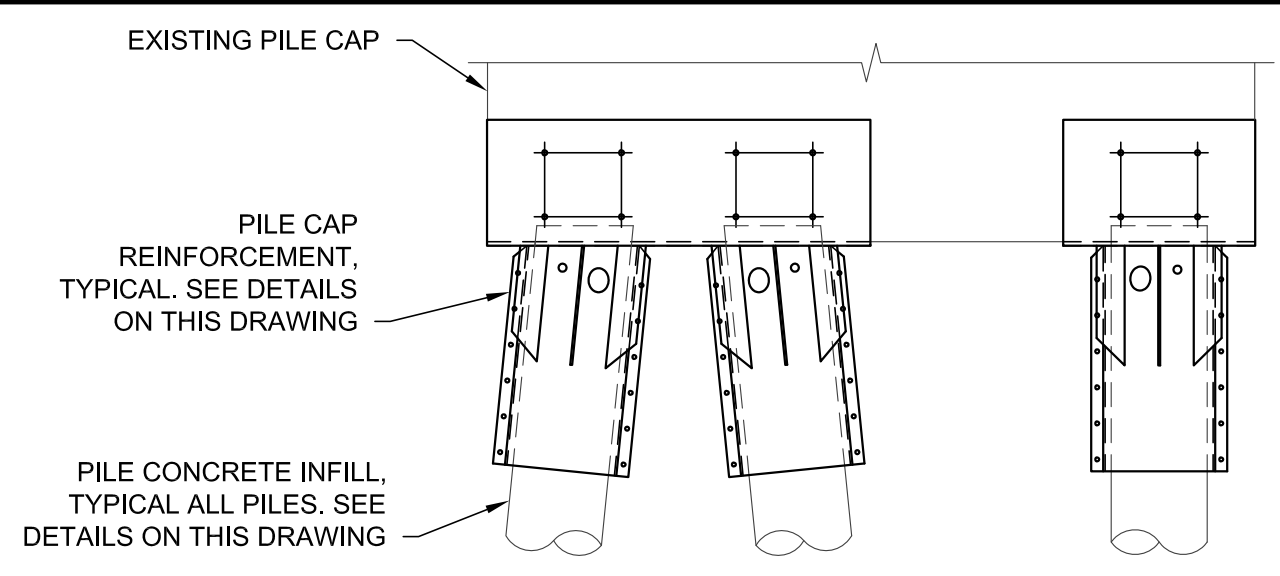
ELEVATION - PILE CAP TYPE 4
1/4" = 1'-0"



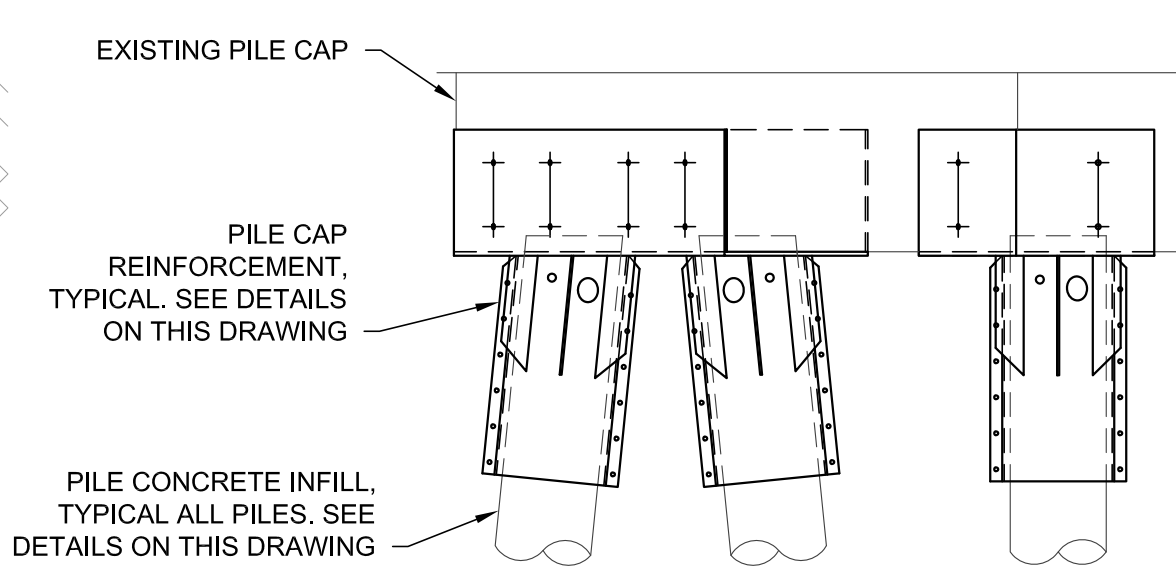
SECTION A
1/4" = 1'-0"



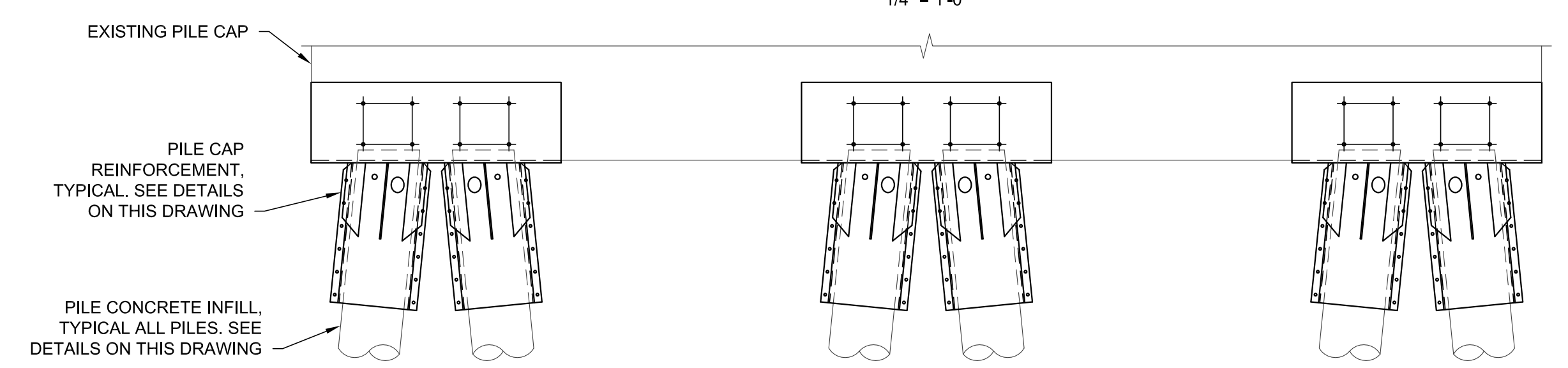
ELEVATION - PILE CAP TYPE 1
1/4" = 1'-0"



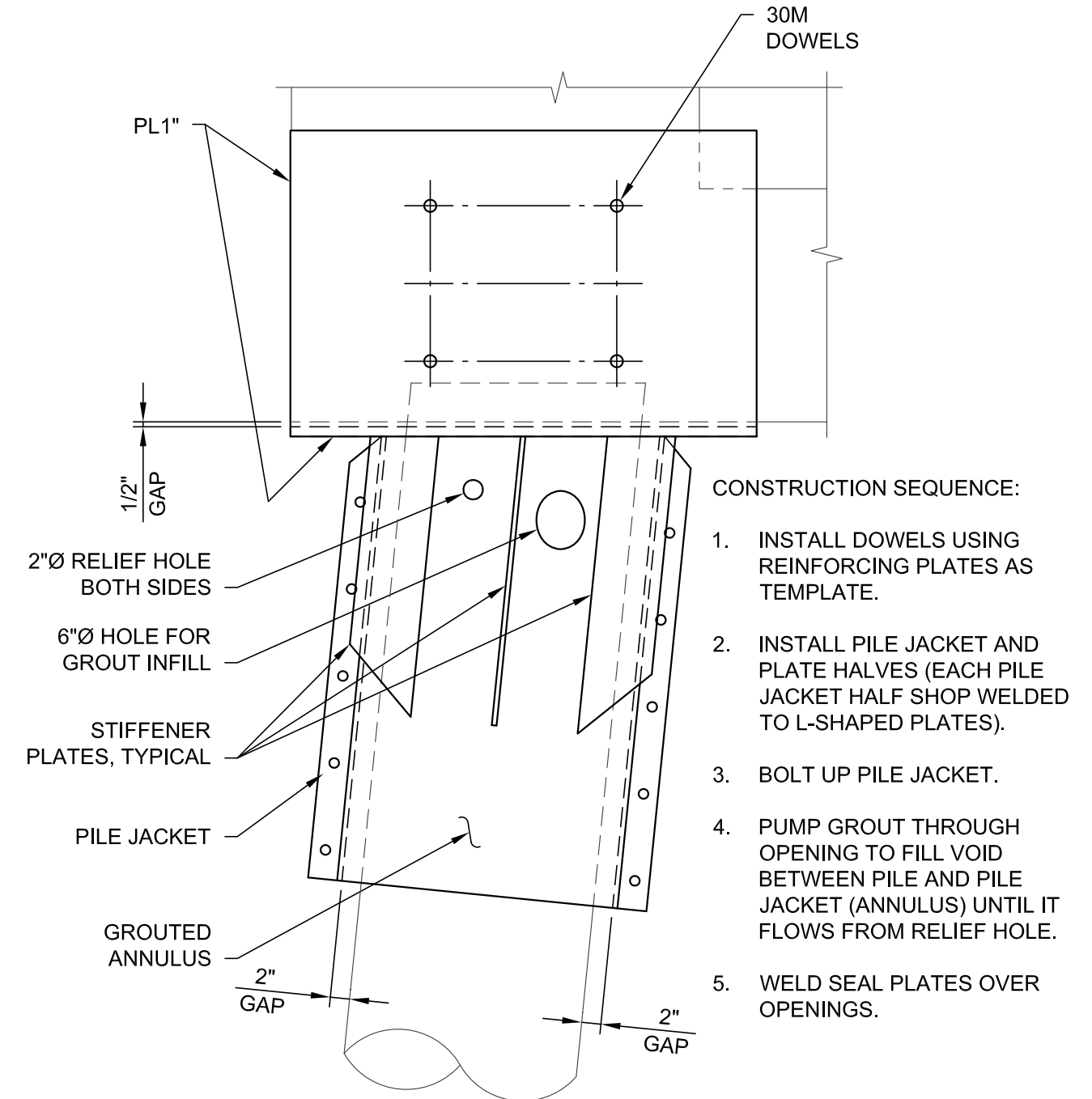
ELEVATION - PILE CAP TYPE 2
1/4" = 1'-0"



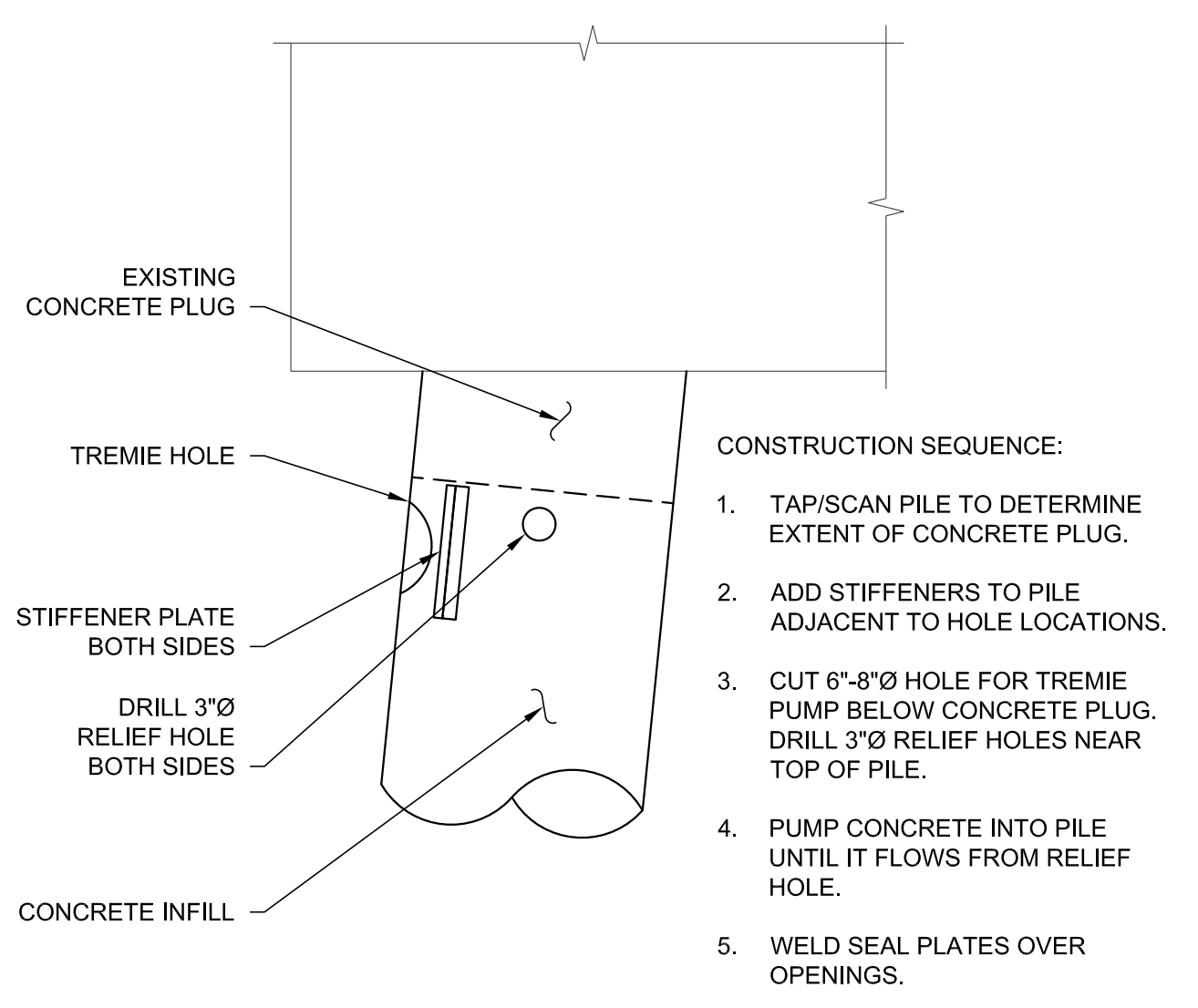
ELEVATION - PILE CAP TYPE 3
1/4" = 1'-0"



ELEVATION - PILE CAP TYPE 5
1/4" = 1'-0"



ELEVATION DETAIL 1 - PILECAP REINFORCEMENT
3/4" = 1'-0"



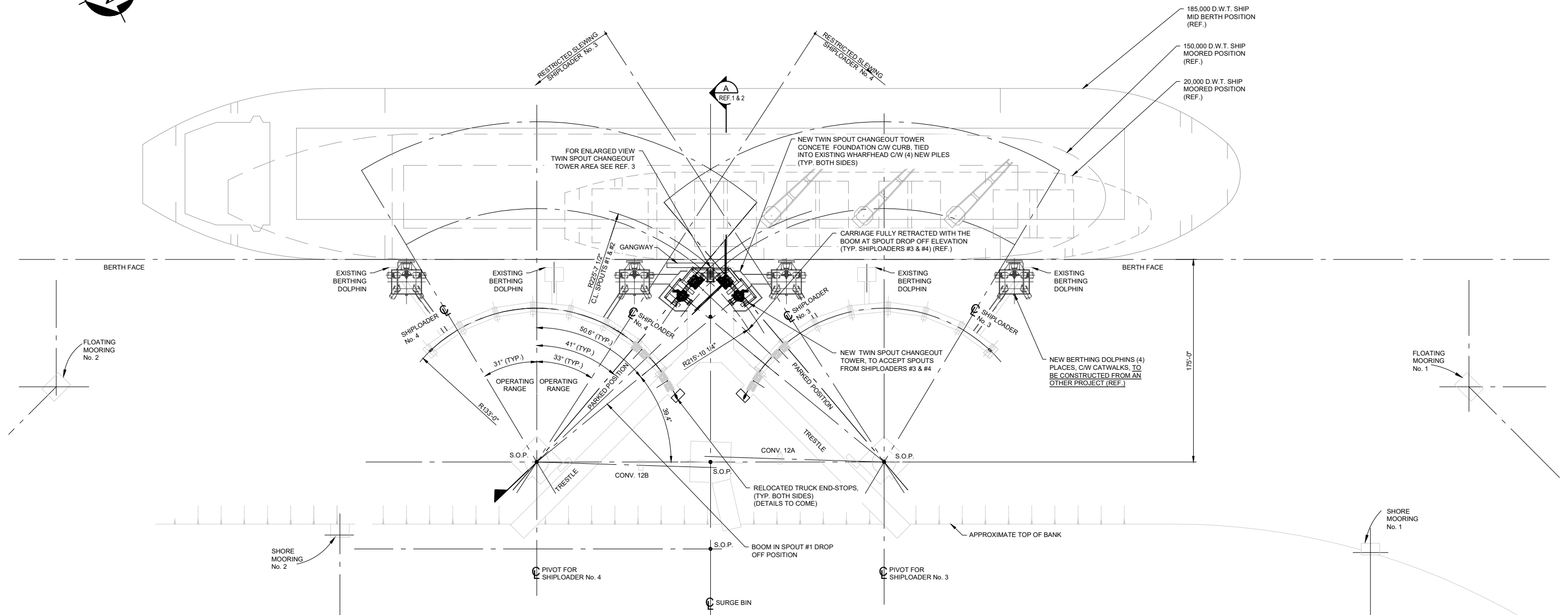
ELEVATION DETAIL 2 - PILE CONCRETE INFILL
3/4" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

REF.	DWG. NUMBER	DESCRIPTION	P1 No.	2021-06-28	ISSUED FOR VFPA REVIEW	CPL	DWG. CHECK	DJC	DESIGN	DESIGN CHECK	AMG	AJK	PROJ. APPROVAL
		REFERENCE DRAWINGS / DESIGN STANDARDS											
		ISSUES / REVISIONS											

CWA
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WestshoreTerminals
CWA PROJECT NUMBER: 19899
NEW CARGO STUDY
BERTH 2 RETROFITS
TRESTLE AND WHARFHEAD CONCEPTS
19899-100-SK-1110 **P1**



MOD' TO EXISTING BERTH 2 & SHIPLOADERS No.3 & No.4 PLAN
1"=40'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

REF.	DWG. NUMBER	DESCRIPTION	No.	YYYY-MM-DD	DESCRIPTION	DRAWN	DWG. CHECK	DESIGN	DESIGN CHECK	DISC. APPROVAL	PROJ. APPROVAL
		REFERENCE DRAWINGS / DESIGN STANDARDS			ISSUES / REVISIONS						
			P5	2020-12-15	ISSUED FOR USE - STAGE 2 STUDY	JRM		JRM		PMD	AJK
			P4	2020-11-27	ISSUED FOR REVIEW	JRM		JRM		PMD	AJK
3	85690-D0300-0003	ENLARGED VIEW - TWIN SPOUT CHANGEOUT TOWER - PLAN	P3	2020-11-06	ISSUED FOR REVIEW	JRM		JRM		PMD	AJK
2	85690-D0300-0002	BERTH 2 SHIPLOADING SPOUT CHANGEOUT SYSTEM G.A. - SECTION	P2	2020-07-17	RE-ISSUED FOR STAGE 1 REVIEW	JRM		JRM		PMD	AJK
1	85690-D0300-0001	BERTH 2 SHIPLOADING SPOUT CHANGEOUT SYSTEM G.A. - SECTION	P1	2020-07-03	ISSUED FOR STAGE 1 REVIEW	JRM		JRM		PMD	AJK



CWA PROJECT NUMBER: 19899

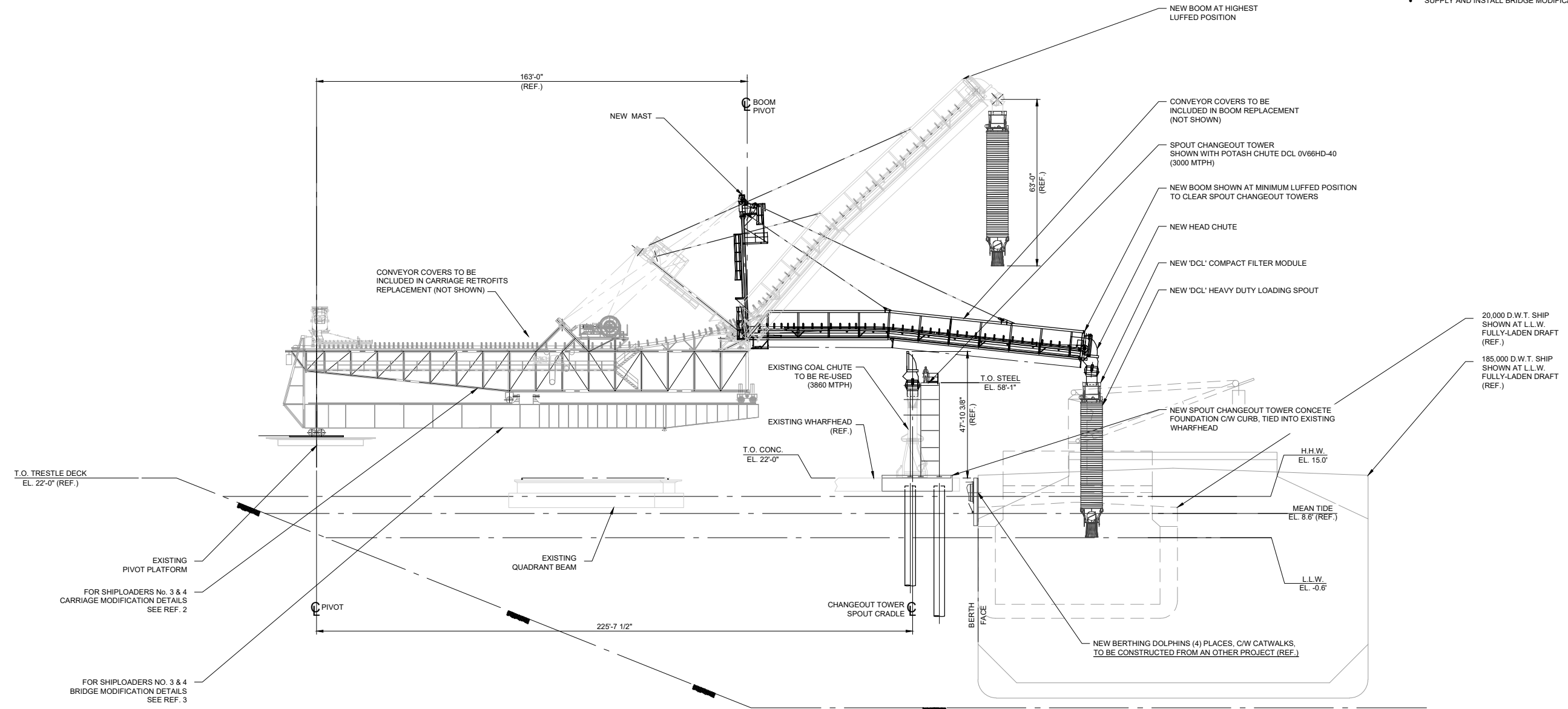
NEW CARGO STUDY
BERTH 2 SHIPLOADING SPOUT
CHANGEOUT SYSTEM G.A. - PLAN

85690-D0300-0000 **P5**

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NOTES:

- THE FOLLOWING SCOPE INDICATED ON THIS DRAWING WILL BE COMPLETED BY THE SHIPLOADER MODIFICATIONS CONTRACTOR:
 - SUPPLY AND INSTALL SPOUT CHANGEOUT SYSTEM
 - SUPPLY AND INSTALL NEW BOOM INCLUDING CONVEYOR COVERS
 - SUPPLY AND INSTALL NEW MAST
 - SUPPLY AND INSTALL CARRIAGE MODIFICATIONS INCLUDING CONVEYOR COVERS
 - SUPPLY AND INSTALL BRIDGE MODIFICATIONS



SHIPLOADER & SPOUT CHANGEOUT TOWER WITH CARRIAGE FULLY EXTENDED - SECTION A
SCALE 1"=20'-0" REF.1

PRELIMINARY
NOT FOR CONSTRUCTION

REF.	DWG. NUMBER	DESCRIPTION	No.	YYYY-MM-DD	DESCRIPTION	DRAWN	DWG. CHECK	DESIGN	DESIGN CHECK	DISC. APPROVAL	PROJ. APPROVAL
		REFERENCE DRAWINGS / DESIGN STANDARDS			ISSUES / REVISIONS						
3	82260-D0020-0010	SHIPLOADERS No. 3 & 4 BRIDGE MODIFICATION DETAILS	P4	2020-12-15	ISSUED FOR USE - STAGE 2 STUDY	JRM		JRM		PMD	AJK
2	82260-D0020-0020	SHIPLOADERS No. 3 & 4 CARRIAGE MODIFICATION DETAILS - SHEET 1	P3	2020-11-27	ISSUED FOR REVIEW	JRM		JRM		PMD	AJK
1	85690-D0300-0000	BERTH 2 SHIPLOADING SPOUT CHANGEOUT SYSTEM G.A. - PLAN	P1	2020-07-17	RE-ISSUED FOR STAGE 1 REVIEW	JRM		JRM		PMD	AJK



CWA PROJECT NUMBER: 19899

NEW CARGO STUDY
BERTH 2 SHIPLOADING SPOUT
CHANGEOUT SYSTEM G.A. - SECTION

85690-D0300-0001

P4

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DRAWN BY: JRM SCALE: AS NOTED ACAD FILENAME: 85690-D0300-0000 TO 0003

* HAND INITIALS ON FILE

REV.

Appendix A2

**Berth 2 Mooring Dolphin
Replacement – DFO Response
File No. 20-HPAC-00516**



Fisheries and Oceans
Canada

Pacific Region
Ecosystem Management Branch
200 – 401 Burrard Street
Vancouver, BC
V6C 3S4

Pêches et Océans
Canada

Région du Pacifique
Direction de la gestion des écosystèmes
Pièce 200 – 401 rue Burrard
Vancouver (C.-B.)
V6C 3S4

September 17, 2020

Our file *Notre référence*
20-HPAC-00516

Westshore Terminals Ltd.
Attention: Greg Andrew
1 Roberts Bank
Delta, BC V4M 4G5

Via Email: gandrew@westshore.com

**Subject: Berth and Mooring Dolphin Replacement, Strait of Georgia, Delta –
Implementation of Measures to Avoid and Mitigate the Potential for Prohibited
Effects to Fish and Fish Habitat**

Dear Greg Andrew:

The Fish and Fish Habitat Protection Program (the Program) of Fisheries and Oceans Canada (DFO) received your proposal on April 16, 2020. We understand that you propose to replace berthing and mooring dolphins at Berth 2, at Roberts Bank in Delta, BC. As described in your proposal, we understand that works will be conducted in two phases as outlined below:

- Phase 1
 - Removing Dolphin 1 and catwalks (including removing 21 timber fender piles, timber whaler beams, element fenders, concrete pile caps and 6 steel piles); and
 - Installing Dolphin 1 and Dolphin 4a, including driving steel piles.
- Phase 2
 - Removing Dolphin 5, catwalks, and wharf-head fendering; and
 - Installing Dolphin 5 and Dolphin 2a, including driving steel piles.

We understand that the purpose of the project is to prevent the risk of a berthing dolphin failure that would disrupt operations and create a safety concern to personnel.

The site is located within critical habitat for Southern Resident Killer Whale (SRKW, *Orcinus orca*). Furthermore, we understand the following aquatic species listed under the *Species at Risk Act* may use the area in the vicinity of where your proposal is to be located:

- SRKW, Leatherback Sea Turtle, Basking Shark, and Northern Abalone which are currently listed as Endangered;
- Northeast Pacific Transient (Bigg's) Killer Whales which are currently listed as Threatened; and,

- Yelloweye Rockfish, Bluntnose Sixgill Shark, Grey Whale, Humpback Whale, Harbour Porpoise, and Steller Sea Lion which are currently listed as Special Concern.

Our review considered the following information:

- The Request for Review form and accompanying supplementary information (including a Construction Environmental Management Plan, design drawings, and location maps) received from Greg Andrew of Westshore Terminals Ltd., via email on April 16, 2020;
- Additional clarification and information provided via email from Spencer Townsend of CWA Engineers on August 25, 2020;
- VFPA & DFO Permit Submission Support Document sent via email on April 16, 2020; and
- Vancouver Fraser Port Authority Project and Environmental Review Report and Permit 19-187, dated April 3, 2020.

Your proposal has been reviewed to determine whether it is likely to result in:

- the death of fish by means other than fishing and the harmful alteration, disruption or destruction of fish habitat which are prohibited under subsections 34.4(1) and 35(1) of the *Fisheries Act*; and
- effects to listed aquatic species at risk, any part of their critical habitat or the residences of their individuals in a manner which is prohibited under sections 32, 33 and subsection 58(1) of the *Species at Risk Act*.

The aforementioned outcomes are prohibited unless authorized under their respective legislation and regulations. Works must not result in the destruction of critical habitat for SRKW.

To avoid and mitigate the potential for the death of fish by means other than fishing and the harmful alteration, disruption or destruction of fish habitat, it is important that all proposed measures are implemented as set out in the information that was submitted to the Program in relation to your project. In addition, we recommend implementing the measures listed below to avoid and mitigate the potential for the death of fish by means other than fishing and the harmful alteration, disruption or destruction of fish habitat. If there is a conflict between the proposed measures as set out in the information that was submitted to the Program and the following measures, the following measures shall prevail:

- While DFO acknowledges that the works are currently proposed to occur in two phases, between the months of June and September, we encourage in-water works, undertakings and activities to be scheduled to respect timing windows to protect fish, including their eggs, juveniles, spawning adults, and/or the organisms on which they feed and migrate. The appropriate marine least risk timing window for fish and fish habitat in the Vancouver Area Inlet is: **August 16th to February 28th**.
- Additionally, as SRKWs are mostly sighted in the vicinity of the location of the proposed works between May and September, we recommend that any works with high risk of acoustic impact occur between **November 1st and February 28th**.

- Impact pile driving should not occur when SRKW's are most likely to be present within the area.
- Ensure a Qualified Environmental Professional (QEP) is on site for all sensitive and higher risk works (e.g., pile driving). The QEP is required to monitor for compliance with regulations and to ensure appropriate implementation of environmental best management practices.
- An experienced and qualified Marine Mammal Observer (MMO) is to be present at all times during authorized works and shall monitor marine mammal presence.
- All pile driving activities are to be conducted during daylight hours in good visibility and weather conditions that permit visual observations.
- Water-based equipment shall not ground upon the seabed except for the use of anchors or spuds needed to keep the water-based equipment in place;
 - Ensure there is enough clearance between the seabed and the vessels to avoid/minimize propeller wash and/or grounding of vessels; and
 - Minimize re-positioning of spuds and avoid placement of spuds on sensitive aquatic vegetation or habitat (e.g., kelp and/or eelgrass).
- Acoustic monitoring and sound source verification is recommended for all pile driving activities, particularly in areas where aquatic at-risk fish and/or marine mammals may frequent the project vicinity, and especially in areas defined as critical habitats. The acoustic monitoring is to confirm that pile driving does not exceed acoustic thresholds.
 - DFO acknowledges that the majority of the pile driving (and pile removal) will occur with a vibratory hammer. To mitigate potential for negative acoustic impacts, DFO recommends applying the following acoustic noise thresholds and mitigation measures for the protection of fish:
 - An exclusion zone should be established around the pile driving site (i.e., noise source) to delineate where sound levels are not to exceed 206 dB re 1 μ Pa and a SELcum of 186 dB re 1 μ Pa²s. This fish exclusion zone should not extend greater than 10 m from the noise source;
 - Continuous hydroacoustic monitoring should be conducted during all pile driving activities to monitor sound levels; and
 - If monitoring indicates sound levels in excess of the above-mentioned thresholds, the activity will cease and will only resume after additional mitigation measures (e.g., installation of bubble curtains) have been implemented to reduce sound levels to below the threshold.
 - Vibratory pile driving, rather than impact pile driving is preferred to reduce the potential impacts on fish and marine mammals. If impact pile driving is to occur, the following additional mitigation measures should be implemented:
 - A sound attenuation device (e.g., bubble curtain and/or shell and containment system) around the full wetted length of the pile should be installed to reduce sound levels;

- Daily inspection of the sound attenuation device (e.g., bubble curtain) should confirm that it is fully connected and functioning prior to pile driving works;
- All impact pile driving will require an increased bubble curtain run time prior to the start of piling activities. The bubble curtain is to be activated sequentially one ring at a time starting from the top ring, and the curtain must be run at full power for three (3) minutes prior to the first hammer strike; and
- The use of a timed slow-start (ramp-up) procedure should be implemented for all pile driving installations.
- In addition to acoustic monitoring to ensure compliance with sound level thresholds for fish, the QEP/MMO will establish marine mammal exclusion zones which are to be confirmed with on site monitoring data and meet the following criteria:
 - A cetacean exclusion zone (e.g., 1,000 m from the noise source) will be established and maintained during impact pile driving activities where underwater sound pressure levels are not to exceed 160 dB re 1 μ Pa outside of the cetacean exclusion zone.
 - A minimum 75 m pinniped exclusion zone will be established and maintained during impact pile driving activities.
 - The QEP/MMO must monitor for marine mammals within the exclusion zones for at least 30 minutes prior to the start of pile installation. The QEP/MMO must be stationed in a location where they can survey the full extent of the exclusion zones and to see approaching marine mammals and be able to halt work before a marine mammal enters its respective exclusion zone.
 - If acoustic monitoring indicates sound levels in excess of the above criteria at the boundary of the cetacean exclusion zone, the work must be immediately halted. The work will only resume after adaptive management measures (e.g., extending the exclusion zone(s), implementing additional bubble curtains, etc.) are implemented to reduce sound levels below threshold levels.
 - Pile driving activities will be ceased if a marine mammal is observed within its respective exclusion zone and will only resume once the animal has left the exclusion zone, or has not been re-sighted for 30 minutes.
 - Construction activities will be ceased if there is a risk of physical harm to any marine mammal from direct contact. Construction activities may only resume once there is no longer risk of injury to marine mammals from direct contact.
- As the project is located in critical habitat for SRKW, establish a killer whale “Safety Zone” at a radius of 1,000 m from the piling locations. Halt all works immediately if a killer whale enters the “Safety Zone” and notify the DFO Observe, Record and Report line at 1-800-465-4336. Re-initiate works only after killer whales have not been observed in the “Safety Zone” for 30 minutes.

- Implement a Sediment Control Plan to minimize sedimentation of the aquatic environment during all phases of the work, undertaking or activity. Monitor for signs of sedimentation during all phases of the project and take appropriate corrective actions.
- Implement a response plan to avoid a spill of deleterious substances.

Provided that you incorporate these measures into your plans, the Program is of the view that your proposal is not likely to result in the contravention of the above mentioned prohibitions and requirements. Please note that the validity of the advice provided in this letter is subject to there being no change in the relevant aquatic environment, including any legal protection orders or designations.

Should your plans change or if you have omitted some information in your proposal, further review by the Program may be required. Consult our website (<http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html>) or consult with a qualified environmental consultant to determine if further review may be necessary. It remains your responsibility to remain in compliance with the *Fisheries Act*, avoid prohibited effects on listed aquatic species at risk, any part of their critical habitat or the residences of their individuals, and prevent the introduction of non-indigenous species.

It is also your *Duty to Notify* DFO if you have caused, or are about to cause, the death of fish by means other than fishing and/or the harmful alteration, disruption or destruction of fish habitat. Such notifications should be directed to the DFO-Pacific Observe, Record and Report phone line at 1-800-465-4336 or by email at DFO.ORR-ONS.MPO@dfo-mpo.gc.ca.

We recommend that you notify this office at least 10 days before starting your project and that a copy of this letter be kept on site while the work is in progress. It remains your responsibility to meet all other federal, territorial, provincial and municipal requirements that apply to your proposal.

If you have any questions with the content of this letter, please contact Rebecca Barrick at our Vancouver office at 236-330-3053 or by email at Rebecca.Barrick@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

Yours sincerely,



Anne Rutherford
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Fish and Fish Habitat Protection Program

cc: Spencer Townsend, CWA Engineers Inc., spencer.townsend@cwaengineers.com