CHAPTER 2

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

This chapter describes the proposed action to implement the Project for the POA and describes the process used to identify and evaluate potential alternatives to the action. The Project would add approximately 135 acres of land and approximately 8,880 feet of waterfront structures in an area located west, northwest, and southwest of the existing POA facilities. The proposed action consists of two primary components:

- ***Construction*** of marine structures for berthing barges, cruise ships, container ships, RO-RO, cement, and POL vessels for the critical replacement of functionally obsolete existing facilities in conjunction with development of tidelands for creation of cargo transfer and storage areas, staging area for Stryker Brigade Combat Team and other USARAK deployments, industrial fabrication and staging areas and
- ***Operation*** of a modern, stable, and secure facility with improved equipment for loading, unloading, cargo transfer, and storage.

In addition, dredging would be conducted by the U.S. Army Corps of Engineers (USACE) to provide construction site preparation and suitable water depths for ships that would call on the terminal. Dredging would apply to the berthing area and maneuver area for ships and extend to a maximum design depth of -45 feet MLLW, or ten feet deeper than current dredge depths.

The proposed action would meet the defined needs presented in Chapter 1. Although MARAD and the POA examined 25 alternatives to determine whether they met the purpose and need, three methods of design, a sheet pile method, a pile-supported dock, and a combination of the two design techniques, were identified as alternatives under the proposed action and were carried forward for detailed analysis. In conformance with CEQ regulations (40 CFR 1502.14(e)), the POA and MARAD have used the results of the environmental analysis to identify a preferred alternative. The POA and MARAD identified Alternative A, the 100 percent sheet pile design method, as the preferred alternative. In addition, this EA also examines the no-action alternative under which the Project would not be implemented.

2.1 ANALYSIS OF ALTERNATIVES

2.1.1 Alternatives Considered

As the POA has surpassed its design life and operating capacity, various alternatives for POA expansion have been identified through numerous planning efforts. For example, the 1999 Master Plan (VZM 1999) identified anticipated operational needs for the POA through 2020, and developed twelve separate alternatives for meeting those needs. Similarly, other alternatives have been advanced and explored that consider renovations and improvements to the existing facilities, land expansion and construction of new docks through use of both cellular sheet pile construction and the use of pile-supported docks, and the complete relocation of POA operations.

While each alternative brings certain merits for POA expansion, it is critical that the alternatives considered (and ultimately implemented) meet the needs of the POA as defined in Chapter 1. Alternatives that do not address those needs or are not technically feasible are not of value to carry forward for environmental impacts analysis. The following section examines several alternatives and determines whether they meet the stated purpose and need and whether they will be carried forward for more detailed analysis.

2.1.2 Screening Process to Identify Reasonable Alternatives

The identification of reasonable alternatives represents a key component of the NEPA process. As defined in CEQ regulations (40 CFR 1502.14), reasonable alternatives are practical and feasible from a technical and economic standpoint and reflect common sense. Furthermore, reasonable alternatives must fulfill the purpose and need for an action to warrant definition as reasonable and worthy of detailed analysis. Alternatives selected for evaluation were based upon previously proposed alternatives from various planning efforts and new information from port planners, resources management agencies, and other technical experts.

To define reasonable alternatives and to identify those alternatives not appropriate to carry forward for further analysis in the EA, MARAD and the POA conducted a hierarchical screening process involving three major steps (Figure 2-1): 1) location; 2) size; and 3) orientation and design. These steps and associated criteria tie directly to the seven components of the need defined in Chapter 1. The criteria were both hierarchical and exclusive. That is, a potential alternative must meet the first criterion or it was eliminated before applying the second, and so on. Failure to fulfill any single criterion, or subcriterion, demonstrated that an alternative could not meet the defined purpose and need and would not be considered reasonable and carried forward for further analysis.

Location

This first criterion addresses where the enhanced POA should be sited. To be considered further as an appropriate location, a site must meet the following characteristics:

- Provide sufficient space to accomplish the purpose and need;
- Allow for an efficient and effective configuration of facilities and operations;
- Provide links to established roadway, railroad, pipeline, utility, power, and wastewater disposal networks;
- Minimize removal, replacement, or relocation of existing infrastructure and operations;

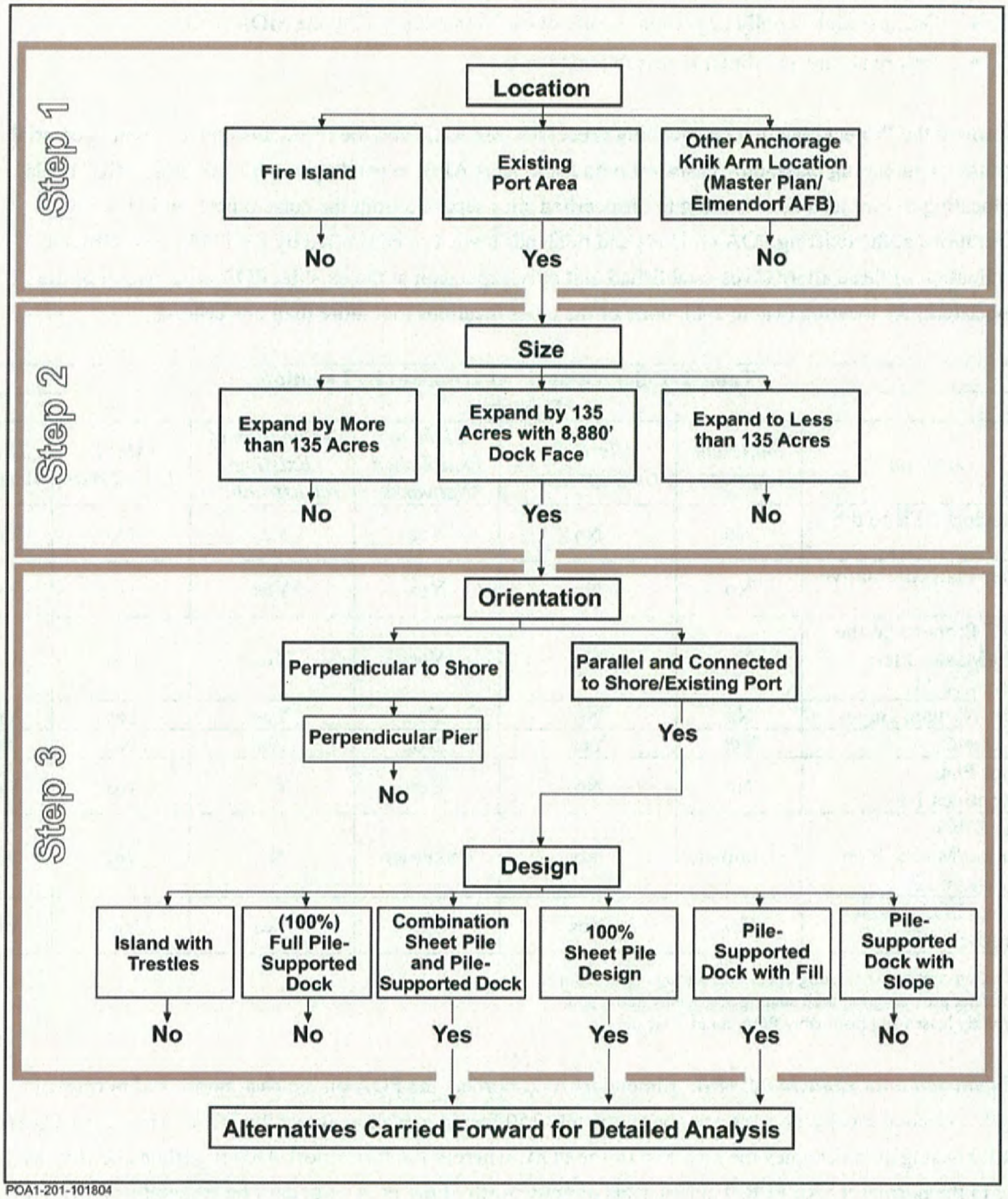


Figure 2-1
Alternatives Screening Process

- Occupy lands wholly or predominantly owned and managed by the MOA; and
- Ensure secure and direct access to DoD lands.

Through the Project planning and scoping processes, MARAD and the POA considered several potential locations, including expanding eastward onto Elmendorf AFB, expanding southward onto ARRC lands, relocating to Fire Island, relocating to unspecified sites separate from the current port, and expanding operations at the existing POA on lands and tidelands owned or controlled by the POA. A systematic evaluation of these alternatives established that only expansion at the existing POA area met all of the subcriteria for location (Table 2-1); none of the other locations met more than one criteria.

Table 2-1 Screening of Alternatives by Location

	Subcriteria					
Location	*Sufficient Space*	*Allows for Configuration*[1]	*Links to Established Networks*	*Relocation of Existing Infrastructure*	*MOA Ownership*	*DoD Access*[2]
Elmendorf AFB to the East	No	No	Yes	Yes	No	Yes
Master Plan Alternative 9	No	No	Yes	Yes	No	Yes
ARRC Property to the South/Master Plan Alternative 11	No	No	Yes	Yes	Yes[3]	Yes
Tryck, Nyman, Hayes	No	No	Yes	Yes	Yes[3]	Yes
Fire Island	Yes	Yes	No	No	No	No
Master Plan Alternatives 1-8	No	No	Yes	Yes	No	Yes
Some Other Location/Master Plan Alternative 12	Unknown	No	Unknown	No	No	No
Existing POA/Master Plan Alternative 10	Yes	Yes	Yes	Yes	Yes	Yes

[1] including continuing existing operations during construction;
[2] including providing required staging acreage by 2005; and
[3] currently leased so presumably POA could lease it.

Expansion onto Elmendorf AFB. Elmendorf AFB borders the POA on the east, north, and northeast, and is situated mostly on a terrace approximately 150 feet in elevation above the POA. The base's Cherry Hill housing area occupies the area east of the POA, whereas the Elmendorf AFB flightline and runway lie to the northeast. An FLR-9 antenna sits directly north of the POA boundary on Elmendorf AFB; Air Force requirements (Directive 3222.5) restrict construction within one mile of this antenna. In addition, geotechnical investigations have indicated that the slopes associated with the bluff on the POA-Elmendorf property boundary are unstable. Although expansion of the POA into Elmendorf AFB would create more backlands area, allow for the removal and relocation of existing infrastructure and operations, and provide DoD access, the constraints from existing military facilities, regulations, and unsuitable topography make the area insufficient in size and unable to accommodate the needed configuration. Such an expansion would not add to the amount of berthing space or access by ships.

Cut Into Elmendorf AFB Bluffs for Backlands (Master Plan Alternative 9). Master Plan Alternative 9 would entail filling approximately 50 acres north of the existing POA up to Cairn Point and the construction of a pile-supported concrete dock structure. Additional storage area needs would be met by excavation of the bluff separating POA property from Elmendorf AFB and expanding onto Elmendorf AFB. For the reasons mentioned above, Master Plan Alternative 9 would still suffer from the constraints of use by existing military facilities, regulations, and unsuitable topography making the area insufficient in size and unable to accommodate the needed configuration.

Expansion to the ARRC-Owned Property. Expansion directly south of the POA would likewise not meet all the necessary subcriteria. First, the area includes only 77.7 total acres, which would not provide sufficient space needed to meet the POA's requirements. Second, expansion would add less than 4,300 linear feet of dock face to the current 3,000-foot long dock. This length of dock would fail to accommodate the required configuration with nine berths (i.e., 8,880 feet), and would limit the capability to site backland facilities. Expansion to the south would retain essentially the same links to the road, rail, utilities, and other networks as the adjacent POA lands. Some of these lands directly abut Elmendorf AFB, thereby ensuring DoD access. ARRC leases the referenced lands to tenants, some of whom use POA facilities and pipeline systems and control their own storage tanks and silos. Other tenants operate their own on/off loading operations as well as controlling their own storage. These tenants include ASIG, Tesoro, North Star, and others with long-term leases. While the POA might be allowed to lease the lands and move all the tenants elsewhere, it would be infeasible and impractical. Relocation of infrastructure and operations would result in delays in operations and disruption of service given the current use of the area. Because this alternative location failed to meet two exclusionary criteria and proved impractical for two other subcriteria, it warrants no further consideration.

Tryck, Nyman, Hayes Alternative. In 2002, the engineering firm of Tryck, Nyman, and Hayes proposed extending the existing POA dock and facilities to the south (Tryck, Nyman, Hayes 2002), an alternative very similar to the southern expansion alternative described above. As detailed in that paragraph, this approach fails to meet the size and configuration criteria. In addition, continued use of the current dock as part of an expanded structure would rely on facilities well past their design life that require extensive repairs and replacement to continue operating. Such an alternative would not be reasonable.

Work with ARRC to Expand the POA to the South (Master Plan Alternative 11). Master Plan Alternative 11 would entail use of some portion of ARRC lands south of the POA to meet backlands storage requirements. This alternative suffers from the same constraints and limitations as the previously described *Expansion to the ARRC-Owned Property.* The alternative would include insufficient acreage, add too little dock face, and require infeasible and impractical relocation of current tenants. For these reasons, the alternative warrants no further analysis.

Fire Island Alternative. Fire Island, suggested as a potential location during the public comment period as well as in numerous previous studies, lies about ten miles southwest of the POA and about three miles due west of Point Campbell. This island lies in Cook Inlet near the point where it splits into the Knik Arm and Turnagain Arm. Isolated from the mainland of Anchorage, Fire Island occupies about 4,000 acres and is privately owned. While Fire Island includes sufficient land area to accommodate a relocated port facility and it offers appropriate terrain (Ott Water Engineers 1988), it suffers from significant limitations. First, the privately owned island would need to be acquired prior to any development activities. Second, the island lacks any road, railroad, and utility links to the mainland. At a minimum, roadways, tracks, and utility networks would need to be constructed to connect the island to Anchorage, resulting in substantial disturbance of existing vegetation, wildlife habitat, and offshore areas. Additional development would need to occur on the island and in Anchorage to ensure the basic functionality of a port, such as development of a road and causeway. Relocating the POA would require extension of POL pipelines for commercial and military needs (e.g., to Elmendorf AFB and Ted Stevens Anchorage International Airport) and relocation of all tank farm fuel storage and the valve yard, as well as expanded intermodal transportation networks and facilities to support cargo and cruise ship passengers. Third, Fire Island offers no direct access to DoD lands and would not support the deployment needs of the military. Fourth, local ship pilots indicate that tides currents and shoals would create a difficult environment for docking. Finally, the costs for such an undertaking would be prohibitive. Given these numerous problems as well as its enormous cost and potential environmental effects, relocation of the POA to Fire Island does not represent a reasonable alternative.

Expansion Through Limited Backfill (Master Plan Alternatives 1 through 8).
The following alternatives were proposed in the POA Master Plan. All alternatives would add approximately 80 to 110 acres of backlands storage through a combination of fill within tidelands to the north of the POA and use of remote or adjoining lands (the former Defense Fuels property or portions of Elmendorf AFB).

- *Master Plan Alternative 1 – Low Fill.* Master Plan Alternative 1 would entail filling approximately 50 acres of POA-controlled tidelands north of the POA up to Cairn Point and using 35 acres of remote (non-POA) lands southeast of POA for additional backlands storage use. Those lands southeast of the POA could be comprised of the Defense Fuels property currently under the ownership of the U.S. Army. The alternative also includes the construction of a new 1,200 foot long, pile-supported concrete dock structure at the new tidelands fill area in the vicinity of the -30 foot MLLW line. The new dock structure would not be connected to the existing dock. Operations under this alternative would involve use of both existing and new structures.

- *Master Plan Alternative 2 – Medium/Low Fill.* Master Plan Alternative 2 would entail filling approximately 60 acres of POA-controlled tidelands north of the POA up to Cairn Point and using 25 acres of remote (non-POA) lands southeast of the POA for additional backlands storage use. Those lands southeast of the POA could be comprised of the Defense Fuels property under the ownership of the U.S. Army. The alternative also includes the construction of a new, non-connected 1,200 foot long, pile-supported concrete dock structure at the new tidelands fill area in the vicinity of the -35 foot MLLW line. Operations would involve the use of both existing and new structures.

- *Master Plan Alternative 3 – Medium Fill.* Master Plan Alternative 3 would entail filling approximately 85 acres of POA tidelands north of the POA up to Cairn Point and using remote (non-POA) lands southeast of the POA for additional backlands storage use. Those lands southeast of the POA could be comprised of the Defense Fuels property under the ownership of the U.S. Army. The alternative also includes the construction of a new, non-connected 1,200 foot long, pile-supported concrete dock structure at the new tidelands fill area in the vicinity of the -45 foot MLLW line. Operations would involve the use of both existing and new structures.

- *Master Plan Alternative 4 – Low Fill with Pile-supported Backlands.* Master Plan Alternative 4 would consist of the same footprint and dock structure as Alternative 3. However, it considers construction of a pile-supported platform for those portions with bathymetric elevations below 10 feet MLLW, as opposed to fill in those areas. This alternative was considered in order to minimize fill in the area. Operations would involve the use of both existing and new structures.

- *Master Plan Alternative 5 – Large Fill with New Dock Line.* Master Plan Alternative 5 would entail filling approximately 110 acres north of the POA up to Cairn Point. The alternative also includes the construction of a new 1,200 foot long, pile-supported concrete dock structure at the new fill area in the vicinity of the -50 foot MLLW line. This alternative has the advantage of being able to connect the new dock with the existing dock during future renovation activities. This alternative does not consider use of the Defense Fuels or other adjacent property for backland storage. Operations would involve the use of both existing and new structures.

- *Master Plan Alternative 6 – Medium Fill with New Dock Line.* Master Plan Alternative 6 would entail filling approximately 80 acres north of the POA up to Cairn Point. The alternative also includes the construction of a new 1,200 foot long, pile-supported concrete dock structure at the new fill area in the vicinity of the -45 foot MLLW line. This alternative had the advantage of being able to connect the new dock with the existing dock during future renovations to accept 100-gage cranes. The alternative also includes the utilization of remote (non-POA) lands for additional backlands storage use. Those lands could be comprised of the Defense Fuels property under the ownership of the U.S. Army.

- *Master Plan Alternative 7 – Medium Large Fill with New Dock Line.* Master Plan Alternative 7 would entail filling approximately 90 acres north of the POA up to Cairn Point. The alternative also includes the construction of a new 1,200 foot long, pile-supported concrete dock structure.

- *Master Plan Alternative 8 – Very Low Fill with Use of Remote Backlands.* Master Plan Alternative 8 would entail filling approximately 40 acres north of the existing POA and construction of a pile-supported concrete dock structure. This alternative relies heavily on the use of remote backlands to meet storage requirements, including the use of Defense Fuels property and Elmendorf AFB lands.

Master Plan Alternatives 1-8 share some common features, including construction of a new 1,200 foot long pile-supported dock structure north of the existing dock and filling of 50 to 110 acres north of the existing POA. Some of these alternatives rely upon using remote lands such as the Defense Fuels property under U.S. Army ownership or portions of Elmendorf AFB for additional backlands storage. The limitations of expanding onto Elmendorf AFB has been discussed previously. Limitations associated with the use of the Defense Fuels property include:

1. lack of sufficient usable space;
2. limited operational efficiency; and
3. proximity to Government Hill.

The Defense Fuels property is comprised of three areas based on topography – the upper bluff, the former tidal flats areas, and the slope deposits area. The upper bluff (approximately 20 acres) occupies the flat-lying ground at higher elevations. It is separated from POA lands by sloping topography (slope deposit area of approximately 35 acres) and the former tidal flat area. The former tidal flat area is approximately 14 acres and lies adjacent to lands leased by Chevron and Tesoro. Approximately 7.3 acres of this area has been leased by the POA for the Road and Rail Extension Project along Terminal Road. Thus, at best, only five acres of flat ground would be available for cargo storage. The remainder of the area either is comprised of sloping gravelly sands that would require extensive stabilization and leveling to provide usable space or the upper bluff that is separated from the POA by the slopes. Overall, very little of the area would provide the usable space to efficiently store and move cargo from the berthing areas out to consumers. Further, the area would not be suitable for military staging of the Stryker Brigade Combat Team, because these staging areas require 40 acres of contiguous space. Of the five acres of usable space remaining in the Defense Fuels property for storage, all of these lands would be located on the opposite side of the POA rail lines, limiting operational efficiency.

There are environmental constraints that further limit use of the Defense Fuels property. The site is undergoing remedial action for known contamination. Until sufficient cleanup levels are achieved, institutional controls limit public access and excavation of soils. The property also abuts Government

Hill, a residential community to the north. Consistent use of the property would increase local noise levels. Finally, the U.S. Army has expressed interest in retaining the area.

These factors render use of the backlands site impractical. Even with the use of remote or adjoining lands, the total acreage would be insufficient to meet future storage needs for commercial and military uses. Likewise, these alternatives would create less than half of the dock length required for configuration of nine berths. Thus, these alternatives warrant no further consideration.

Fill in Front of Existing Dock (Master Plan Alternative 10). Master Plan Alternative 10 would entail filling the area in front of the existing dock to the vicinity of the -50 foot MLLW line. The Master Plan discounted this option on the basis of cost, but recognized that long-term future conditions warranted review of the concept. As a variation of expanding outward from the existing POA, Master Plan Alternative 10 would extend port facilities 400 feet seaward from the existing dock, approximately 1,350 feet westward on the existing shoreline. This alternative suffers from several limitations. First, it would add only about 28 acres, far less than the amount required by the POA. Second, the resultant dock face would remain at 3,000 linear feet, an insufficient length to accommodate nine berths. Third, it would extend too far out into the Knik Arm, resulting in constraints on marine traffic. Thus, this alternative was not carried forward.

Develop a New Terminal North of Cairn Point or Some Other Location (Master Plan Alternative 12). Master Plan Alternative 12 would entail the relocation of the entire POA operation to another location remote from the existing port. One target location includes the area north of Cairn Point. Development of this site would require the filling of a substantial area of tidelands. A second target location considered was even more remote from the present POA site. This alternative suffers from many of the same types of limitations as the use of Fire Island. While a site with sufficient space and appropriate terrain might be found, none would afford the needed linkage or access. Moreover, building a port elsewhere would be impractical and infeasible from a technical and fiscal standpoint.

Expansion Outward from the Existing POA. The only location that meets all of the required characteristics is the tideland area west, northwest, and southwest of the existing POA. With appropriate filling and construction, it contains sufficient land for the size of the proposed expansion and offers appropriate terrain. Existing road, rail, POL, and utility networks extend from the POA and offer the necessary connectivity to Anchorage. Current POA infrastructure and operations could be relocated from the present locations to adjacent expanded areas in phases, allowing the POA to operate during construction. The POA owns both the existing facilities and sufficient adjacent lands to accommodate the proposed expansion. By virtue of abutting Elmendorf AFB, the POA ensures direct, secure access to a DoD installation. Since it meets all these subcriteria, the existing POA represents the only reasonable location alternative that satisfies the set of location criteria.

Size

As the second step in the screening process, MARAD and the POA considered different potential sizes for the POA facilities. To meet the need, an alternative must be of sufficient size to:

- support the necessary acres for berthing, storage, cranes, administrative and security functions, and improved road and rail networks in a configuration that is conducive to efficient operations;
- provide seven modern ship berths and two barge berths;
- provide for continuing POA operations during construction; and
- provide required staging acreage for Stryker Brigade Combat Team deployment by 2005.

As demonstrated in Chapter 1, the current size of the POA cannot accommodate existing or near-future needs for berthing, storage, and other functions. The rate of projected growth at the POA for the next 20 years, regardless of port configuration, would continue to place increasing demands for land and docks that cannot be met with the present port configuration. Therefore, an alternative that adopts the status quo for size cannot be considered reasonable. For this reason, the screening process examined only alternatives that involved expanding the existing port: 1) expand to the proposed 135 acres with an 8,880 foot dock face for ship and barge berthing; 2) expand to a size smaller than the proposed action but larger than the current port; and 3) expand to a size larger than the proposed action.

Add 135 Acres and 8,880-Foot Dock Face. As established in Chapter 1, the first concept would fulfill the subcriteria defined above. The 135 acres, if appropriately configured, would accommodate all necessary expansion for storage, facilities, and transportation, and its 8,880-foot dock face would provide for the seven ship and two barge berths while providing safe and efficient docking. This size would fulfill all of the needs identified through evaluation of the POA's capacities and expected volumes of cargos. Note, however, such a concept would satisfy the criterion only if it is configured in such a way as to maximize operational efficiencies. Configurations such as non-contiguous operational areas or areas that restrict access between berth and storage areas likely would dictate the need for additional acreage to meet the purpose and need.

Anchorage is served twice weekly by two major carriers which originate in Tacoma. TOTE is a RO-RO carrier and Horizon is a LO-LO carrier. Both carriers require preferential berthing in order to ensure the continuity of their "just-in-time" delivery system. Each carrier requires sufficient yard space immediately adjacent to its berthing area to maximize efficiency in loading and unloading freight. Remote yards would cause delays and add inefficiencies and costs to the current system. More hostler trucks and more drivers would be required to make the same number of container moves per hour. Therefore, any configuration must provide both the area and the required access for both operations to continue efficient operations.

Stryker Brigade Combat Team or other military deployments will also require significant contiguous area in proximity to the dock and of appropriate geometric configuration to allow efficient, expeditious loading activities.

Add Less than 135 Acres and Less than 8,880-Foot Dock. A less substantial expansion would not achieve those needs. An expansion to less than 135 acres or less than 8,880 linear feet of dock would constrain one or more of the necessary functions or facilities associated with the transfer and transport of cargos. Reduction of the number of berths would limit access by ships and barges, delaying the transfer of goods and increasing ship congestion in nearby waters. Furthermore, a smaller size or a less efficient layout of the operational area would impact movement of goods and storage at the POA, and require ineffective work-arounds. For all of these reasons, a less substantial expansion would not be reasonable. Examples of alternatives that do not meet the size requirements are Master Plan Alternatives 1 through 8 and 10, expanding onto Elmendorf AFB, expanding onto ARRC property, and the Tryck, Nyman, Hayes alternative.

Adding More than 135 Acres and an 8,880-Foot Dock. While expanding to more than 135 acres and an 8,880-foot dock face would fulfill all the needs for space, it would require development of more tidelands than necessary to accommodate projected growth of the POA and would be restricted by the available space between the POA and Cairn Point. The landform and land ownership cannot accommodate an expansion of the dock face of substantially more than 8,880 feet. It is constrained by the former Summit Barge and Transfer Facility on the south and by the landform of Cairn Point on the north. These constraints would make additional expansion impractical.

Orientation and Design

For the third step in the screening analysis, the last two screening criteria examined alternatives based on their orientation to the current dock and variations in design (i.e., pile-supported constraints relating to dock, sheet pile with fill, or combinations thereof). Each of the orientations and the designs in the following sections must meet constraints relating to engineering feasibility and logistics. It also needs to minimize adverse effects to the environment from noise, area of disturbance, interruption of service at the POA, and use of electricity. The subcriteria associated with these constraints are discussed below.

Minimum criteria were established that identified how the orientation and design would accommodate forces created by currents, tides, earthquakes, and ice. All alternatives were required to meet these minimum criteria in order to be carried forward for further analysis.

- The alternative must not substantially alter the hydrology of Knik Arm by causing water velocity changes that could lead to changes in sedimentation or erosion patterns. Currents in the POA area close to shore are considerably less than the current a few hundred yards into Knik Arm.

The farther the dock extends out into Knik Arm, the greater the forces from currents against the structure. The maximum extension westward should be limited to approximately 500 feet from the existing dock face. In addition to increasing forces due to currents on the dock, the force of the currents can also prevent a ship from berthing safely. This is particularly true when berths are arranged perpendicular, rather than parallel to the currents. Therefore, berths perpendicular to the currents should be avoided.

- The alternative must consider the substantial floating ice loads and minimize the combination of ice loading and tidal fluctuations that detrimentally impact the existing structures at the POA. A rind of ice begins to build on pile-supported dock structures in the tidal zone starting in October. This thin ice layer increases with each wetting of the tide. The ice build-up eventually becomes so large that it effectively becomes a solid block of ice connecting all pilings and blocking the flow of ice mass. The added weight of ice is subject to stresses from currents or seismic forces. The ice also is laden with silt and sand. The movement of the silt-laded ice in the tidal zone effectively abrades the pilings, exposing bright steel and increasing the corrosion process. Finally, large ice floes moving with the current can impose significant lateral loads on moored vessels, as well as the dock structure.

- The current velocities are significantly greater away from the shoreline (see section 1.4.2). Maritime structures within areas of high current velocity are subject to damage by fast moving ice floes. Therefore, extensive pile-supported structures should be avoided, especially for designs extending outward into the swifter currents.

- The design of the structure should adequately minimize the combined impact of seismic and ice loads. The POA is located in an active seismic zone. Maritime structures must resist the large lateral loads that could be imposed by seismic events. Tall slender structures supporting significant operating loads and environmental loads such as massive ice formations must be stabilized against seismic lateral forces. There are two potential options for controlling lateral stability issues. The first is to limit the height of these structures and to locate them within the embankment of land mass. Thus, the height of the proposed maritime structures would be limited to less than 90 feet, which is equivalent to placing sheet piling or pipe piles at about the -45 MLLW contour line. The second would be to enhance lateral stability by the addition of soil or gravity structures on the landward side of a pile-supported dock or, less effectively, trestles or other buttressing structures that provide lateral support. This requires designs that include soil or gravity structures rather than pile-supported structures on the landward side of the dock.

- In addition to criteria relating to engineering feasibility, the alternatives must provide an efficient and effective means of moving goods from the berths to the backlands and out of the POA.

Table 2-2 summarizes the result of the screening analysis and whether each alternative discussed in the following sections was carried forward for more detailed analysis.

Table 2-2 Engineering and Logistical Constraints in the Alternatives

Alternative	*Does Not Significantly Change Hydrodynamic Conditions*	*Provides Seismic Resistance*	*Prevents Excessive Ice Loading*	*Provides Corrosion/ Cathodic Protection*	*Does not Exceed -47 feet*	*Provides Lateral Stability*	*Provides Backland Logistics*	*Minimizes Docking Issues*	*Carried Forward*
Perpendicular Pier(s)	No	No	No	Yes	No/Yes	No	No	No	No
Island fill with Trestles	No	No	No	Yes	No	No	No	No	No
100% Pile-supported Dock and 100% Pile-supported Platform for additional backlands	Yes	No	No	No	Yes	No	Yes	Yes	No
Pile-Supported Dock with Slope	No	Yes	No	No	Yes	Yes	No	Yes	No
100% Sheet Pile	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
100% Pile-supported Dock with fill	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Combination Sheetpile and Pile-Supported Dock	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Orientation

MARAD and the POA evaluated different orientations for the proposed expansion to define reasonable alternatives. Given the nature of POA activities and basic construction principles, two orientations were considered:

- Expand into deeper water, perpendicular to the existing dock or
- Expand parallel to the shoreline.

Perpendicular Pier Alternative. As originally suggested during comments to the draft EA, this alternative would place a single pier perpendicular to the current POA, extending approximately 4,440 feet out into the channel. This alternative would provide 135 acres of additional surface area and the appropriate number of berths. Such an expansion would require a westward extension of at least 4,500 feet at a width of 1,300 feet wide to create the necessary amount (135 acres) of new working surface area.

Such a configuration would not be technically feasible given the engineering subcriteria discussed above and would not provide efficient or effective logistics between the dock and the backlands.

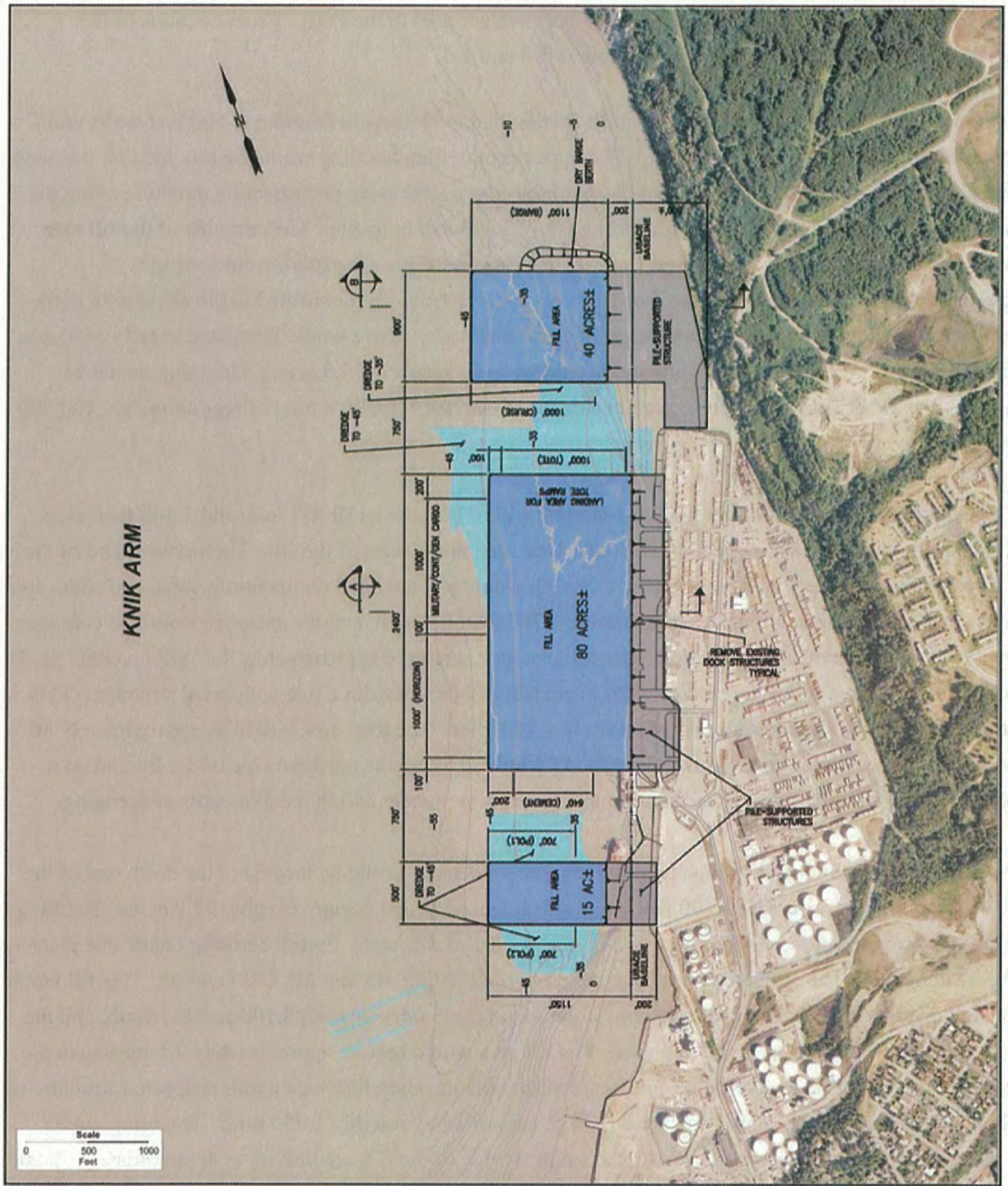
1) The extension of a pier 4,500 feet into the channel would significantly affect the existing hydrodynamic conditions. The pier would be subject to substantial currents that would place significant horizontal loads against the sides of the structure. Ships docking at berths located perpendicular to the current would not be able to maneuver adequately to dock safely. Currents in this area would increase lateral movements on the ship potentially placing excessive stress on mooring and fendering systems. In addition, ice floes, especially when associated with the same increased current, could increase lateral stresses.

2) For stability reasons during seismic events, earth-filled and pile-supported structures should not be constructed in waters deeper than -47 MLLW, and should not be long and narrow. A minimum width of about 400 feet is recommended to keep these structures stable. Tall narrow pile-supported docks also need additional stabilization from ice loading. The ice buildup that occurs during the winter months increases the mass on the piling. During a seismic event, the lateral loading is amplified by the added mass, rendering them potentially unstable.

3) This expansion would pose construction issues for both sheet pile- and pipe pile-supported methods. With a maximum depth limit for typical sheet pile and pipe pile construction of approximately 90 feet, construction in areas with a depth below -47 feet MLLW would not be feasible. With increasing distance from shore, water depths increase dramatically to depths substantially exceeding 90 feet at 4,500 feet from the existing dock face.

4) In terms of logistics, the majority of this additional 135 acres would not be adjacent or contiguous with the existing POA backlands, leading to an inefficient use of existing space. This orientation would require four berths on either side of the extension, thus creating a congested travel lane in the middle of the pier for movement of goods from ship to shore. Also with this configuration, the congested travel lanes for movement of large container and other bulk cargo would cause safety issues for passengers from a dedicated berth for cruise ships attempting to access activities outside of the POA.

For these reasons, the single perpendicular pier was not considered to be technically feasible. In an attempt to make the general concept technically feasible, an alternative was developed that divided the one pier into three finger piers that each extend westward approximately 1,200 feet. This Perpendicular Pier alternative would be comprised of three major berthing and storage areas oriented perpendicular to the shoreline, as shown on Figure 2-2. Each area would consist of a pile-supported section adjacent to the shoreline to provide a potential migration path for fish and a fill section extending out into Knik Arm.



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Anchorage

Figure 2-2
Perpendicular Pier Alternative

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The fill sections would add an additional 135-acre surface area to the POA. Cross-sections of the northern and central piers are shown on Figures 2-3 and 2-4.

The southern (POL) pier would include a fill section that is 950 feet in length and 500 feet wide, and extends out to the existing -45 feet MLLW contour depth. Ship berthing would be provided on the north and south side of the fill. The fill would be contained by a steel sheet pile retention structure along the north, west, and south sides, totaling approximately 2,400 feet in length. The east side of the fill area would be a rock dike with an armored slope. Construction of this alternative would require approximately 1.3 million cubic yards of fill. The fill area would be connected to the shore with a pile-supported structure that is 400 feet in length by 500 feet wide. There would be approximately 510 piles supporting this pier. The entire south area would be approximately 15.5 acres. Dredging would be required on either side of the fill section to a depth of -45 feet MLLW, a total of approximately 180,000 cubic yards.

The central pier would include a large fill section, approximately 1,150 feet long and 2,400 feet wide. Ship berthing would be provided on the south, west, and north sides of the fill. The seaward end of the fill would be in -45 feet MLLW of water. This fill would be contained on the north, west, and south sides by a steel sheet pile retention structure totaling 4,700 feet in length, and the east side would be contained by a rock dike with an armored slope. The fill area would require approximately 7.7 million cubic yards of fill. The fill area would be connected to the existing shoreline with a pile-supported structure. This structure would be supported by approximately 1,840 piles. The total area would be approximately 80 acres. Dredging would need to take place to -45 feet MLLW on the northern side of the fill and on a portion of the western side. These areas amount to approximately 340,000 cubic yards of dredging.

Another large berthing and storage pier totaling about 40 acres would be located at the north end of the POA. The fill area would be 1,100 feet long by 900 feet wide and occupy roughly 22.7 acres. Berthing would be provided along the southern and northern sides of this area. Future berthing could take place on the western side. The seaward end would extend to the existing -45 feet MLLW contour. This fill would be contained by a steel sheet pile retention structure on three sides totaling 3,100 feet in length, and the east side would be retained by a rock dike. The fill area would require approximately 2.5 million cubic yards of fill. The fill area would be connected to the existing shoreline with a pile-supported structure of about 17.5 acres in area. This structure would be supported by roughly 1,950 piles. Dredging would need to take place to -35 feet MLLW on the southern side of the fill, amounting to approximately 30,000 cubic yards of dredged material.

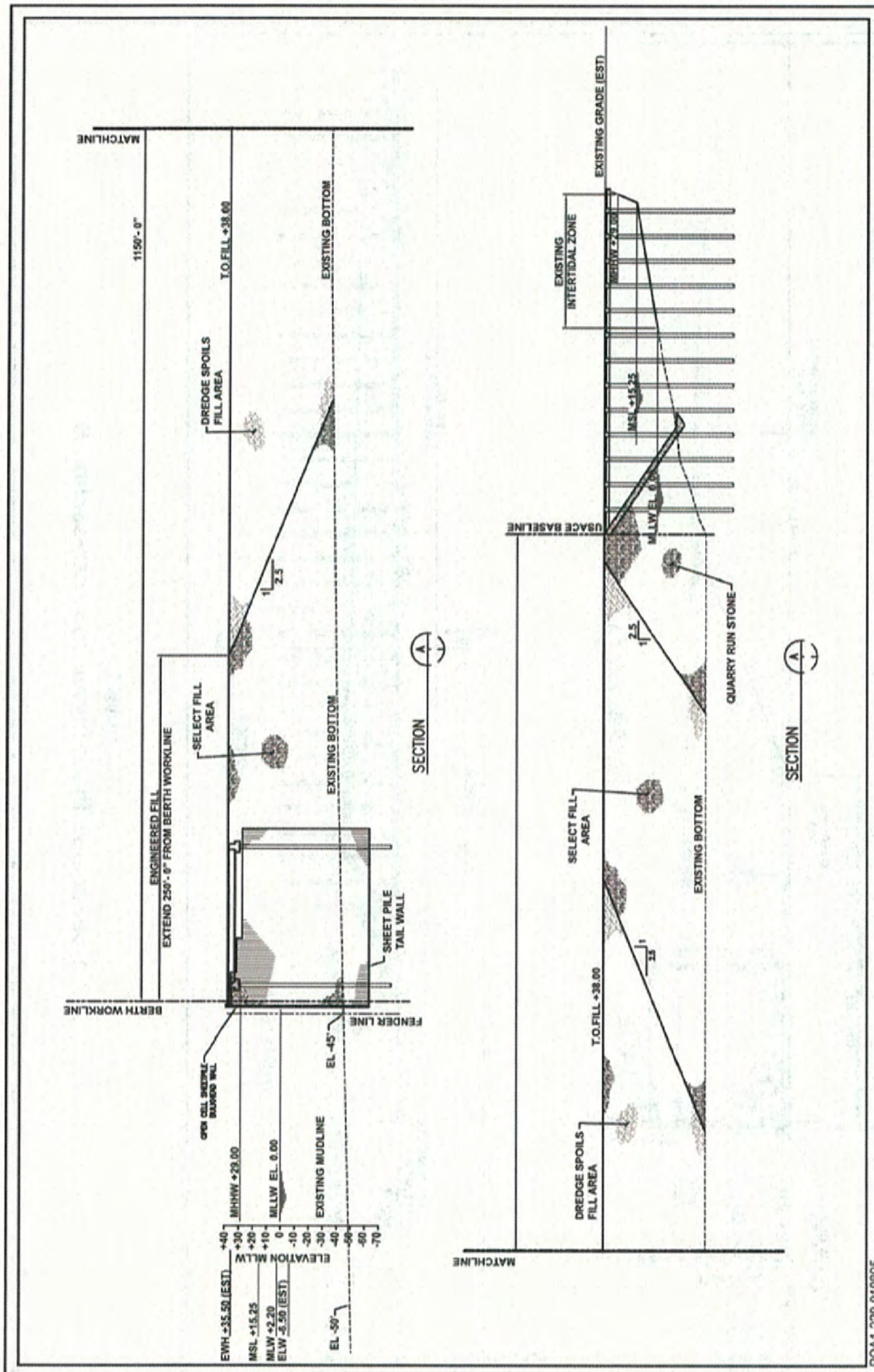

Figure 2-3
Perpendicular Pier Alternative Cross-section A

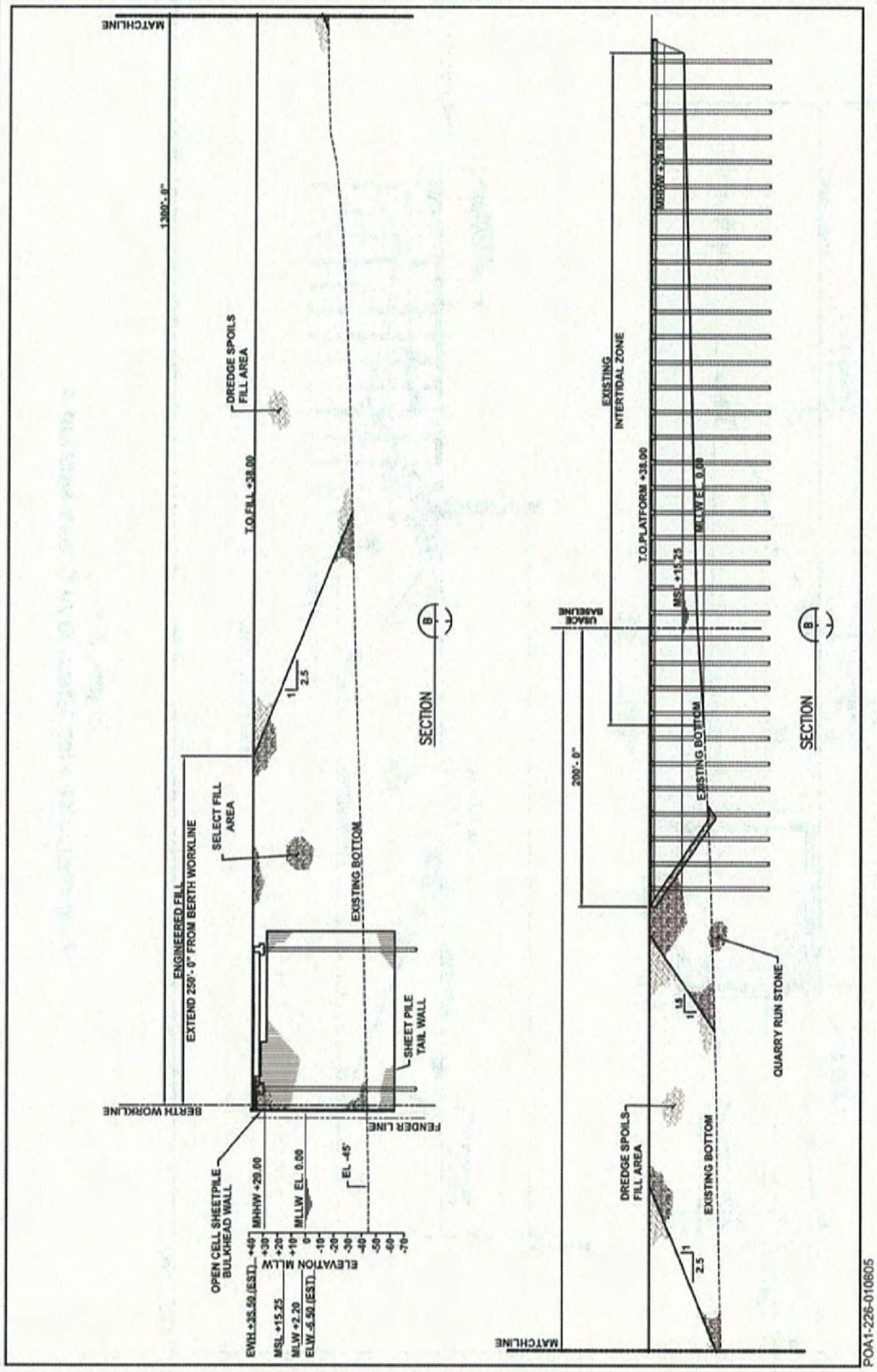

Figure 2-4
Perpendicular Pier Alternative Cross-section B

An essential part of this alternative involves minimizing materials placement or dredging of the intertidal zone. Instead, pile-supported structures would be used to span the intertidal zone, with backfill placement occurring in deeper waters. For this alternative, the total area of tidelands that would be impacted by installation of piles, as determined by the footprints of the individual piles, is estimated to be 41,500 square feet, or approximately one acre.

The length of time needed to construct this alternative would be dependent on several factors, including duration of the construction season, coordination of dredging and fill operations, and maintaining cargo operations throughout construction. It is anticipated that each area would be constructed independently and sequentially, that is, one area would be completed before starting construction on another area. The total duration of this project is estimated to be eight years.

This alternative is not carried forward for detailed analysis due to engineering feasibility and logistical issues enumerated below.

1) The pile-supported areas behind the three fill areas would have significant ice build up and could potentially be solid ice between the shoreline and fill section (Figure 2-5). This would result in significant lateral loading on the support piling in response to tidal currents. The added weight of the ice, coupled with a seismic event less than that mandated for design purposes by the MOA Geotechnical Advisory Commission, could lead to failure of the entire pile-supported structure. Failure of the pile-supported structure, connecting the backfilled area with the existing backlands and the POA transportation system connections would render the newly developed area inaccessible.

Figure 2-5 Ice around Pilings at the POA

2) The open areas beneath the pile-supported structures are intended to provide an area for potential migration of fish; however, this area would constrict the flow of water between the fill structure and the shoreline causing increased velocities as the water flows around the fill sections. This increase in velocity would cause contraction scour. Contraction scour occurs when a decrease in flow area results in an increase in average velocity and bed shear stresses through contraction. The increase in water velocity means that more material is removed than is deposited. The result is the increased erosion of the mudflats in this area.

3) The central pier would provide adequate berth length for a dedicated cement berth, the two current container handling tenants, Horizon and TOTE, and a third berth for the military or

another container/general cargo tenant. There would also be sufficient space for staging and cargo storage activities. Horizon and TOTE would have approximately 28 acres of storage contiguous with their berths, which is adequate for loading and unloading vessels if the cargo were stored on the terminal. However, the Horizon berth would be 1,150 feet beyond the current berth, which would require longer haul distances for cargo entering and exiting the terminal. This arrangement would result in increased congestion on the terminal. The TOTE berth would be located along the north side of the pier because the military berth would need to be adjacent to Horizon to share the container cranes. For TOTE, this arrangement would not be efficient because a turning movement would be introduced into their loading and unloading. This, in turn, would adversely impact their operations by revising their circulation patterns, which are predominantly oriented perpendicular to the berth. These complications, inefficiencies and extended operating times would result in significantly increased transportation and handling costs for goods entering Alaska through TOTE operations. The north pier would provide adequate berthing and storage for cargo via barges. A cruise berth would also be provided. However, potential limitations to this arrangement would include orienting vessels perpendicular to the current and longer transit times from the berth to the public roadway system.

4) Because these structures would be constructed directly in front of existing facilities, operations would be interrupted during the construction process. Constructing the project without interrupting the flow of critical goods to the State of Alaska is of primary importance to the POA.

Other problems making this orientation impractical include:

- An increased potential for spills due to the need to extend the POL lines further from storage and transfer facilities and further from the existing shore.
- Increased safety concerns and a requirement for enhanced fendering systems to protect the dock face structure because ships would need to line up perpendicular to the current.
- Lack of initial space for military deployment requirements starting in 2005.

Due to these myriad problems, orienting an expanded dock perpendicular to shore would not be feasible or reasonable. As such, it is not carried forward for further analysis.

The second orientation of the dock involves expansion parallel to and along the existing dock face at the POA. While requiring materials placement into the tidelands, it offers many advantages over the other orientations, including:

- Direct and short connections to utility and POL lines;
- Efficient movement of goods from berth to shore;
- Limited hydrodynamic effects and erosion;
- Docking ships parallel to the currents; and
- Flexibility in operations.

This orientation would be both practical and feasible from a technical and economic standpoint. Therefore, it merits consideration as a reasonable alternative.

Design

The three previous steps of the screening process established that 1) the existing POA represented the best location for the expansion; 2) an expansion of 135 acres with an 8,880-foot long dock face met the size requirements; and 3) expansion parallel to and along the existing POA formed the most practical and feasible approach. Thus, in the fourth step of the process, MARAD and the POA considered alternative construction designs for the expanded port facilities. These alternative designs derived from previous engineering proposals, the POA Master Plan, and the results of substantial geotechnical testing and evaluation. All of the design alternatives were evaluated according to their ability to meet engineering constraints associated with seismic stability, ice loading, corrosion, construction methods, and hydrodynamics. Cost was considered as a criteria only if the selected design was substantially greater than those for the other alternatives and if the cost was sufficiently great as to exceed reasonable levels of funding. In addition, design features were considered that would require less fill in intertidal areas, while satisfying requirements relating to logistics and the movement of goods and equipment efficiently around the POA. Six design approaches were evaluated:

- Island Fill with Trestles;
- 100 Percent Pile-Supported Dock;
- Pile-Supported Dock with Slope;
- Sheet Pile Design;
- Pile-Supported Dock with Fill; and
- Combination Sheet Pile Design with a Pile-Supported Dock Area.

Island Fill with Trestles Alternative. The main element of this alternative is the construction of a 140-acre filled "island" with pile-supported trestles spanning the intertidal zone and connecting the current POA backlands to the island. The plan view of this alternative is shown on Figure 2-6, and cross-sections are shown on Figures 2-7, 2-8a, and 2-8b. The fill area would extend out about 1,150 feet from the existing pierhead line and would be approximately 6,250 feet long and 1,000 feet wide. The face of the new berth would be at approximately -45 feet MLLW. The fill would be retained by a 8,880-foot long steel sheet pile support system on the south, west, and north sides. The east side would be retained by a 5,250 foot long rock dike. The fill would be composed of 16.2 million cubic yards of material. A small amount of dredging would be required on the south side, to -35 feet MLLW, and on the west side to -45 feet MLLW. The total amount of dredging would be about 400,000 cubic yards.

The fill island would be connected to the existing shoreline by six pile-supported trestles rather than creating a solid fill area within the intertidal zone. There would be a total of approximately 300 piles needed to construct these trestles.

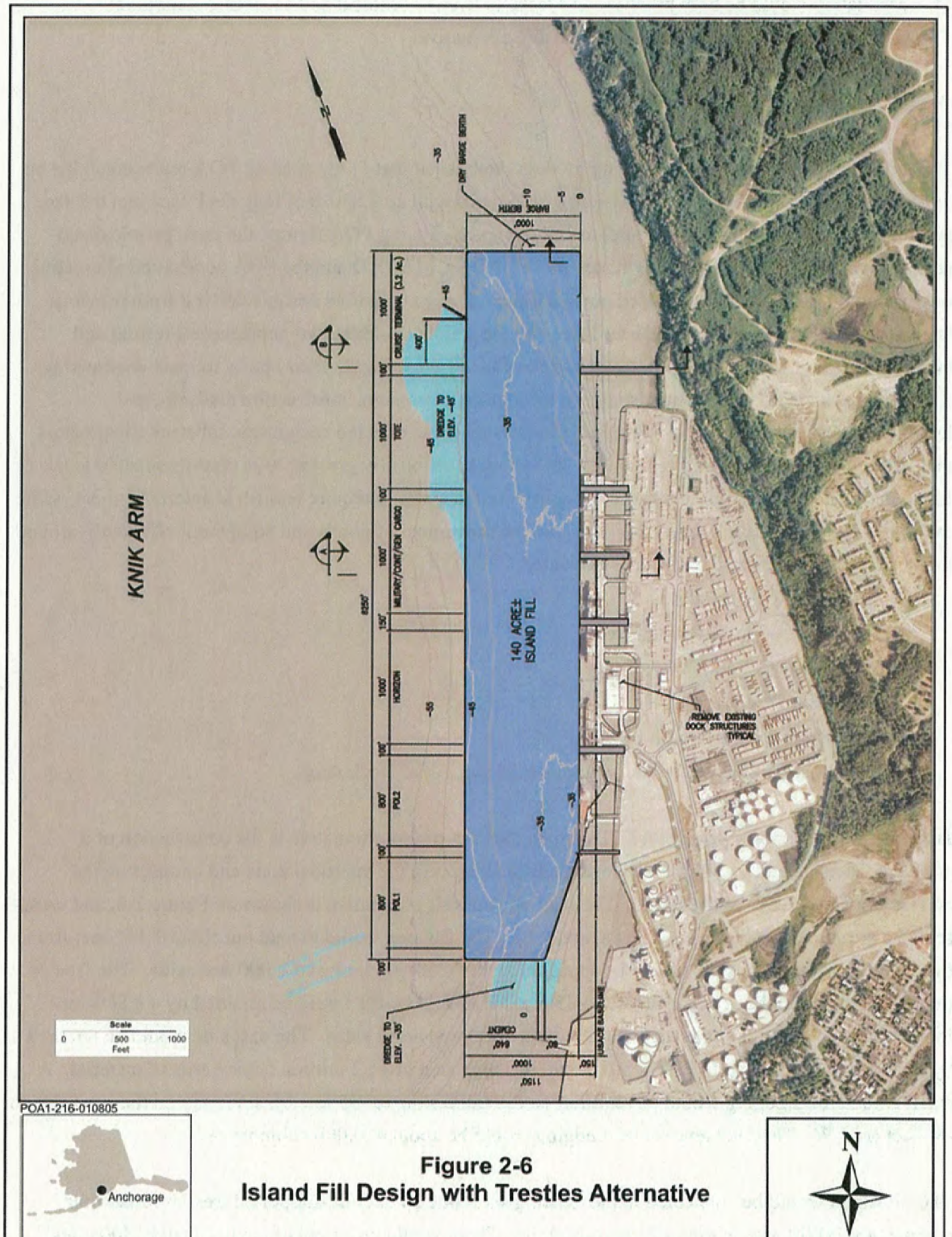

Figure 2-6
Island Fill Design with Trestles Alternative

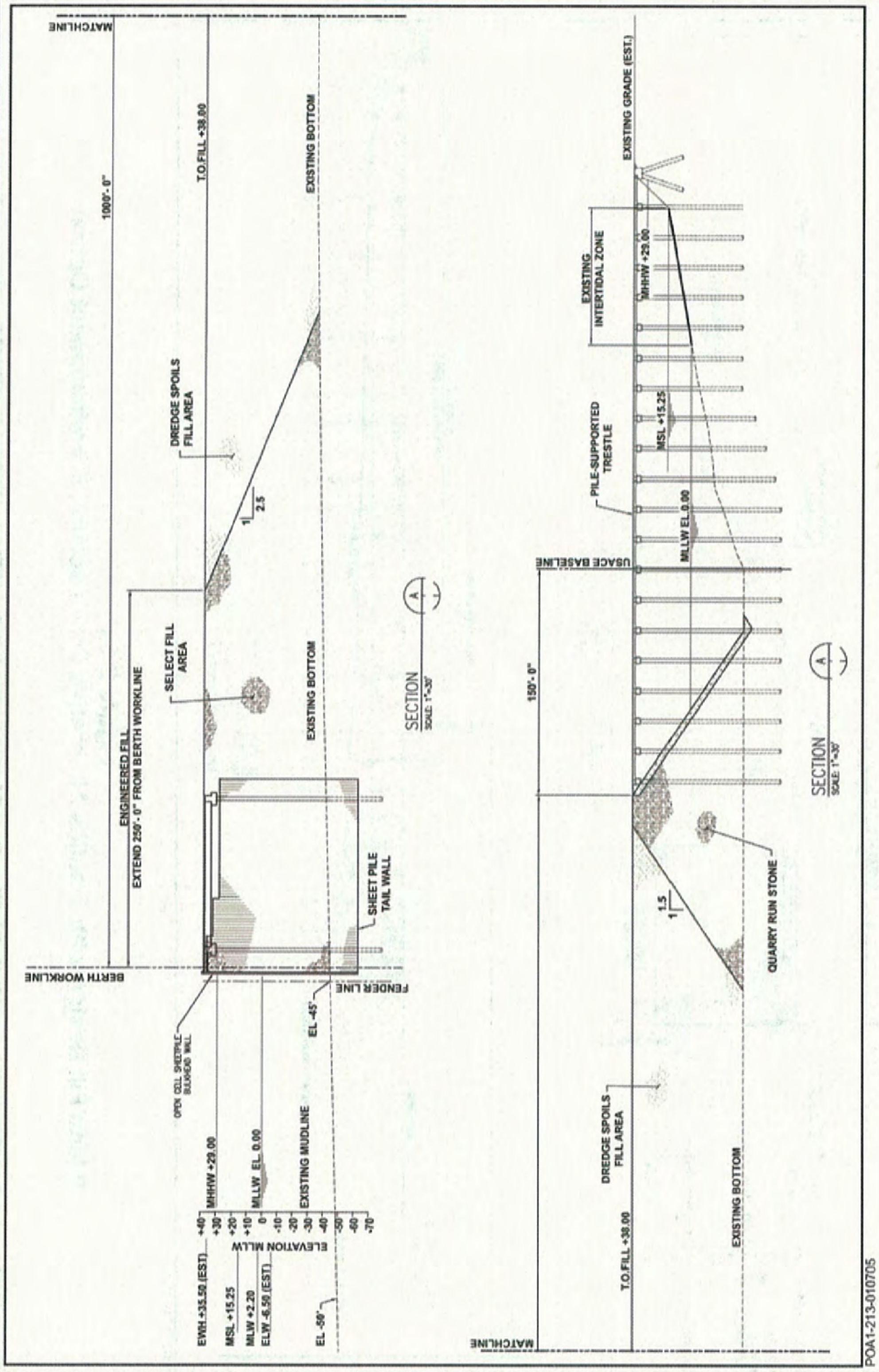

Figure 2-7
Island Fill Design with Trestles Alternative Cross-section A

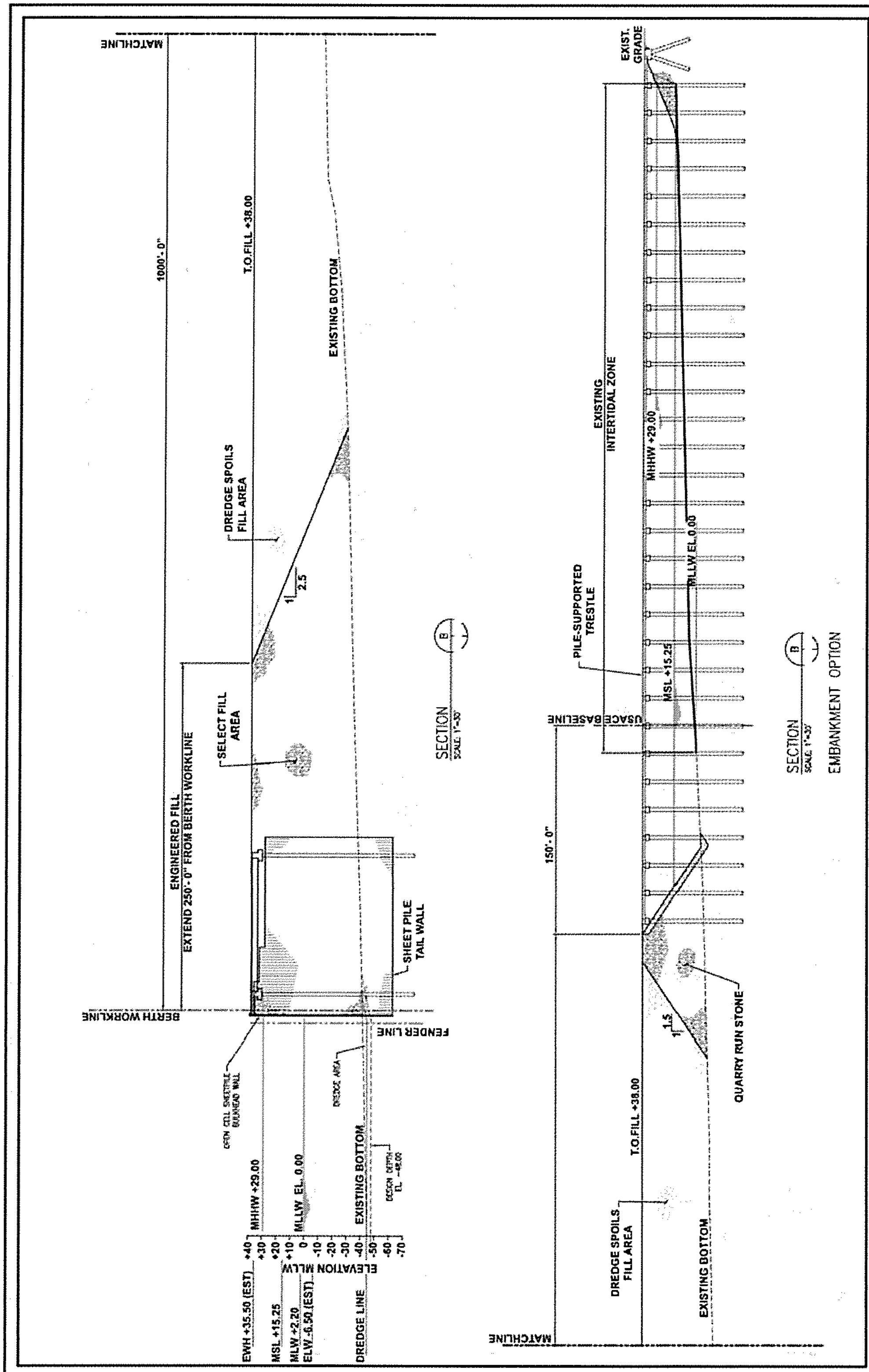

Figure 2-8a
Island Fill Design with Trestles Alternative Cross-section B Embankment Option

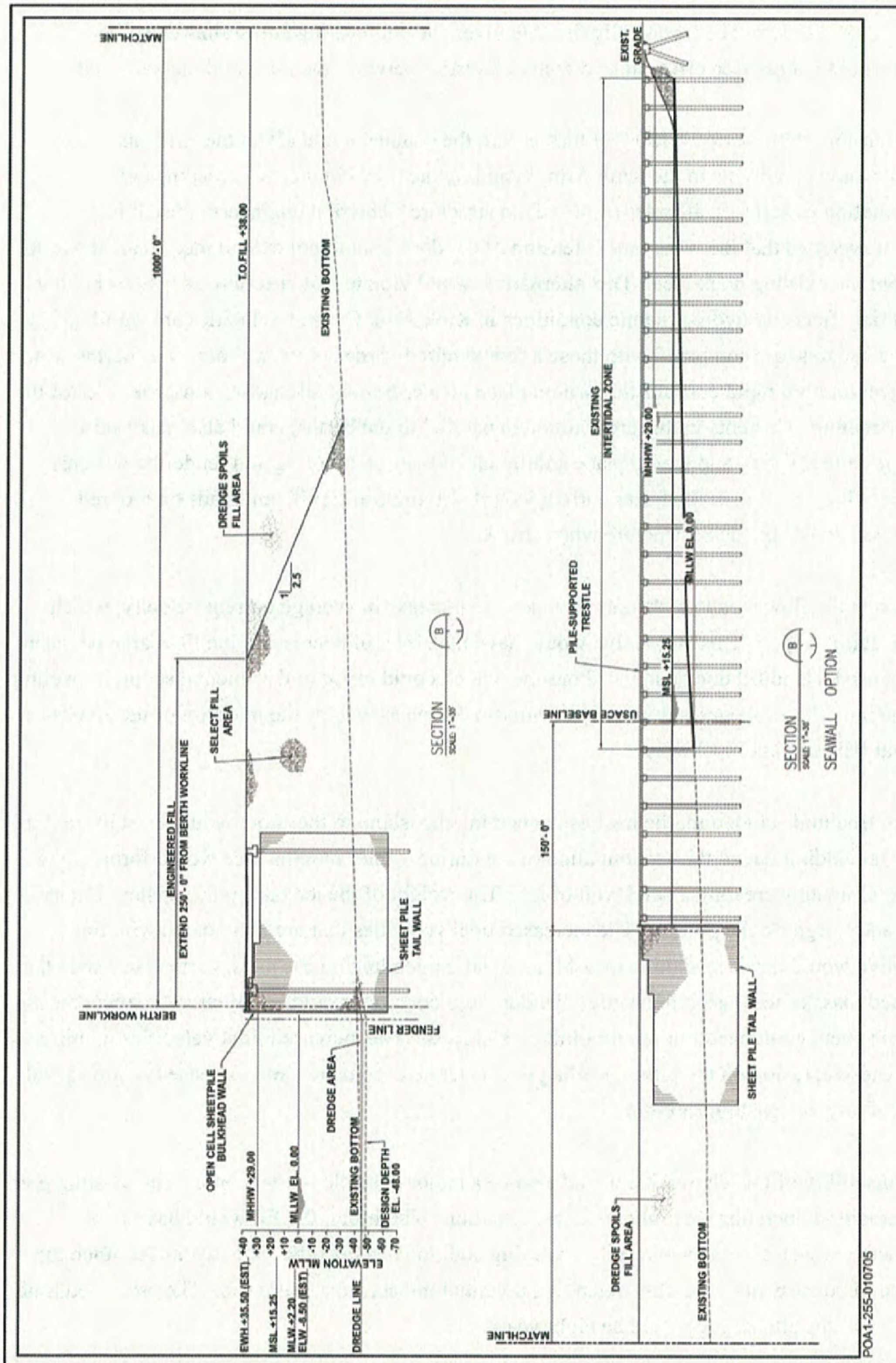

Figure 2-8b
Island Fill Design with Trestles Alternative Cross-section B Seawall Option

Such a configuration would not be technically feasible given the engineering constraints described previously and would not provide efficient or effective logistics between the dock and the backlands.

1) The extension of the berths 1,150 feet further into the channel could affect the existing hydrodynamic conditions in the Knik Arm, including the tidal circulation, erosion, and sedimentation patterns on all sides of the island structure. The first engineering feasibility criterion specifies that the westward extension of the dock should not extend more than about 500 feet from the existing dock face. This alternative would violate that criterion, as well as having substantial effects on hydrodynamic conditions in Knik Arm. Current velocities are significantly slower close to shore compared with those a few hundred yards out from shore. The berths would be subject to more rapid currents that would place greater horizontal loads against the sides of the island structure. Currents in this area, although parallel to the berths, could also make ship berthing more difficult and would place additional stresses on mooring and fendering systems. Large ice floes moving in the faster current would also impose significant loads on moored vessels, as well as the dock structure when struck.

2) Decreasing the flow area in a channel results in an increase in average current velocity, which could result in scour. This alternative would have the effect of decreasing the flow area between the proposed island fill dock and the shoreline, which could result in detrimental scour, impacting both the integrity of the piles driven in the intertidal zone as well as the integrity of the zone as a potential fish migration pathway.

3) From a structural standpoint, the trestles connecting the island to the shore would be subjected to additional loading due to the accumulation of ice during winter months. Ice would form on the trestles, ultimately creating a solid wall of ice. The weight of the ice during the winter months would add weight to the pilings. The increased tidal velocities that are anticipated with this alternative would result in significant additional lateral loading on the piles, particularly with the increased mass of ice during the winter. Under these conditions, additional lateral loading during a seismic event could result in failure of these elements. The increased tidal velocities in this area would cause abrasion on the piling, leading to accelerated corrosion, and increased scouring and erosion along the existing shoreline.

4) Constructability of this alternative would also be a major obstacle to overcome. The existing port must remain in operation throughout the construction. Therefore, the fill would have to be constructed in phases or separate cells, requiring additional sheet pile. This would lengthen the duration of construction, possibly extending potential impacts to aquatic life. The estimated time to construct this alternative would be eight years.

5) This concept would also be impractical from an operational perspective. Cargo staging and storage could be accommodated on the island; however, all cargo would have to cross the access trestles at some point. This would result in increased haul distances between the berths and public road system, and increased congestion within the terminal. All of the operations would essentially be discontinuous from the berth area to the current land area, requiring additional equipment, buildings, and related infrastructure.

For all of the reasons discussed above, this alternative is not carried forward for further analysis.

100 Percent Pile-Supported Dock and Platform Design. This alternative consists of a 135-acre pile-supported platform constructed from the existing shoreline out approximately 400 feet from the existing dock. The plan view of this alternative is shown on Figure 2-9. A cross-section showing the pile-supported platform is shown on Figure 2-10.

The platform would be 8,880 feet long and extend out from the existing pierhead line by 400 feet. Dredging to -45 feet MLLW in most areas would be required for a majority of the berths. The total amount of dredging would be approximately seven million cubic yards. This material would be disposed of at a disposal site located off the POA area. The platform would require approximately 15,570 piles. The direct footprint of these piles would cover approximately 3.5 acres of intertidal and subtidal areas. It is estimated that it would take up to ten years to construct this platform. The pile driving would take seven years assuming two shifts throughout the construction season.

From an operational standpoint, the fully pile-supported alternative would allow a great deal of flexibility for cargo loading, unloading, storage, and staging operations. The pile-supported dock would be contiguous with the adjacent land and minimize the possibility of traffic congestion on the dock as well as reducing haul distances.

This alternative would not be technically feasible given the engineering subcriteria described previously. It is not carried forward for detailed analysis due to the following structural issues and construction related impacts:

1) Ice that would form on the platform pilings would cause a significant increase to the piling mass, resulting in significant deflections during a seismic event due to imposed lateral loads. This could result in a catastrophic failure of the structure during a seismic event. Ice loading in conjunction with tidal fluctuations would also substantially increase the rate of corrosion of the piles potentially limiting their design life through abrasion of the steel from the vertical movement of silt laden ice.

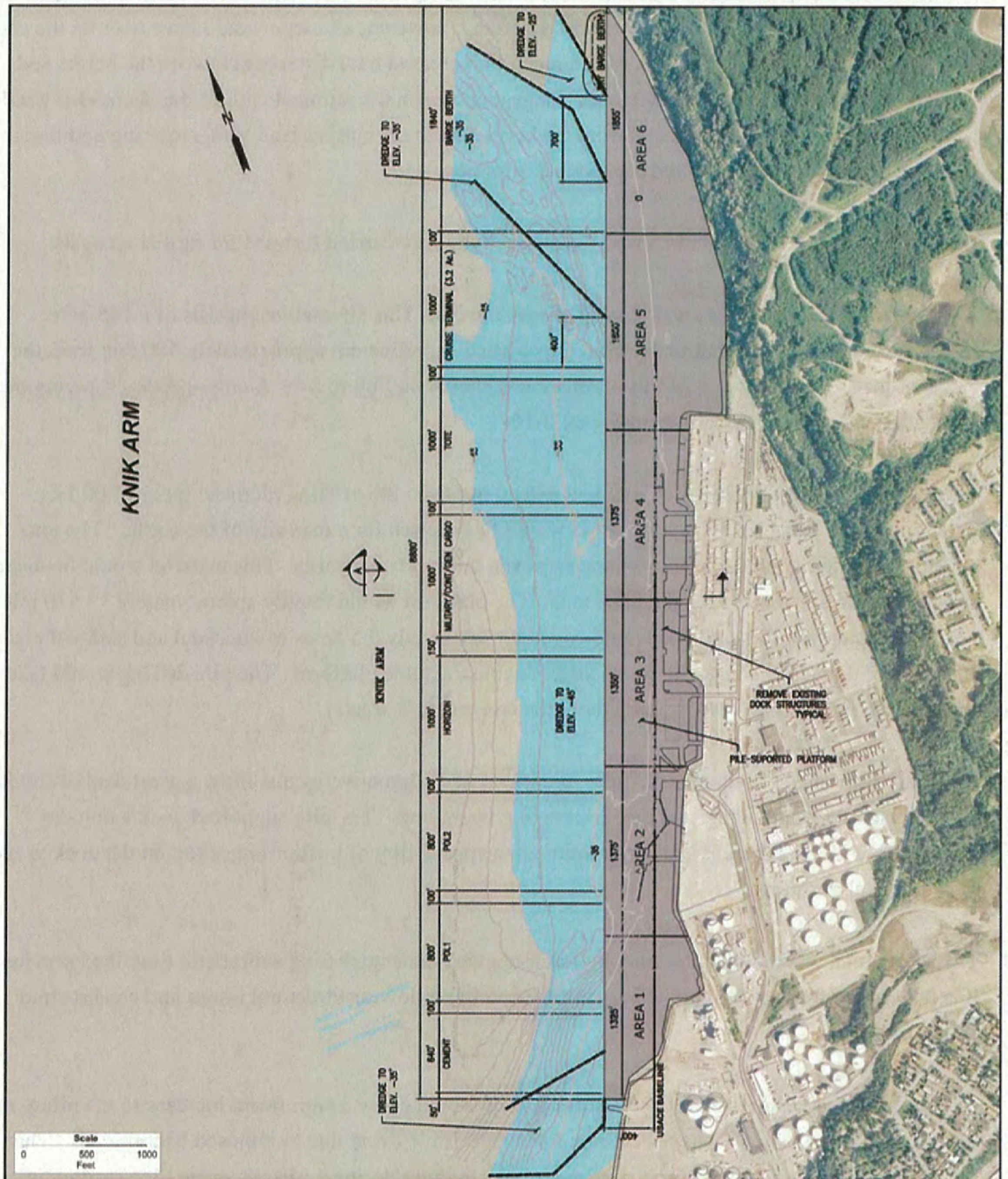

Figure 2-9
100 Percent Pile-Supported Dock Alternative

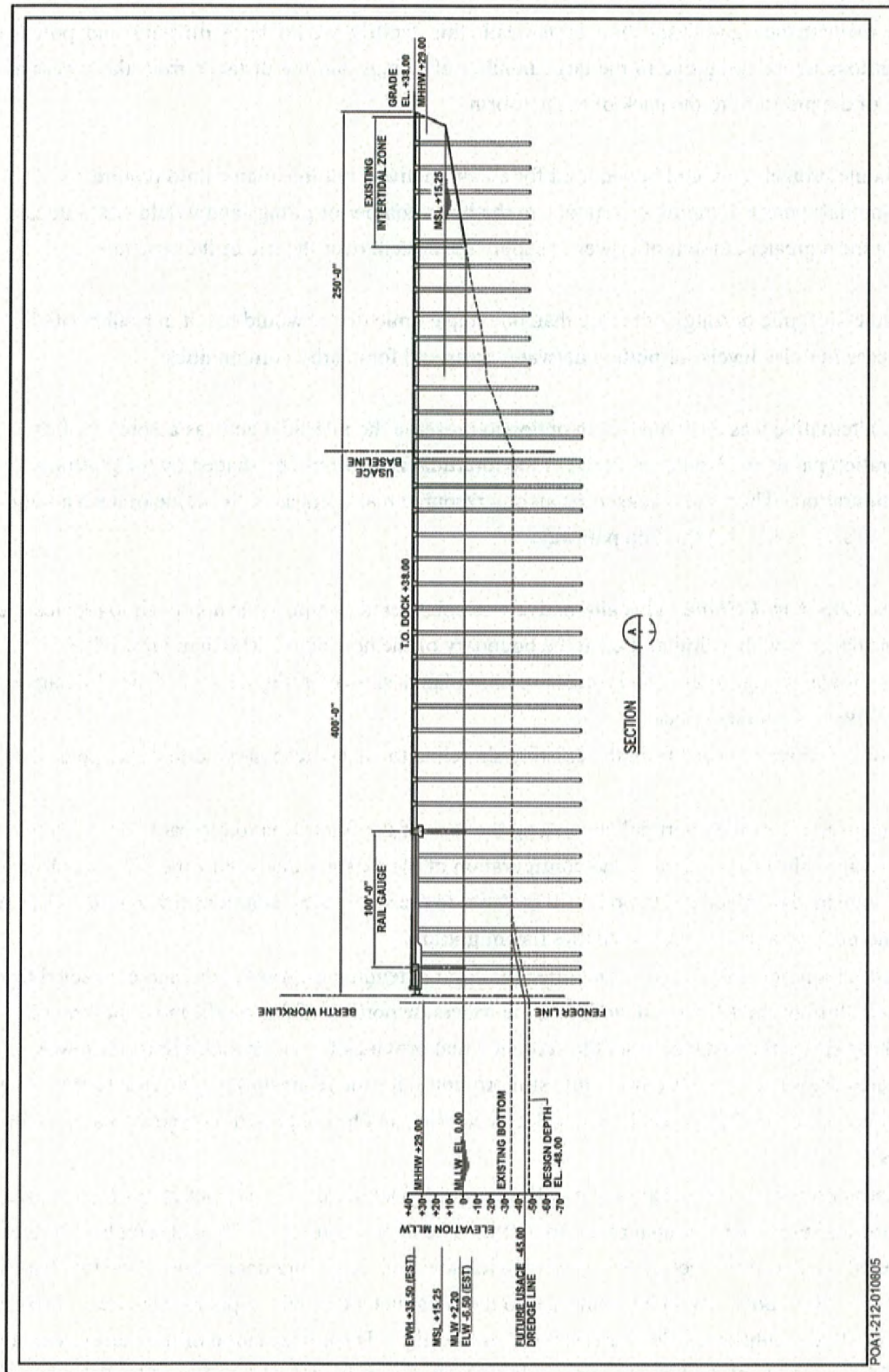

Figure 2-10
100 Percent Pile-Supported Dock Alternative Cross-section

2) The maintenance and inspection underneath this facility would be a difficult and potentially hazardous undertaking due to the large number of pilings and the distance from the access at the face of the platform to the back of the platform.

3) Cathodic protection would be required for all alternatives, but this plan would require a substantially more complex system due to the large number of pilings and would continuously consume a greater amount of power to supply the system over the life of the structure.

4) Double-shift pile driving with more than one impact pile driver would result in a substantial increase in noise levels for both underwater areas and for nearby communities.

5) This alternative was evaluated as an option to preserve the intertidal zone as a potential fish migration pathway. However, much of the intertidal zone would be shaded by the platform configuration. There is no consensus among resource managers as to the value of such a long shaded area as a fish migration pathway.

Pile-Supported Dock with Slope. This alternative was considered as a possible approach to replace the existing intertidal area with a similar area at the boundary of the new dock. The plan view of this alternative is shown on Figure 2-11 and a cross-section plan is shown on Figure 2-12. The alternative is comprised of five major components:

- Fill of 115 acres outward from the existing shoreline to create necessary additional operational area.
- Reconstruction of the intertidal zone along the face of the filled area to recreate, to the extent practicable, the characteristics and configuration of the existing intertidal zone. This would be accomplished by placing additional fill material to create a gently sloping surface in that area that would provide a pathway for potential fish migration.
- Construction of a 25-acre, pile-supported platform extending outward from, and connected to, the middle third of the fill area. In addition, the waterside portion of this platform would provide docking space at a distance from the shoreline that provides for the required draft for newly targeted ships (i.e. -45 MLLW), while still providing for the reconstructed intertidal zone. The platform would be 3,350 feet long and 325 feet wide, and be supported by approximately 3,140 piles.
- Construction of an additional 8-acre, pile-supported dock north of, and contiguous to, the 25-acre platform to provide additional required berths. The dock would be 2,300 feet long by 150 feet wide pile-supported structure to support the loading and unloading operations of the two berths in this area. This dock would be connected to the fill area by two pile-supported trestles. There are a total of 760 additional piles for this dock and trestles. The combination of the platform area and the 25-acre northern dock extension would provide approximately 8,700 feet of berthing length.

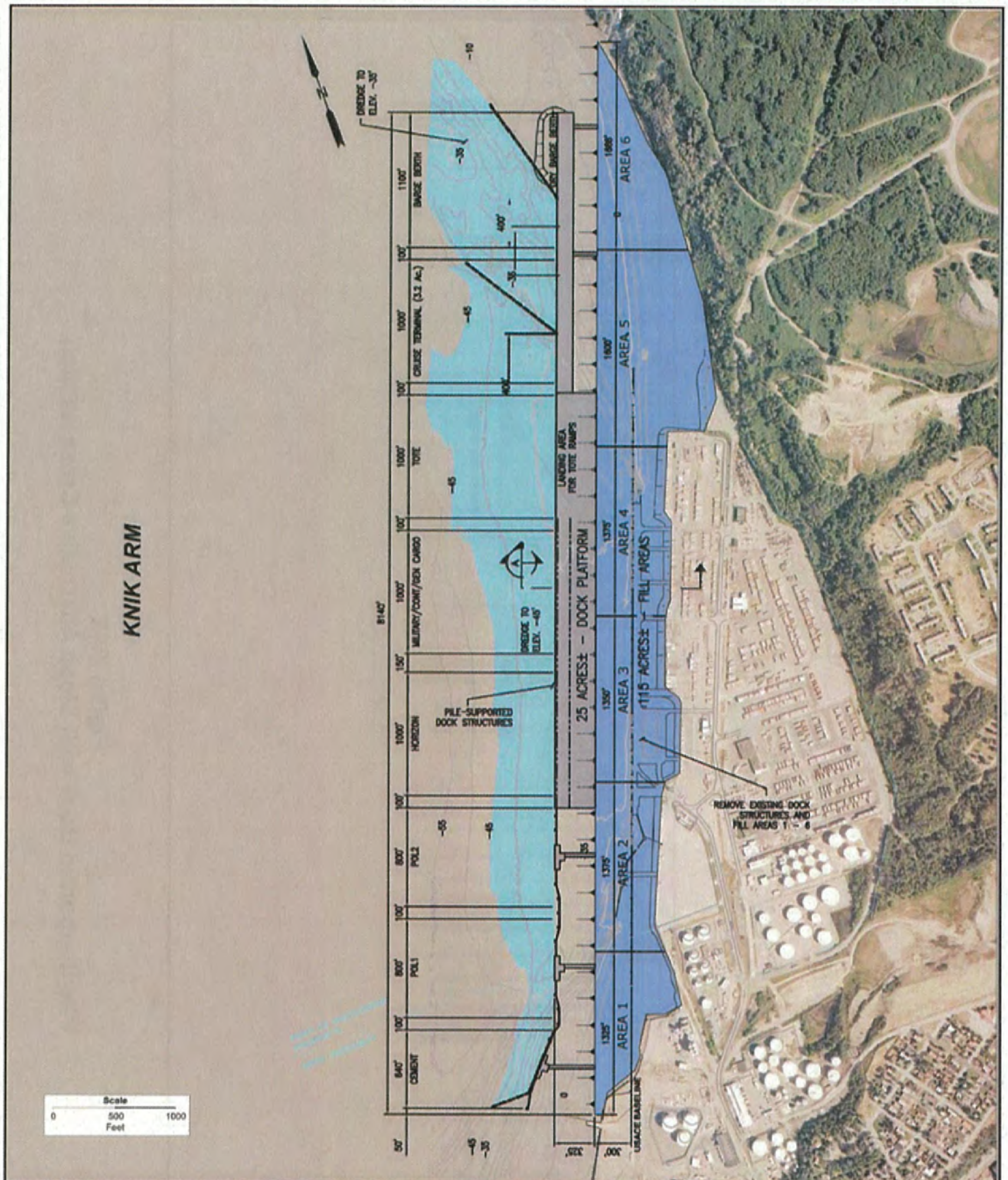

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Figure 2-11
Pile-Supported Dock with Slope Alternative

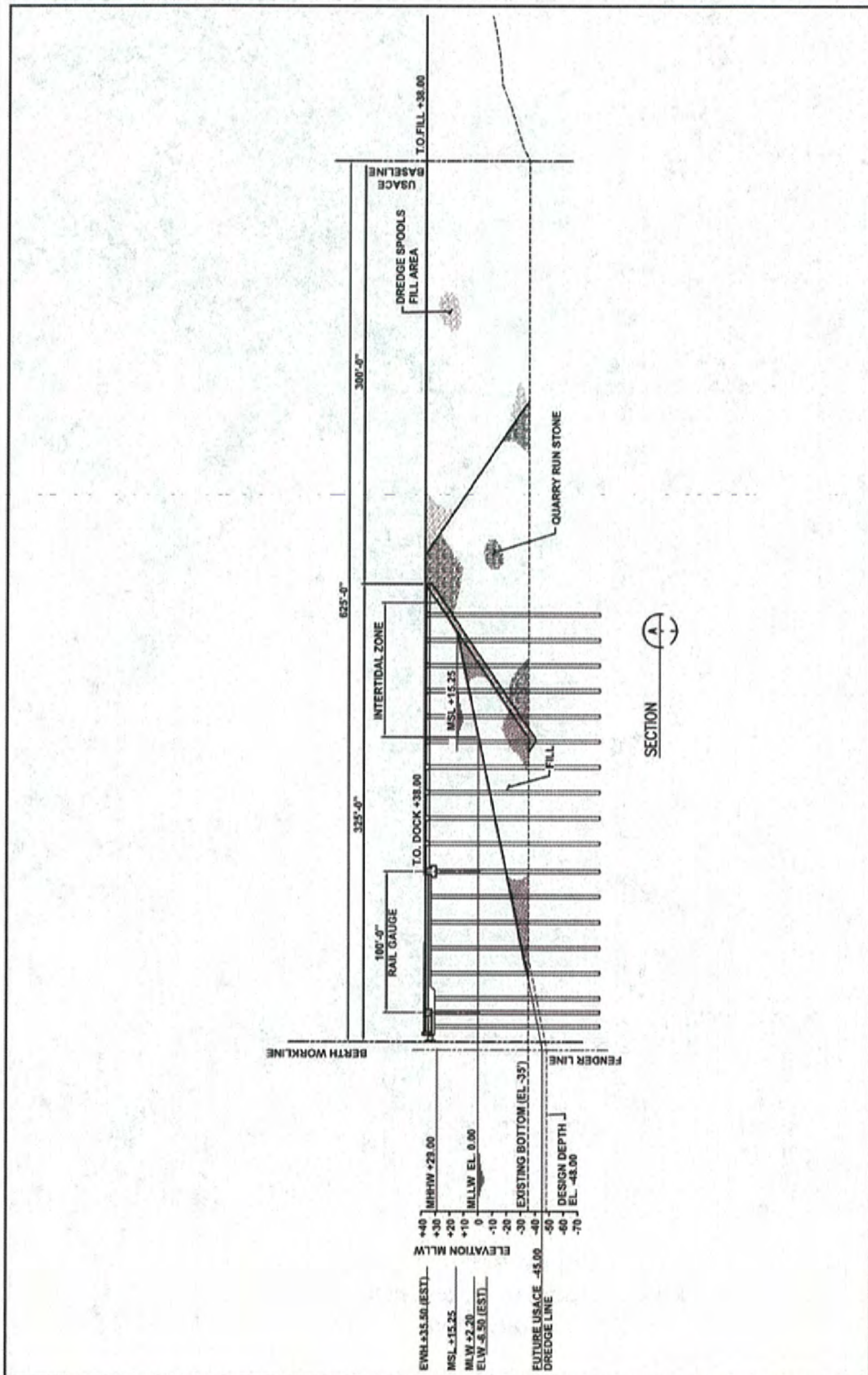

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Figure 2-12
Pile-Supported Dock with Slope Alternative Cross-section

- The fifth major element, to the south of the pile-supported platform, would be three trestle structures and a series of mooring dolphins to support the proposed POL and cement berths. These would be 325 feet to 400 feet in length, with a total of another 182 piles.

In all there would be 4,082 piles required for this alternative, which would occupy about 0.7 acres of land area (based on an average pile diameter of 36 inches) occupied by the foot print of the driven piles.

Dredging would be required on the western side of the pile-supported structures to a depth of -45 feet MLLW along most of the dock and a small area on the north end would be dredged to -35 feet MLLW. This would amount to 1.7 million cubic yards of dredging. The material would either be disposed of in the fill area or the existing USACE disposal site. Material would be placed in the intertidal zone along the western side of the rock retention structure to mimic pre-expansion, engineered conditions within portions off the existing tidal zone. This material would assume the natural angle of repose below the new pile-supported dock. This area would comprise a zone of potential fish migration. Approximately 1.0 million cubic yards of fill is estimated for this area.

The total time required to construct this project would be dependent on several factors, including duration of the construction season, coordination of dredging, fill, and pile driving operations, and maintaining cargo operations throughout construction. It is anticipated that the fill areas would be completed sequentially, and the pile-supported sections would be completed after the fill was completed. For the 115-acre fill area, there would be a total of 7.5 million cubic yards of fill. This portion of the project would require up to three years to complete.

For the pile-supported sections, there would be a total of 4,082 piles for this alternative, which would require an estimated total of 320 days of pile driving. Due to sequencing issues, the pile driving and platform construction would likely require four separate construction seasons. The total time required to complete this alternative would be approximately seven years.

Operationally, this alternative would meet most of the requirements for efficiently moving goods around the POA. The 25-acre pile-supported platform would be used for supporting container handling operations and is capable of supporting the current tenants, Horizon and TOTE, the military, and provide other project needs. The cargo staging and storage areas would be contiguous with the berths, providing for the efficient transfer of cargo. The pier line would be approximately 625 feet beyond the current pier line, resulting in a nominal increase in haul distances between the berth and the public roadway system. The cement and POL berths at the south end of the POA area would provide adequate berthing facilities.

At the north end of the POA, the cruise terminal berthing would be acceptable, and the trestles for access from the berth to the roadway system would also be acceptable considering the type of vehicles and anticipated number of vessel calls per year. For the barge berth, the trestle system would adversely impact operations. The preferred method of handling cargo from barge berths is a "pass-pass" approach, wherein the cargo is moved on and off the barge by ground equipment, as opposed to cranes. The loading and unloading operations are greatly influenced by the tide cycle. Using this approach, the time required to unload a barge would be significantly increased because the storage areas would be disconnected from the berth. The trip distances and times would be increased, requiring additional equipment to load and unload the barges.

This alternative would not be technically feasible given the engineering subcriteria described previously. It is not carried forward for detailed analysis due to the following structural issues, construction related impacts associated with the dock platform, and operational considerations.

1) The southern trestle would lack continuous lateral support to withstand loads imposed by seismic events. The dock platform would lack sufficient lateral support to withstand an earthquake, exceeding the acceptable distance (approximately 325 feet) from the lateral reinforcement provided by a contiguous fill section.

2) Ice that would form during the winter would add weight to the piles. Lateral loads due to seismic events, would result in both temporary and permanent deflections that would exceed acceptable limits. Both the ice loading and the deflections would cause significant additional stress on the system such that the factor of safety for overall stability during a seismic event would be unacceptably low.

3) For this alternative, the intertidal zone would be recreated by placing existing material along the slope and allowing it to settle to its natural angle of repose. During an earthquake, this material would likely slough seaward, which would cause significant lateral load on the piling system increasing stress and damage to the structure. The likelihood of such sloughing is directly related to the slope of the materials. However, to obtain the necessary draft for ships, this would mean extending the dock further into Knik Arm. Such an extension would reduce lateral stability during seismic events, would require additional piles with associated ice loading and corrosion issues, and would extend the dock outward into areas of swifter currents with associated docking issues.

4) There would be inspection and maintenance safety issues associated with this plan due to the large number of pilings used in its construction.

Sheet Pile Construction. The March 2002 POA Intermodal Marine Facility Progress Report (Tryck, Nyman, Hayes 2002) indicates that cellular sheet pile structures are proven to be one of the strongest and most reliable forms of sheet pile structures, and are one of the best types of earth fill structures that can be used to resist seismic events. It also explains that public works projects requiring stable structures with a long and predictable design life often use cellular sheet piles. A 100 percent sheet pile design consisting of a 135-acre filled area oriented parallel to the existing POA structures and contiguous with the current backlands would meet the logistics requirements as previously described for the 100 percent pile-supported structure. It would satisfy concerns relating to seismic loading by providing adequate global stability and resistance to lateral forces during an earthquake. The fill would not be subject to the concerns for ice loading and tidal fluctuations and abrasion would be less significant. For these reasons, this alternative is carried forward and will be described in more detail in the following section.

Pile-Supported Dock with Fill. The pile-supported dock with fill alternative would consist of a filled sheet pile structure between the existing shoreline and the proposed berth face and would consist of approximately 68 percent of the total 135-acre area. The sheet pile filled area would be connected to a pile-supported dock that would provide the berthing face and the required 8,880-foot dock. This pile-supported dock design of a 135-acre area parallel to the existing POA structures and contiguous with the current backlands would meet the logistics requirements as previously described for the 100 percent pile-supported structure. It would satisfy concerns relating to seismic loading by providing adequate global stability and resistance to lateral forces during an earthquake through the filled area attached to the backlands. Although ice buildup would occur during the winter, the reduced number of piles would not undermine the stability provided by the filled section. For these reasons, this alternative is carried forward and will be described in more detail in the following section.

Combined Sheet Pile/Pile-Supported Dock Construction. The combined sheet pile and pile-supported dock alternative would consist of a predominately sheet pile design with a single area located approximately in the middle of the dock face, constructed of the pile-supported dock as described above (68 percent sheet pile with 32 percent pile-supported dock). The advantage of the single pile-supported section is that it would be placed in an area with the weakest foundation soils of the entire Project. These soils have the potential to become unstable during a seismic event. Although seismic response is similar for the two types of construction, more historical information is available on how pile-supported structures behave during a seismic event. This alternative would also facilitate drainage of the backlands, because existing drainage structures could be incorporated with existing outfalls through this area. The combined design of a 135 acre area parallel to the existing POA structures and contiguous with the current backlands would meet the logistics requirements as previously described for the 100 percent pile-supported structure. It would satisfy concerns relating to seismic loading by providing adequate global stability and resistance to lateral forces during an earthquake through the filled area attached to the backlands. Although ice buildup would occur during the winter, the reduced number of piles exposed to the ice build-up would not undermine the stability provided by the filled section. The reduced number of piles in this alternative would also reduce concerns regarding tidal pile corrosion and damage caused by the abrasive action of silt-laden ice sliding along the pile during tidal fluctuations. For these reasons, this alternative is carried forward and will be described in more detail in the following section.

2.1.3 Results of the Alternatives Analysis

Applying the three-step process described above, MARAD and the POA evaluated the numerous options for location, size, orientation, and design for the expansion of the POA and decided on a single proposed location for construction and operation of expanded vessel berthing and cargo storage facilities. The POA established that expansion would be limited to property under control of the POA to the west, northwest, and southwest of the existing POA (see Figures 1-2 and 1-3). Expanding onto the tidelands to the west would not create land ownership conflicts similar to those for the backlands to the south, east, or north or conflicts in management and use similar to lands to the north and east.

With immediate and longer-term growth in POA use expected, location and orientation of the expansion to promote the efficient movement and flow of cargo to and from the waterfront and maximization of the cargo storage space must occur. The selected alternative for expansion must also reduce the internal and external traffic conflicts by optimizing vehicular flow within the boundaries of the POA. The expansion west, northwest and southwest of the POA into the existing tidelands would meet these needs.

Expanding into the tidelands meets all of the defined criteria and requirements, and would fulfill the purpose and need for the action. The footprint lies wholly within or directly adjacent to the POA, providing for efficient and secure off-loading, on-loading, and storage of commercial and military cargo. Because of its location adjacent to Elmendorf AFB and the POA, this location provides secure access without inhibiting the flow to or from the cargo area or docks during mobilization operations of the military. Given the criteria and requirements for the Project, no other reasonable alternative location exists.

Three alternative designs were deemed acceptable for further evaluation for the expanded terminal facilities—100 percent sheet pile construction, pile-supported dock with a sheet pile fill, and a combination of the two designs. The sheet pile design has been used at a number of port and dock facilities world-wide, including Seward, Port Mackenzie, Flint Hills Petroleum (adjacent to the POA), Dutch Harbor, on the North Slope of Alaska, and at other locations. MARAD and the POA also decided to assess a combination of these two designs given differences in soil stability from Cairn Point south to the former Summit Barge and Transfer facility. Any one of the alternative design methods would meet the stated purpose and need.

Other alternatives for design oriented toward creating or maintaining a shallow water intertidal zone for potential fish migration purposes through the use of trestles or 100 percent pile-supported dock structures were not adequate to meet engineering constraints. The use of extensive steel pile supports (i.e., 50 percent or greater of the structure) with associated icing issues, material stability and lateral support issues during seismic events, hydrologic impacts, and increased construction schedules and constructability issues all act to render such an approach infeasible.

2.1.4 Identification of the Preferred Alternative

NEPA and CEQ guidelines provide for the identification of an agency's Preferred Alternative. The POA and MARAD have evaluated environmental, maintenance, and construction logistical information on the Project alternatives and identified Design Alternative A, the sheet pile construction, as the Preferred Alternative. Alternative A would produce fewer adverse environmental effects, be easier and less costly to maintain, and would be less complex and less costly to construct than Alternatives B and C.

Although any of the design alternatives could be implemented without a significant adverse impact to the environment, Alternative A would produce less above ground and underwater noise than Alternatives B and C. Above ground noise levels during construction would increase 0.5 to 1.0 dB over existing conditions, and above ground noise levels would increase from 1.5 to 2.2 dB under Alternatives B and C. Adverse impacts to both Federally-managed and unmanaged fish species due to underwater noise also would be less under Alternative A as compared to Alternatives B and C. Peak noise levels from impact pile driving under Alternatives B and C would reach 209 dB re 1 μPa, while peak noise levels under Alternative A would not exceed 192 dB.

Construction logistics and management are much more complex under Alternatives B and C. Because of the need to implement a combined sheet pile and pile-supported design under Alternatives B and C, the resulting construction logistics would require two types of materials (piles and sheet pile) and additional construction equipment.

A sheet pile design requires less maintenance than a pile-supported design, and allows for a more efficient cathodic protection system. For these reasons, the POA and MARAD chose Alternative A, the 100 percent sheet pile constructed dock as the Preferred Alternative.

2.2 DESCRIPTION OF THE PROPOSED ACTION

The alternatives carried forward for detailed analysis consist of the proposed action and the no-action alternative. As described below, there are three design alternatives: A) a 100 percent sheet pile dock face with associated fill method; B) 100 percent pile-supported dock with associated fill method; and C) a combination of the two. Although the no-action alternative would not meet the purpose and need for the Project, it is carried forward for analysis in compliance with CEQ guidelines. The no-action alternative is described in section 2.3. Alternative A is the Preferred Alternative.

The Project would add 135 acres of surface area to the existing POA lands. This would be accomplished by constructing 8,880 feet of dock located along a line approximately 400 feet from, and parallel, to the face of the existing dock structure and backfilling behind the new dock structure to the existing shoreline. The completed Marine Terminal would include:

- Seven modern dedicated ship berths;
- Two dedicated barge berths;
- Rail access;
- Modern shore-side facilities and equipment to accommodate cruise passengers, dry-bulk, POL, RO-RO cargo, containers, general cargo, Stryker Brigade Combat Team, and general cargo on barges (Figure 2-13); and
- Additional land area to support expanding military and commercial operations.

These facilities would provide for the critical replacement of existing facilities that are past their design-life, that have deteriorated structurally to unacceptable levels, and that do not have the capacity to service increasing demand.

Implementing the Project would involve two major components and one related activity:

- Continued expansion onto tidelands and construction of marine structures for berths to accommodate barges and additional RO-RO vessels; a floating dock; a cement berth; two improved POL terminals; three longer berths to accommodate larger container ships; a staging area for Stryker Brigade Combat Team and industrial fabrication; and land for other new or expanded operations.
- Reorganization of the POA system and support structure for loading, unloading, and storage of cargo, and more efficient placement of intermodal transport and freight transfer facilities for commercial and military use. As part of the reorganization, the POA would provide enhanced security measures, state-of-the-art cargo tracking procedures, and improved equipment for loading and unloading containers.
- In a related activity, direct dredging in the POA harbor area during construction would provide necessary deeper draft for the larger commercial and military ships that must call at the POA in the future.

Construction is anticipated to take approximately seven years, primarily occurring in summer field seasons beginning in 2005 to support Stryker Brigade Combat Team deployment needs. After anticipated completion of the construction in 2011, the POA would proceed with operations for the foreseeable future. In order to continue to supply critical goods to Alaska, operations at the POA must continue unabated during construction.

The proposed action has three alternatives all relating to design opportunities. Regardless of the substructure design selected, elements of the proposed action relating to dredging, land reclamation, surface pavement, utilities, equipment and system upgrades, phasing of construction areas, and operations of the POA during and upon completion would remain common to all alternatives as described below.

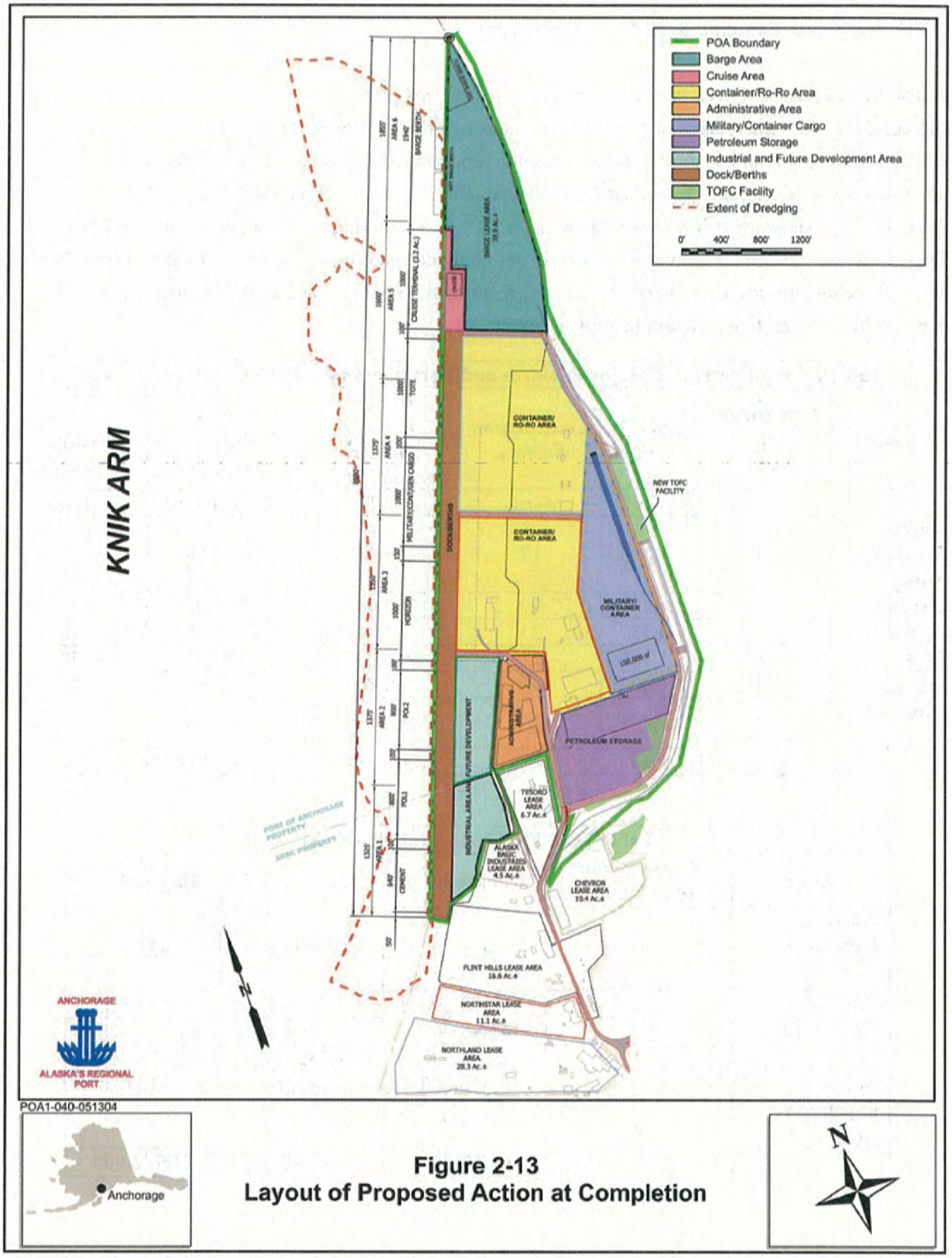

Figure 2-13
Layout of Proposed Action at Completion

2.2.1 Elements Common to all Design Alternatives

Construction Areas. Given the size of the expanded surface area envisioned for the Project, the need to segregate the work undertaken in each year for Project control purposes, and the need to temporarily relocate existing operations during the construction program to keep the existing port functions operational at all times, the Project has been divided into six construction areas (Figure 2-14, Appendix B). These areas have been numbered from 1 to 6 beginning at the south end of the Project. They are so designated for convenience and do not imply design or construction sequence. Tables 2-3a and 2-3b below provide a summary of the major features and planned earthwork unique to each manageable construction area within a given season.

Table 2-3a Summary of Major Features and Earthworks for Each Construction Area

Location	*Construction Area Number*	*Berth Length*	*Construction Surface*	*Dredge Volume (under berthing area)*	*Dredge Volume (in berthing area)*	*Total Dredging Surface Area*
		Feet	*Acres*	*Cubic Yards*	*Cubic Yards*	*Acres*
Southern Expansion Area	1	1,325	17	865,000	1,067,000	45
Current Operations Area	2	1,375	19	358,000	289,000	39
	3	1,350	23	285,000	261,000	40
	4	1,375	22	221,000	392,000	40
Northern Expansion Area	5	1,600	34	560,000	372,000	60
	6	1,855	20	787,000	1,336,000	62
	Total	**8,880**	**135**	**3,076,000**	**3,717,000**	**286**

Table 2-3b Fill Volume (cubic yards)

Location	*Construction Area Number*	*Alternative A*	*Alternative B*	*Alternative C*
Southern Expansion Area	1	1,425,000	973,000	1,425,000
Current Operations Area	2	2,123,000	1,581,000	2,123,000
	3	2,398,000	1,869,000	2,398,000
	4	2,273,000	1,732,000	1,732,000
Northern Expansion Area	5	2,310,000	1,733,000	2,310,000
	6	1,754,000	1,186,000	1,754,000
	Total	**12,283,000**	**9,074,000**	**11,742,000**

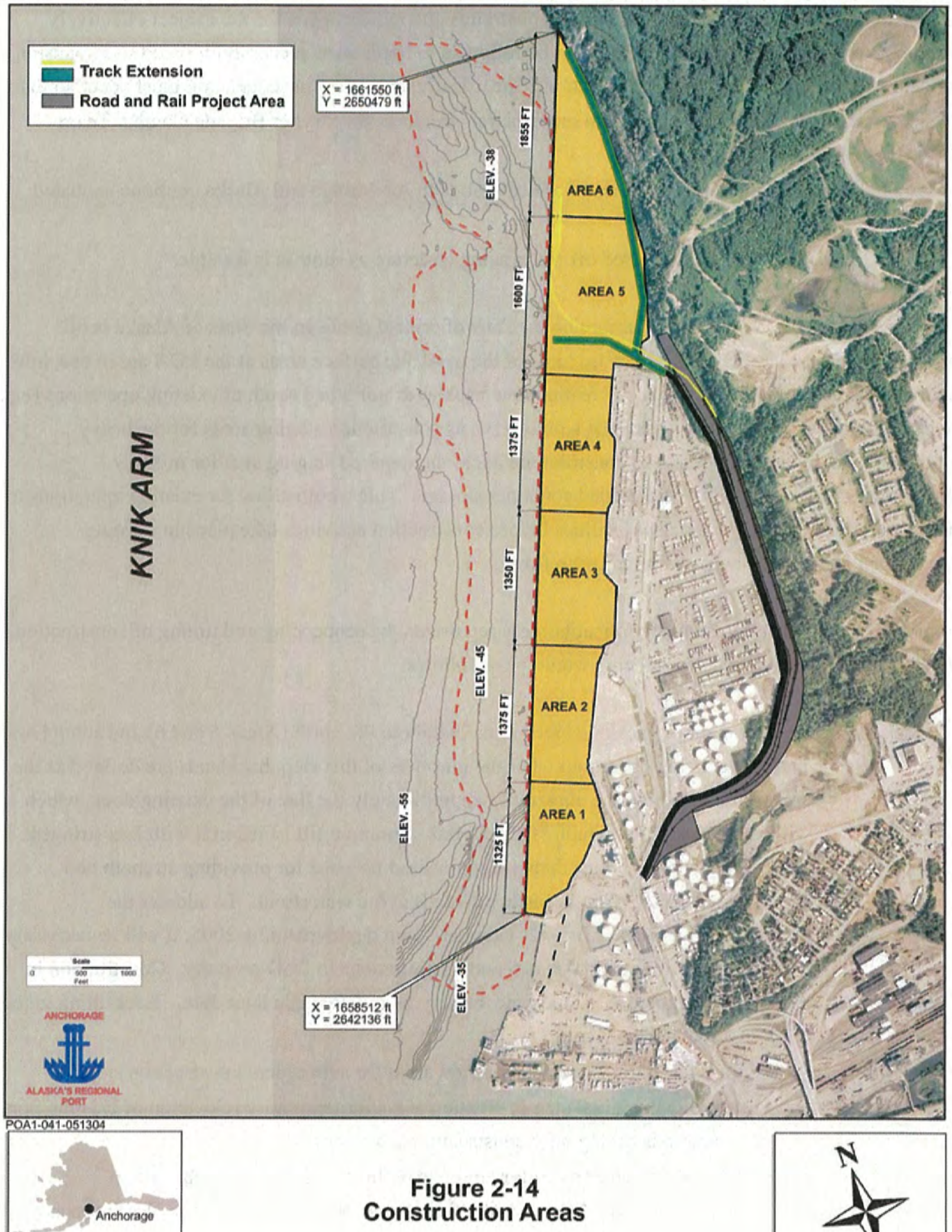

Figure 2-14
Construction Areas

Construction Phasing Strategy. The given constraints and requirements for the Project effectively define the construction sequencing that must be followed to implement successfully the POA expansion, while maintaining existing levels of operation. Specifically, construction sequencing must occur so that:

- Additional lands are available to meet the requirements for Stryker Brigade Combat Team deployment in 2005;
- The present and future supplies of critical goods to Anchorage and Alaska continue unabated; and
- Crane operations are relocated off the existing structure as soon as is feasible.

Constructing the Project without interrupting the flow of critical goods to the State of Alaska is of primary importance to the POA. Because most of the available surface areas at the POA are in use, initial construction activities would focus on creating new backlands north and south of existing operations (e.g., Areas 1, 5, and 6). These new backlands would serve as construction staging areas for the heavy equipment and materials required to construct the dock, the required staging area for military deployments as early as 2005, and needed container storage. This would allow for existing operations to be temporarily relocated to the new facilities before construction activities take place in existing operational areas, without interrupting cargo flows.

Figure 2-15 presents a schematic that qualitatively represents the sequencing and timing of construction to meet the above constraints. Sequencing would be as follows:

Step 1: Development of backland areas immediately to the north (Areas 5 and 6) and south (Area 1) of the existing operations. For the purposes of this step, backlands are defined as the areas from the shoreline outward to approximately the line of the existing dock, which will be filled with "common" fill material. Common fill is material with less stringent engineering specifications than the engineered fill used for providing strength and frictional resistance with the sheet pile cells at the waterfront. To address the requirement for Stryker Brigade Combat Team deployment by 2005, it will be necessary to initiate construction in Areas 5 and 6, contiguous to DoD property. Construction in Area 1 may begin at the same time, or may be initiated at a later date, Backfilling in the north and south areas would:

- provide staging and construction areas for subsequent construction steps;
- provide the initial step in creating areas for temporary relocation of existing port operations during later construction tasks; and
- provide required areas for emergency Stryker Brigade Combat Team deployments in Areas 5 and 6 that are accessible directly from DoD property continuously throughout construction.

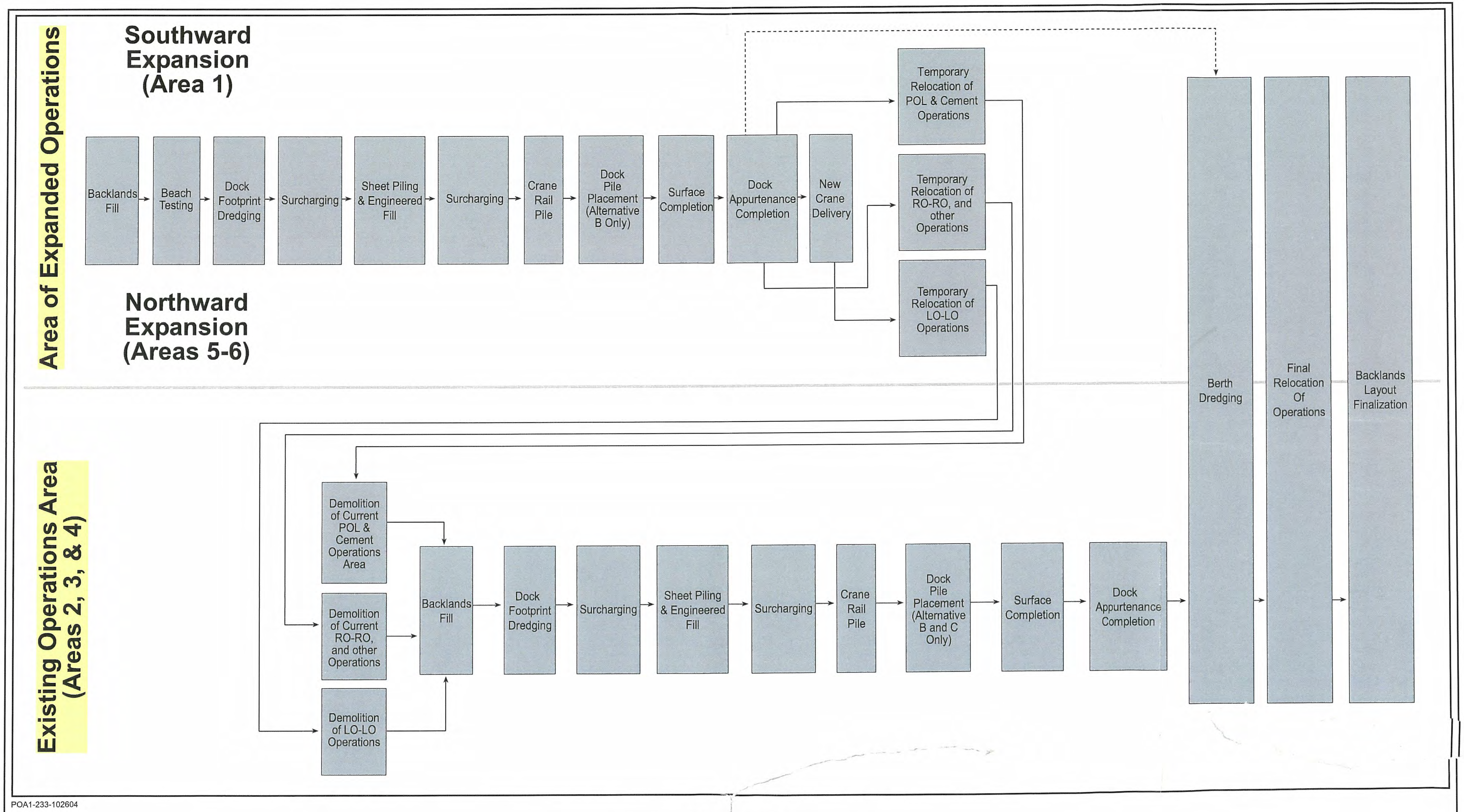

Figure 2-15
Construction Phasing Strategy

Fill activities in these locations would begin adjacent to existing POA operations and progress southward or northward, as applicable. Bench tests described in section 2.2.2 could be implemented during backlands development in Area 5. Completion of backlands development, as well as other construction actions in Areas 1, 5, and 6 could be accomplished in one or more construction seasons, and could occur concurrently, staggered over a timeframe, or at different times.

Surcharging would be required in each area. Surcharging is the utilization of either natural or mechanical means to purge water from the pore spaces within the placed fill to provide required structural strength and stability before constructing permanent features on the fill. It is anticipated that surcharging would be accomplished between the end of one construction season and the initiation of the next.

Step 2: Upon completion of backlands development in Area 1, 5, or 6, unsuitable soft materials would be dredged from the sheet pile cell and dock construction area.

Step 3: Upon completion of dredging, engineered fill would be placed and sheet pile cells would be constructed in each respective area (1, 5, and 6). After fill placement, surcharging, vibro-compaction, dewatering, or similar activities may be required in these zones.

Step 4: Piles for supporting the crane rail would be driven into the areas with engineered fill in Area 5.

Step 5: If the alternative for a pile-supported dock is implemented (Alternative B), pipe pile would be driven for subsequent dock construction in Areas 1, 5, and 6. Because of potential conflicts in operation, this could not occur simultaneously with placement of engineered fill and construction of sheet pile cells. However, it could occur simultaneously with placement of pile for crane rail support.

Step 6: After development of backlands, construction of open pile cells, and driving of crane and dock piles, as appropriate, the surface of each area (Areas 1, 5, and 6) would be completed. Surface completion would entail the placement of final fill, grading and drainage systems, lighting and utility systems, pavement structures and striping.

Step 7: After construction of open cell piles and driving of crane support and dock support piles (as appropriate), the completion of dock construction would occur in each area (Areas 1, 5, and 6). This would include deck and/or apron construction, crane rail completion (as appropriate), placement of utilities, installation of cathodic protection, and construction of mooring and fendering systems. Dock construction and completion might or might not occur simultaneously with surface completion in a given area.

Step 8: Upon completion of dock and surface construction in Area 1, dry-bulk and liquid-bulk operations (cement and POL) would be temporarily relocated to that area.

Step 9: Demolition of applicable existing facilities for current dry-bulk and liquid-bulk operations would occur.

Step 10: Upon completion of dock and surface construction in Areas 5 and 6, RO-RO operations (TOTE) would be temporarily relocated to portions of those areas.

Step 11: Demolition of applicable existing facilities for RO-RO operations would occur.

Step 12: Upon completion of dock and surface construction in Area 5, new cranes would be delivered and placed on the crane rail system.

Step 13: Upon placement and operational availability of the new cranes, LO-LO operations (Horizon) would be temporarily relocated to Area 5. POA administrative and maintenance operations would be relocated as appropriate.

Step 14: Demolition of applicable existing facilities for LO-LO operations, as well as existing POA administrative and maintenance facilities, would occur.

Step 15: Upon completion of steps 9, 11 and 14, as appropriate, Steps 1 through 7 would be repeated for Areas 2, 3, and 4. Step 5 would only be executed for Alternative B or for a portion of Area 4 under Alternative C.

Step 16: Anytime after completion of dock construction activities in Areas 1, 5, and 6 (Step 7) and before final relocation of operations, berth dredging to new design depths would occur in those areas.

Step 17: After completion of dock construction in Areas 2, 3, and 4, berth dredging to new design depths would occur in those areas.

Step 18: After completion of berth dredging, all operations would be relocated to their permanent sites.

Step 19: Final operations layouts, road systems, security systems, and other operations systems would be completed.

Area Specific Construction Activities. The previous section described the sequencing strategy for the entire Project area common among alternatives. That strategy included identification of six distinct construction areas. In the overall strategy framework described above, there is a construction sequence that will be common to each area. Construction activities would be likely to occur in multiple areas at the same time. A typical construction season in Anchorage lasts approximately 180 days and takes place from mid April through October, depending upon weather conditions. Some backland construction and material deliveries may occur year round. Construction activities that generate high noise levels would typically occur from 6:00 a.m. to 10:00 p.m. seven days a week. The following is a listing of major construction activities that would occur at each area.

1. Demolish existing structures (Areas 2, 3, and 4 only).
2. Deliver, place, and consolidate fill in backlands area.
3. Dredge dock area to prescribed depth to ensure stable foundation.
4. Build dock structure and crane rail supports.
5. Backfill behind dock structure with select engineered fill and consolidate.
6. Dredge in front of dock structure to prescribed depth for safe berthing of deep draft ships.
7. Install crane rail support beams in prescribed areas.
8. Grade backland area to prescribed sub-grade elevation.
9. Backfill backland area with select engineered fill to final grade elevation.
10. Install crane rails in prescribed areas.
11. Install underground utilities and miscellaneous foundations.
12. Install impressed current cathodic protection system.
13. Pave designated areas with asphaltic concrete or reinforced concrete as prescribed.
14. Install marine appurtenances (i.e., fenders, bollards, etc.).
15. Install above ground appurtenances.
16. Construct buildings in prescribed areas.
17. Sign, stripe, landscape, and fence various operational tracts.

A typical construction season would include the following activities in different construction areas: demolition; site preparation; dock construction; dredging; material placement in any given area; and area finishing. Each season could involve importing between 1.4 and 2.3 million cubic yards of fill. Remaining work items in any given area would be completed in subsequent seasons.

Dredging. Based on available information, dredging in front of and behind the new dock to a depth of -45 feet MLLW (approximately ten feet below the current dredging depth of -35 feet MLLW) would be conducted in conjunction with the development of tidelands. To the extent feasible, dredge material would be used for common fill material in the proposed backlands. Dredge material not suitable for use as fill would be disposed of at an approved site. Methods similar to those employed by the USACE in the Knik Arm for maintenance dredging would be used for the Project. For the construction phase of the proposed action, approximately 6.7 million cubic yards (286 acres) of material would be removed by dredging (refer to Table 2-3a). It is anticipated that the same disposal area that is currently being used for dredging of the deep draft navigation channel for Cook Inlet would be used for disposal of Project dredge material.

The maximum anticipated limits where dredging would occur in relation to the intertidal zone are depicted in Figure 2-16. Approximately 16 percent (46 acres) of total dredging would occur in the intertidal zone, with the remainder (240 acres) occurring in the subtidal zones.

USACE currently performs annual operations and maintenance dredging of 206 acres within the POA area. Volumes of dredge materials have increased in the last five years from 438,000 cubic yards in 1999 to over 800,000 cubic yards in 2003. During the summer of 2004, dredge quantities substantially escalated to 2,100,000 cubic yards of material. Figure 2-17 depicts the current USACE dredge area in relation to the 286 acres of dredge areas for the proposed Project. Approximately 70 percent of the 206 acres currently dredged by USACE overlap with the POA expansion dredge areas. As part of the Project, 149 additional acres outside of the current USACE dredge area to the north and south would be dredged. Sixty-six of these acres would be within the footprint of the expansion area, whereas 83 would be within the berthing area. Approximately 68 acres currently within the USACE project limits would no longer require dredging to support POA operations after completion of the Project.

Fill material. All design alternatives would require a large amount of suitable engineered and common fill material (9.1 to 12.3 million cubic yards or 11.8 to 16 million tons). Common fill is fill that includes top soils, silts, clays, and similar materials that do not meet the more stringent requirements for engineered fill. Engineered fill includes materials with 15 percent or less passing through a number 200 screen. Dredge materials would be used to the extent feasible for common fill. Multiple sources could supply the remaining fill. A discussion of borrow sources for fill material is presented below. Depending on the source locations, substantial quantities of imported material could arrive either by railcar, barge, truck, or all three. Some material would arrive by truck for initial site preparation work. Other site preparation material may be obtained from property adjacent to the POA expansion area. Such material would likely be delivered by a combination of off-road trucks and conveyors. For purposes of analysis, it is assumed that material would be delivered using all three methods, consisting of one train, 160 truck trips, and one barge delivery of material per day. One train with 80 cars carrying 100 tons of material in each car could transport 8,000 tons of fill. Ten 25-ton trucks could transport 250 tons or over 325 cubic yards of material per hour or 4,000 tons per 16-hour day. A single barge could transport approximately 6,750 tons of material per trip. Fewer trips would be required if dredged materials are used for some of the fill material.

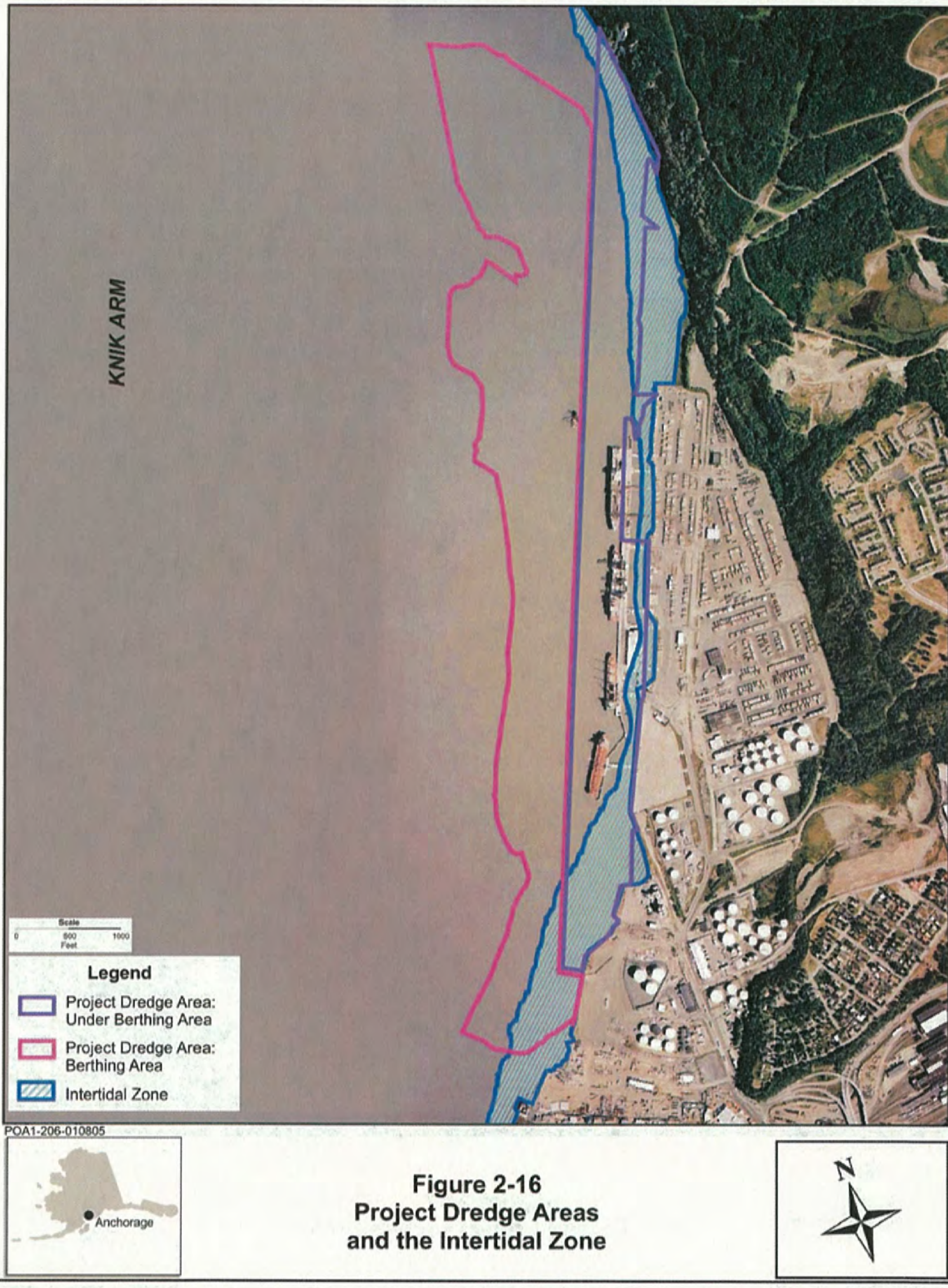

Figure 2-16
Project Dredge Areas and the Intertidal Zone

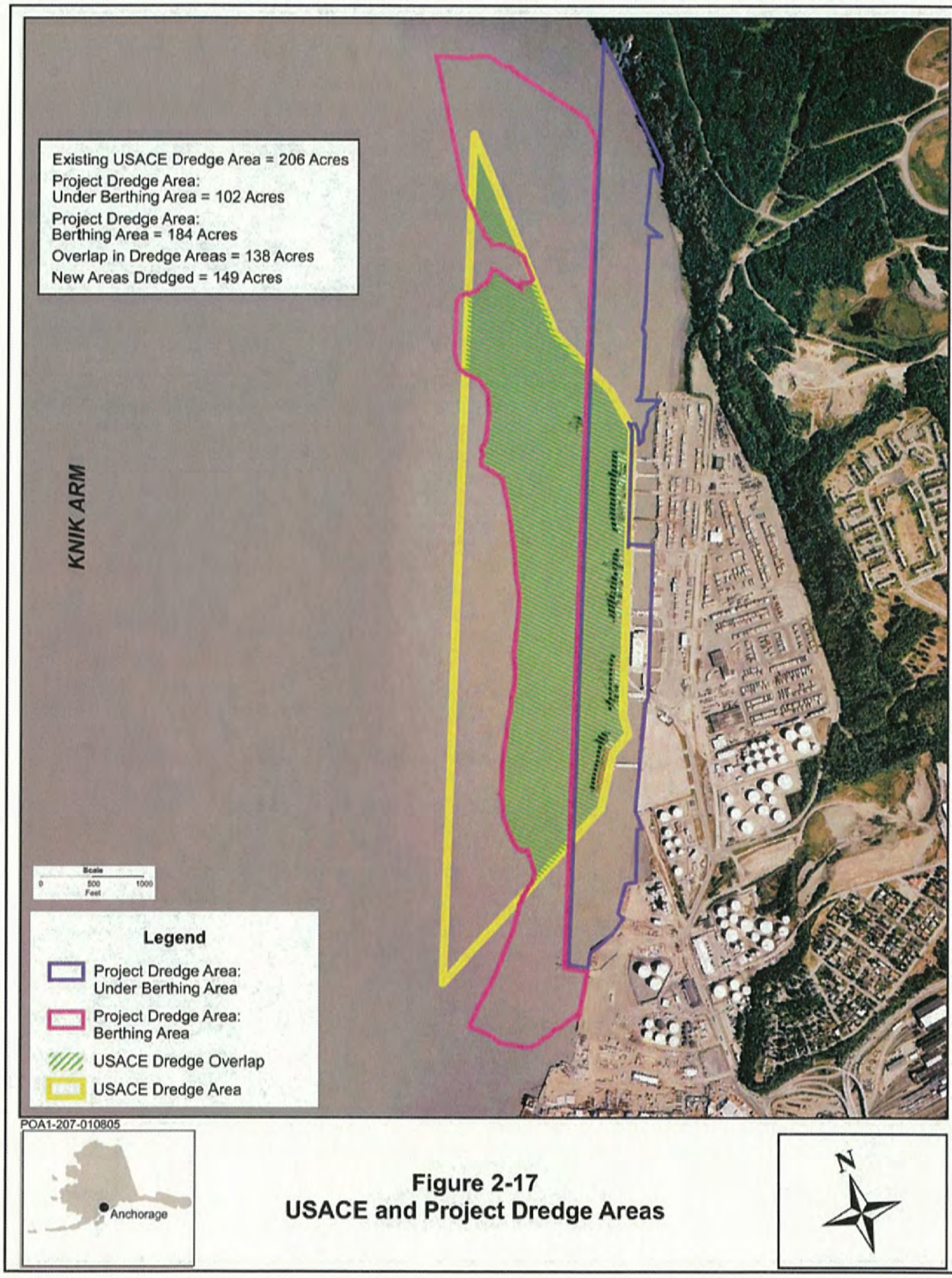

Figure 2-17
USACE and Project Dredge Areas

After reaching the subgrade elevation, the imported materials would be dewatered and/or surcharged and prepared for paving. A road grader would generally level the entire area and then create multiple drainage slopes along the entire surface. The surface area would then be paved as appropriate. Designed to accommodate tractor-trailers and heavy equipment, the pavement would be constructed on a layer of select non-frost susceptible material and would be capped either with asphaltic concrete or paving blocks. Prior to installing the capping material, multiple catch basins and underground drainage pipes would be installed. The storm drains would collect and divert rainfall runoff and snowmelt to Knik Arm, as is done currently at the POA. The storm drainage system typically would be designed for a 100-year storm. Utility trenches, conduits, fire and potable water pipes, and miscellaneous foundations for light poles and other features would also be installed prior to capping the surface, as required. Construction would include security fencing along the perimeter and designated gates for entrance to the POA.

MARAD and the POA would require selected construction contractors to identify and implement Best Management Practices (BMPs) to prevent erosion and sedimentation during construction and operation; control specific on-site erosion and sedimentation; protect adjacent properties and watercourses from effects related to erosion, sedimentation, and flooding; control spills; and handle potentially hazardous materials and waste in accordance with federal, state, and local requirements.

Sources of fill material would be determined by the chosen contractor; however, the contractor would adhere to existing laws and regulations governing placement of fill material and would consider special procedures and BMPs provided in the bid package including procedures for encountering contamination at source sites.

The POA's Program Management Office would carefully monitor construction to determine proper implementation of BMPs such as:

- clearly marking construction limits with stakes and survey tape;
- staking of fills to prevent unnecessary materials placement;
- placement of silt fencing in appropriate locations to reduce erosion and sedimentation;
- reseeding of slopes subject to erosion;
- armoring of slopes subject to flooding with riprap; and
- maintenance of on-site capabilities to respond to spills of oils, fuels, or other similar materials.

Borrow Sources for Fill Material. Implementation of the Project for the POA would require 9.1 to 12.3 million cubic yards of imported material during construction under any of the action alternatives. Imported material would be purchased competitively from commercial providers, non-commercial providers or a combination. Commercial providers may include the following known providers: AggPro; Central Paving Products; Kiewit; and Anchorage Sand and Gravel. Non-commercial providers may include the following: Department of Transportation and Public Facilities; ARRC; Matanuska-Susitna Borough; Elmendorf AFB; Fort Richardson; and various native landholdings under Alaska Native Claims Settlement Act. In addition, the Alaska Department of Natural Resources (ADNR) has provided a list of approved borrow sites within approximately 70 miles of the Project site that have train or highway access (Figure 2-18) (ADNR 2004). This figure illustrates the maximum amount of gravel fill (in cubic yards) determined to be available at the listed sites.

It is anticipated that the source or sources of borrow material would be selected by the contractor. Contract terms would specify that materials can be obtained only from appropriately permitted sources (including Section 106 of the National Historic Preservation Act (NHPA), as appropriate), must be substantially contaminant free, and must meet minimum engineering specifications.

To minimize the volumes of borrow materials from remote locations, and to minimize the impacts of deposition of dredged materials, dredged materials would be used for common fill to the maximum extent practicable.

Crane Replacements. The proposed action includes installation and operation of three 100-gage container cranes. Figure 2-19 shows the evolution of container ships and identifies the maximum class of ship for which the expanded POA is to be designed. The proposed Project intends to accommodate ships having a maximum draft of 41 feet and an overall length of 1,000 feet.

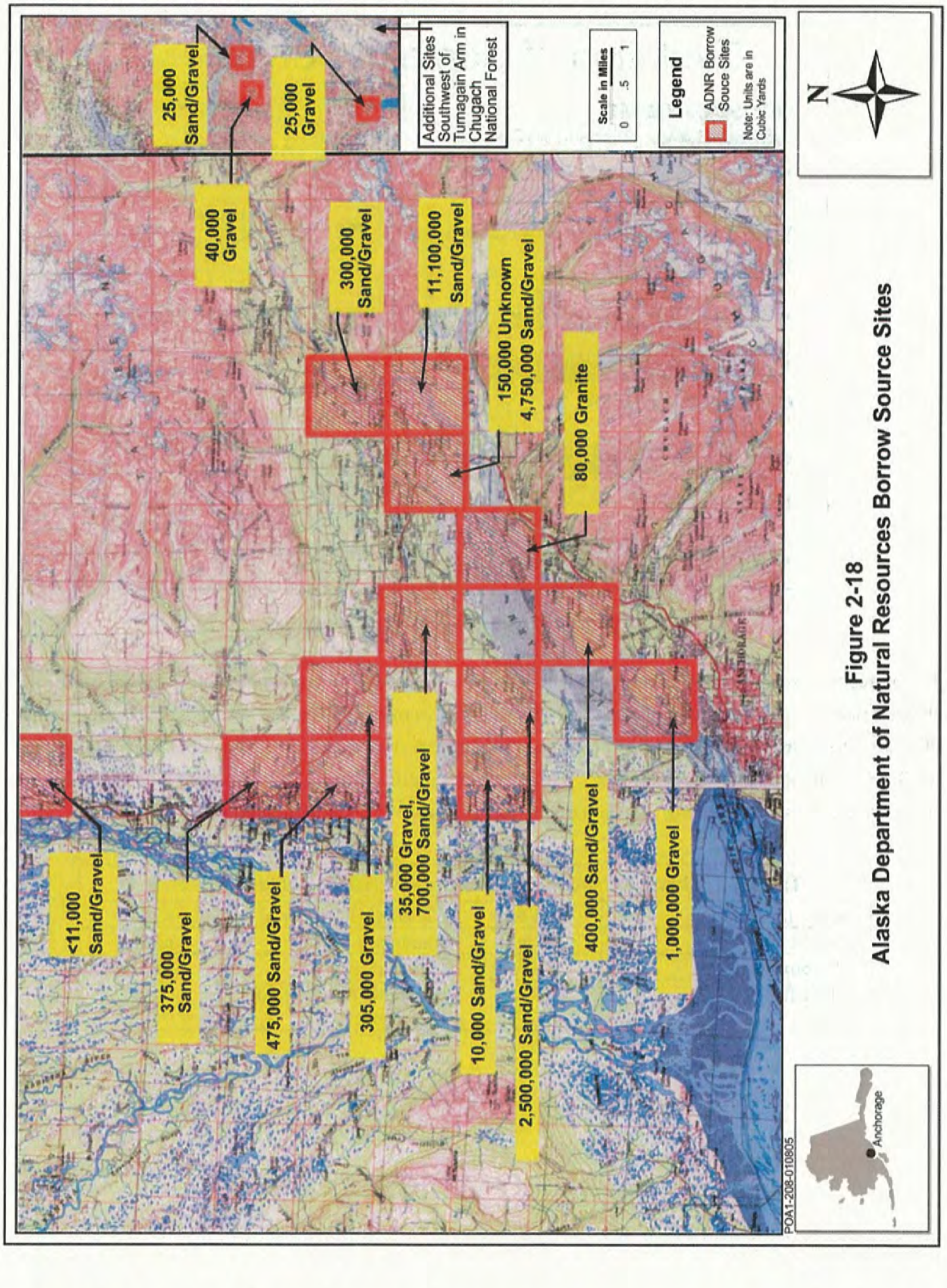

Figure 2-18
Alaska Department of Natural Resources Borrow Source Sites

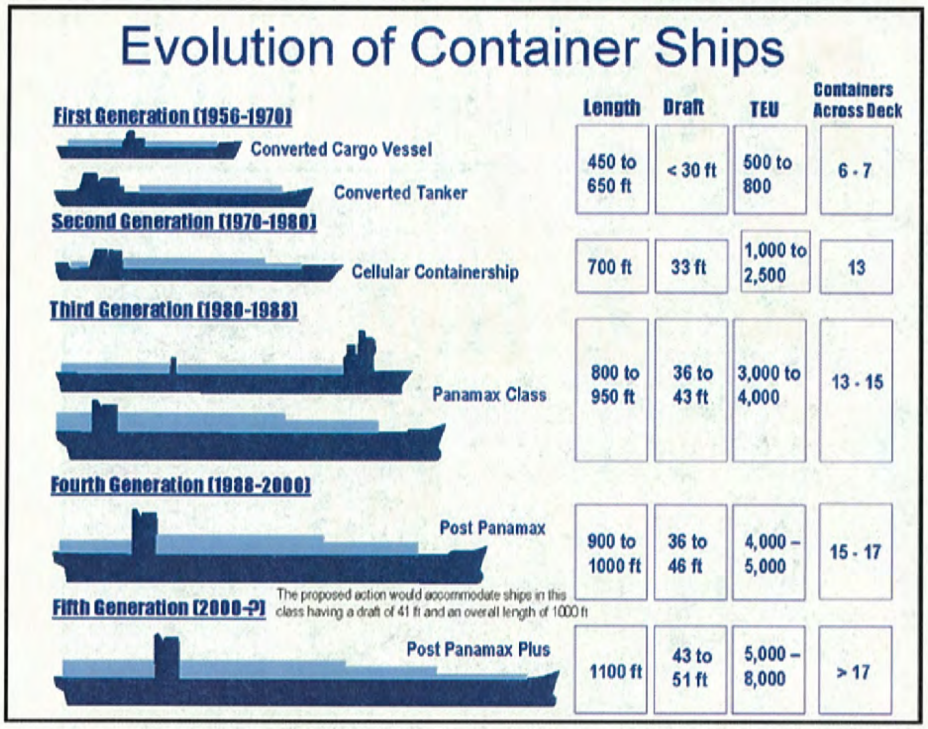

Figure 2-19 Evolution of Container Ships

The outreach of the proposed cranes would be able to service ships 16 containers wide. Figure 2-20 shows a photo of such container cranes. Key characteristics of the cranes that would be purchased by the POA are shown in Table 2-4. Use of these cranes requires a substantial increase in dock area and apron width to accommodate the larger cranes. It also requires additional support built into the dock structure to support the weight of the cranes and containers (a maximum of 175,000 pounds).

Table 2-4 Characteristics of Typical Post-Panamax Container Cranes

Gantry rail gage	100 feet	Clear height to portal	40 feet
Clear between legs	60 feet	Backreach	50 feet
Lift above rail	110 feet	Outreach from waterside rail with 13 feet setback	165 feet
Total lift	170 feet		

Figure 2-20 Example 100-Gage Container Cranes

Figure 2-21 Waterside Crane Rail along Face of Dock

The cranes would be fabricated, assembled, erected, and rigged completely at the factory, including electrical wiring and piping work. The cranes may be partially disassembled and transported in major pieces to the POA, where they would be reassembled and tested. Because of the requirements of cranes during military deployments, at least one crane would have an emergency backup power source.

Crane rails are usually mounted on a continuous steel plate that allows the rail to slide longitudinally with temperature variations (Figure 2-21). The movement of cranes along the crane rails generates stresses on the rail and underlying foundation. Because of the high bearing pressures, the steel plates are set in non-shrink grout, and in some cases, fabric-impregnated elastic bearing pads are used to achieve a more uniform bearing surface.

The crane rails are supported on concrete crane beams that distribute loads to the soil below, usually with deep foundations such as concrete or steel piling. The waterside crane beam is designed for a higher load capacity than the landside crane beam, because a greater percentage of the load is supported by the outboard rail during lifting operations.

Under all three action alternatives, the three existing 38-gage cranes would be replaced with new 100-gage cranes. Differences between crane systems associated with each of the design alternatives are discussed in sections 2.2.3 and 2.2.4.

Cathodic Protection and Protective Coatings. Corrosion is often accelerated at the tidal zones and splash zones common to seaports. Seawater solution, an electrolyte, in combination with air, can result in rapid corrosion of steel support piles if left unaddressed, eventually resulting in structural failures. In the case of the POA marine structures, corrosion is exceptionally problematic due to large tidal fluctuations, high oxygen content in the water, significant tidal velocities, and high mineral content of the seawater resulting from glacial runoff. Since corrosive rates are much higher in the splash and tidal zones, strong tidal variance and water turbulence result in a substantially more corrosive environment than is common to most seaports. The movement of ice floes and the abrasive action of ice rubbing against the pilings removes protective coatings. As a result, an effective corrosion protection system is vital.

Cathodic protection is a process for reducing or eliminating corrosion on a metallic structure in contact with a corrosive electrolyte (seawater), by introducing an electrolytic action greater in strength and opposite in direction to the electrolytic activity (corrosion), than would otherwise take place. Cathodic protection is simply a way of minimizing the current by overpowering it with a stronger current from an external source.

An impressed current cathodic protection system is currently used at the POA. This system applies low-voltage, high-amperage direct current from an external source. Figure 2-22 shows the basic arrangement of an impressed current cathodic protection system. Alternating current, supplied by the local electric utility, must be converted by a rectifier to direct current. An impressed current system would be used to protect the steel pilings and/or sheet piles used to construct the proposed POA dock.

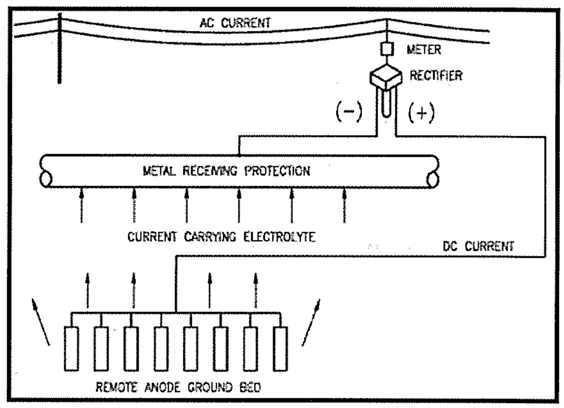

Figure 2-22 Impressed Current Cathodic Protection System

Under the three action alternatives, the steel piles or sheet piles would be protected by a combination of protective coatings and impressed current cathodic protection. Protective coatings at the POA need to stand up to cold weather and the particularly harsh environment that is prevalent in Knik Arm. The ice that forms on the pilings at POA is laden with silt and sand, which is very abrasive. The protective coating must stand up to the abrasive action of the ice rubbing against it on every tide cycle. For the proposed action, a polyurea based coating with approximately 100 mils dry fill thickness is anticipated. This type of coating has a history of good performance at POA. A comparison of cost for coating and electrical requirements for Alternatives A and B is presented in Table 2-5. Cost and electrical requirements for Alternative C would be similar to Alternative A.

Table 2-5 Electrical Requirements for Cathodic Protection

Cost Item	*Alternative A* Sheet Pile (coated on seaside only)	*Alternative A* Sheet Pile (coated on seaside and landside including tail walls)	*Alternative B* Pile-Supported Dock Coated
Protective Coating	$4,000,000	$29,000,000	$14,500,000
Cathodic Protection System	$8,000,000	$3,000,00	$7,500,000
Total Capital Cost	**$12,000,000**	**$32,000,000**	**$22,000,000**
Amperage Required	26,707	9,172	24,574
Power/Rectifier (watts)	6,708	6,708	6,708
Number of Rectifiers	103	36	95
Total Power Requirements (watts)	690,924	241,488	637,260
Cost per kilowatt-hour (KWH)	$0.06	$0.06	$0.06
Estimated Monthly Power Cost[1]	**$42,639.88**	**$14,903.26**	**$39,328.05**

[1] Estimated Cost = [(720 hours/month) (power in watts) (cost/KWH)]/[(1,000)(Eff)]; Eff = rectifier efficiency, assumed as 70 percent)

Fendering Systems. The energy required to stop the movement of a large vessel approaching a berth can be quite high. The berthing force can damage the ship and the dock, if not properly absorbed. A fendering system absorbs the berthing energy of a ship and reduces the berthing force against the ship and dock.

There are many types of fenders available on the market. Most are made of solid rubber and reduce the berthing force by buckling and elastic deformation of the fenders. Figure 2-23 is a picture of a typical shore side fender. Panels mounted with a synthetic resin low friction tiles are often provided to further reduce the pressure on the ship's hull. Good fenders will absorb a large amount of energy with a small reaction.

Floating type fenders are either filled with air or foam and absorb the berthing energy by means of elasticity of compressed air or foam instead of using the elasticity of the rubber. Figure 2-24 is a picture of a typical floating fender.

Figure 2-23 Typical Shore Side Fender

Figure 2-24 Typical Floating Fenders

The tidal range in Cook Inlet poses a challenge to the design of a fender system because the point of contact between ship and a fixed fender system will differ depending on the tide. This is especially true for a pile-supported dock, where the contact point with the ship is significantly below the concrete deck level. In addition, components of the fendering system can be subject to corrosion in the same manner as the piles, and must be protected to ensure integrity for the life of the design. Sections 2.2.3 and 2.2.4 discuss the fender systems proposed under the action alternatives.

Drainage Systems. Stormwater drainage is an important consideration for the design of marine terminals and dock structures. Storm drainage system outfalls typically are placed through dock structures at an elevation that would allow gravity drainage during all anticipated tidal conditions, while maintaining sufficient fall through the drainage system to effectively drain the site during precipitation or snowmelt conditions.

From a hydraulic perspective, increasing the number of outfalls is desirable because it minimizes the area contributing flow to each outfall. This allows the system to have sufficient fall while maintaining appropriate outfall elevation. However, decreasing the number of outfalls is usually desirable from a regulatory standpoint. All outfalls typically are permitted through local jurisdictions and the National Pollutant Discharge Elimination System (NPDES). Minimizing the number of potential pollutant sources is important to be able to monitor and maintain water quality standards. The optimum number of outfalls results when the system does not flood during high tides, drains adequately during rainfall events and at low tides, controls point-source pollution, and is cost effective. A discussion of drainage systems proposed for each action alternative is provided in sections 2.2.3, 2.2.4, and 2.2.5.

Utility Systems. Marine terminals may be equipped with a wide variety of utility systems depending on the type of operations on the terminal. The most common utilities provided at marine terminals used for cargo operations include water, sanitary sewer, electrical power, and communications. For industrial or military uses, utility systems may also include steam, fuel, natural gas, oxygen, acetylene, and compressed air.

Potable water is typically supplied to vessels for drinking water and washing. Non-potable water may also be supplied for washing down, flushing, and fire protection. The ship service connections should be supplied with double check backflow preventers to prevent contamination of the potable water supply. Potable water and sewage systems would also be provided to the administration and maintenance buildings.

Electrical power supply to the dock is required for container crane operations, site lighting, shore power, cathodic protection systems, and auxiliary power. Most crane equipment operates at a voltage of 480 Volts. A high voltage feed, typically 13.8 kilovolts, is brought to the cranes or a substation near the dock. If the high voltage is taken to a substation, it is stepped down, and independent feeders are distributed to vaults on the dock. Due to the high power requirements for the new generation of container cranes, it is sometimes advantageous to take the high voltage feed directly to the crane to minimize power loss and the size of incoming feeders. The POA is also considering placing electrical conduits for shore power at the dock. These conduits could be used by ships while berthing instead of running ship engines.

Site lighting is installed behind the backreach of the cranes to illuminate the dock and to supplement any lighting provided by the cranes. The site lighting is typically tied into the yard lighting system.

Communication systems include telephone lines to the dock, and fiber optic cable for security and data transmission requirements. These services are typically grouped with the electrical distribution system for convenience of routing and ship connections.

Operations. Once completed, the Project would accommodate military vessels, multi-purpose vessels, barges, and railroad traffic associated with cargos at the POA. Projected increases in commodities through the POA using multipliers from the Master Plan (VZM 1999) are presented in Table 2-6. Expansion would include accommodations for a cement berth, two POL berths, two container berths, a military RO-RO cargo berth (with access to 100-gage cranes), and two barge berths. The general layout of the POA would accommodate increased areas for container and RO-RO customers, a dedicated area for military use, a larger and more efficiently organized intermodal freight transfer area, new cargo areas, a fire station to serve the POA and Government Hill, and an industrial area (see Figure 2-13). The new port would also have increased lighting facilities, improved stormwater drainage, and improved access within the POA, as well as secure access to the POA from the outside. The expanded area is projected to be sufficient to accommodate projected increases in commodities and traffic through 2025 and beyond (Table 2-7).

Table 2-6 Summary of Increases in Commodities through 2025 (in units per year in thousands)

Commodity Type	*Units in 1,000's*	*1998*	*2003*	*2005*	*2010*	*2020*	*2025*
Container	Short Tons	1,572	1,713	1,804	1,973	2,410	2,663
Container	TEU	359	391	411	450	550	607
Break-Bulk	Short Tons	0	5.5	6	6.4	7.8	8.7
Autos/Vehicles	Units	37	29	30	33	40	44
Liquid-Bulk	Short Tons	1,280	2,583	2,719	2,974	3,632	4,013
Dry-Bulk	Short Tons	96	145	152	167	203	225
Passenger	Passengers	13	4	4	4.6	5.7	6.3

Table 2-7 Summary of Increases in Transportation Trips per Year through 2025

Transportation Type	*2003*	*2008*	*2010*	*2020*	*2025*
Ship Calls	491	542	565	690	763
Truck Trips	277,700	280,135	291,901	356,418	393,842
Trains	0	312	312	312	312

The expanded POA would allow a great deal of flexibility for cargo loading, unloading, storage, and staging operations. The deck elevation would be contiguous with the adjacent land, minimizing the possibility of traffic congestion on the dock and in the staging areas. This increased access also allows for a more efficient layout of POA operations and a smaller acreage requirement than would be possible with the present pile-supported design that needs trestles to connect the dock to the mainland.

The primary container terminal tenants, Horizon and TOTE, would have their lease areas directly behind the dock, and their areas would be made more rectangular than the current configuration. The entrance and exit gates for these tenants would be situated close to their current locations, with convenient access to the public roadway system. This layout would minimize the haul distances between the dock and cargo storage facilities and improve traffic circulation within the terminal, while maximizing total operational capacity. The remaining tenants in the POL, cement, barge, and cruise liner industries would also have contiguous access to their lease areas from the dock.

2.2.2 Management Actions

The proposed action would include the implementation of various management actions, including mitigation, monitoring, and the implementation of environmentally beneficial programs to limit potential impacts to the environment.

Mitigation

Although best available data do not indicate significant adverse impacts, the proposed action includes mitigation to avoid, reduce, or compensate for adverse impacts.

Best Management Practices. The proposed action includes a variety of BMPs designed to lessen the potential for adverse environmental effects. Prior to implementing the proposed action, MARAD and the POA would require contractors to identify and implement BMPs to prevent erosion and sedimentation during construction and operation; control specific on-site erosion and sedimentation; protect adjacent properties and watercourses from effects related to erosion, sedimentation, and flooding; control spills; handle potentially hazardous materials and waste in accordance with federal, state, and local requirements; and otherwise lessen the potential for adverse environmental effects. BMPs under the proposed action include those identified in Table 2-8.

Table 2-8 BMPs Included in Project Implementation

Measure	*Responsibility*
General	
Construction and operations would be conducted so as not to interfere with the public's right to free navigation on all navigable waters of the U.S.	POA and Contractor
The POA would continue to follow the guidelines for establishing operations in the event of a major response effort to an oil spill or hazardous material release as defined in the Alaska Federal/State Preparedness Plan for Response to Oil and Hazardous Substance Discharges/Releases (AURT 1999).	POA and Contractor
Contractors would be required to prepare a plan detailing methods to control spills and for handling hazardous materials and wastes in accordance with federal, state, and local regulations.	Contractor
All required safety lights and signals as prescribed by the U.S. Coast Guard will be installed and maintained.	POA and Contractor
Contractually require construction contractor to meet City of Anchorage construction noise standards.	POA
Perform maintenance of on-site capabilities to respond to spills of oils, fuels, or other similar materials.	Contractor
Marine spill response equipment, including absorbent pads and containment booms will be stored on site in case of accidental spills.	POA and Contractor
Training those involved with construction and operations in BMPs.	POA and Contractor
Construction debris and dredged fill material would be recycled when feasible or disposed of off-site at an approved landfill.	Contractor
The Project would be designed and constructed to comply with the *Anchorage Erosion and Sediment Control and Materials Containment Guidance Manual* (MOA 1999a) and the *Stormwater Treatment Plan Review Guidance Manual* (MOA 1999b).	POA and Contractor
A whale observer will be employed during in-water construction activities.	POA and Contractor
The Project would include the design of drainage facilities to minimize pollution of terrestrial water sources by appropriate management practices.	POA and Contractor
Protecting water quality for beluga whales and finfish by adhering to construction BMPs, NPDES permit requirements, and a pollution prevention plan during construction and during POA operations after construction (See section 3.3.3, Water Quality).	POA and Contractor
Sediment traps, fencing, and other measures would be employed during construction to minimize the potential for erosion and sedimentation during construction and to protect adjacent properties and waterways from effects related to erosion, sedimentation, and flooding.	Contractor
Marine Environment	
Dredging will be preceded by a bathymetric survey.	Contractor
All bids will be reviewed to make certain that they contain adequate budgets for safety, maintenance, erosion control materials, installation of erosion or turbidity control measures, and maintenance of those measures as appropriate.	POA
Sources of fill would be determined by the chosen contractor; however, the contractor would adhere to existing laws and regulations governing removal and placement of fill material and would consider special procedures provided in the bid package.	Contractor

Table 2-8 BMPs Included in Project Implementation (con't)	
Measure	*Responsibility*
Terrestrial Environment	
Apply water three times daily, pave, or apply nontoxic soil stabilizers on all unpaved access roads, parking areas, and staging areas at construction sites for airborne dust control.	Contractor
Prior to construction and earth movement, the POA would be responsible for preparing a Soils Management Plan in the event that contaminated soils are encountered at the pre-existing port during fill activities.	Contractor
Cover, enclose, water twice daily, or apply nontoxic soil binders to stockpiles of dirt, sand, etc.	Contractor
Limit traffic speeds on unpaved roads to 15 mph.	Contractor
Provide a generic construction SWPPP to be used by contractors to avoid contamination from site runoff.	POA
Clearly mark construction limits with stakes and survey tape to prevent unnecessary disturbances to surrounding areas and delineate fill areas to prevent unnecessary materials placement.	Contractor
Install silt fencing in appropriate locations to reduce erosion and sedimentation.	Contractor
Retain natural vegetation wherever possible. Replant vegetation in disturbed areas as quickly as feasible. Reseed slopes with natural vegetation or sod.	Contractor
Construct grassy swales or vegetated filter strips adjacent to the developed areas.	Contractor
Armor slopes subject to flooding with riprap.	Contractor

In addition, current procedures implemented at the POA would be continued, including:

- general litter control and cleanup;
- periodic inspections;
- construction and post construction stormwater quality controls;
- preventative maintenance including inspection of above ground storage tanks, stormwater system, and vehicle refueling areas;
- restrictions on the use of pesticides, herbicides, and fertilizers; and
- training of employees to prevent spills.

Essential Fish Habitat (EFH) and Tidelands Mitigation. The Project would fill up to 135 acres of mapped EFH. This area would consist of a loss of 66 acres of intertidal area and 69 acres of subtidal area. Through the Section 404 process with the USACE, the POA and MARAD will mitigate the loss of these areas, as appropriate.

Mitigation would occur in the Ship Creek area and may include habitat restoration, stream channel restoration, development of conservation easements, dam lowering, or other appropriate projects. The specific mitigation proposal will be designed with input from appropriate resource agencies and after completion of the first phase of the USACE's watershed modeling project in 2005. Potential projects to mitigate habitat loss include:

- Habitat restoration (25 acres) in the mudflats south of Ship Creek (Figure 2-25);
- Channel restoration and streambank protection of lower Ship Creek;
- Lowering of the first Ship Creek dam to allow salmon migration at high tide;
- Procurement of other conservation easements; and
- In lieu fees.

Monitoring and Ongoing Studies

To provide additional information on fish and beluga whales, the POA is working with National Oceanic and Atmospheric Administration (NOAA) fisheries and other agencies to develop and implement studies before, during, and, in some cases, after construction activities. As the lead agency, MARAD is committed to continued involvement in the Project into the future. If new information during the monitoring phase indicates that the Project would have a significant adverse impact on resources, then appropriate environmental documentation and mitigation would be implemented.

Fish Studies. This management action will include conducting fish and marine biological studies in support of the Project. The POA will develop and implement fish and invertebrate sampling studies in association with the proposed action. The purpose of the studies will be to provide data necessary to evaluate unforeseen potential and/or actual impacts to managed fish species from POA expansion activities. Data collection activities will occur within the discrete marine environment involved in the proposed action. These studies were initiated in September 2004 after review and tentative concurrence of the plan by representatives of appropriate resource management agencies (e.g., NOAA Fisheries, ADNR, U.S. Fish and Wildlife Service [USFWS]). Performance of these studies are in conjunction with, but separate from, marine biological studies associated with the Knik Arm Bridge and Toll Authority (KABATA). The POA studies will supplement the U.S. Department of Transportation (USDOT) 1983 study, the only Knik Arm-based study to date. In addition to using similar fish seining techniques as those in the 1983 study, the proposed fish and marine biological studies will also include invertebrate sampling. Fish and invertebrate sampling will be conducted at four stations in the vicinity of the POA: 1) south of Cairn Point and north of the POA (same station as the USDOT [1983] study); 2) South Tidelands south of Fuel Dock POL-2; 3) immediately landward of the POA offices and south of Trestle No. 1; and 4) south of the boat launch. These studies are to be completed by the end of 2005. The studies also include a survey of juvenile salmonid outmigration from Ship Creek in the spring of 2005, identification of fish from the Ship Creek hatcheries, and fish habitat use in the vicinity of POA facilities.

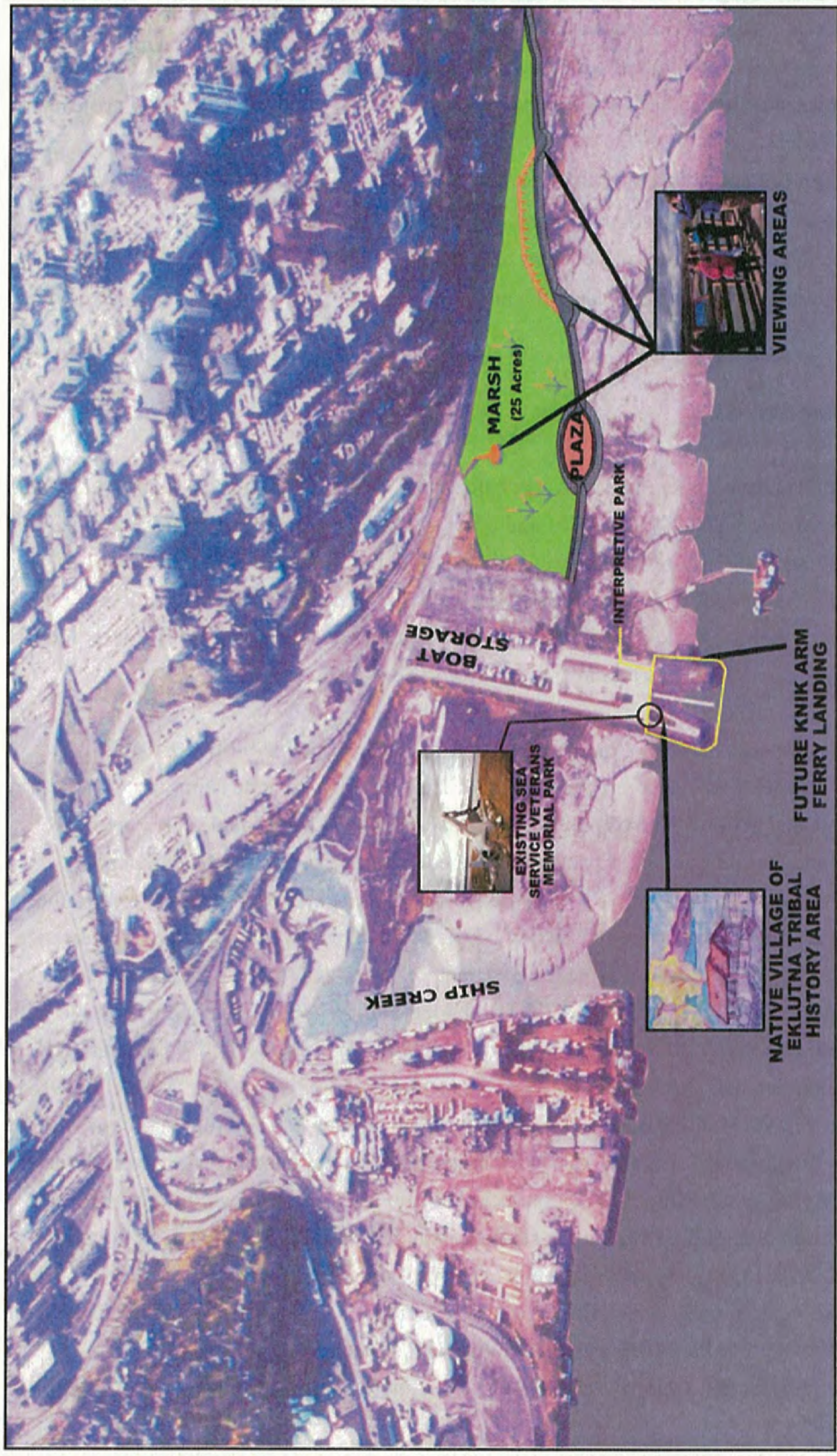

Figure 2-25
Ship Creek 25-Acre Habitat Restoration

Beluga Whale Monitoring. The POA will develop and implement a beluga whale monitoring plan in association with the proposed action. The POA, MARAD, and marine mammal specialists from the Alaska office of NOAA Fisheries and the Marine Mammal Lab have initiated discussions to design that plan. The intent of the plan will be to provide data necessary to evaluate unforeseen potential and actual impacts on beluga whales from POA expansion activities. Data collection will occur within the discrete marine environment involved as part of the proposed action. The plan will also identify procedures for observing and reporting beluga whales and implementing appropriate management actions, if whales are sighted during construction. The plan will include the following components: 1) shore-based observations by two teams to provide data on beluga movements, timing, group size, locations, identifiable behaviors and patterns, and use of the Project area; 2) acoustics monitoring to measure the noise and vibrations associated with proposed construction activities and the development of sound attenuation maps to determine low impact areas; and 3) analysis of data using tools such as geographic information system, to the extent feasible and practicable. Implementation of data collection will be timed to overlap with bench test studies to obtain data about the response of belugas to various construction activities. To the extent feasible, the plan also will be designed to be compatible with the collection of data confirming belugas in Upper Cook Inlet by other parties.

Environmental Enhancements

Enhancement to Ship Creek Point/Sea Service Veterans Memorial Park. The POA manages property with a boat ramp, owned by the MOA, at the mouth of Ship Creek. Given the new security requirements required at ports, this property is now the only property controlled by the POA where public access is allowed. It is a component of a larger area that has been deemed of value for tourist and pedestrian use, and which is targeted by MOA and ARRC for revitalization for such usage.

At this Ship Creek Point location, near the public boat ramp, is a public restroom and public parking maintained by the POA. The Sea Service Veterans Memorial Park occupies the north finger extension at the boat ramp. This memorial, which was created through the cooperation of the Anchorage Veterans Affairs Commission and the MOA, was dedicated on June 10, 1992 to honor all veterans of the U.S. Navy, Marine Corps, Coast Guard, and Merchant Marine. The centerpiece of the memorial is the anchor from the decommissioned *USS Anchorage*, and the inscribed dedication plaque. The park is landscaped, lit, and maintained by POA.

To assist in the revitalization of the area and provide enhanced public exposure of the Sea Service Veterans Memorial Park, as well as to provide for public access to information about the port and waterfront, the POA is instituting a management program to enhance this area for public access (see Figure 2-25). The enhancements would be comprised of interpretive sites that would include information on historic cultures and usage of Upper Cook Inlet as well as recreational amenities. The interpretive sites would present information on the local Dena'ina culture and historic use of Ship Creek as an original "railroad town." The site would also include a beluga observation point containing "tear-off" forms with mailing instructions or a "hotline" telephone number or website to report opportunistic whale sightings from the point. A key component of the enhancements will be the development of an open-air public pavilion designed to model a Dena'ina culture "Nichil" or "Big House" (Figure 2-26). It will contain interpretive information specifically related to the Dena'ina history and culture of the Upper Cook Inlet area.

LF04 (Knik Bluff Landfill) Enhancement. LF04 is an inactive, Comprehensive Environmental Response, Compensation, and Liability Act regulated landfill north of the existing POA operations. The landfill, owned by Elmendorf AFB, is located along the bluff that forms the boundary of Elmendorf AFB with the tidelands controlled by the POA. The bluff is currently eroding and landfill debris is migrating onto the beach area. Under the existing Record of Decision (ROD) for this facility, the active Air Force remediation approach is a combination of groundwater monitoring and annual "beach sweeps" to remove materials that have sloughed off from the bluff. The proposed action includes filling the areas adjacent to this landfill, including portions of the beach where debris currently accumulates. This action, which will be coordinated with Elmendorf AFB and appropriate regulatory agencies to assure regulatory and legal compliance, will result in protection of the bluff from erosion; containment of the materials in the currently unstable slope; and reduction of the potential for migration of contaminated materials containing pesticides, dioxins, polychlorinated biphenyls (PCBs), and industrial solvents onto the beach and adjacent marine habitat.

Preliminary design for the Project includes placing fill to an elevation of +38 feet MLLW adjacent to and along the western edge of the area encompassed by LF04. Placing this fill would have two primary effects on the ability and need for Elmendorf AFB to continue fulfilling the requirements of the ROD with respect to LF04. First, it would eliminate the erosional action by ordinary high tides on the toe of the bluff supporting LF04. Second, it would improve access control to the area.

Placement of fill for the Project would extend the POA and dock surface to above ordinary high tide along the length of LF04. The +38 feet MLLW preliminary design elevation roughly corresponds with the toe of the bluff on which LF04 is located. Tidal action currently undercuts the toe of the bluff causing the face to slough, bringing down both soil and landfill debris.

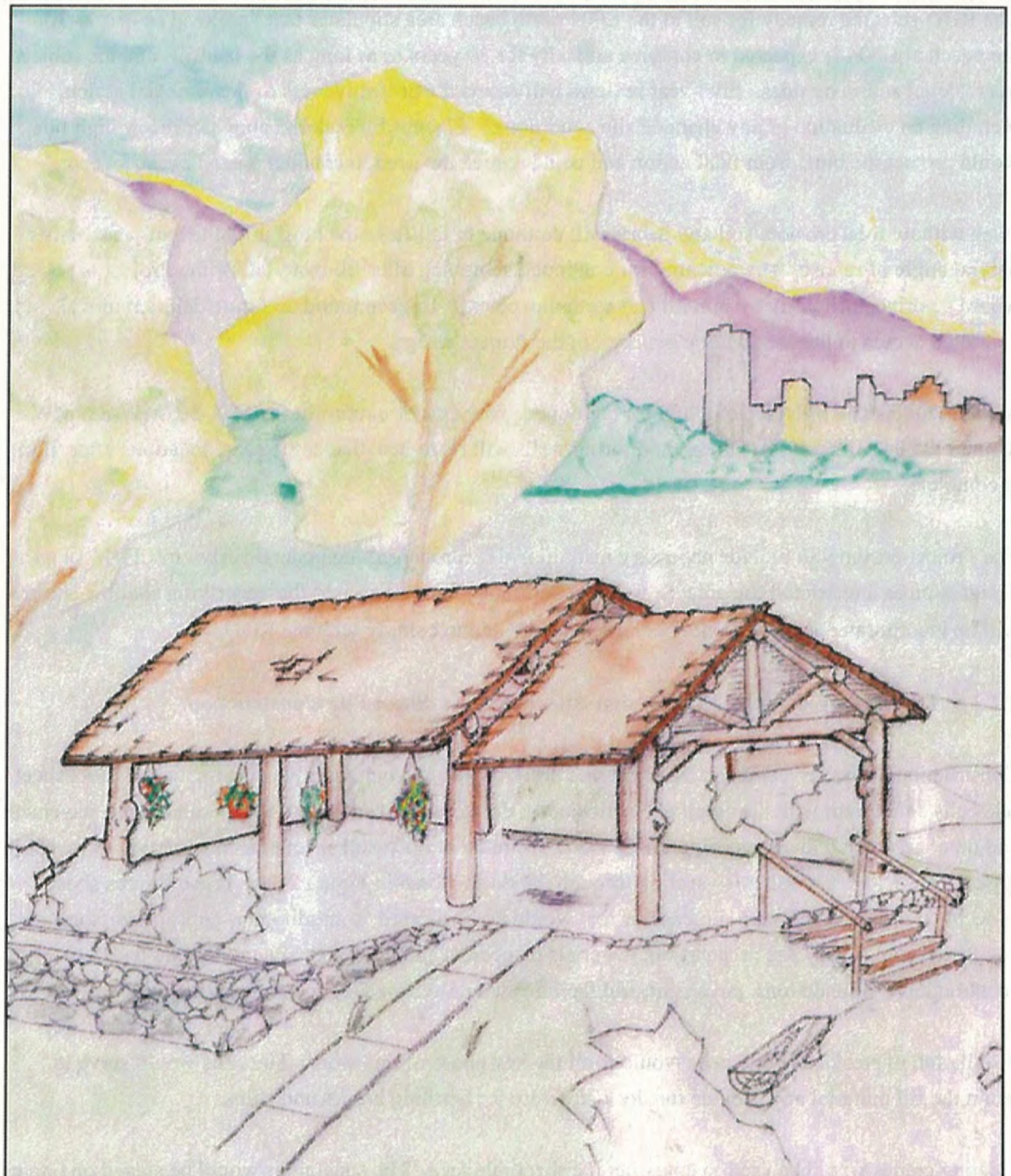

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Figure 2-26
Native Hall Building

The ROD-selected remedy for soil at the LF04 north beach area stipulates that "removal of debris from the beach at LF04 is expected to continue annually for 30 years or as long as the landfill remains subject to erosional action by tides. Five-year reviews will assess the protectiveness of the remedial action, including an evaluation of any changed site conditions." Placing fill material above ordinary high tide would protect the bluff from tidal action and could reduce the need to conduct annual beach sweeps.

Even without tidal erosion, soil and debris will continue to fall from the bluff until the bank reaches its natural angle of repose. The potential for continued sloughing after fill material for the Project is placed would be driven primarily by rainfall and earth movement. To accommodate future debris removal, restricted access to the area will be included in the Project design.

Access will also be provided to allow for continued groundwater monitoring at MW-80, MW-81, MW-82, and K-304. If necessary, these monitoring wells will be re-installed at the same locations after filling is complete.

The Project design will include necessary institutional controls limiting general access to LF04. LF04's designation as a restricted use area, as well as restrictions for drilling into the underlying shallow aquifer, will be incorporated in order to protect human health and to comply with the ROD.

2.2.3 The Preferred Alternative/Design Alternative A: Sheet Pile Construction

Construction of the Project using the sheet pile design concept would involve construction of steel sheet pile cells concurrent with development of tidelands; dredging; and construction of foundations, pavement, and other associated facilities (Figure 2-27). A schematic of open cell sheet pile construction is shown in Figure 2-28 with a typical cross-section through the dock shown in Figure 2-29. These figures show conceptual design details and dimensions that would be confirmed, or modified as appropriate, through detailed design. Early site preparation; materials placement and dredging techniques; and backland construction of foundations, pavement, and facilities would follow the procedures already discussed.

Installation of steel sheet pile cells would form the key phase of this work. The cells would serve to retain the fill material and provide the dock structure for berthing barges and ships.

Floating cranes would be used to construct the sheet pile face. The sheet piles would be staged on barges and positioned near the crane. A template would be used to guide the sheet piles to their proper position. The template would be positioned in the correct location with the help of survey instruments.

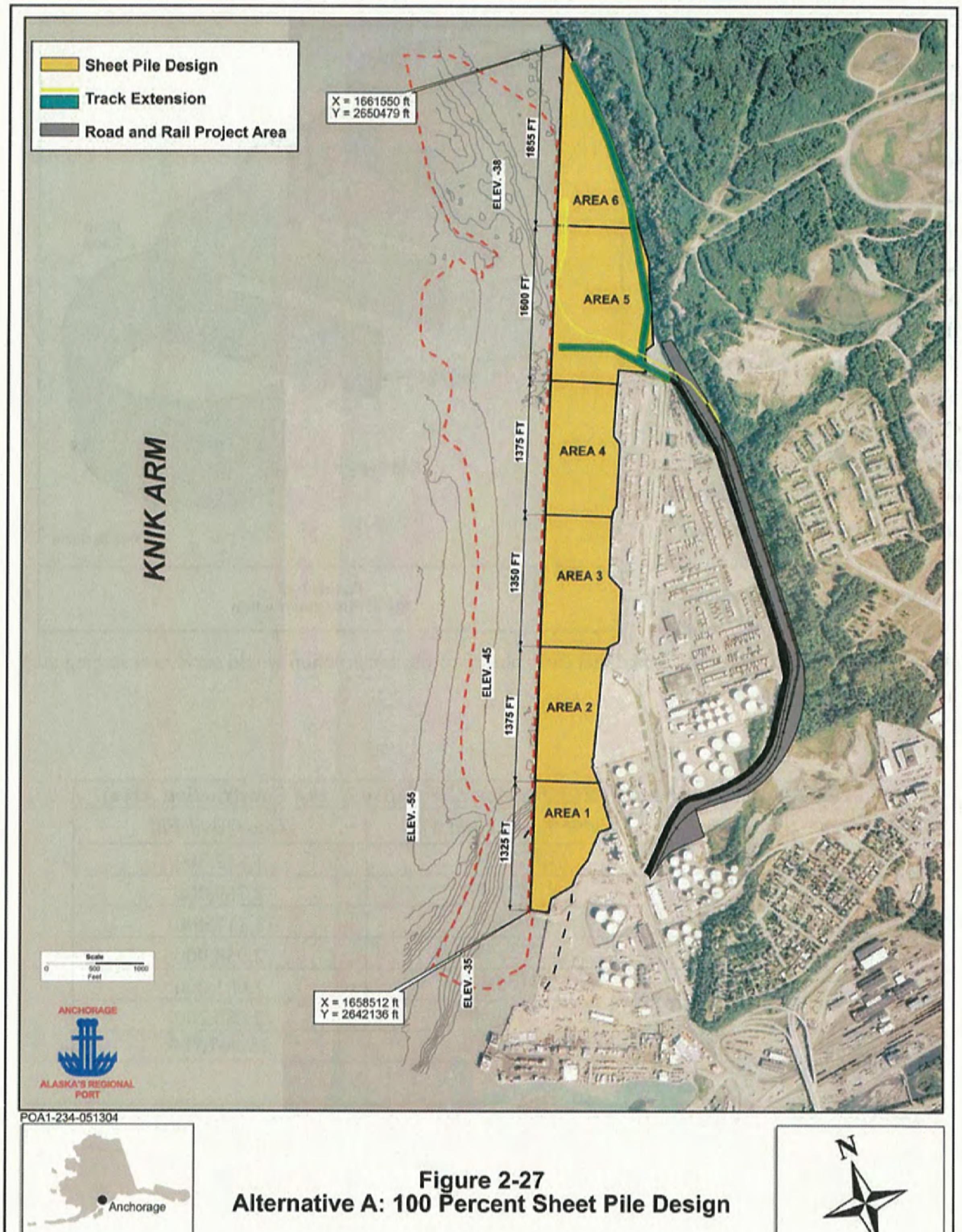

Figure 2-27
Alternative A: 100 Percent Sheet Pile Design

The sheet piles would be installed to the desired tip elevation by a pile driving hammer, likely a vibratory hammer. Backfill material would be placed behind the sheet pile cells to the finished elevation. Engineered fill material, i.e., clean sand, gravel, or stone would be placed immediately behind the sheet pile face, and back a distance determined in the final design (see Table 2-9 for material quantities). Common fill, including dredge material, could be used behind the engineered fill. The fill material would require deep compaction using a vibrating probe at multiple locations after placement and/or by vibratory rollers passing over the ground as it is placed. It is anticipated that early phases of the construction would serve as a staging area for future construction.

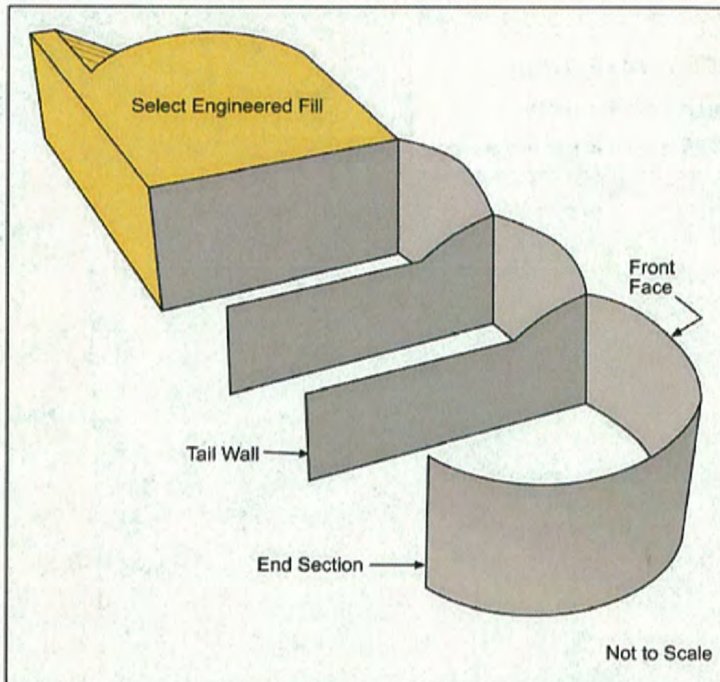

Figure 2-28
Sheet Pile Construction

Table 2-9 Backfill Material Required for Alternative A (per Construction Area)			
Area	***Acres***	***Cubic Yards/Total Fill***	***Tons/Total Fill***
1	17	1,425,000	1,852,500
2	19	2,123,000	2,759,900
3	23	2,398,000	3,117,400
4	22	2,273,000	2,954,900
5	34	2,310,000	3,003,000
6	20	1,754,000	2,280,200
Total	**135**	**12,283,000**	**15,967,900**

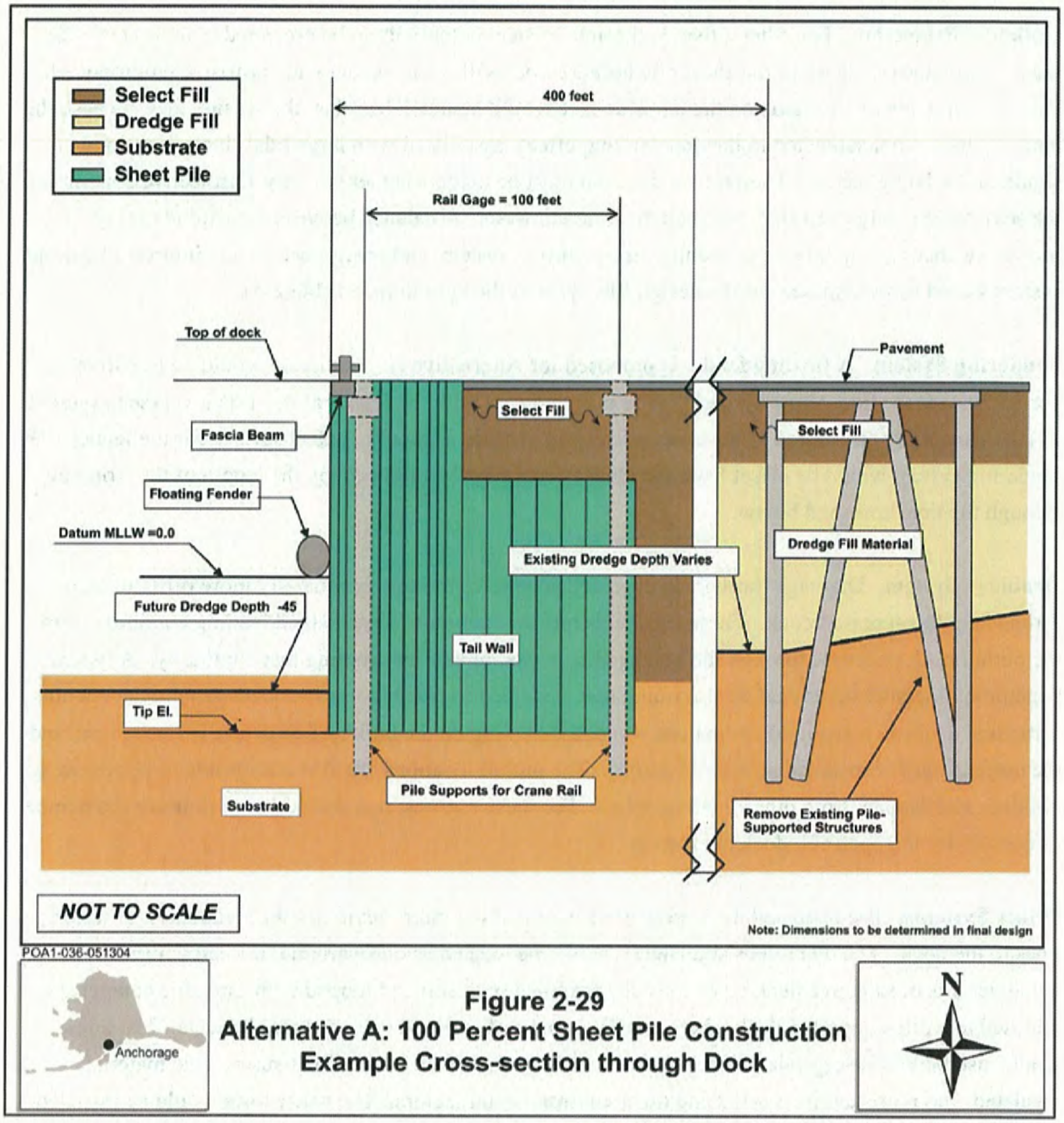

Figure 2-29
Alternative A: 100 Percent Sheet Pile Construction Example Cross-section through Dock

Cranes. For the open cell dock, the crane beams would be supported on piling that would be driven through the fill. Various options exist for the type of piles that can be used for the crane beams, including steel pipe piles, H-piles, precast concrete piles, and auger-cast (or cast-in-place) concrete piles. Because the crane beams and the open cell dock would be independent by design, the crane beam size and pile spacing could be optimized. Special design requirements need to be considered for the pile placement and spacing in the vicinity of the open cell dock tail sections.

Cathodic Protection. For Alternative A, the area of steel potentially to be protected includes both the seaside and landside faces of the sheet pile because both will be in contact with corrosive environments. However, the rate of corrosion on the landside face would be much less than the seaside face because the landside face is not subjected to the depolarizing effects associated with large tidal fluctuations and significant tidal velocities. Therefore, a decision must be made whether to apply a protective coating to the seaside face only or to all faces, including the tail walls. A balance between the capital cost of protective coating, capital cost of the impressed current system, and energy use for the impressed current system would be determined for the design life-cycle of the system (see Table 2-5).

Fendering System. A floating fender is proposed for Alternative A. Fendering would be free to move vertically with the tide; allowing the ships to make contact with the fender at any tide level (see Figure 2-24). A panel may be secured to the sheet pile cell to provide a smooth contact surface for the fender. The fendering system would be offset from the main structure and would occupy the length of the structure through the tidal zone and below.

Drainage System. Drainage through an open cell sheetpile structure is generally more difficult than through a pile-supported dock. These structures rely on continuity to withstand loading conditions, but the outfall must penetrate through the bulkhead face, potentially interrupting that continuity. A typical penetration includes additional steel framing that is welded in place to transfer loads around the opening. Structural analysis is required to evaluate where the loading on the bulkhead structure is less severe, and the outfalls may be installed at these locations. The outfall locations are also susceptible to corrosion, ice buildup, and damage from other floating debris. For these reasons, it is desirable to minimize the number of outfalls for the open cell dock alternative.

Utility Systems. The open cell dock alternative would allow more flexibility for installation of water lines to the dock. The main lines and laterals would be located as underground, insulated utilities wherever it is most convenient, since the cells are filled with soil and topped with asphaltic concrete, as opposed to a pile-supported dock where there is a maze of exposed substructure elements. The lines would also be less susceptible to freezing because they are buried in non-frost-susceptible material, insulated, and protected from wind and other environmental factors. The water lines would be installed below the crane beams, which are typically 4 feet to 4.5 feet below grade, or sleeved through the crane beams. Another option with an open cell dock would be to construct common utility trenches or utilidors for installation of water lines and other utilities. Utilidors can be designed to provide added protection, more convenient access for maintenance, and more reliable freeze protection, as well as providing a future location for conduits. For the open cell dock alternative, conduits could be routed through the fill or installed in utility trenches.

2.2.4 Design Alternative B: Pile-Supported Dock with Fill

Alternative B would employ a design approach consisting of two sections: a sheet pile structure where vertical cells retain imported fill and a pile-supported concrete deck. Both the sheet pile structure and the associated dock would extend for 8,880 feet along and parallel to the face of the shoreline (Figure 2-30). The combination of fill on the landward side and pile-supported dock provides lateral stability and sufficient earthquake resistance needed to meet current operational standards. This surface design, in effect, is the same as Alternative A, with variations in the support structure to contain necessary backfill and the addition of a pile-supported dock. As such, it would require less fill to construct.

Constructed like the structure in Alternative A, the sheet pile structure with backfill would extend from the limit of the existing dock 280 feet out (west) into the tidelands (Figure 2-31). The existing dock, as in Alternative A would be dismantled and replaced with a new structure.

Construction methods for the sheet pile structure would mirror those described for Alternative A. Similar and briefer timeframes would apply in later construction years. A total of approximately 9.1 million cubic yards of fill would be required, or about 30 percent less than for Alternative A (see Table 2-9).

The pile-supported concrete deck would connect to the sheet pile structure, extending an additional 120 feet further seaward. As in Alternative A, the top of the deck elevation would remain at about 38 feet above MLLW with dredge depths to -45 feet MLLW. A line of steel piles, each three to four feet in diameter and varying in length to accommodate the slope of the tideland bottom, would be driven into the subsurface to the designated tip elevation. Roughly 4,005 steel pipe piles would be driven into the tideland bottom with a mechanical pile hammer. Concrete pier caps or beams would then be constructed on-site to tie the pipe piles together and form the necessary underdecking. Perpendicular to the shoreline and spaced at 20-foot intervals, a total of approximately 445 concrete beams would be required for the 8,880-foot long dock. Large protective boulders or armor rock would be placed on the surface around the piles to protect against erosion at the mudline. Upon completion, the top deck would be constructed utilizing cast-in-place concrete techniques to form the dock surface.

Use duration of equipment such as the vibratory hammer for driving sheet pile would be greatest for the largest area (Area 5) coinciding with the longest steel span (i.e., 128 days). As in Alternative A, subsequent areas require shorter use durations of this type of equipment (Table 2-10). The dredging, demolition of the existing dock, and backlands improvements would require the same duration to complete as in Alternative A.

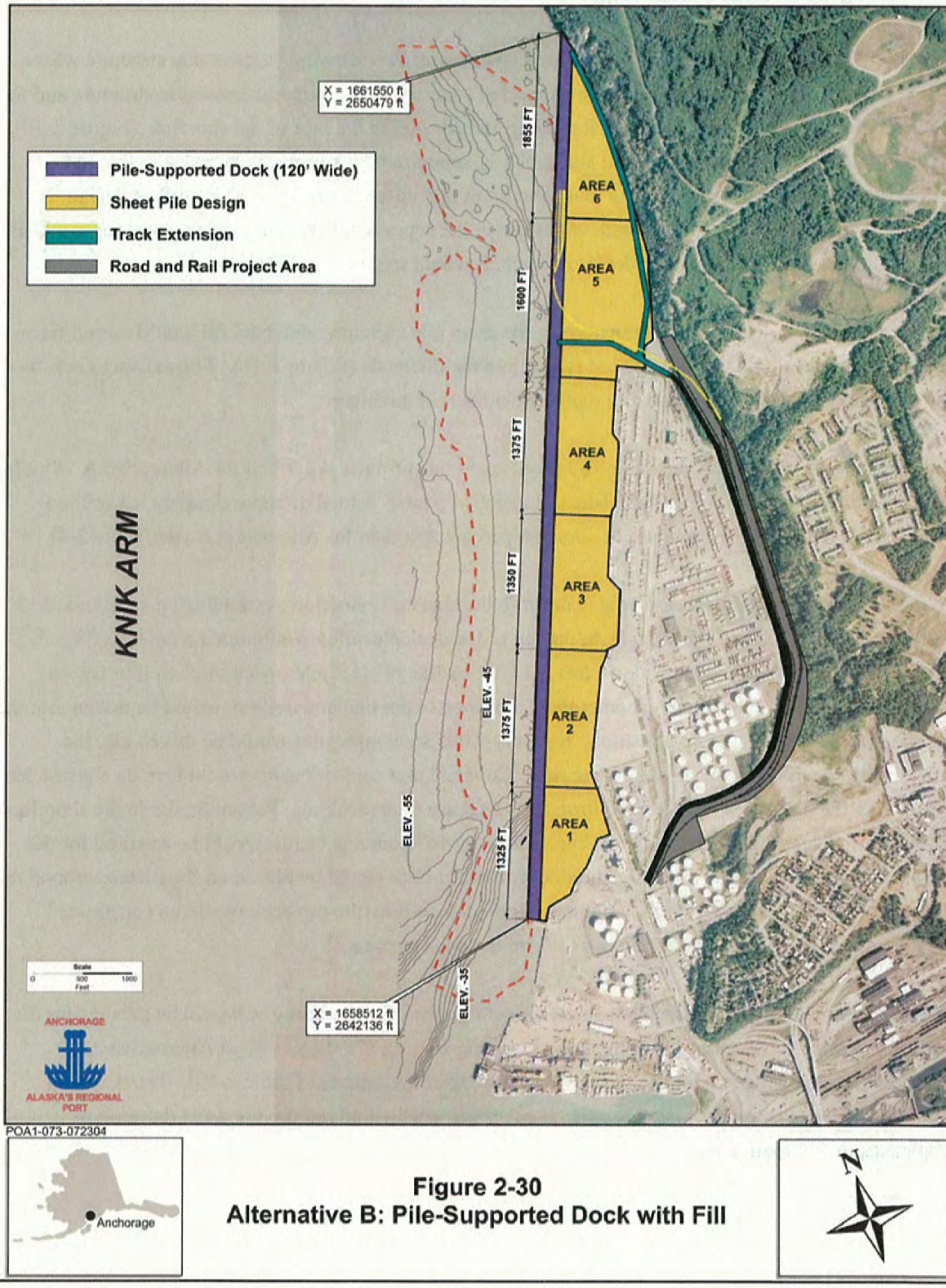

Figure 2-30
Alternative B: Pile-Supported Dock with Fill

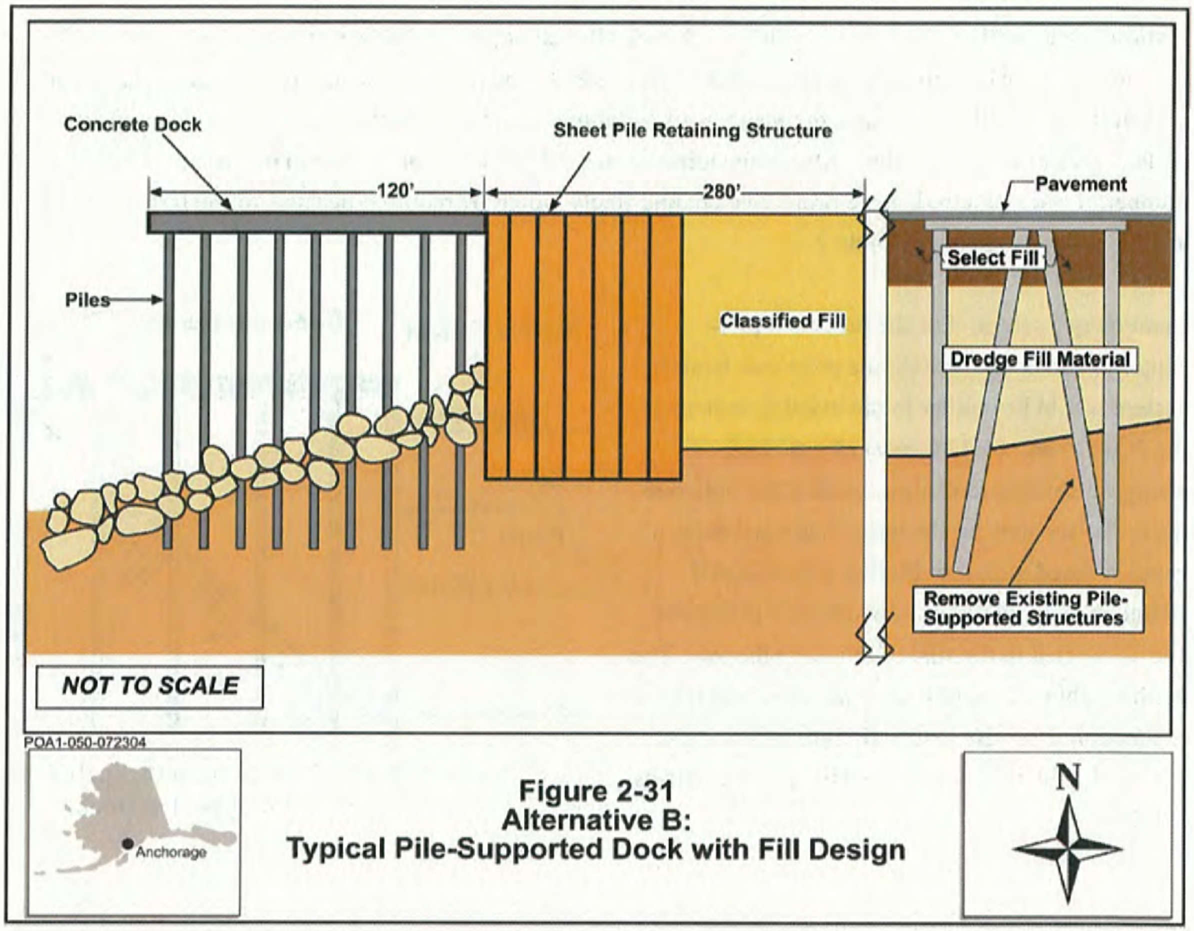

Figure 2-31
Alternative B:
Typical Pile-Supported Dock with Fill Design

Table 2-10 Fill Material Required for Alternative B (per Construction Area)

Area	*Acres*	*Cub Yards/Total Fill*	*Tons/Total Fill*
1	13.2	973,000	1,264,900
2	15.6	1,581,000	2,055,300
3	18.9	1,869,000	2,429,700
4	18.2	1,732,000	2,251,600
5	29.9	1,733,000	2,252,900
6	14.5	1,186,000	1,541,800
Total	**110.3**	**9,074,000**	**11,796,200**

Crane System. For the pile-supported dock alternative, the outboard crane beam is usually cast into the concrete dock substructure, and extends below the deck. The beam is heavily reinforced to handle the extreme bending and shear loads. Additional piles are required to support the crane loads, and it is a common practice to provide an additional pile cap with pilings between the primary rows (or bents) of piles. Therefore, if the primary bent spacing is 20 feet, the crane beam pile caps and pilings would be spaced at 10 feet on center to provide the necessary support for the crane beams.

Cathodic Protection. For the pile-supported dock alternative, the cathodic protection system would be the same as for Alternative A. However, the area of steel to be protected would include the outer surface area of the sheet pile face (since the inside wall is not in contact with seawater) and the entire exposed surface area of all 4,005 piles. Also, depending upon the final selection of design pile diameter and number of piles required, more protective coating likely would be required because of the larger surface area of exposed steel (see Table 2-5).

Fendering System. For the proposed pile-supported dock alternative, the proposed fender system would be similar to the existing system at the POA. This would consist of a rubber, energy-absorbing fender mounted to the concrete deck. To account for the large tidal variations, a panel covered with low friction tiles made of synthetic resin would be supported by pipe piles and connected to the rubber fender at the top. The berthing ship would strike the panel, which would in turn compress the fender (Figure 2-32). Figures 2-33 and 2-34 are photos of existing fender panels at POA.

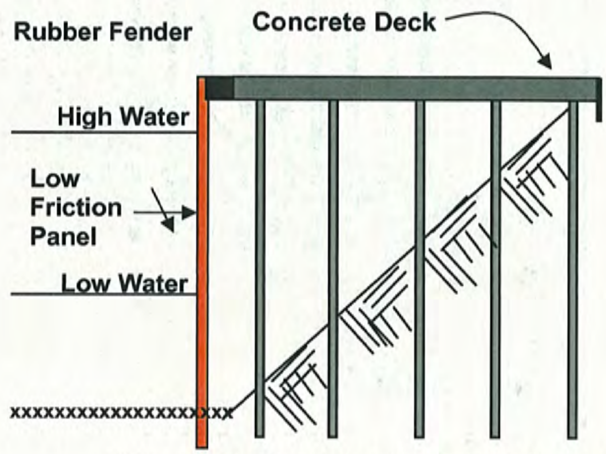

Figure 2-32 Cross-section through Schematic of Pile-Supported Deck

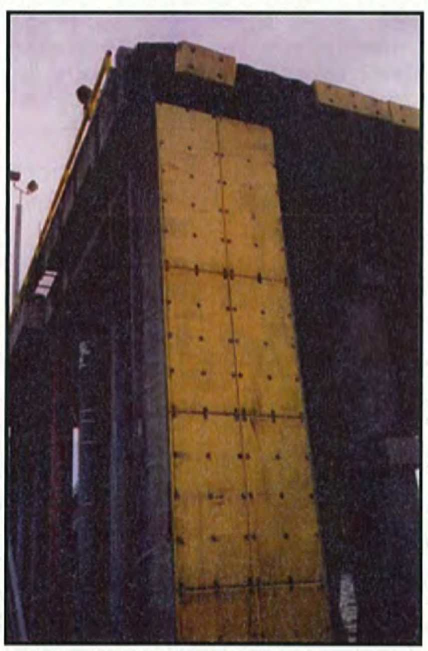

Figure 2-33 Close-up of Fender Panel at the POA

Figure 2-34 Fender System at the POA

Drainage System. Because an open cell sheet pile design behind the dock is prescribed by seismic requirements, Alternative B retains all the issues associated with drainage and structural stability described previously for Alternative A. For Alternative B, storm drain outfalls penetrate the bulkhead at the rear of the structure and typically come out along the armored slope. A concrete headwall is constructed to protect the outfall from tidal fluctuations and currents, which act to scour around the pipe. The outfalls may be located at virtually any location along the pile-supported dock. The number and location of outfalls does not typically have any impacts on the structure. The outlet would extend to beyond any piling to prohibit potential for scour at the pile interface with the mudline.

Drainage of the pile-supported dock itself would be accomplished by installing 2-inch to 4-inch diameter holes through the deck, and scuppers (curb openings in the bullrail) along the dock face. Drains would be provided for every bent, and the deck would be sloped toward the drains.

Utility Systems. For Alternative B, the water supply line would run parallel to the dock behind the bulkhead structure (i.e. in the fill). Lateral lines would run perpendicular to the dock to water vaults that are installed at the edge of the dock or in the bullrail, if present. The lateral lines could be installed in a larger sleeve with insulation and/or protected by electric heat tracing. Water lines installed through the bulkhead structure would be installed in steel sleeves for protection from impact, but not from weather. The water lines may be cast into the concrete deck or pile caps, or run inside utility trenches for access and maintenance. Installation details for the water lines would be dictated by the structural design of the dock, whether it is predominantly cast-in-place, precast, or includes a ballasted deck. In either case, the design would include electrical provisions to keep the water lines from freezing.

Electrical service for the pile-supported dock alternative would be provided in conduits embedded in the concrete deck or pile caps, or run inside utility trenches for access and maintenance.

2.2.5 Design Alternative C: Combination of Sheet Pile and Pile-Supported Dock Construction

The combination design alternative would consist of using the sheet pile design method as described in Alternative A for all areas except one, probably Area 4, where subsurface soils improvements may be required. Area 4 would be constructed using the pile-supported dock design (Figure 2-35) as described for Alternative B. Slightly less fill material would be required for Alternative C (11.7 million cubic yards or five percent less than Alternative A) because of the need for less fill in Area 4 (Table 2-11). Area 4 was chosen for the pile-supported dock design because it contains pockets of sand interspersed with Bootlegger Cove Formation clays.

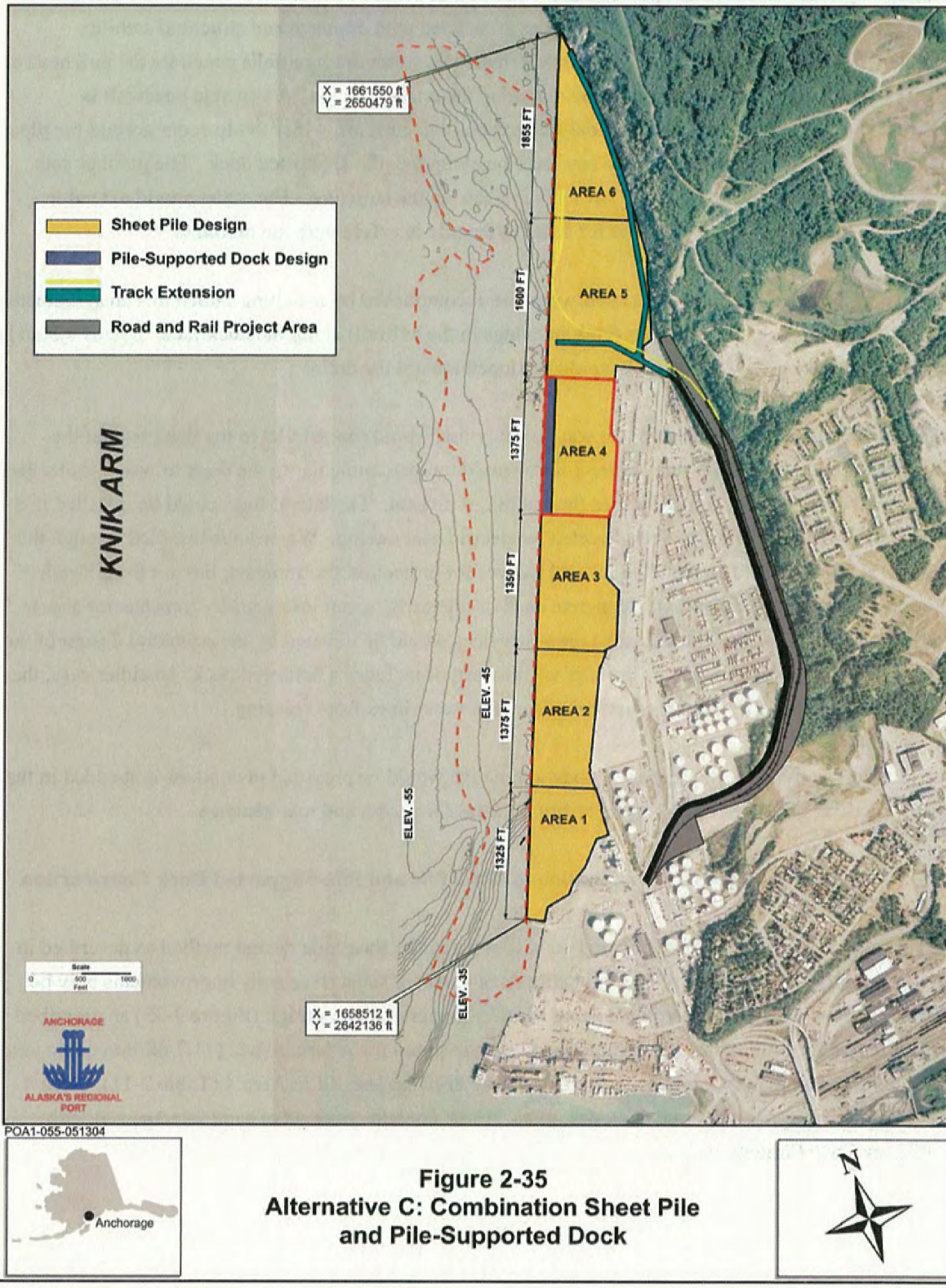

Figure 2-35
Alternative C: Combination Sheet Pile and Pile-Supported Dock

Table 2-11 Fill Material Required for Alternative C (per Construction Area)

Area	*Acres*	*Cubic Yards/Total Fill*	*Tons/Total Fill*
1	17	1,425,000	1,852,500
2	19	2,123,000	2,759,900
3	23	2,398,000	3,117,400
4	18.2	1,732,000	2,251,600
5	34	2,310,000	3,003,000
6	20	1,754,000	2,280,200
Total	**131.2**	**11,742,000**	**15,264,600**

From an engineering standpoint, Area 4 has potentially the weakest foundation soils of the Project. These soils may have the potential to become unstable during a seismic event. Engineering analysis shows that the safety factor for global stability during an extreme seismic event in this area is about the same for both the sheet pile cell concept and the pile-supported dock concept. However, there is a more detailed historical record concerning the behavior of pile-supported docks during seismic events resulting in a more complete database for developing construction details to accommodate seismic stresses in this type of structure. This is due in part, to the prevalence of this type of structure in the marine environment. For these reasons, Area 4 was selected as an area that may require the pile-supported dock, as part of an alternative examining the combining of the two design concepts.

Crane System. For the combination sheet pile and pile-supported dock alternative, the crane beam would extend along Areas 3 through 5. In Areas 3 and 5, the beams would be supported on piling driven through the fill. In Area 4, the outboard crane beam may be cast into the concrete dock substructure, and extend below the deck. Additional piles would be required in this area to support the crane loads as described for Alternative B.

Cathodic Protection. The cathodic protection system for Alternative C would be similar to that described for Alternative A as the majority of exposed steel would be from the sheet pile design with this alternative. Both the seaside and landside faces of the sheet pile would be in contact with a corrosive environment and would need to be protected. As with Alternative A, a decision would be made whether to apply a protective coating to all faces including the tail walls or to the seaside face only. This decision would incorporate a balance between the capital cost of protective coating, and the capital cost of the impressed current system and associated energy use.

Fendering System. Alternative C would use a combination of fendering systems. For all areas except Area 4, a floating fender system is proposed. To provide a smooth contact surface for the fender, a panel may be secured to the sheet pile cell. In Area 4, the proposed fender system would be similar to that currently used at the POA.

Drainage System. As with the other two alternatives, the combination sheet pile and pile-supported dock alternative would require minimization of the number of outfalls due to harsh environmental conditions at the POA. Placement of outfalls may be determined based on structural evaluations of areas where loading on the bulkhead structure is less severe. The drainage system would be similar in Area 4, although storm drain outfalls would be located further east, where they would penetrate the bulkhead at the rear of the structure and daylight along the armored slope.

Utility Systems. For most areas of Alternative C, the flexibility of Alternative A would be maintained for installation of utilities due to the lack of substructure elements under the areas with sheet pile and fill. However, Area 4 would require accommodations for running utilities through the water side portion of the pile-supported dock as described for Alternative B.

2.3 No-Action Alternative

NEPA and CEQ regulations require analysis of a no-action alternative to assess environmental consequences that would occur if the proposed action were not implemented. Under the no-action alternative, the POA would not implement the proposed Project. The POA would not be expanded to increase capacity and operational efficiency, and no improvements or upgrades would be made to obsolete facilities, backland operations, equipment, or tracking systems that increase efficiency and security. However, the no-action alternative must include major rehabilitation of existing structures. The POA has been operating for 25 years beyond its original design lifespan, and the structural integrity of the supporting steel infrastructure has been greatly reduced by corrosion and deterioration. Consequently, in order to reduce the risks of structural instability and continue to operate the POA in a safe and responsible manner, the no-action alternative would require implementation of the following component actions:

- a long-term program to repair and/or replace corroded steel piles, deteriorating concrete structural elements, and other facility elements that are past their design life;
- replacement of the obsolete and poorly-functioning cathodic protection system to help slow future corrosion; and
- increased maintenance requirements and costs in the future as other existing facility features further exceed their design lifespan. This would include rapid implementation of deferred repair or replacement projects identified in previous inspection reports, as well as more responsive or proactive maintenance efforts in response to future inspections.

These actions would require extended periods of restricted access to existing terminals and, in some cases, closure of specific berths during periods of replacement or repair, resulting in long delays and temporary but lengthy disruptions in cargo loading and unloading operations. Such closures would be implemented at the same time that the POA was trying to balance the rising demand for consumer goods and the need to support military deployment during national emergencies. Such closures would violate the criterion in Chapter 1 requiring that throughput of goods and services be maintained in order to supply required consumer goods to Alaskans.

2.3.1 Conditions for the No-Action Alternative

Structural Integrity. The major facilities at the POA were designed for a life expectancy of 20 years. Terminals 1, 2, and 3 were completed in 1959, 1970, and 1977, respectively. All of these facilities are substantially beyond their original design life expectancy. In the years since original construction, the underlying infrastructure has been steadily degrading due to corrosion of the steel piles and deterioration of the concrete structural elements such as pile caps and concrete decking. Under the no-action alternative, the current rate of corrosion of structural components would continue to increase over time. Periodic analyses of the structural integrity of the port infrastructure indicate that many steel piles are near or below design standards. The annual POA inspection in 2003 rated the pile conditions at POA Terminals 1, 2, 3, and POL No. 1 as poor (R&M 2004). Other important findings in the inspection included the following:

- The fendering systems on Terminals 1, 2, 3, and POL 1 are in significant need of repairs and 15 fender panels were observed to be missing. There is a severe corrosion zone from extreme low water to about +10 feet MLLW.
- On Trestle 3, two of the four support piles have completely corroded through since 2002 and provide no support to the trestle. Traffic loads have been restricted to less than ten tons. Other piles appear to be corroding at an accelerated rate.
- An estimated 240 piles (out of a total of about 1,000 piles exposed below the MLLW line) showed signs of concave weld profiles, which can weaken the piles and eventually result in total weld consumption and no support capacity. Such welds require strengthening and repair. In 2002, a small maintenance project repaired 25 piles with a pile clamp sleeve (out of a total of 69 piles scheduled for repair), but such repairs are not considered permanent; they only serve to strengthen the subject piles until other improvements can be scheduled. The inspection report noted that there could easily be many more cracked and corroded piles, but visibility is limited by tidal access limitations and the density of pile distribution. Because the corrosion zone extends somewhat below extreme low water, and is visible for only 30 to 45 minutes on about six days per year, there are probably corroded butt splices that are never exposed to view or are exposed for a very limited duration. In POL 1 and Terminals 1 and 2, there are about 925 piles that extended into the corrosion zone at the time of construction, and the condition of the butt splice locations on these piles is not known. The longer that needed repairs are deferred, the more likely it is that complete replacement of piles would be required under the no-action alternative.
- Thirteen piles with partial or complete corrosion consumption of butt welds were noted (the 13 piles must be strengthened in the spring of 2005 to regain strength. However, these temporary repairs will not provide additional lateral strength to compensate for that lost from the corrosion).

- Several piles within the south end of POL 1 display evidence of corrosion pits extending completely through the pile walls. Other measurements of pile wall thickness indicate an average thickness as low as 0.17 inch in POL 1 and Terminal 1, and minimum thicknesses as low as 0.1 inch. For comparison, the original pile wall thickness at the time of construction was 0.44 inches and the minimum design thickness (allowing for 20 years of corrosion) was 0.38 inches.
- A corrosion survey completed in 1998 and 1999 indicated that most of the piles are not getting adequate cathodic protection. Most piles are therefore corroding at an unprotected high rate (R&M 2004).
- Trestle 1B has full depth cracking and cracked beams at all supports and flexure cracking in the concrete beams at midspan. This type of cracking reduces the structure's capacity to safely carry its intended loading. The West Trestle is also severely cracked and two batter piles have sheared off at the underdeck attachment. The lateral capacity is estimated to be 33 percent less than originally designed.
- Although the concrete deck currently functions to transfer loads both longitudinally and transversely, this should not be relied upon. Structural failures due to shear failure in concrete beams and/or pile buckling are usually sudden and unpredictable, and result in significant deformation or collapse.

The increasingly degraded condition of supporting piles, and the limited effectiveness of isolated pile repairs under present conditions (refer to section 1.3.1), suggest an increasingly higher risk of structural failure and a progressively lower safe loading capacity over time. The 2003 inspection (R&M 2004) and those from previous years identified numerous repair and maintenance requirements, many of which have not been addressed. Some of these recommendations include:

- Repairing the fendering systems on Terminals 1, 2, 3, and POL 1.
- Replacing pile to reduce the risks associated with thinning pile walls.
- Strengthening the West Trestle as soon as practical and restricting regular traffic until repairs have been made.
- Limiting traffic over Trestle 3 to smaller vehicle traffic until repairs have been completed.
- Continuing maintenance dredging and other general facility maintenance operations.

Seismic Risk. The POA infrastructure under the no-action alternative would be subject to substantial and increasing risk of collapse during a significant seismic event. According to the most recent inspection report (R&M 2004), while many of the corroding piles are still able to support vertical loads for which the dock was designed, "the capacity of the dock to withstand significant earthquakes is substantially diminished and there could be a collapse of portions of the pier in a significant earthquake event." Anchorage is one of the highest risk areas and most seismically active areas in the world, and port design guidelines for earthquake resistance have evolved dramatically in the 45 years since the POA was constructed. Combined with the ongoing and increasing rate of corrosion, the use of outdated seismic design guidelines and construction methods from more than 40 years ago that do not meet modern engineering standards for seismic resistance suggest an increasingly higher risk of severe earthquake damage.

Under the no-action alternative, a considerable amount of retrofitting and structural upgrades, or more likely the complete replacement of all piles and other structural features, would need to be implemented to improve the structure's ability to withstand seismic events. During the 1964 earthquake, the present Terminal 1 structure did not collapse, but it was substantially damaged in many locations with sheared connections between piles and pile caps, vertical displacements, and damage to the crane support system. Current seismic design standards for structures in Anchorage, as recommended for the Project by the MOA Geotechnical Advisory Commission, exceed that of the 1964 earthquake. Because of the characteristics of the original POA design, retrofitting the existing structure to meet current seismic design criteria would be very difficult, if not impossible, to achieve. However, replacement of steel piles and other elements of the structure would improve structural integrity and lower the seismic risk to the extent possible under current design conditions.

Continued Growth in Demand for POA Services. As previously discussed, the existing POA structure cannot meet current needs and demands nor the demands from continued growth, due to the undersized operational surface areas of the dock and yard, limitations of ship size and draft, and the limited infrastructure. Under the no-action alternative, current and projected capacity constraints and the relatively shallow water depth would increasingly limit the ability of the POA to satisfy this growing demand. Currently, the annual throughput of two of the five types of cargo transported through the POA exceeds the SPC of the POA facilities, and by 2025 it is projected that annual throughput of four of the five cargo types would exceed not only the SPC but the MPC as well. The demand for goods in Alaska is expected to continue to increase as a function of population and economic growth, and it is already straining the capacity of the POA. Under the no-action alternative, it is likely that the POA, with no additional capacity, would effectively become a bottleneck in the supply of goods to Alaska, thereby constraining economic growth in the state.

Similarly, the 38-gage cranes at the POA have exceeded their design life. The 38-gage cranes are no longer an industry standard and replacement cranes logically would be 100-gage cranes to allow complete reach across modern container ships. However, the existing dock apron is only 70 feet in width and is insufficient for 100-gage cranes. In addition, the existing substructure was not designed to support the additional weight of 100-gage cranes. Thus, crane replacement is not feasible with the existing dock configuration.

Increasing Constraints on SPC/Reduced Levels of Service. Under the no-action alternative, as storage and transport capacity of the POA is reached, conflicts with existing users and delays in ships using existing berths are expected to increase over time. POA capacity would be further restricted and levels of service further reduced during extended periods of construction necessary to repair and/or replace corroded steel piles and other structural elements at each berth. In addition, the POA would not be able to accommodate the newer, larger, more efficient ships that require larger and deeper berths and larger cranes. Failure to provide additional berth space and storage capacity, as well as deeper water at each berth, would result in increasingly restrictive capacity constraints, reduced levels of service to shipping companies, delays in the delivery of needed goods, and an overall increase in the cost of living. In addition, the increased congestion associated with time delays in off-loading would increase both operational safety risks and potential environmental impacts.

Constraints on Military Deployment and Strategic Seaport Requirements. Under the no-action alternative, military supply shipments currently conducted by commercial carriers would continue to be accommodated. However, projected requirements for large force deployments in support of the global war on terrorism or for other national security objectives would be restricted by capacity constraints, a lack of sufficient staging area, and an inability to use larger ships due to water depth limitations and berth size. Security infrastructure and rail and other intermodal support facilities would also not meet identified requirements to support the Strategic Commercial Seaport mission.

If the Stryker Brigade Combat Team needed to deploy with the current POA configuration, there would be approximately ten to twelve acres of staging area available rather than the 40 acres recommended by Strategic Defense Deployment Command. Major deployments that would otherwise use the LMSR ships to maximize efficiency would be limited to the use of smaller Cape Henry class ships that are 750 feet long and draw less than 30 feet of water. The process to load these ships for deployment would be to stage some of the equipment in the POA staging area, and then bring in a ship for three to four days to load at one of the existing container berths. During the loading process, these likely could be a 3,000-foot security buffer between military and commercial ships at the POA. When loaded, the military ship would depart the berth, which would then become available for a commercial operator to bring in another shipment while the military is staging another portion of the Stryker Brigade Combat Team equipment. This entire process would require approximately 3 to 3.5 weeks to fully deploy the Stryker Brigade Combat Team, as compared to an estimated eight to twelve days if the larger LMSR ships could be used. In case of national emergency, the military could take over all POA berths and could load ships simultaneously in a shorter timeframe. This would not allow for commercial shipping operators to bring in cargo for up to two weeks. Given the "just-in-time" nature of goods and supplies to Anchorage, such restrictions on commercial dock use would likely result in food and other shortages.

2.3.2 Component Actions of the No-Action Alternative

Repair or Replace Steel Piles. Under the no-action alternative, all exposed steel piles supporting the existing POA (approximately 1,000 piles) would need to be repaired or replaced in order to improve the structural and seismic integrity of the POA. Various methods are available to repair or replace piles that are damaged, corroded, or have exceeded their useful life. In general, these methods involve selective repairs, strengthening, or replacement. As noted previously, selective repairs provide some degree of strengthening but are considered to be only temporary solutions. Depending on the method selected, the work may be completed from the deck level, from below the deck with divers, or a combination of topside and below-deck work. The quality of the work and the level of disruption to existing operations is greatly influenced by the method selected. Three potential repair/replacement methods are discussed below.

Repair Below the Deck. Repairs in the corrosion zone may be accomplished by installing a steel sleeve around the corroded section of pile and either welding the sleeve to the existing pile or filling the sleeve with epoxy grout. In either case, the sleeve must extend beyond the damaged area to sound pile. The most severe corrosion zone is estimated to be from about +10 to -10 MLLW, and the overlap should be five to seven feet to transfer loads, requiring a sleeve of up to 34 feet in length. Handling a steel sleeve of this length below the deck, under tidal conditions, would be extremely challenging. Also, this type of repair would not work near the back of the existing dock where the mudline is at or above MLLW. The silt would have to be removed or an alternate approach would be required. In addition, the period of time that the corrosion zone is accessible is limited to short periods of extreme low tides that occur over four or five days about once a month. High currents, zero visibility, cold water, extreme tidal variations, and density of piling beneath the dock also complicate the repair efforts. For these reasons, the quality of this type of repair would be compromised and the cost would be very high. Such repairs are also temporary, perhaps extending the design life of each pile by five to ten years, and they do not provide any appreciable increase in seismic resistance. For these reasons, this repair method is not recommended.

Strengthening Existing Piles from the Deck. The existing 24-inch diameter piles may be strengthened by driving a smaller (18-inch) diameter pile within an existing pile. This would be accomplished by demolishing a section of the existing concrete deck and pile cap over the existing pile, removing the sand and gravel within the pile, and driving a closed-end 18-inch diameter pile inside to the same tip elevation as the existing pile. The annulus would be grouted, and the 18-inch pile would be filled with sand and gravel or concrete. The section of pile cap and decking would be repaired with new reinforcing and concrete.

The majority of this work would be accomplished from the existing deck, which could impact existing cargo loading and unloading operations. It is envisioned that portions of the existing dock, 300 to 400 feet in length, could be completed in a single construction season. The area would be closed for construction, and the existing tenants would have to shift or halt their operations to allow construction to proceed. This retrofit work would take six to eight years to complete and could extend the design life of the dock by 20 years or more. In addition, since accommodating existing customers during the construction period is a primary goal of the POA, it would be necessary to construct additional marine structures to accommodate the berthing of ships during construction. This type of repair would provide only a marginal increase in seismic resistance and is also very expensive, on the order of $40,000 per pile, which would greatly exceed the cost of installing new piles. For these reasons, this repair method is not recommended.

Replacement of Existing Piles. Another approach to retrofitting the existing dock consists of demolishing sections of the existing concrete deck and installing new 24-inch diameter pipe piles between the existing pile bents. The existing deck essentially acts as a working platform for the new construction. Upon completion of pile driving, or after a large enough section is completed, the existing concrete deck and pile caps could be demolished, and existing deteriorated piles removed, as required. Using the new piles for installation of formwork, new pile caps and concrete deck would be constructed to essentially replace the existing dock in place.

This approach would require taking over portions of the existing terminal, similar to the strengthening method discussed above. Consequently, this type of retrofit would require six to eight years to complete, with substantial disruptions to existing operations. It would extend the design life of the dock by 20 years or more. This type of construction is also very expensive and time consuming due to restricted working areas and multiple operations required to complete the work. This action would also address the seismic risk issue described earlier to the extent feasible under current design conditions. However, it would not be feasible to retrofit the current infrastructure to completely meet modern seismic design standards. As described above for the steel pile insert method, the full pile replacement approach would also require construction of additional marine structures to accommodate the berthing of ships during construction. Considering costs, strength and stability of the resulting dock, and relative degree of seismic resistance, this method would be the recommended approach for strengthening and stabilizing the POA under the no-action alternative.

Replace Cathodic Protection System. The existing cathodic protection system, like the piles it is designed to protect, is beyond its useful life and is no longer effective in limiting further corrosion. This system is in need of complete replacement, particularly to protect new, strengthened, or repaired piles as described above. This involves installation of wiring from a power source to piles, reinforcing steel, and anodes. A majority of this work would be performed below the dock with divers and, as previously described, under severe conditions. Such a system does not repair existing corrosion damage. It would therefore not eliminate the need for replacement of existing corroded piles.

Deferred Maintenance Projects and Ongoing Maintenance Programs. Under the no-action alternative, the POA would need to be more aggressive in implementing deferred maintenance and repair or replacement projects identified in previous inspection reports (e.g., trestle repairs, replacement of missing or damaged fenders, etc.). The POA would also need to be more responsive to future maintenance requirements in order to extend the useful life of existing facilities, most of which have far exceeded their original design lifespan. Maintenance dredging would continue to occur according to the same schedule and operational procedures currently implemented.

2.4 ENVIRONMENTAL IMPACT ANALYSIS PROCESS

The management approach for the EA and associated efforts is a unique cooperative effort between MARAD and the POA designed to fulfill both the spirit and letter of NEPA, while streamlining the environmental process. As the *lead agency*, MARAD provides contractual, technical, and regulatory oversight for the Project. MARAD works closely with the *proponent*, the POA, to ensure schedules and requirements are met and the Project is completed as planned. As the proponent, the POA defines the purpose and need for the proposed expansion as well as the components of the proposed Project. The POA provides overall control of and direction for the Project, including establishing schedules and goals. As such, MARAD and the POA set the approach used in the environmental impact analysis process.

Under NEPA, other agencies can serve in coordinating roles due to their responsibility over lands, resources, or permits. In these roles, the agencies provide data and identify issues for input to the analysis, conduct reviews of NEPA and permitting documentation, and assist in streamlining the regulatory process. The USACE, Alaska District, who is responsible for issuing a Section 404 Permit under the Clean Water Act, is a coordinating agency for the Project.

2.4.1 NEPA Approach

This EA was prepared by MARAD and the POA in accordance with NEPA, CEQ regulations implementing NEPA, and procedures established by MARAD. This EA also adheres to the goals of streamlining processes as embodied in EO 13274, *Environmental Stewardship and Transportation Infrastructure Project Reviews*, its associated Memorandum of Understanding, and Section 1309 of the *Transportation Equity Act for the 21st Century*. Under this approach, MARAD and the POA streamline and coordinate all environmental investigations, reviews, permitting processes, and consultations as a single process for compliance with all applicable environmental requirements to the extent practicable. As noted above, any coordinating agencies provide support for these efforts.

Using best available data as required by NEPA regulations, this EA examines the affected environment; considers the current conditions of the affected environment; and assesses the direct, indirect, and cumulative effects of implementing the proposed action on the affected environment. The following outlines the steps involved in the preparation of this EA.

1. *Conduct Scoping*. Scoping was the first major step in identifying relevant issues to be analyzed in depth and eliminating issues that were not relevant. For this process, comments were solicited from the public, native organizations, local governments, federal and state agencies, and interest groups to ensure their concerns and issues about the proposal were included in the analysis. In January and February 2004, MARAD and the POA held scoping meetings with the public and with agencies to request input on the proposal (Appendix A). The public scoping meeting was held in Anchorage on January 15 and scoping comments

were collected between January 15 and February 15, 2004. Agency scoping meetings were held on January 12, February 26, and June 24, 2004.

2. *Conduct Data Collection.* Based on the location and nature of the proposed action, the affected environment was defined and data on the existing (or baseline) conditions were collected. Data collection involved site visits; review of existing literature, maps, and reports; performing technical studies; and conducting interviews with knowledgeable persons from local, state, and federal agencies.
3. *Perform Consultation and Coordination.* From January 2004 onward, MARAD and the POA consulted and coordinated with numerous agencies (e.g., State Historic Preservation Office [SHPO], USFWS, NOAA, ADNR, among others) in accordance with requirements of Intergovernmental Interagency Coordination of Environmental Programs and other specific regulatory requirements. Section 2.4.2 below provides more details on consultation and coordination.
4. *Prepare a Draft EA.* After relevant issues were identified in the scoping step, the environmental impacts of each alternative, including the no-action alternative, were analyzed. Results were described in the draft EA, the first comprehensive document for public and agency review. The draft EA was available on a website (www.portofanchorage.org) and at the Loussac Library. Notification of document availability was published in the Federal Register (MARAD 2004a) and the document was made available through the DOT Document Management System (http://dms.dot.gov). Copies of the document were provided on request.
5. *Provide a Public Comment Period.* A public comment period was originally held from August 11 to September 10, 2004. At the request of the NOAA, the comment period was extended until September 17, 2004 (MARAD 2004b). The goal during this process was to solicit comments concerning the analysis presented in the draft EA. MARAD and the POA received comments from the public, and federal, state, and municipal agencies.
6. *Prepare a Final EA.* Following the public comment period, a final EA was prepared. The final EA considered all comments and provides MARAD decisionmakers with a comprehensive review of the proposed action and alternatives and their potential environmental consequences. Changes in the final EA that reflected public and agency comments included an expanded alternative selection process (section 2.1); addition of management actions to the proposed action (section 2.2); and expanded direct, indirect, and cumulative impact discussions concerning biological and other resources (sections 3.4 and 4.1). A summary of comments received during the public comment period is included in Appendix H.
7. *Issue a FONSI.* As the analysis in this document demonstrates, the proposed action would not result in any significant adverse impacts that would not be adequately mitigated through the proposed action, it is the intention of MARAD to issue a FONSI, or a mitigated FONSI, no sooner than 30 days after the publication of this document. MARAD and the POA will

provide copies of the Final EA and FONSI to the public and agencies at local repositories and on the POA website at www.portofanchorage.org.

2.4.2 Other Regulatory and Permit Requirements

Completing the environmental process for the proposed Project involved fulfilling several other regulatory and permitting requirements, as described below.

Transportation Act 4F/106 Programmatic Evaluation: Assessment of effects to 4(f) properties as required under the Transportation Act of 1966 is discussed in section 3.4.4. This assessment includes a discussion of whether the Project would affect any significant cultural resources (see section 3.4.7).

Section 810: The Alaska National Interest Lands Conservation Act, Section 810 provides that "no withdrawal, reservation, lease, permit," or other disposition of public lands, which would significantly restrict subsistence would occur without an evaluation. Evaluation of effects to subsistence is discussed in section 3.4.1.

Section 404 (Wetlands) of the Clean Water Act: A Section 404 permit is required under the Clean Water Act (33 United States Code 1344, Section 404) when wetlands or jurisdiction waters of the U.S. are affected by the discharge of dredged or fill material or construction activities. The POA is applying for a Section 404 permit from the USACE, Alaska District. This permit is required because of the need to fill approximately 135 acres of tidal mudflats west, northwest and southwest of the POA. The necessity for building in the tidelands is presented in section 2.6. The Section 404 permit application is being reviewed.

Coastal Zone Consistency Determination: The Federal Coastal Zone Management Act authorizes a state to review federal activities and federally permitted activities within or affecting the coastal zone. The POA is located within the MOA Coastal District and is governed by the Alaska Coastal Management Program (ACMP) as well as the Anchorage Coastal Management Plan. Projects that occur within the Alaska Coastal Boundary, as defined by the Alaska Coastal Management Act, are subject to a review to determine if they are consistent with the state and local coastal management programs when certain state or federal permits are required (such as a USACE Section 404 permit). The Project requires a Section 404 permit and therefore requires a coastal zone consistency determination. A finding of consistency with the ACMP must be obtained before permits can be issued for the Project. The lead agency for the local permitting review of the Project within the MOA Coastal District is the MOA's Department of Community Planning and Development.

The consistency review also serves as the review process for most permits needed from state resource agencies. State agencies reviewing the consistency permit include the Alaska Departments of

Environmental Conservation (ADEC), Fish and Game (ADFG), and ADNR. The lead coordinating agency for the state's permitting review of the Project within the state's coastal zone is the Office of Project Management and Permitting in the ADNR. Upon completion of the review the Office of Project Management and Permitting issues a "consistency determination," which triggers the issuance of state permits and also allows any federal permits to be finalized. An ACMP permit application is being reviewed. More information on coastal zone consistency is presented in section 3.4.1.

Endangered Species Act: MARAD and the POA entered into discussions with the USFWS concerning endangered species in January, 2004. The USFWS requested that the EA contain analyses of effects on wetlands and migratory birds. These issues, as well as issues relating to EFH, threatened and endangered species, beluga whales, and others are discussed in sections 3.3.4 and 3.3.5.

Magnuson-Stevens Fishery Conservation Management Act (MSA): The MSA establishes procedures designed to identify, conserve, and enhance EFH for species regulated under the Federal Fisheries Management Plan. The MSA requires all agencies to consult with NOAA Fisheries on all actions or proposed actions that may adversely affect EFH. As part of the consultation process, this EA serves as the EFH assessment for the proposed Project area.

Consultation and Coordination with Indian Tribal Governments: In accordance with EO 13175 MARAD initiated government-to-government consultation with the Native Village of Eklutna, the Native Village of Tyonek, the Knik Tribal Council, the Ninilchik Village Traditional Council, Kenaitze Indian Tribe, Seldovia Village Tribe, and the Native Village of Chickaloon.

National Historic Preservation Act: MARAD and the POA entered into discussions with the Alaska SHPO in September, 2004. On November 1, 2004, the SHPO concurred with a determination that the Project would not affect any National Register of Historic Places (National Register)-eligible historic properties.