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# REPORT TO THE ANCHORAGE ASSEMBLY

## PORT OF ALASKA MODERNIZATION PROGRAM REVIEW AND ANALYSIS

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## Abbreviations

A - Acre  
ABI - Alaska Basic Industries  
ACDA - Anchorage Community Development Authority  
Administration - Municipality of Anchorage Administration  
ADOT - Alaska Department of Transportation  
AM - Assembly Memorandum  
ASCE - American Society of Civil Engineers  
Assembly - Municipality of Anchorage Assembly  
B - Billion  
CM - Construction Management  
CMAR - Construction Manager at Risk  
CM/GC - Construction Manager/General Contractor  
CLE - Contingency Level Earthquake  
D/B - Design-Build  
D/B/B - Design-Bid-Build  
DBB - Dry Barge Berth  
DBMP - Design Build Maximum Guaranteed Price  
DE - Design Level Earthquake  
DRB - Dispute Review Board  
DSCR - Debt Service Coverage Ratio  
DOD - Department of Defense  
DWT - Dead Weight Tonnage  
ENR - Engineer News-Record  
GAC - Geotechnical Advisory Commission  
KABATA - Knik Arm Bridge and Toll Authority  
ICE - Independent Cost Estimator  
ITB - Invitation to Bid  
Jacobs - Jacobs Engineering Group, Inc.  
JBER - Joint Base Elmendorf Richardson  
FY - Fiscal Year  
g - Gravity  
GEER - Geotechnical Extreme Events Reconnaissance  
GO - General Obligation  
IBC - International Building Code  
IRS - Internal Revenue Service  
ITA - Incidental Take Authorization  
LF - Lineal Feet  
LNG - Liquefied Natural Gas  
LOA - Length Overall  
lo-lo - Lift-on and Lift-off  
M - Million  
MARAD - United States Maritime Administration

MCE - Maximum Considered Earthquake  
MLLW - Mean Low Low Water  
MOA - Municipality of Anchorage  
MOU - Memorandum of Understanding  
MOTEM - California State Lands Commission Engineering Standards for Marine Oil Terminal Design and Maintenance  
Municipality - Municipality of Anchorage  
NMFS - National Marine Fisheries Service  
NE - North Extension  
NES - North Extension Stabilization  
OCSP - Open Cell Sheet Pile  
OLE - Operating Level Earthquake  
PAMP - Port of Alaska Modernization Program  
PCT - Petroleum and Cement Terminal  
P/D/B - Progressive Design/Build  
PGA - Peak Ground Acceleration  
PHGA - Peak Horizontal Ground Acceleration  
PIEP - Port of Anchorage Intermodal Expansion Project  
PM - Project Management  
POA - Port of Alaska  
POL - Petroleum, Oil and Lubricant  
Port - Port of Alaska  
Port Users - Port User Group  
PPM - Pacific Pile & Marine LP  
Project Team - Jacobs and MOA staff working on PAMP  
PSF - Pounds Per Square Foot  
PT - Petroleum Terminal  
P3 - Public Private Partnership  
PDA - Public Development Authority  
RFQ - Request for Quotation  
RFP - Request for Proposal  
ro-ro - Roll-on and Roll-off  
SF - Square Feet  
SWAPA - Southwest Alaska Pilots Association  
T - Terminal  
TAG - The Adherence Group  
USACE - United States Army Corps of Engineers  
USGS - United States Geological Service  
VE - Value Engineering  
WBB - Wet Barge Berth

## Executive Summary

On April 4, 2019 the Anchorage Assembly (Assembly) issued a Request for Quotation (RFQ) to furnish Port of Alaska Modernization Plan (PAMP) analysis and review services. Ascent PGM and subconsultant Northern Compass Group was selected to perform these services.

This report to the Anchorage Assembly and Enterprise Committee reflects months of dialogue with Port of Alaska (Port) users, concerned citizens, businesses, industry leaders, contractors, elected officials, government leaders, stakeholders and more. We want to recognize and sincerely thank all the participants who have spent countless hours working on aspects that matter to all the sectors that depend on the Port and are committed to its long-term success.

Many positive outcomes have been observed such as: greater dialogue between the Port Users Group (Port Users) and the municipal administration (Administration), in-depth information exchange between interested parties and the Anchorage Assembly, detailed discussion about technical aspects of the Port, budget and finance and long term sustainable needs of the users to be able to deliver goods through the Port across Alaska. We were able to witness the great appreciation people have for this important transportation infrastructure as well as the understanding among Alaska residents that groceries, goods, fuel and cement come through the Port. While people did not always totally agree, we witnessed many instances of common ground and basic agreement. In addition, through extensive interviews, meetings and material review, our team was able to break down large amounts of data and information into smaller pieces and generate answers to the Assembly questions posed in the original RFQ.

This report is a result of gathering information and arranging it to highlight key points and recommended action items. We consider this both a summary and a work in progress, as there will be multiple decisions made after submittal of our final report to the Assembly. The report is intended to be a tool to help the Assembly and the Municipality evaluate options and create a successful, funded port for the long term.

This document provides the Assembly and other stakeholders an overview of the Port of Alaska Modernization Program (PAMP), including an analysis of what caused the costs to increase and what options exist to successfully advance the program.

The initial portions of the document provide a brief history of the Port and program followed by a cost increase analysis. The subsequent section looks at Design Criteria components and discusses alternatives and considerations. Review is also done on Design Parameters which contributed to the design requirements. This is followed by evaluation of a range of potential design solutions.

Subsequent sections present information on Port User priorities and discussions, information on funding alternatives and recommendations on program facets including management, funding, planning, programming, design, construction and governance. Finally, we present Next Strategic Action Steps to provide a forward path to success.

Through our work, we have determined that while the working title of the Port has been changed

to better describe the Port's function, many people outside Anchorage do not see it as a statewide port. It is clear there needs to be better understanding and branding of the Port of Alaska as the port that benefits most of Alaska. There also needs to be a more inclusive operations structure and statewide advocacy that touches all those who depend on the Port, such as shippers, household good consumers, the military, cruise lines and all stakeholders. Each group has a unique reason for using the Port but there is thing upon which we all agree: We need a secure port to meet our long-term household, business and security needs.

If the Port of Alaska is expected to continue to serve the citizens, businesses, utilities, industry and U.S. military operations across the entire state, the funding priority must shift from the Municipality of Anchorage (MOA) to the entire state. Without this change, it will be difficult to create the financial support to re-develop the Port of Alaska.

Fully integrating the Port of Alaska as a statewide priority and lowering the overall project costs is possible, and many of the steps outlined in the recommendation section, including project management, funding, planning, programming, design, construction and Port governance/operational management, should be reviewed and acted upon as soon as possible.

It is important to note that to achieve the best results, several items outlined in this executive summary and listed in the next strategic steps section must be done simultaneously and in the very near term. For real change to happen, many of the items we have identified must happen in concert with one another, and not in a piecemeal fashion.

By making the suggested changes, we see a way to save between \$600 million and \$800 million and fund Port repair and modernization projects into the future. There is no single action or person that will accomplish this, but a new approach is required as it relates to project design and management, governance, and financing which will require collaboration and support from consumers, Port Users, the Administration, elected officials, Port tenants and technical experts.

It's recognized that different stakeholders have different needs and constituencies that must be balanced. User groups have product to move and tariffs that affect their profitability. Consumers will be concerned about prices they will have to pay, the safety of the Port, and the long-term impact to the economy if development is not done right. The government has multiple requirements including budget, taxpayer and rate payer limits, community acceptance and Port safety.

The following presents brief descriptions of some key areas warranting immediate attention, with more detail later in the report.

### **Project Management and Build to Budget**

We recommend future major Port projects consider use of the Design Build Maximum Guaranteed Price (DBMP) approach. This approach provides a way to "build to the budget" with an accountability element as employed in the Dena'ina Civic and Convention Center project. This concept creates an opportunity to maximize cost control. The concept is simple: The POA details their needs along with the total amount of money available to spend for the project, based on cash in hand, cash in process and planned dollars over the life of the project.



The MOA then enters into a contract that allows cost control by the contractor guaranteeing costs and controlling cost overruns. This is a change from current approach. It defines the amount of funding available for each phase and then requires the contractor to deliver within that level of funding and timeline. This concept shifts risks to the contractor that they are in the best position to manage and limits the POA design team effort. If this approach is to be successful, it's critical the POA stays at the higher level of definition of the need and does not create prescriptive requirements that limit options. In other words, the POA describes the functional needs and then challenges the design and contracting community to meet that need within the POA's cost constraints.

While there are tradeoffs with using this method if the firm discipline of a design to budget mentality is not employed, the POA will creep back towards an unaffordable higher cost project that is unachievable.

Comprehensive evaluation of options to renovate existing wharf facilities in place has not been performed. These options should be explored, and the tradeoffs carefully considered.

### **Funding Plan, Plan of Finance**

And where will the funding come from? Many different sources. It's not realistic to rely on just tariff increases or one or two taxpayer dollar sources. Instead, it's essential to map out all possible funding sources and then create general schedules from application for funds to possible award. Creating a realistic funding plan and then successfully implementing it is critical to program success. The section of this document entitled Potential Funding Sources presents an identified funding sources review. A cash-flow plan for both revenues and expenses should be built as part of this funding map.

The Plan of Finance must be both flexible and conservative, as all funds will not materialize as initially expected. One key to success is having the project scope and cost aligned with the revenue stream and then making the hard decisions as the program progresses to keep the elements in alignment. Achieving agreement on development related tariffs between the Administration and Port Users will serve as a foundation to broaden outreach to other stakeholders. Applying for and acquiring Port infrastructure funding will be much easier when the Port is fully accepted as a statewide asset.

Development of a balanced Plan of Finance should be a priority with a strong first draft completed in 2019. There is not yet a consensus path to fund the balance of the PCT and the timing of the next phase of PAMP construction is even more uncertain.

As we describe potential funding sources and annual budgeting and appropriation timelines, we emphasize the Plan of Finance section is intended to be the start of an overall strategic approach and action plan to manage each funding track over the next three to five years. There are things outside the direct control of the Project Team that could change the funding sources dynamics, so timing and the ability to execute an effective plan is critical to funding success.

## **Port Governance/Operational Management for the Future**

The Port must gain more statewide support and understanding to achieve its funding needs. In this report we will describe use of a quasi public authority which is the simplest way forward. We recommend changes to the existing governing ordinances to accomplish this, including adding more regional representation and statewide consumer representatives to the Port Commission and other modifications. We also see value in expanding the Port Commission role to include more regulatory and budgetary control and other duties needed to meet the new POA requirements. Anchorage Telephone Utility Authority is an example of an Authority that expanded its role and added non-Anchorage people to their board. Other local examples include the Anchorage Community Development Authority and Visit Anchorage. A new structure could allow formation of a Public Development Authority model which could allow the use of programs such as the Internal Revenue Service (IRS) 63-20 tax-exempt debt financing and more.

We also recommend adding municipal staff solely dedicated to program administration and creation of a Port Commission subcommittee dedicated to program oversight.

## **Tariffs**

Through many conversations with Port Users it is clear they collectively anticipate scheduled changes in the tariff structure and have worked it into corporate financial planning. Tariffs are typically reviewed every 5 years, although the latest version presented to the Port Commission in October 2019 was for 10 years. It would be economically unwise to assume a large tariff hike will pay for needed changes and the cost will be passed on through consumer goods in a market where things are generally more expensive than the rest of the country.

Tariffs should be considered one piece of a multifaceted revenue stream used to finance Port development.

As the current tariff is expiring, now is the perfect time to have discussions on timing and amount of the tariff increases needed to fund the program. While it may not be the right time to significantly raise the current tariff escalation rate, discussions must happen to recognize the timing and confirm it will be within the next agreement. One accepted idea that has come up many times throughout this process is to bank tariff increase income, use it to raise other match funds and save up enough to do some of the larger needed projects.

## **Statewide Community Support**

We note in this report that the understanding of the Port of Alaska by the general public is limited. People understand the importance of the Port but recent issues regarding funding and cost increases have eroded public opinion. Public education and transparency is key to gaining back public trust and building public opinion.

There is significant interest in lowering the overall cost of the program, including reducing the design life, lowering the level of seismic enhancements, evaluation of renovation in place versus new construction, and installation of fuel headers in the cargo berths among some business and community leaders, and also some elected officials.

While a definitive funding plan has not been generated, the Port Users and Administration have been supportive of a general plan where most PAMP funding would come from sources other than tariffs, including State and Federal funding. Both the Users and Administration have noted the need to collaboratively work together in a unified effort to procure grant funding. The Port of Alaska benefits the entire State and it's anticipated a stakeholder coalition would be developed to advocate at the State and Federal levels. This will require a strategy and action plan to keep the stakeholders engaged and supportive.

### **Build Flexibility into the Cargo Berths**

The Administration has suggested combining Roll-on and Roll-off and Lift-on and Lift-off (ro-ro and lo-lo) cargo operations in one joint use terminal that could significantly reduce program capital requirements. We present a conceptual solution that allows this transition to occur in the future and lowers the berth capital costs. We also recommend doing a deeper review of the existing constraints and alternatives that could shape a clearer path to potentially implement a single joint use cargo terminal.

### **Use of PCT High Seismic Costs for Entire Program**

The Administration updated the program cost estimate using information obtained during the Petroleum and Cement Terminal (PCT) design to inform the Plan of Finance discussions. The use of parametric costs was a rough approximation intended to bound the upper level of the overall program capital requirements. Two factors in this effort contributed to a conservative cost presentation. The PCT was designed for high seismic resiliency, which increased pile and superstructure costs. Of the three other remaining new wharfs, the ro-ro berth was the only one programmed to be seismically enhanced. Use of some of the PCT substructure and superstructure parametric costs on the lo-lo and second petroleum terminal berths created extra contingency.

The PCT estimated costs were influenced by information generated during the Construction Manager at Risk (CMAR) process which were higher than the market. The 2020 PCT bid was more than 30% below the engineer's estimate. Use of the same PCT parametric cost numbers for the other three new wharf facilities likely resulted in those estimates being over market value.

The use of the contractor and PCT influenced numbers was a clear primary driver in the 79% cost growth that occurred between November 2017 and October 2018 and have added a high level of conservatism to the current \$1.932B program estimate.

**There are multiple potential forward paths for the Port of Alaska Modernization Program. Developing a consensus solution and implementing fundamental shifts to all the major program elements as detailed in this report will assist in the successful delivery.**

## **Brief History**

The Port of Alaska (POA) has constructed 5 wharf facilities that are currently operational:

- Terminals T1, T2 and T3 used for cargo, passenger and miscellaneous other vessels;
- Petroleum, fuel and lubricants terminals, POL-1 and POL-2. POL-1 is also used for break bulk products, primarily cement.

Construction of the existing Port of Alaska (Port) facilities started in 1958, with T1 going into service in 1961. T1 was the only existing POA marine facility in operation during the 1964 earthquake. Major repairs were done to the T1 concrete superstructure along with significant piling replacement in about 1972 and 1973.

The balance of the main POA wharf facilities were brought into service as follows:

- POL-1 1965
- T2 1970
- T3 1977 with an added access trestle activated in 2001
- POL-2 1990

The POA also has other facilities, some operational and some not, as further described in this section. The Appendix includes graphics showing major existing and future PAMP elements.

The Port issued their last Master Plan on September 30, 1999. The prime consultant was TranSystems Corporation of Oakland, California, with five primary sub-consultants. The report evaluated potential growth rates and opportunities and recommended planning for a doubling of activity by 2020. The report presented three growth rate planning scenarios: high, medium and low. While there has been variability across business lines, the actual aggregate growth rate appears to be between the low and medium scenarios, with a primary driver towards the low end related to container growth being slower than projected. The report contained a facilities subplan with five buildout phases. The first phase included upgrades to the T1 area, with the later phases including access improvements and wharf expansion using pile-supported berths north of the northernmost facility at that time (T3).

The POA development concept shifted from pipe pile-supported marine infrastructure to an open cell sheet pile (OCSP) concept after a change in MOA leadership. Working in conjunction with the United States Maritime Administration (MARAD), the MOA and POA initiated the Port of Anchorage Intermodal Expansion Project (PIEP) in a 2003 agreement. MARAD was primarily responsible for project administration.

The PIEP design concept anticipated installation of OCSP over most of the Port waterfront and was to be installed in multiple construction phases. The vessel berth line was designed to be about 400' seaward of the existing marine facilities, reducing dredging requirements and creating substantial new port upland areas, which had limited unused upland capacity.

Construction of four PIEP structures was initiated:

- Dry Barge Berth (DBB)
- Wet Barge Berth (WBB)

- North Extension 1 (NE1)
- North Extension 2 (NE2)

The WBB and NE1 were designated as Essential Facilities with increased seismic resiliency. Hard sheet pile driving was encountered during construction and all the work was not completed. A new construction contractor was hired to complete the facilities, but the shape of the contract was modified after the magnitude of the damage to the installed sheet pile work was more clearly understood. The new contractor, who had significant previous OCSP installation experience, was able to repair a significant portion of the identified damaged sheet pile by late 2011, using contractually reallocated funding. The estimated cost of the PIEP increased from slightly above \$200 million (M) in 2003 to above \$1 billion (B) in January 2011. On April 11, 2012 MARAD and their Program Manager ICRC presented a Budgetary Cost Estimate. It has been reported “Scenario 2” of this document, which was to complete the north end, was estimated at \$665M.

Of the four PIEP constructed structures, only the DBB is currently operational. NE1, NE2 and the WBB are considered defective and unusable by the MOA and Jacobs staff working on the PAMP (Project Team) and are scheduled for demolition in the current construction program.

The Memorandum of Agreement between the Municipality and MARAD was revised in November 2011 and remained in effect through the end of May 2012. It changed management responsibilities and created a project oversight team called the Port Oversight and Management Organization.

CH2M Hill was awarded a contract to perform a PIEP Suitability Study by the United States Army Corps of Engineers (USACE) on November 11, 2011. CH2M Hill was subsequently acquired by Jacobs Engineering Group, Inc. (Jacobs). Jacobs identified static and global stability concerns with the design and as-built construction conditions of three of the four constructed PIEP structures. Subsequent to the Suitability Study work, they were also awarded another task order to develop concept design options to remedy the existing PIEP construction. The effort identified five initial options. In November 2012 a design charrette was held with certain stakeholders where the options were evaluated. Subsequently, favored elements from Options 1 and 5 were combined in a hybrid entitled Option 5H.

The Administration issued a Project Management (PM) Request (RFP) for a new program in September 2013 and in February 2014 the MOA Assembly (Assembly) awarded the PM contract of the Port of Anchorage Modernization Program (PAMP) to Jacobs. A subsequent name change to the Port of Alaska Modernization Program occurred after the Assembly changed the Port’s name to reflect its statewide significance in 2017. The PAMP acronym did not change.

Another design charrette with certain stakeholders occurred in August 2014. Concept D was selected as the preferred option and presented to the Assembly on November 21, 2014.

After discussions with the Project Team, the MOA Geotechnical Advisory Commission (GAC) recommended in a September 23, 2014 letter that additional seismic resiliency be added to one fuel and one cargo berth to facilitate commodity delivery after a major earthquake. The full level

of seismic resiliency recommended by the GAC and the associated program cost increases had not been incorporated into the program presented to the Assembly in November 2014.

Substantial PIEP litigation has occurred. The MOA sued multiple parties including PIEP consultants and MARAD. The private party lawsuits have been settled. The MARAD lawsuit is ongoing, and MOA has requested more than \$300M in damages. While a firm schedule has not been established, it's possible the lawsuit could be concluded within six months.

The MOA issued an RFP for assistance in developing a Plan of Finance and evaluating Public Private Partnership (P3) alternatives in May 2018. Capstan Consulting was selected along with subconsultant Davenport & Company. Their final report was issued in November 2018. The report included projected required tariff increases, with and without state credit guarantees, for two PAMP program phases. General annual POA revenue requirements were projected to increase from \$11.3M to \$32M (183% increase) for the PCT construction and from \$11.3M to \$197.7M (1,646% increase) for Phase (PH) 2 based on \$1.2B in bonds issuance. The report also provided different Public Private Partnership (P3) frameworks for consideration.

The Assembly issued a Request for Quotation to furnish PAMP Analysis and Review Services on April 4, 2019. Ascent PGM and subconsultant Northern Compass Group was selected to perform these services.

The Port User Group was formed in May 2019 and is made up of various shippers including cargo, cement, petroleum and more.

A facilitated roundtable was held with the Administration, Project Team, Port Users and other stakeholders on June 13 and 14, 2019. Multiple topics were discussed with much of the focus on history of the program and the PCT. While there wasn't comprehensive discussion on how to move forward with the program, the MOA did present a possible forward path involving construction of two new facilities, the PCT and a joint use ro-ro and lo-lo berth.

The Administration introduced Assembly Memorandum 477– 2019 on July 9, 2019 recommending contract award of the initial structural portion of the PCT to be constructed in 2020 in the amount of \$42,156,000 to Pacific Pile & Marine LP (PPM). Work included the access trestle, platform and miscellaneous other work. The PCT is the first major construction phase of the larger PAMP.

The Port Users had submitted a letter listing concerns along with a recommendation to not proceed with the 2020 PCT Invitation to Bid (ITB) award. After multiple work sessions and much discussion, the Assembly approved award of the 2020 PCT Contract on July 30, 2019. As part of the discussions that occurred prior to this award, a value engineering (VE) process was established for the PCT (2020 and 2021 elements).

A five-member review team was established with Jacobs serving as staff. The review team consists of two Administration members, two Port Users and an Assembly consultant. The PPM project manager participated in the initial meetings related to the 2020 work.

The Assembly introduced and approved Assembly Resolution AR 2019-263 entitled “A resolution of the Anchorage Municipal Assembly requesting the Administration to take certain actions on the Port of Alaska Modernization Program in accordance with Assembly’s objectives” on July 30, 2019. Section 2 of the resolution stated, “Work with stakeholders by convening the work group referenced in AM 477-2019(A) to further identify areas of value engineering and cost savings in the Port of Alaska Modernization Program design that would result from eliminating non-essential features, provided that cost saving measure shall not include reductions in life and safety and seismic performance. The work group shall convene beyond current discussion of the Petroleum Cement Terminal and through substantial completion of the Port of Alaska Modernization Program.”

The resolution also requested compliance with GAC seismic recommendations and investigation of VE change proposal clauses in subsequent ITB’s. It’s anticipated the makeup of the work group could change over time as different components of the program come to the forefront.

MOA authorized Notice to Proceed to PPM for the initial structural work on August 18, 2019. This work will be constructed in 2020 and will be followed by another phase to be constructed later, potentially as early as 2021, upon receipt of about \$81M in additional funding.

On October 23, 2019 the Port Commission voted five to four supporting a ten-year tariff intended to fund the balance of the PCT through increased payments from the petroleum and cement users.

## **Additional Background**

The current Program envisions a reduction of one terminal (T3) from the existing five main operational wharfs. The cost of the program was initially presented to the Assembly on November 21, 2014 as \$485M at an 80% confidence level. It was presented as \$1.928B at the January 17, 2019 work session and \$1.932B at the July 12, 2019 work session.

Given the cost escalation and the lack of identified funding, there is not a clear consensus on the program’s ultimate scope or cost. While there was not alignment between the Administration and Port Users on how to proceed on the PCT, there was general agreement that the scope of the remainder of the program needed to be modified to provide a lower-cost solution.

The Port has three primary business lines: cargo, fuel and cement. The amount of cargo deliveries has varied but is currently about the same as in 1999. Fuel deliveries have varied, with major shifts in volume based on industry changes throughout the state. Fuel is delivered to the Port in marine vessels and from a pipeline from Nikiski.

The amount of cement is a function of the vibrancy of the state construction industry and is currently below recent levels.

The utilization rate of the existing five wharfs is relatively low. The major cargo carriers, TOTE and Matson, each make about 102 port calls a year. TOTE uses ro-ro truck-based technology. Matson uses lo-lo crane-based technology. The use rate on their preferential use terminals are

both about 40%. Vessels from both cargo companies are scheduled to arrive on Tuesdays and Sundays. POA receives about 40 petroleum and four bulk cement deliveries a year.

POA services other ships and barges and has been designated as a Department of Defense (DOD) National Strategic Seaport, used by Joint Base Elmendorf Richardson (JBER), the adjoining military base, and other Alaskan military bases. It averaged two deployments a year between 2005 and 2010, transporting an annual average of 3,600 pieces of equipment during this period. The Port has received MARAD guidance on a Preliminary Planning Order for minimum infrastructure requirements based on Surface Deployment Center Minimum Support Requirements. Up to three 1,100' berths are desired. Minimum requirements are not clearly defined but potentially could be interpreted as either one or two berths totaling 1,100' to 1,400'. The Visit Anchorage website listed ten scheduled cruise ship arrivals in 2019.

Maintenance dredging of the Port is done annually and paid for by the USACE through a prescribed line-item limit to the USACE national operations and maintenance activities annual appropriations. Dredging is done to -35 Mean Low Low Water (MLLW). The contractor performing the work is paid to -38 MLLW for over dredging.

The POA is the state's largest general cargo port. There are other regional ports. Port MacKenzie across Cook Inlet in the Matanuska-Susitna Borough has a barge dock and deep-water trestle with significant undeveloped uplands. It is connected to the road system and has a partially completed railroad spur. Its focus is on commercial and industrial development and resource export. The level of activity over the last 20 years has been low. Whittier is about 60 miles southeast of Anchorage. It is an ice-free port with a cruise ship dock and is connected to Anchorage by road and railroad.

Seward is about 120 road miles south of Anchorage and is connected via road and railroad. Seward is an ice-free port with two piers and a loading facility operated by the Alaska Railroad. The passenger pier services cruise ship and light cargo operations. The second pier is primarily dedicated to freight. While the railroad facilities have been considered as a contingency port for TOTE ro-ro operations, the facilities are not fully configured to efficiently accommodate those operations. Seward also has an industrial marine center operated by the City. Prior to the 1964 earthquake Seward received a much larger portion of the cargo shipped to southcentral Alaska. Much of its waterfront was destroyed in that earthquake.

Homer, about 220 road miles south of Anchorage, has a deep draft freight dock and the Pioneer dock, which services the Alaska ferry system and other vessels. The ice-free Port of Valdez, connected to Anchorage via the Richardson Highway, has a container terminal. It has a 700' concrete floating dock, which is extended to 1,200' with two dolphins. The dock is a multipurpose berth which can handle ro-ro and lo-lo operations. There is a grain terminal with nine concrete silos having a total capacity of 522,000 bushels. The Valdez facility has been used to offload large assemblies for road delivery to the Interior as well as munitions for Interior military bases.



## Existing Construction Program

The following section provides additional program information. It provides a current program scope overview, discusses the baseline program evolution, articulates some of the major changes that have occurred subsequent to the baseline program selection in November 2014, and provides information on the current sequencing, status and schedule of the program.

### Current Program

The current PAMP program will;

- Demolish
  - All five major operational wharf facilities (T1, T2, T3, POL-1, POL-2)
  - NE1, NE2 and the WBB
- Stabilize south backlands
- Reconstruct between DBB and T3 with an engineered armor stone-covered embankment
- Construct
  - Four major pile-supported wharf structures
    - PCT
    - T1 (lo-lo)
    - T-2 (ro-ro)
    - Petroleum terminal (PT)
  - Reduced scope port building
- Relocate (south) floating dock

Appendix graphics A-1 and A-2 show current facilities and the new program.

The face of the two new cargo terminals is planned to be moved out 140 feet from the existing location. The wharfs are being designed to accommodate additional dredging in the future to provide a -45 MLLW dredge depth. The Project Team has stated the proposed berth line for the new T1 lo-lo and T2 ro-ro is about -42 MLLW. The lo-lo berth will accommodate four 100-gauge cranes. Gauge is the distance between the crane rails on which the cranes operate. The electric cranes will be powered through cables run in an in-deck vault and the berth will have areas to store ship hatch covers.

The PCT is being placed south of the existing POL-2, off the south backlands. The new PT will be located seaward of the existing POL-2. The ro-ro cargo berth and the PCT are being designed with enhanced seismic resilience based on discussions and recommendations between the Project Team and the municipal GAC. The south floating dock will be relocated south of the PCT.

### Design Evolution

A summary of the design evolution which led to the current PAMP follows.

The Jacobs concept design effort, under USACE contract, initially developed five options which were refined by a group of users and other stakeholders in a November 2012 design charrette.

The focus of the effort was to develop a repair/improvement strategy for the PIEP constructed assets that would best meet the original Wet Barge Berth and North Extension intended uses.

During the charrette, a hybrid of two of the favored options was developed (5H). Some of the charrette's outcomes were to advance concept designs and Options 1 and 5 costing and create Option 5H. The final charrette report was issued January 15, 2013. In February 2013, more detailed designs and cost estimates for the two initially favored options and the hybrid of those options were presented.

During the charrette, parametric cost estimating was employed with wharf costs estimated at \$700/square foot (SF) and trestle costs at \$600/SF with a 22.3% contingency and an 18% allocation for project management and construction management (PM/CM) and design. Charrette cost estimates were represented to be in a range of +50 to -30%. A detailed estimate was done after the charrette with costs represented to be in a range of +30 to -15%.

Option 1 demolished the North Extension south of the DBB. It was to be replaced with a new landward cellular sheet pile bulkhead and 2200' long by 124' wide new pile-supported wharf having two berths and six 38' wide access trestles. The wharf face was to be in the same location as the OSCP face. There would have been 1,100 lineal feet (LF) of crane rail and the modification would have resulted in a 19 acres (A) uplands loss. Initial charrette costs were presented as \$491M. Costs were estimated as \$377M at the 80% confidence level and \$447M at the 100% confidence level in the February 2013 estimate. Construction was anticipated to start in April 2015 and take 30 months. The more detailed February plans presented the berths as being for wet barge and ro-ro operations.

Option 2 employed similar demolition and cellular sheet pile replacement but angled the new installation from the DBB to T3. The new wharf was envisioned to be 2,800' long by 124' wide with 1,100' of crane rail and six 230' long by 38' wide trestles. There was a 28-acre uplands loss. Initial charrette costs were presented as \$493M. This option did not receive the more detailed design and costing effort.

Option 3 included leaving the northern sheet pile in place and installing engineered fill in front of the sheet pile face at a 4:1 slope. It included a 2,200' long by 124' wide pile-supported dock seaward of the sheet pile. It had six 236' long by 38' wide trestles and 1,100' of crane rail. This option was removed from consideration early in the 2012 charrette process. The municipal manager did not support the option in part because the fill in front of the existing bulkhead would exacerbate the T3 shoaling problems. No charrette cost estimate was developed for this option and the concept did not receive the more detailed design and costing effort. This option has similarities to the concept presented by PND to the Assembly Enterprise Committee at the February 2019 work session.

Option 4 included removing the top 40' of OSCP and spilling the top backfill at a 4:1 slope in front of the remaining bulkhead. The concept also included a 2,200' long by 124' wide pile-supported dock seaward of the sheet pile. It had six trestles and 1,100' of crane rail. There was an 8-acre uplands loss. Initial charrette costs were presented as \$451M. This option did not receive the more detailed design and costing effort.

The Option 5 North Extension solution used an articulated concrete mat in lieu of cellular sheet pile and constructed a new wet barge berth off the north end. It replaced the ro-ro and lo-lo berths in their same general locations. The option included 2,900LF of new wharf face and nine trestles. There was a 9.7-acre uplands loss. Initial charrette costs were presented as \$560M. The February 2019 costs were estimated as \$641M at the 80% confidence level and \$762M at the 100% confidence level. The February 2013 plans changed the North Extension articulated concrete mat to closed cell sheet pile. The wet barge berth was 700' long by 60' wide. The ro-ro berth was 1,000' long by 60' wide and the lo-lo berth was 1,000' long by 116' wide. The base construction duration was estimated at 54 months.

During the charrette, discussions occurred about combining Options 1 and 5 features to create a new Option 5H (Hybrid). No charrette timeframe costs were produced. The concept included a closed cell sheet pile solution on the North Extension and a hybrid berth that would provide temporary ro-ro operations for TOTE during their terminal replacement and serve as an additional wharf upon completion. Replacement ro-ro and lo-lo berths were also provided. The concept was further refined after the charrette. The 600' long by 60' wide wharf was to have three trestles and four dolphins. It was represented to have an effective length of 1,100' when considering the dolphins.

The ro-ro berth was 825' long by 60' wide and the lo-lo berth was 950' long by 116' wide. A mooring dolphin off the ro-ro berth added an additional 125' of effective length. Both berths were moved about 140' seaward from the existing wharf location. Dredge depth was presented at about -35 MLLW and noted as future -45 MLLW. The facilities were envisioned to be founded on 36" diameter piling on about 10' by 15' grids. Top of deck elevation was at +38 MLLW. Paving 38 acres of uplands was included. The maximum considered earthquake (MCE) was assumed to have a peak ground acceleration (PGA) of 0.39 times the force of gravity (g) or 0.39g. The earthquake acceleration imparts lateral loads which must be resisted by the structure with the loads increasing as the PGA gets larger.

Construction of Option 5H was envisioned to be done in two phases with the first phase estimated at \$327M and \$275M for the second phase, for a total of \$602M at an 80% confidence level. The costs at the 100% confidence level were \$394M for PH 1 and \$342M for PH 2 for a total of \$736M. The base PH 1 construction duration was anticipated as 30 months and the base PH 2 duration was 24 months.

An idea which was discussed but not pursued in the charrette was to evaluate a 100-acre conveyance from the adjoining JBER.

After being awarded the Program Management contract by the Assembly in February 2014, Jacobs prepared a second set of concept designs that expanded the focus area to include all POA's marine infrastructure and expanded the study area to the entire Port. Jacobs prepared four concept design options (A-D) which were again reviewed in a design charrette including certain users and other stakeholders.

The four concepts considered in the August 2014 charrette were initially presented as per the following bullets. The estimates were created using 2015 costs and then escalating them at 2.5% per year for two years. \$30M in crane costs were included.

- Concept A – Replace T2 and T3 in place, retrofit T1 and POL-1 in place and reconstruct POL-2 seaward of its existing location. Cut back the North Extension south of the DBB. Costs were estimated at \$549M.
- Concept B – Reconstruct T2 and T3 about 140' seaward, retrofit T1 and POL-1 in place and reconstruct POL-2 seaward of its existing location. Cut back the North Extension south of the DBB. Costs were estimated at \$508M.
- Concept C – Reconstruct T1, T2, T3, POL-1 and POL 2 with all wharf faces 140' seaward of the existing T1 – T3 location. Cut back the North Extension south of the DBB. Costs were estimated at \$575M.
- Concept D – Move TOTE to a new T2 ro-ro and Horizon to a new T1 lo-lo. Rebuild POL-2 seaward and rebuild POL-1 south of POL-2. All terminals would move out from the existing wharf line. Costs were estimated at \$531M.

Parametric unit costs used during the August 2014 charrette were as follows:

- Trestles and Wharfs \$1,000/SF
- Dolphins \$2M each
- NE Stabilization \$105.6M
- Wharf and Trestle Structural Retrofit \$500/SF
- Sheet Pile Bulkhead \$500/SF
- Utilities \$10M
- Power Upgrades \$18M
- Stevedore Buildings \$1.5M each
- Rebuild POL-1 \$15M
- T1 Wharf and Trestle Structural Retrofit \$21M
- Program cost included 20% contingency, 18% PM-CM-Design, 8.5% owner contingency (2015 Costs)

Modifications to all the concepts occurred during the charrette. Costs for Concept D were reduced by \$83.3M as a result of several modifications including reducing the lo-lo cranes from 100 to 50 gauge and deleting one trestle to a new total of two. Comparative considerations for Concept D at the charrette included: good initial cost, lowest life cycle cost, lowest dredging cost, easiest expansion, long term uplands cargo conflicts due to terminal relocation, and least operational disruption during construction.

Concept D, the 2014 charrette preferred option, and the basis of the solution presented to the Assembly Enterprise Committee in November 2014, had a total project cost of \$485M at the 80% confidence level and \$628M at the 100% confidence level. The presentation noted construction was anticipated to start in 2016 with a 2019 midpoint. This translates to a 2022 completion.

The entire program was envisioned to be completed within 96 months. The estimate was defined as an ASTM (International) Budget Level Class 4 cost estimate with a range of +25 to -15% to the base estimate. It was based on 15% plans. The estimate included 4.38% in escalation and used a pre-risk evaluation contingency allocation of 20%.

The November 2014 Assembly presentation had the port building being performed under a design-build (D/B) format with procurement by August 2015. The North Extension work was to be done under a Construction Manager/General Contractor (CM/GC) arrangement with procurement done by December 2015. CM/GC is like the CMAR format initially used on the PCT. Two design teams were anticipated to be selected to prepare the design/bid/build (D/B/B) documents for the four wharf structures.

The POL/cement terminal designers were to be selected by November 2015 and the container terminal designers by February 2016. Peak MCE PGA was presented as 0.39g on the landside and 0.27g seaward. A construction estimate assumption was the work would be performed under a single prime D/B/B contracting arrangement. Prime contractor overhead and profit was assumed as 20% and an additional allocation of 8.5% was made for owner contingency.

## Section 408 Authorization

In July 2019, discussions occurred with the Project Team about USACE permit conditions related to PCT orientation to the balance of the PAMP new construction. On October 22, 2019, the Project Team issued a memo that explained the rationale for the PCT permit conditions and the PAMP modeling efforts that had been done by the USACE. In order to construct the PAMP, the program was required to get USACE Rivers and Harbors Act Section 408 Authorization. The USACE noted approvals would not be provided for program construction that increased the dredging requirements unless funding levels were revisited. The USACE agreed to provide PCT maintenance dredging, which increased the nominal Anchorage dredging amount by about 25% with the understanding that implementation of the balance of the PAMP would reduce the dredging by an equivalent amount. This reflected pulling back the North Extension, demolishing T3, and extending the T1, T2 and PT replacement berths seaward of their existing locations. This allowed the east dredge limit to move seaward and the northerly limit to move to the south. Program modifications will require additional USACE Section 408 Authorization.

## Changes from Baseline

The current program reflects modifications from Concept D presented to the Assembly on November 21, 2014. Some of the major changes are as follows:

- Increase crane gauge from 50' to 100' and adjust wharf width accordingly
- Add one lo-lo crane to a new total of four
- Add 37' wide wharf hatch cover storage
- Eliminate 6" asphalt overlay on wharfs and incorporate 8" concrete topping slab
- Eliminate TOTE's The Adherence Group (TAG) from port building, reducing 2,000 SF
- Increase number of access trestles from seven to ten
- Increase PCT wharf platform area by 79%

- Increase PT wharf platform area
- Increase wharf height from +38 MLLW to +44 MLLW
- Accommodate future cement unloader at PCT
- Change North Extension stabilization design concept from circular sheet pile to armor stone engineered embankment
- Add operational assist tender tugs
- Move PCT shoreward and increase transitional dredging
- Increase number of dolphins from 11 to 17
- Increase seismic resiliency at fuel/cement berth and one cargo berth
- Increase MCE at mudline to about 0.57g
- Replace fuel hose towers and operations shacks at POL berths

## Sequencing, Status and Schedule

The new construction must be integrated into the existing operation which drives the sequence and schedule. While the exact sequencing is more complex, construction can generally be envisioned as being sequenced as follows:

- South backlands/PCT transitional dredging/south float
- PCT
- South half of North Extension reconstruction
- New port building
- T1, port building and POL-1 demolition
- T1 lo-lo construction
- T2 demolition
- T2 ro-ro terminal construction
- PT construction
- T3 demolition
- North half North Extension reconstruction

This sequencing is generally shown on Appendix graphic A-1.

The construction status of the PAMP is as follows. Soil stabilization shoreward of the PCT has been completed. A construction contract for the south backland stabilization and PCT -38 MLLW transitional dredging has been awarded, with construction scheduled to complete in 2019. Relocation of the south floating dock was originally part of that same contract but has been removed by deductive change order and will be rebid for 2020 construction. The Assembly has approved award and notice to proceed has been provided for the 2020 phase of the PCT to construct the structural portion of the trestle and wharf platform.

The program master schedule with a data date of July 29, 2019 projects Early Finish of the PAMP construction at the end of 2029, with total PAMP completion through closeout with an Early Finish of March 2, 2030. While the program schedule contains some funding elements, it is generally not funding constrained.

While the schedule is useful to understand the planned general work sequencing, actual timing is highly dependent upon receipt of funding to drive the critical path elements. As could be expected based on an assumption that funding is not a schedule constraint, the critical path of the later program elements is driven by the projected duration of the major construction elements.

## Cost Growth

On November 21, 2014 the Project Team presented their preferred option to the Assembly. The cost of the program was identified as \$485M at the 80% certainty level. On January 17, 2019 the Project Team presented the Assembly Enterprise Committee with an updated cost estimate of \$1.928B. An \$1.932B update was presented at the July 12, 2019 work session. This reflects a 298% increase from the November 21, 2014 presentation.

The Ascent proposal contemplated reviewing the design and costing documents supporting the 2014 and 2019 Assembly cost presentations to determine the cost increase causes. While that general process was employed, the process was complicated by changes in the estimating methodologies and the estimate work breakdown structure. The initial budget reporting included separate soft cost categories for elements such as design and project management while these costs were aggregated into major work elements in later estimates. Presentation of cost by work areas also changed over time.

The 2014 cost numbers in the table below were developed using data from different sources and then allocated into the cost categories presented in 2019. The 2014 allocations and associated percentage increase in the following table are accurate in total but should be considered approximate at the individual program element level.

The following presents a general comparison of the major program work elements

	Nov. 21, 2014	July 12, 2019	Price Increase
	Assembly Briefing	Assembly Work Session	
North Extension	\$ 138,304,217	\$ 254,802,928	84%
Terminal 1 (lo-lo)	\$ 139,706,021	\$ 747,374,069	435%
Terminal 2 (ro-ro)	\$ 108,658,236	\$ 446,079,706	311%
Terminal 3 Demo	\$ 9,942,669	\$ 48,298,181	386%
POL -1 (Now PCT)	\$ 38,241,546	\$ 245,390,995	542%
POL -2 (Now PT)	\$ 28,954,168	\$ 174,510,349	503%
Building	\$ 21,193,143	\$ 15,611,067	-26%
<b>Total</b>	<b>\$ 485,000,000</b>	<b>\$ 1,932,067,295</b>	<b>298%</b>

## Cost Drivers

There are multiple factors that contributed to the program cost growth with many of them overlapping and not individually and cleanly discernible. While the cost increases could be presented differently, the following seven categories were chosen to present the major cost growth factors. The presented cost numbers are intended to provide an understanding of the general magnitude of the factor and should not be taken as precise allocations of the cost increases.

- User-requested changes
- Use of conservative contractor-driven costs in estimate
- Incorporation of conservative resiliency requirements
- Extended program duration
- Design evolution
- Use of conservative design assumptions
- Betterments

### *User-Requested Changes*

The Project Team attributed \$422M in increased costs to change requests from Matson, TOTE and Alaska Basic Industries (ABI) in their January 2019 Assembly presentation. Matson requested four 100-gauge cranes in lieu of the baseline three 50-gauge cranes, which drove a change in the width of the lo-lo facility from 70' to 125.5'. The existing cranes are 38-gauge. The Project Team estimated this added an estimated \$135.8M. Substitution of in-slab Panzerbelt electrical conductor channels in lieu of above ground busbars for the electrical power distribution system added an estimated \$8.1M. Adding a 750' by 37' vessel hatch cover storage area added an estimated \$31.1M. Two added lo-lo trestles increased costs an estimated \$19.4M including the reduction in length associated with other changes. The Matson crane costs increased \$10M to \$40M. The additional work also contributed to a 11 months extension in the master program schedule.

ABI requested the PCT be designed to accommodate a future cement unloader that was available to them in Portland. This increased the trestle width by about 8' and added about 900 square feet which equates to about 6% of platform area. In addition, the larger cement unloader increased the dock live load which may have increased the seismic loading and could have affected member sizes.

TOTE requested an additional 30' by 340' trestle which the Project Team estimated increased costs by \$18M. TOTE related costs decreased at the port building through elimination of certain tenant requested improvements and tenant assumption of the TAG-The Assurance Group building function.

It should be noted that a portion of the \$422M attributed to User Requests could be a result of the cost factor presented directly below.

### *Use of Conservative Contractor-Driven Unit Costs in Estimate*

Estimating is not an exact science. While there are established guidelines based on the level of design development and other factors, there are multiple ways to perform estimates. Unit costs



from past projects and other cost information are often used as guidelines by the engineering community. Contractors typically use a much more detailed resource-based approach and rely on their direct experience and historical costs. The engineering community sometimes uses this approach if they have access to the appropriate data and have staff experienced in the resource-based estimating methodology.

The program cost estimate increased about 79% between November 2017 and October 2018. While there are other contributing factors, it appears that use of cost information generated during two initial PAMP contractor procurements significantly influenced the increase. As further described below, a telling example is the 2020 PCT bid, where the engineer's estimate was 31.4% above the sole bidder.

The initial construction contract formats changed from what was presented to the Assembly in November 2014. The North Extension Stabilization (NES) evolved into a Progressive/ Design/ Build (P/D/B) contract format. The south stabilization component was an enabling work element for the PCT and was contracted under the NES procurement. The PCT changed to a CMAR format.

While many construction contracts are performed under the more standard design/bid/build (D/B/B) approach, the P/D/B and CMAR alternate delivery methods are both widely used in the industry. There are benefits and tradeoffs with all three approaches. D/B/B has limited contractor involvement in the design and selects the contractor typically based solely on a low bid. This can sometimes lead to lack of financial alignment and result in contractual differences of opinion.

D/B contractually integrates engineers and contractors into one team, allowing a unified and targeted approach. There are many forms of D/B. P/D/B, the selected process, provides owner flexibility in shaping the design solution. The CMAR approach allows the owner to retain full design control but benefits from contractor participation in the design process, offering real time costing assistance and design suggestions.

While the two alternative delivery approaches have differences, they also share some important similarities. Qualifications and experience are major factors in contractor selection, final cost is not a selection-criteria, and the initial contract construction cost becomes a matter of negotiation. In both selected approaches, the contractor negotiates with the Project Team on a non-competitive basis. While Jacobs was the primary negotiator, they used the design engineer to prepare the "owner" estimate and an independent cost estimator (ICE) to provide a comparison estimate.

The individual entities in the Kiewit Manson Joint Venture selected for both the North Extension/South Backlands P/D/B and PCT CMAR contracts are both highly experienced in Alaska marine construction. Kiewit was also the PAMP's test pile contractor selected in an additional procurement.

These contractors are known to bring robust and heavily resourced management teams which would likely receive high marks in a contractor selection process. The combination of two strong contractors, each performing a portion of the work, would likely add to mobilization and management costs. This was observed in review of the PCT estimates.

While standard industry practice, it appears likely the chosen formats contributed to raising initial contract construction costs over what would have occurred under a competitive bid situation. The CMAR approach typically benefits from closer and collaborative working relationships with better contractor understanding of realistic costs. While this can result in overall program cost savings through less change orders and other elements, many professional independent estimators assign cost premiums to the initial pre-owner contingency CMAR construction contract amounts. For example, a recent nationwide cost estimator recently assigned a 2.5% premium when establishing the Construction cost component of a pre-owner contingency program budget estimate as compared to a traditional D/B/B contract.

The North Extension P/D/B team, including AECOM as engineer and Kiewit Manson Joint Venture as contractor, submitted different design solutions which led to selection of a different concept than originally contemplated. The PCT CMAR, Kiewit Manson Joint Venture, was brought in early in the design process and provided design assistance beginning at the 35% design level. The initial PCT schedule at the start of design contemplated construction being done in one season. Many of the contractor-initiated design suggestions involved solutions that would reduce schedule duration in addition to lowering anticipated costs.

Earlier in the PAMP, it was perceived the south portion of the North Extension and the PCT could be completed with the funds available. Priorities shifted as cost estimates increased on both components and stakeholders advocated to use initial funding to advance new facilities in lieu of North Extension reconstruction.

The PCT dredging, south stabilization and south floating dock were awarded to the Kiewit Manson Joint Venture under their P/D/B and CMAR contracts. The contract amounts were about an aggregate 15% more than the Owner Engineer and ICE estimates. Award was justified based on program benefits including avoiding escalation on the follow on PCT work. While owner and ICE estimates often vary from construction contractors' estimates due to many factors, they typically are intended to be slightly above the low bidder in a D/B/B format contract.

While the decision to proceed with the 2019 construction work appears reasonable, it appears initial contract construction costs would likely have been lower in a competitive bid situation. In addition to the 15% premium noted above, individual contractors in the contracting community bring a wide range of experience, equipment assets, and proprietary means and methods which can lower competitively bid construction costs.

The 2020 PCT work was not awarded to the CMAR after the owner, ICE and CMAR estimates could not be reconciled.

The ICE and owner estimates were 26% and 11% respectively lower than the CMAR. PPM, the sole 2020 PCT bidder, was approximately 28% below the CMAR 95% documents cost estimate. As explained in more detail later, part of this was likely due to a reduction in steel prices in the seven months between the CMAR and PPM estimates.

The ICE and owner cost estimates significantly increased as the design advanced, with much less variation from the CMAR. The 35% design CMAR estimate was about 57% more than the ICE

estimate and 38% more than the owner estimate. The 65% design estimate was closer, with the CMAR estimate about 38% more than the ICE estimate and 4% above the design engineer.

Part of the convergence was process driven. The basis of the estimate shifted over time, from fully independent estimates to incorporation of certain CMAR equipment and material pricing into the design engineer and ICE estimates. This provided more visibility on labor and productivity factor variances between the three estimates but eliminated other potential variances. An example of this was observed in the PCT VE effort performed after award of 2020 work to PPM. During the discussions the Project Team noted that the realistic value of the 2021 PCT Operations Building was about 15% of the cost included in the CMAR estimate and included in the \$1.928B program cost number presented to the Assembly on January 17, 2019.

Use of the contractor influenced numbers in the Engineer's PH 1 bid estimate were a major contributing factor to the 31.4% variance with PPM's bid.

#### *Use of PCT High Seismic Costs for Entire Program*

Program costs were updated in 2018 in parallel with development of the Capstan effort. One of Capstan's tasks was to evaluate tariff increases across business lines. In order to do this, they needed to know the required capital funding costs.

The program estimate was updated based on cost information obtained in the P/D/B, CMAR, and owner estimates. While the North Extension costs had increased about \$116M, the impact on the remaining three wharf facilities was even larger. The PCT was designed for high seismic resiliency, which increased pile and structure costs. Of the three remaining new wharf structures, the ro-ro berth was the only other programmed seismically enhanced berth. By using the PCT cost parameters, all three of the remaining new wharf facilities were escalated by contractor-influenced higher-than-market costs. This also meant that while the lo-lo and PT facilities were not to be seismically enhanced, some of the PCT enhanced seismic substructure and superstructure premium costs were included in their estimates. The largest impact would have been at the lo-lo berth given its larger deck area.

The use of the contractor and PCT influenced numbers was a clear primary driver in the 79% cost growth that occurred between November 2017 and October 2018. In addition, it appears likely that use of contractor influenced costs that were above market rates and use of unit costs based on a higher standard for the ro-ro and PT facilities have added a high level of conservatism to the current \$1.932B program estimate. A detailed evaluation of the cost premium associated with these factors was not done as part of this study.

To understand the general potential magnitude of these factors, the following simplistic analysis was performed. After completion of the PCT there are about \$1.1B in remaining direct construction hard costs in 2019 dollars. If these costs were over-market the same ratio as the 2020 PCT bid, this would equate to a \$330M contingency. This simple view has some inherent conservative and potentially aggressive assumptions, so it should be viewed from an order of magnitude perspective. It ignores the additional premium associated with using enhanced seismic cost parameters on the lo-lo and PT terminals which are programmed for lesser earthquake resistance.

It also doesn't account for related increases in escalation and soft cost elements, which on a go-forward basis after the PCT are about 52% of the 2019-dollar hard construction costs. The \$330M amount would increase to \$502M if soft costs were included. On the other side of the assumption level, it is not a given that actual future cost elements will follow the PCT example. They could be less or more.

### *Tariff-Related Steel Cost Increase*

Steel material prices are often volatile and there have been significant recent increases related to international tariff activity. The PAMP uses a large amount of steel in the pilings, catwalks, and dolphins, including rebar in concrete, and other elements. It appears this element may have played a factor in the overall program cost increases. Depending on the perspective, this element could be considered a primary or secondary factor.

*Engineer News-Record* (ENR) publishes cost data based on surveys in 20 markets across the United States. In their April 8, 2019 magazine edition, they published a six-year history and a three-year projection for structural steel prices. While this is not a direct indicator for PAMP pricing, it does project a general perspective. Costs changes were presented as follows.

Year Change	
• 2014 +2.3%	Actual
• 2015 -11.1%	
• 2016 -3.6%	
• 2017 +4.6%	
• 2018 +14.0%	
• <u>2019 +4.0%</u>	Forecast
• 2020 -0.5%	
• 2021 -9.6%	
• 2022 -1.1%	

Some observations on this data follow. Using the four full years of actual data after preparation of the PAMP baseline estimate reveals a total arithmetic increase of 3.9% in four years. This equates to slightly less than 1% per year, which is in general alignment, and slightly smaller than, the baseline cost estimate anticipated escalation premium of 2% per year. On a go-forward basis, ENR projected an arithmetic average annual decrease of 3.8% over the next three years.

This data suggests steel costs have not significantly increased the actual 2020 PCT costs over the baseline estimates, and if the forecasts are accurate, costs for the next phase may decrease over the next few years.

It needs to be recognized that the ENR forward projection is one estimate and actual costs are ultimately a factor of multiple unforeseeable elements, including tariff negotiations.

Subsequent to issuance of the draft of this report, ENR issued another projection. The October 7, 2019 ENR projection for Structural Steel for the years 2020 to 2022 had changed to -1.0%, -5.1% and -0.2%. This reflects an arithmetic average annual decrease of 1.8% over the next three

years. This compares to an arithmetic average annual decrease of 3.8% in their April 2019 forecast.

Review of Steel and Iron producer price indexes published by the US Bureau of Labor Statistics presents a graphical representation of costs over time in relation to a previous baseline. The data shows monthly relative costs back well beyond when the PAMP costs were presented to the Assembly in November 2014. The early, low, high and latest costs are presented directly below.

Factor	Month	% of November 2014	% of November 2018
226.3	November 2014	100.0	91.7
172.2	December 2015	76.1	69.8
246.7	November 2018	109.0	100.0
217.3	July 2019	96.0	88.1

This data reveals a slight decrease in steel costs since November 2014. It also indicates the highest steel prices, since program initiation directly correlated to the time the CMAR was preparing its 95% PCT cost estimate. The CMAR estimate was dated December 10, 2018. Steel prices decreased 11.9% from November 2018 to July 2019, which helps to explain part of the reason why PPM’s bid was so far under the engineer’s estimate. The data also reveals there was a 9% increase in steel costs from presentation of the baseline estimate in 2014 to the CMAR estimate. This is aligned with the Project Team’s original assumption of 2% escalation and tends to validate steel costs were not a major driver in the total project cost increase.

Subsequent to issuance of the draft of this report, the Project Team provided information on the commodity cost forecasts they developed in 2018. It projected an average 3.3% annual increase in steel products from 2019 to 2027 and about a 2.2% annual increase between 2019 and 2021. The forecast was developed using Monte Carlo simulation techniques based on US Bureau of Labor Statistics Producer Price Index for Steel Mill Products price data.

The historical data for the Steel Mill Products index generally tracked the Steel and Iron index with the variances averaging about 2.2% as shown in the table below.

Factor	Month	% of November 2014	% of November 2018
200.6	November 2014	100.0	89.4
160.1	December 2015	79.8	71.3
224.4	November 2018	111.9	100.0
201.3	July 2019	100.3	89.7

During the CMAR pricing of the 65% and 95% PCT design documents, steel prices were at relatively elevated and consistent levels as compared to the previous period from the late 2014 baseline cost estimate. While these prices influenced the program cost and estimate and were consistent with 2014 assumptions, they are potentially conservative on a go-forward basis. The July 2019 prices were about 10% lower than the steel prices informing the estimate. At least one major industry participant anticipates a reduction in steel costs over the next three years. It’s recognized this conflicts with the Project Team’s short-term commodity projections.

### *Incorporation of Conservative Seismic Resiliency Requirements*

The seismic requirements for the program increased from the baseline as a result of at least three factors:

- Incorporation of ASCE 61-14 as the design code
- An updated seismic hazard analysis study
- Incorporation of the recommendation from the GAC to seismically enhance two of the wharf facilities

The GAC seismic resiliency premium was originally presented as \$12.5M in a January 2016 quarterly report to the Legislature. This premium was based on use of an alternate resiliency concept than was ultimately employed. The Project Team's initial concept was to implement a system to be able to rapidly access wharfs after an earthquake. The solution involved installation of additional seismically enhanced trestle piling and caps.

The project would also procure pre-manufactured trestles, such as Bailey bridges, that could be rapidly deployed after an earthquake.

A project briefing to the GAC in December 2015 presented an analysis of these options. The Bailey bridge solution was \$12.5M. The estimated cost to construct the PCT and ro-ro facilities to respond elastically to the GAC's recommended damage standard was \$48.1M. It's relevant that this cost represented about 10% of the total PAMP estimated costs at that time and did not account for escalation, design evolution and other factors which have contributed to the program cost growth.

The Project Team has presented the seismic resiliency and 75-year design life premiums as \$162M in their January 17, 2019 Assembly presentation. The Project Team presented the PCT seismic premium as \$10M in an Assembly work session. This does not include previously incurred soil stabilization costs.

The 2018 PCT soil stabilization work added to mitigate the potential for liquefaction in a strong seismic event cost about \$8.5M. The GAC also requested a level of seismic resiliency like the PCT at one cargo berth. The Project Team elected to add seismic resiliency to the ro-ro terminal which has 3 trestles. This translates to about \$20M of soil stabilization costs in 2019 dollars.

Defining an accurate seismic resiliency premium cost has complications. To do a completely accurate comparison, you would need to be able to compare costs for two different designs for similar structures designed under different seismic criteria. This is further complicated by use of the strain-based design process prescribed under the ASCE 61-14 code used in the PAMP. The code has only been recently adopted and the universe of comparable structures is not large. The Project Team addressed this complexity by estimating potential material reductions to define the seismic premium. The \$10M PCT premium was represented as a 10 to 20% increase in pile and deck material. This range appears reasonable when looking solely at the weight of a single pile, but it does not account for several other elements in the cost equation.

Different fabrication methods are typically employed for piles over and under 1” thick. Piles over 1” thick typically cost more to initially fabricate and to weld to required pile lengths. While pile segments less than one inch thick may often be fabricated in 30’ segments, mills quoting on the 2020 PCT received approvals during the bid to initially fabricate segments in five- and eight-foot lengths and then weld into full pile lengths. The heavier wall translates into increased transportation and installation costs. It also requires having to use more robust and expensive equipment to handle the piles. The successful 2020 PCT contractor is spending a significant amount of money to upgrade their marine fleet to handle the heavier piles which increased their bid amount. In addition to increasing costs, the multiple welds increase future corrosion risk, as the steel plate and weld material have different material properties and can lead to increased weld corrosion. The welds have been a weak link in the existing POA piles. The design solution provides multiple safeguards to minimize the corrosion risk.

Other data points were obtained to better understand the impact costs. The PPM bid for the platform piles equates to about \$1.63 per pound to furnish the piles and about \$0.41 per pound to install. This equates to \$1,012/LF to furnish and \$253/LF to install. Similar costs for the trestle piles are \$1.46 and \$0.68 per pound and \$992 and \$460/LF.

Discussions were held with two experienced marine contractors on the 2020 PCT square foot costs and their opinion on the portion of the \$42M in costs that were attributable to the enhanced seismic design. While no detailed estimates were performed, the smallest of the two premiums exceeded \$12M in extra seismic related costs.

The weight of the 48” diameter piles up to 1.625” thick necessitated a large crane for installation. This contributed to PPM bidding \$3.8M for a temporary access trestle to install the piling and required them to spend a significant amount more to modify their floating equipment fleet to install the platform piles from the water.

A less robust seismic design would potentially have allowed all the piling to have been installed from the dry with less falsework. Instead of a full trestle, falsework could have been installed between permanent trestle bents. Completion of construction would have been performed from land to sea from the dry.

Extrapolating the PCT \$12M premium on a square foot basis to the ro-ro trestles and platforms equates to about a \$28.5M premium. As noted above, PCT soil stabilization costs were about \$8.5M, which equates to about \$20M for the ro-ro berth structure. PCT dolphin costs are of the same general magnitude as the dock structure and the design is generally controlled by the seismic design. While simplistic, this would equate to another \$12M order-of-magnitude premium for the 2021 PCT and about \$1.5M for the single ro-ro dolphin.

The Project Team has noted the latter element will be constructed with batter piles to avoid mobilization costs for only one structure.

The PCT dolphin design has been reported to be primarily controlled by seismic forces. On a lineal foot basis, neglecting pile depths, the PCT battered mooring dolphin design used by the CMAR to compare costs with the monopile used more than 350% more steel than the POL-1 mooring dolphin that has been in place for 50+ years. Taking pile lengths into consideration would increase the difference. The Jacob's 2014 baseline drawings detailed dolphins with six batter piles. Review of the cost estimate reveals these were 36" diameter piles, 1" thick. The initial PCT dolphin design used as the basis to switch from batter pile to monopile design used about 430% to 575% more steel than in the 2014 baseline design on a per foot basis. This neglects pile depths, which if considered would increase the difference.

Summing the individual premium numbers equates to a PAMP direct construction seismic premium of \$70.5M. Escalation would add another \$10M. Other soft costs such as design, PM, CM, and risk would be in addition to this amount.

As noted at the beginning of the Cost Driver section, there are different ways to segregate the cost increases. But for incorporation of the GAC seismic recommendation into the PCT, the enhanced seismic costs would not have been estimated by the CMAR and then allocated in part by the Project Team across the entire estimate. Using this categorization approach would likely result in the enhanced seismic allocation being in the multiple hundreds of millions of dollars.

While not part of the current program, there has been discussion about providing enhanced seismic resiliency for the lo-lo berth instead of the ro-ro berth. Not counting the hatch cover storage area, the lo-lo berth has about twice the area of the ro-ro berth, which a similar analysis suggests would add an order-of-magnitude \$35M premium.

#### *Comparison with Kodiak Cargo Berth*

Another way to look at the seismic premium is to compare the PCT costs with similar facilities. The following analysis compares costs for a recent Kodiak, Alaska project. It compares costs using different metrics and attempts to equalize known and quantifiable variables.

The City of Kodiak contracted for the Pier 3 Replacement, a new lo-lo facility. The \$37M project was constructed between 2014 and 2016. The project created a 330'-long pile-supported wharf supporting a 100-gauge crane. The landward crane rail was supported within a relatively low height OCSF structure. The pipe piling were founded on bedrock and pile lengths typically ranged from 125' to 175'. This compares to an average of 173' at the PCT. The PCT was designed for fuel vessels up to about 750' length overall (LOA) and cement ships up to about 600' LOA. Kodiak's Pier 3 was built to handle 710' LOA container ships.

Kodiak's Pier 3 costs equates to \$112,121/LF of dock face. The current estimate for the 1,000' PAMP lo-lo terminal, not including crane costs, is \$707.4M or \$707,374/LF of dock face. To provide a more direct comparison, Kodiak Pier 3's costs were escalated at 3% per year to the midpoint of T1 lo-lo construction based on the July 2019 PAMP schedule. This increased the Kodiak costs to \$142,030/LF of dock face. T1 lo-lo has substantially more demolition than Kodiak. Adding the T1 demolition costs to Kodiak increases its costs to \$171,141/LF of dock face. The T1 lo-lo costs are 313% more per LF than those of Kodiak Pier 3 after equalizing



escalation and demolition. PCT pile and deck parametric costs were used when Jacobs updated the T1 lo-lo estimate in 2018.

The 2020 PCT contract constructs the primary facility basic structure not including catwalks and dolphins. The direct construction bid cost for these elements was about \$1,588/SF. After eliminating Kodiak Pier 3's crane rail, utilities, upland works, dolphins and catwalks to provide a more similar scope, its bid cost was \$649/SF. After further refinements including eliminating PCT's temporary trestle costs, eliminating marine mammal monitoring costs on both projects, increasing Kodiak's cost to account for use of foreign steel, increasing Kodiak's cost to account for PCT's added pile lengths and escalating Pier 3 costs at 3% annually from the different bid dates, the costs are \$1,410/SF for the PCT and \$797/SF for Pier 3.

Using this analysis, the PCT structure is \$613/SF, or 77% more expensive than Pier 3. What caused this difference? Comparing steel price data available from the US Bureau of Labor Statistics from the two bid periods indicates steel prices were roughly the same. Kodiak's piles were drilled into bedrock as compared to driven into glacial till at the PCT. The upper level soils in Kodiak were of poorer quality than at the PCT. Kodiak's piling was installed from the land. At a high general level of review, peak horizontal ground accelerations used in the design appear generally similar.

The higher Cook Inlet tides would have added additional premium costs to the PCT for the marine platform installation. Removal of the temporary trestle equalizes the land-based installation portion.

Some of the big remaining differences relate to design requirements and choices, including seismic resiliency and engineering assumptions. Cook Inlet has faster currents and ice floes, which increases berthing velocities and ice forces. This would contribute to increased fender costs and increased costs on two of the PCT dolphins. Seismic forces typically controlled the PCT dolphin design and while calculations were not reviewed, they likely controlled much of the trestle and platform design. From discussion with a professional engineer experienced at pile design it's possible the Bootlegger's Cove Formation (BCF) soil strength parameter assumptions could have had a material effect on the PCT pile requirements.

In addition, design choices and use of the Minimal Damage seismic criteria interact to increase costs. The 75-year design life helped drive the PCT solution to use of reinforced concrete in the superstructure in lieu of using steel. A similar choice was made in the dolphin caps. While concrete helps the design life, it adds seismic mass which much be resisted by larger pile and superstructure elements. Incorporation of an 8" topping slab as part of the deck structural solution helped the wharf and trestle achieve a 75-year design life and meet seismic requirements but may have added mass and increased the lateral load demand. The baseline design included a 6" asphalt wearing surface.

Kodiak did not include a topping slab or wear surface over the deck. Kodiak's design used a low height OCSF structure tied into the pile-supported wharf structure. The OCSF provided lateral resistance and reduced pile and superstructure costs. While it's possible this solution could have been implemented at the PCT, it would have required additional transitional dredging and

increased annual dredging costs. The PCT's 6-foot elevation increase over the original design, use of concrete superstructure in lieu of steel, incorporation of an 8" topping slab and increasing pile thickness for added pile life, all contributed to the seismic mass lateral load requirements. Enhancing the Design Level Earthquake resiliency beyond ASCE 61-14 code requirements exacerbated all these elements.

It would take additional review to accurately allocate the \$613/SF cost difference to all the factors considered in this analysis. Design calculations would need to be reviewed to understand the impact of the added mass on the lateral load requirements and member sizes. It should be noted that allocation of the cost premium for increased lateral resistance could be allocated to conservative design choices, design life or seismic resiliency. With that said, it doesn't seem unreasonable to assume about 50% of the premium is associated with enhanced seismic resiliency. That equates to \$11.1M, which is of equal magnitude to one of the marine contractor's ballpark number.

### *Design Evolution*

The concepts envisioned in the baseline program budget changed over time. Piling designs changed, which were driven in part at the PCT by the incorporation of enhanced seismic resiliency. The location of the PCT was moved landward of the initial location, which increased dredging costs but lowered trestle costs. Minimal dredging costs were included in the original program estimate. The additional transitional dredging added about \$21M to the program cost.

Seven dolphins were added based on mariner feedback which led to tens of millions of dollars in added costs. Additional use of tender tugs during construction driven by increased stakeholder input also added tens of millions in costs.

### Use of Conservative Design Assumptions

A subset of the design evolution is related to the additional review and definition of the design requirements that occurred after the initial design. As an example of this, ice loads increased from two to three feet thick and were established as a minimum 750' diameter. Ice loads-controlled design for at least two of the PCT dolphins. The strength of ice in bending, which is relevant to batter pile design, was about two times the amount used in the ADOT KABATA study. The soils parameters chosen for the BCF, coupled with designing for increased seismic resiliency, could have increased pile size requirements.

### *Betterments*

There were other discretionary modifications that added to the program costs. This factor made up a relatively small percentage of the overall program cost increase. A detailed analysis was not done to precisely allocate the exact percentage of the following changes that were fully discretionary and those that changed through a wider range of design evolution.

The initial PAMP 15% PCT design drawings had an 8,244 SF platform. The platform increased to 15,300 SF in the bid documents, an 86% increase. While the baseline design platform size was similar in size to the existing POL-1 platform, it is smaller than the existing arrangement when considering the space used by the adjacent petroleum hose tower. The true POL-1 functional use

was probably closer to about 11,000 SF, which suggests the 15% design may have been undersized by roughly 2,500 – 3,000 SF. About 900 SF of the platform increase was due to ABI's request to plan for a larger cement unloader. Design decisions also contributed to the size increase. While the piping is cantilevered over the side on the trestle it runs over about 3,000 SF of platform. It's possible this increase could be viewed as design evolution. The PT platform also increased, although proportionately less than the PCT.

Decisions were made to replace and upgrade the operations shack/building and hose tower at both the PCT and PT, which added more than \$10M. The POL-1 operations shack, having less than 100 SF of space, was replaced with a 700 SF structure having two levels and a third level railing-enclosed space not included in the area calculation. Clear area requirements around the Ops building translated to a requirement to add more than 1,000 SF of platform to accommodate the building. The hose tower changed from a simple steel structure to a more expensive hybrid hose tower/ loading arm solution. This change was a combination of betterments and increasing the component design life, which could be considered design evolution.

Adding smart hooks at the bollards increases safety but has added multiple millions in costs. While all these elements offered benefits they also added to the overall costs.

As part of the process to finalize the draft of this report, discussions occurred with the Project Team on the allocation of the increased costs by category. The Project Team offered the following to better understand the Modernization effort. The format has been modified slightly to match the balance of the report.

The program was established to modernize all Port marine infrastructure. Modernization includes incorporation of current codes, best practices for safety, operations, and maintenance, and future requirements. The program charter did not define the limits of future requirements but there is an operation assumption that the program would include anticipated future requirements in a three to five-year window. Program solutions bring the infrastructure up to the current state of the maritime industry and anticipate future requirements to prevent obsolescence of any attribute by the time the program is completed. Some examples of decisions based on a modernization concept follow.

- Design PCT for future cement off loader equipment because the current equipment is reaching the end of its useful life.
- Petroleum hose tower incorporates some loading arm technology with safety disconnect capabilities.
- Petroleum operations building brings working space requirements up to safe operational and maintenance functionality.
- Design vessel sizes and dredge depths include all anticipated vessels which call infrequently, and vessel changes specified by Users.
- Upgrading gantry cranes for container cargo from the current 38' gauge to 100' gauge.
- Incorporation of seismic codes specific to wharves and piers as well as increased performance criteria on one petroleum and one cargo berth to support disaster preparedness.
- The program solutions ruled out renovation or rehabilitation of the existing infrastructure because of the inability to meet current codes and planned increases in equipment and

dredge depths. Replacement in-kind was ruled out for elements such as the operations building and hose tower because it did not meet a modernization methodology. While many of the modernization-based decisions and solutions can be viewed as discretionary, they were made from User input and current industry practice consistent with a modernization methodology. This methodology does come at a higher cost than renovation or replace in-kind of aging infrastructure but provides safety, reliability, operational, and maintenance benefits.

### *Extended Program Duration*

The initial program was anticipated to have been completed by about the end of 2022. The July 29, 2019 PAMP Master Schedule projected completion in 2030 with a midpoint of construction in about 2025, six years later than the November 2014 baseline. Assuming a future escalation rate of three percent between 2019 and 2025, costs would increase by about 20%. Looking at the entire PAMP program on a single factor basis, this equates to about \$322M of the latest cost estimate of \$1.932B. The Project Team did an analysis that presented a lower amount of escalation as they were presenting escalation from current dollars and not the 2014 baseline.

There are many causes for the schedule extension, including an unbalanced Plan of Finance with construction timing driven by funding or lack thereof, tenant-requested changes, installation of enhanced seismic resiliency work, conservative design assumptions and other factors.

Lack of funding is a major schedule extension factor. The Northern Extension was initially programmed as a PH 1 element but was later split into two segments, with the initial one put on hold for at least three years due to lack of funding. The latter element moved to a standalone component late in the program. Construction of this element as planned early in the program would have accelerated T1 lo-lo construction from the current sequencing plan as it would no longer be a schedule constraint to starting the cargo dock construction.

Lack of funding contributed to the delay in starting PCT construction and has contributed to a delay in starting the design and permitting of the new port office T1 lo-lo enabling work.

User-requested changes also contributed to the schedule extension. Matson's requested changes to increase the crane gauge, add crane hatch storage and a trestle likely added about a year to the schedule. Adding a TOTE trestle and enlarging the PCT trestle and platform to accommodate a larger cement unloader would likely have added some nominal construction duration.

The enhanced seismic requirements increased the mass of the PCT structure and contributed to the construction duration and schedule extension. The 2018 soil stabilization would likely not have been required but for the enhanced seismic requirements. Adding seismic resiliency could have increased the ro-ro terminal construction duration by adding soil stabilization elements at the trestles and increasing the structural elements. The amount of impact would be a function of construction sequencing.

Enhanced non-seismic resiliency and conservative design assumptions would likely have contributed to duration extensions to all the wharf facilities.

The inability to perform transitional dredging using the USACE contract also contributed to a delayed start and could have potentially added a year to the construction duration.

Climate plays a role in the schedule extensions. Snow, freezing conditions and lack of light limit upland winter civil construction. While uplands work can be accomplished year-round, costs significantly increase in below-freezing temperatures.

While there are other complexities, marine mammal environmental permit restrictions effectively prohibit in-water construction work when there is ice in Cook Inlet. Effective construction operations are limited to the April through October timeframe.

The PAMP involves replacement of multiple operational facilities. The project sequence must be done in a way that allows construction to be done concurrent with ongoing operations. While some scope increase can be absorbed within an existing construction season, other larger changes will extend the construction duration critical path.

Approximately \$6.3M in additional funding is available towards the remaining 2021 PCT work. An estimated \$81M of additional funding is required to complete the work. While it's possible funding may be achieved to allow construction in 2021 as scheduled, it's also possible some or all the remaining PCT work may need to be deferred if funding is not obtained. This would increase the duration extension cost impacts.

The original cost estimate used an annual escalation factor of 2% per year to the midpoint of construction. The new program estimate uses 3% per year on a go-forward basis. While the effect of the difference is relatively small at the original 2014 assumptions, the effect becomes much larger with all the other cost increases. A 1% decrease in the future annual escalation rate would lower costs by about \$70M.

Duration extension adds other costs in addition to general escalation. Program extension also increases the amount of time the program management and design teams are dedicated to the project. Adding eight years to the initial eight-year program doubles the length of program management team involvement. While the effect is not likely exactly linear, doubling the duration could be expected to roughly double the management costs. Design team costs likely would increase with schedule duration but at a lesser rate, as more of their services are likely performed on a fixed fee basis and directly tied to contracts.

The following paragraph is intended to present a summary of the general factors contributing to the program duration extension. It should be viewed from an order-of-magnitude perspective. It was performed by high level review of the baseline and current master schedules through the prism of the above observations and is not based on a detailed schedule analysis.

While preconstruction requirements, betterments, tenant requests, enhanced seismic resiliency and conservative design assumptions have all contributed to the delay, lack of funding could reasonably be attributed to three to four years of program slip. Port User requests and enhanced seismic resiliency could reasonably be attributed to having extended the schedule another 1.5 to two years. Betterments and other elements under direct owner control could be perceived to account for up to two years or more of the slip.

## Change in Cost Over Time

The following presents a brief recap of the program cost growth over time. Information is primarily from PAMP presentations to the Assembly, quarterly grant reports submitted by the MOA to the state legislature and presented on the POA website, and MOA budget information.

**11/21/14.** Program cost presented to Assembly at \$485M at the 80% confidence level and \$642M at the 100% confidence level.

**8/7/15** grant report to the Legislature presented project costs as follows:

- Terminals 1, 2 and 3 \$225M
- North Extension \$127M
- Landside Buildings \$18M
- PM \$54M
- Test Pile \$750K
- POL-1 (now PCT) and POL-2 (now PT) \$59M
- Total \$485M

**9/30/15** budget report attached to grant report sent to the Legislature had \$58,536,707 for the two petroleum terminals, not including PM, miscellaneous project support and the test piles.

**1/29/16** grant report to the Legislature, with a data date of 12/31/16, noted the GAC had recommended enhanced seismic resiliency to two berths, resulting in a \$12.5M or about 2.6% increase to the total program cost.

**2/13/17** quarterly report with December 31, 2016 budget data presented costs at \$540M. The report also noted issuance of a Progressive Design Build RFP for the North Extension and south backlands.

**5/5/17** quarterly grant report to the Legislature noted MOA was pursuing dredging at the PCT through a USACE cost-sharing agreement using their unit dredging costs with an estimated cost of \$8 million.

**8/15/17** quarterly report to the Legislature with a June 30, 2017 data date indicated COWI had been awarded the PCT design contract.

**11/6/17** quarterly report to the Legislative report indicated an RFP was issued for a PCT CMAR on August 1, 2017.

**November 2017.** Updated estimates prepared by Program Manager had costs increasing to \$1,079,813,422. The increases were attributed to incorporation of user requests, enhanced seismic resiliency, development of more conservative design parameters and increased escalation. Significant increases occurred at all the new berths, with the largest percentage increases at the PCT and T1 lo-lo.

**October 2018.** Program cost was presented as \$1,928,526,515 reflecting a 79% increase over November 2017. The Project Team reported subcategory increases as follows: Preconstruction services and PM/CM 8%, Construction 58%, Escalation 200% and Risk Contingency 473%.

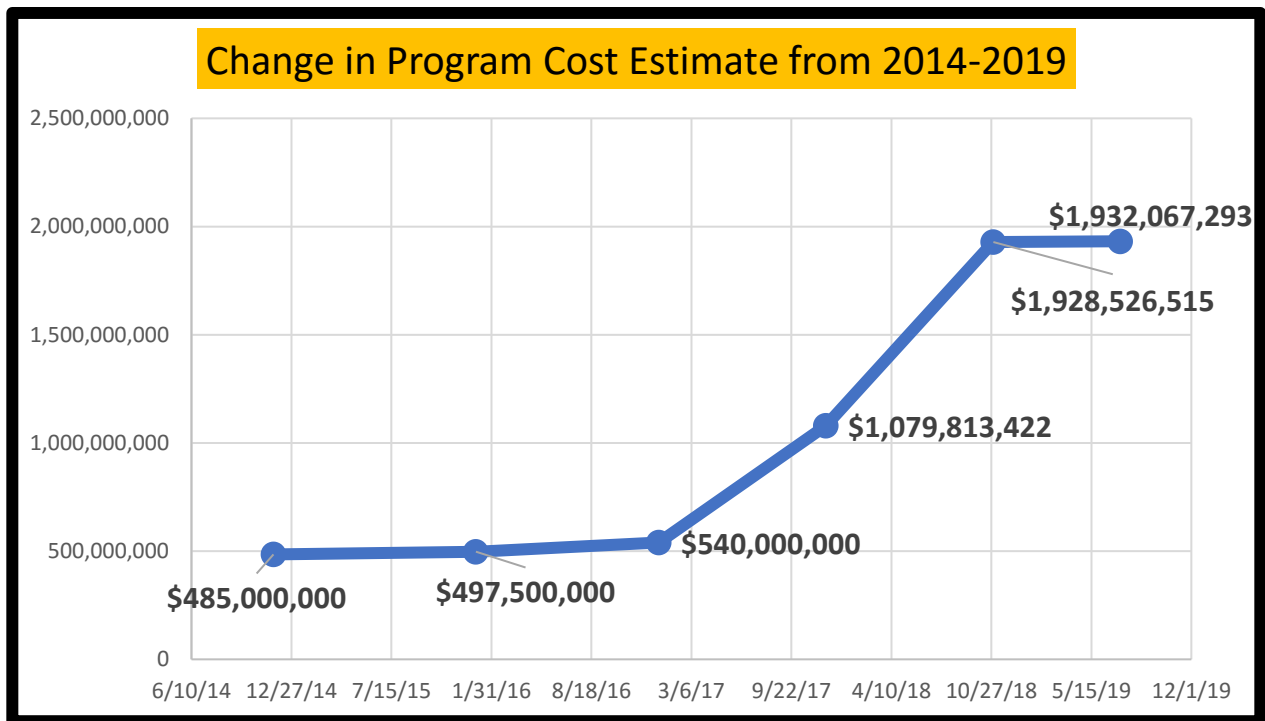
**11/8/18.** PAMP program costs presented as \$1.885B in Capstan Consulting Financial Advisories Services report.

**November 2018.** The Assembly approved Fiscal Year (FY) 2019 Port Capital budget was presented as \$1.1B. It appears this is a remnant prepared prior to the updated October 2018 estimate and amount in Capstan report.

**1/17/19.** Program cost presented as \$1.928B by Project Team at Enterprise Committee update.

**7/12/19.** Program cost presented as \$1.932B by Project Team at Assembly Work Session.

The following table presents a generalized view of the cost increases over time.



## Program Development and Sequencing Options

Standard practice for many ports and airports is to prepare master plans which analyze current demand, competition, growth opportunities and project ranges of future demand. The plans also typically provide conceptual infrastructure planning solutions to accommodate demand changes over time. The plans often have 20-year planning horizons and are updated at five-year intervals. Master plans are typically used to inform the capital program development solutions. POA's last master plan was prepared in 1999 and had a 20-year planning horizon. The existing master plan is at the end of its planning life.

The industrial trend for marine vessels is to increase in size. Larger vessels are typically more efficient than smaller vessels, with lower operating costs per unit weight of delivered goods/products. The existing class of cement ships could increase volume to handle increased demand.

Fuel is delivered in barges and vessels, typically medium-range tankers. Deeper draft longer-range tankers can more cost-effectively deliver product and are currently available at relatively attractive rates due to market conditions.

TOTE is modifying propulsion on its vessels from diesel to Liquefied Natural Gas (LNG). Their planning horizon for vessels appears to be about 25 – 30 years. While it conflicts with earlier planning assumptions, TOTE has confirmed a requirement of -37 MLLW should likely work for 90% of their vessel operations after switching to LNG. Confirmation is required if -37 MLLW is acceptable to TOTE. Matson's current vessels are 710' LOA, which is about 18% less than the TOTE vessels. Matson's ships servicing Alaska are towards the end of their economic life. They are in the process of evaluating vessel replacement options and recently went through a similar effort for their Hawaiian fleet. While no firm decision has been made, it appears their next Alaska vessel class will be upsized in length, width and carrying capacity. It's possible they may be generally similar in size to the current TOTE vessels.

Discussions at June 2019 Roundtable indicated the DOD dredging requirements did not appear to be changing over the near to intermediate term.

The Project Team has made a myriad of choices and decisions to advance the program to its current state. The following analysis looks at other potential ways to shape the program and lower the cost while still meeting the POA's primary needs. Major considerations include:

- Design Criteria
- Design Parameters
- Combine Functional Elements
- Renovate in Place
- Alternate Design Concepts
- Other Design Options
- Sequencing Options
- Other

## Design Criteria

The following evaluates four elective design choices: seismic resiliency, design life, wharf height and dredge depth.

### *Seismic Resiliency*

Three primary factors contributed to the increased PAMP seismic design parameters.

- The Project Team, in conjunction with the GAC, elected to use the ASCE 61-14 code to design the facilities.
- The GAC recommended, and the Project Team incorporated, that a fuel berth and a cargo berth be provided with enhanced seismic resiliency. The PCT was designed to the higher



seismic standard and the Project Team designated the ro-ro cargo berth for this higher standard. Assembly Resolution AR No. 2019-263 reaffirmed support for the GAC enhanced seismic recommendation.

- The Project Team incorporated an updated seismic hazard analysis performed by URS into the basis of design.

The ASCE 61-14 code chosen by the Project Team evaluates three levels of earthquake loading: Operating Level Earthquake (OLE), Contingency Level Earthquake (CLE) and Design Level Earthquake (DE). The latter is two-thirds of the Maximum Considered Earthquake (MCE). The probabilistic frequency of occurrence of the OLE, CLE and MCE are 50 years, 475 years and 2,475 years respectively.

The ASCE 61 code also defines three increasing levels of performance: Life Safety Protection, Controllable and Repairable Damage and Minimal Damage. These levels of damage are pictorially presented in the code.

ASCE 61-14 establishes the following base standards; Minimal Damage for the OLE, Controllable and Repairable Damage for the CLE and Life Safety Protection for the DE. The GAC recommendation changed the CLE performance requirement to Minimal Damage and the DE performance requirement to Controllable and Repairable Damage. The GAC also recommended changing the maximum duration to repair a structure after a DE event to a maximum of seven days from the “no more than three to four months” detailed in the ASCE 61-14 code. The practical effect of this added condition ultimately led to the PCT being designed to Minimal Damage. Experienced Alaskan engineers have stated the PCT has been designed to be the most seismically resistant port structure in the United States.

Anchorage has experienced two significant earthquakes since 2015. On January 24, 2016, the magnitude 7.1 Iniskin earthquake occurred on the west side of Cook Inlet across from Homer. This was the largest intermediate-depth earthquake in the regional area since installation of the regional seismic network in late 1960s.

The November 30, 2018 Port MacKenzie earthquake had the same magnitude, but the epicenter was much closer to Anchorage, had higher local peak ground accelerations, and caused more damage.

As part of the PIEP litigation, ground accelerations from the Iniskin earthquake loadings were evaluated to test design models and assumptions. Experts on both sides of the litigation expressed different conclusions on the validity of the models and projected outcomes based on the earthquake event.

The GAC has long advocated for installation of strong motion monitoring systems to be installed at the Port to better manage the facilities. A proposal from UAA to install a \$400K system was submitted to MOA about ten years ago.

The United States Geological Service (USGS) published the following data related to the November 30, 2018 Port MacKenzie earthquake. The three columns represent location, Peak Horizontal Ground Acceleration (PHGA) and distance from the epicenter in kilometers.

- Gov Hill Elem School    0.269g    13.4km
- Hilton Hotel            0.214g    13.7km
- Atwood Building        0.208g    14.3km
- Port Access Bridge      0.440g    14.4km
- Anchorage FS #1        0.293g    14.8km

The Port Access Bridge sensor is actually a control sensor located under a building loading dock about 400' east of the Port Access C Street Bridge. The sensors installed directly on the bridge did not record during the 2018 event. The accelerations for the other four listed sensors were higher than the 2016 Iniskin event. As one example the 2018 PHGA at the Government Hill Elementary School was almost 2.7 times the 2016 event.

The PCT MCE firm ground PHGA is 0.70g. The DE is two-thirds this amount, or 0.45g. The Port access road sensor recorded 0.44g at ground level. These numbers are not directly comparable as the former is at firm ground well below the surface and latter is at the surface. The MCE PHGA at the mudline of the PCT was calculated by the design team at about 81.5% of the deeper firm ground PHGA. While there are many factors and variables affecting a direct comparison, the Ship Creek sensor reading approached the magnitude to the PCT DE.

The five existing wharf structures and the Northern Extension OCSP structures all survived the 2018 Port MacKenzie earthquake with a small amount or no damage. Damage assessment done at the high spring tides and later found failure in about 2.1% of the 1,400 total terminal piles. On a percentage basis, the most damage was observed at POL-2 where eight piles were damaged. This equates to about 14% of the POL-2 piles.

The tide level during the earthquake was at about +8 MLLW. This is relevant to North Extension seismic loading.

The Great Alaska 1964 earthquake seismic accelerations have been reported in the literature to be in the range of 0.15 – 0.20g in Anchorage. While the 2018 earthquake PHGA's in Anchorage were of the same magnitude or greater than the post event estimates of the 1964 earthquake, the earlier earthquake was much longer and impacted certain facies of the Bootlegger Cove Formation which are not present at the Port. The magnitude of the 2018 Port MacKenzie earthquake approached the CLE for many Anchorage locations and was near the DE at the Ship Creek sensor 400' east of the Port Access Bridge.

The 1964 earthquake was also of a different type, mega thrust, versus the 2018 deep intra slab-type quake. The Design Earthquake could be of the mega thrust type and have a much longer duration than the 2018 quake.

The PCT VE team met with the GAC on August 27, 2019 to discuss their 2014 seismic recommendation. Discussion occurred on the December 2015 presentation the Project Team

made on alternative solutions to meet the intent of the GAC recommendation. GAC members noted that using the Bailey bridge type solution in lieu of designing the entire structure to elastically achieve Minimal Damage was consistent with their recommendation and they had no preference on the two potential solutions.

Discussions occurred on the magnitude of PCT costs associated with their recommendation. A former GAC chairman noted that part of the reason for the high costs was the Project Team decision to also provide enhanced seismic resiliency for cement ships. Their recommendation was for petroleum products, not petroleum and cement. GAC members noted the primary focus behind their recommendation was being able to import petroleum and cargo after a major earthquake. Discussion occurred on combining seismic resiliency in one facility that could handle petroleum products and cargo. Several GAC members supported this concept.

While it is moot for the PCT, the initial rapid deployment trestle solution could be reconsidered for the cargo terminal and based on past costing efforts would likely be significantly less expensive. Subsequent to issuance of the draft of this report, the Project Team noted there were risks, challenges and other disadvantages associated with the original solution that were identified during the PCT design effort and contributed to the design decision on how to comply with the GAC recommendation.

### *Design Life*

The current program established a 75-year design life for the main wharf structures. The dolphins, fenders and deck facilities have lower design lives. Many marine structures are planned for a 50-year design life. On a nationwide basis, given the poor condition of our national infrastructure, an increased percentage of our transportation infrastructure is being designed for a 75-year design life.

The major wharf structural elements such as piling, pile caps, decks and dolphin caps have material and corrosion protection options that can lead to different solutions when considering 50-year and 75-year design life options.

One of the most critical upgrades required to go from a 50- to 75-year design life at the POA relates to the piling. The original POA terminal piles were typically 7/16" thick without galvanization or other applied corrosion protection. Standard unprotected steel is susceptible to corrosion, particularly in saline marine environments. While severely compromised, many pilings have been in place for 50 to over 60 years, with about 50% of them having received steel/grout "jackets" in the highest corrosion areas starting in about 2000. Some initial jackets have corroded and are nearing the end of their useful life.

The corrosion problem is exacerbated in Cook Inlet due to a microbiological process known as accelerated low water corrosion, which is primarily observed in the tidal range from about -1.5 MLLW to the lowest astronomical tide. The POA is spending about \$2M per year jacketing piling. The 2019 average cost to jacket a pile was about \$32,000. The jackets are reported to be effective in transferring vertical loads but less effective at transferring lateral loads such as those experienced in an earthquake. The Geotechnical Extreme Events Reconnaissance (GEER) Association in their November 30, 2018 earthquake report noted however, "A pile jacketing

program to shore up the dock-supporting, corroded piles appears to have largely prevented damage during the earthquake.”

The PCT corrosion protection solution has multiple layers. The steel pile specifications allow two options. Piles can have an overcoating of either plural component urethane with a dry film thickness of 40 to 60 mils, or a multi-coat fusion-bonded epoxy with an abrasion resistant overcoat and ultraviolet topcoat having a total thickness of 45 to 71 mils. The piles also have extra steel to allow for sacrificial corrosion protection. Some PCT piles also have a reinforced concrete core on their upper portion which typically extends below the major corrosion zone. While this is not part of the formal corrosion strategy, it likely would provide some additional corrosion benefit. In addition, the PCT has an impressed current cathodic protection which connects the piles to the negative pole of a direct current source and the positive pole to a sacrificial anode. The protective coatings are designed to protect the steel from ice and saltwater and minimize anode consumption and electrical energy. While the capital costs of the selected system increase overall capital costs on the order of two to three percent, they significantly extend the design life.

Discussions with several interested parties have noted it does not make sense to design marine structures for a 75-year life, as this is significantly greater than the life span of the vessels using the wharf and well beyond the visibility of the specific facility needs. While there are elements of truth in these comments, with possible exception to the 1964 seismic event, piling corrosion has proven to be one of the POA wharf facilities’ most damaging problems. It is interesting to note that there appears to be more general support for piling corrosion protection than for a 75-year design life. It appears there may not be a common understanding of what a 75-year design life means in terms of upgrades and the associated costs. Additional discussions between the Port Users and the Project Team using different terminology could align the parties’ thoughts on the cost effectiveness of using enhanced piling coating to prolong the piling life.

Structural elements including platform deck framing, pile and dolphin caps can be designed with different solutions. Protecting steel for a 75-year year design life in a marine environment is typically more complicated than protecting a similar concrete element. Steel is stronger than concrete in many design conditions and weighs less, which decreases seismic mass that must be resisted in an earthquake. While the PCT piles were steel, most of the other structural elements were reinforced concrete. The addition of the 8” topping slab above the PCT deck and trestle assists in achieving the 75-year design life but potentially added to seismic mass and cost.

### *Wharf Height*

Existing POA deck elevations were typically designed to a deck height of +40 MLLW. The 2014 baseline program was designed to an elevation of +38 MLLW. A discretionary decision was made to increase the wharfs to +44 MLLW. The docks are being raised 4.23’ to accommodate projected sea level rise 75 years in the future as well as storm surge which is projected to increase about 3’.

The amount of actual deck raise is conservative to both projections. It has also been noted by interested stakeholders that new design elevations are above the adjacent uplands, which would lead to POA upland flooding if the contemplated changes materialized. The change adds about

3% to the direct pile costs. The POA team is pursuing grant funds that could reimburse these added costs.

While the height rise is a relatively minor issue in the currently defined program and sequencing, it becomes more complex if a renovate-in-place strategy is employed in the program. POL-2, while connected by catwalks, is a stand-alone structure and could accommodate a height variation on adjacent structures. More complexity would occur if the T3 ro-ro berth and a portion of the T2 wharf were renovated in place. If these facilities were left in place and the new T1 lo-lo berth was constructed to the +44 MLLW elevation, there would be a 4' elevation difference which would complicate operations.

There are several solutions with different tradeoffs. The issue could be mitigated by lowering the T1 lo-lo deck elevation to a less conservative height. T1 lo-lo could become a stand-alone terminal rather than part of a continuous wharf face as currently planned. The existing program reduces the total amount of wharf face by about the length of T2. If a ramp were installed from the new T1 lo-lo terminal towards the existing T3, much of T2 could be retained while providing for access continuity along the wharf.

While not all the 38-gauge existing crane rails are currently functional, they have been installed along most of T1 – T3. This provided flexibility to operate the cranes in different locations, which facilitated maintenance, repair and other operational needs. This type of flexibility would be lost in the event the wharfs had different elevations. The issue would be exacerbated if the decision was made to furnish four cranes, versus the baseline three, as there would be less free area outside the crane footprint.

The Project Team's 50-year projection for sea level rise is 2.4'. Discussions with an experienced marine structural engineer who has worked in Cook Inlet indicated a 2' rise would be a reasonable solution for the current program.

### *Dredge Depth*

The PAMP program contemplates minimum dredge depths could increase from -35 MLLW to -45 MLLW in the future. There are benefits with this, as the deeper drafts translate to larger vessels which can transport more product at a lower unit cost. Moving the dock face 140' seaward as contemplated in the existing program reduces the amount of maintenance dredging that would be required and is consistent with Section 408 USACE authorization. The 2019 PCT transitional dredging is being done to -38 MLLW with over dredge quantities being paid to -40 MLLW.

Some past PAMP correspondence and discussions have addressed the need for the increased dredge depth to accommodate various user needs in the interim timeframe, say five to fifteen years. DOD and TOTE had previously been mentioned as needing the additional depth to accommodate their vessels. Discussion on dredge depth requirements occurred at the June 2019 Roundtable. During the meeting it was noted that neither DOD nor TOTE needed the -45 MLLW dredging.

If the -45 MLLW dredging requirement was a result of federal vessel requirements, it would facilitate federal funding of the transitional dredging and potentially help justify an increase in annual federal maintenance dredging funding. Paying for increased dredge depth becomes more problematic without a clearly defined federal need.

Subsequent to the June 2019 Roundtable, TOTE reconfirmed their dredging requirement was less than previously stated. After additional discussions they also confirmed dredging to -37 MLLW would accommodate about 90% of their operations. It would be beneficial to have additional discussions to clarify their exact minimum requirements.

Another dredging consideration that was discussed during the June 2019 Roundtable was that Cook Inlet shoals south of POA were not dredged to -45 MLLW. Ship pilots navigate these shoals with deeper draft vessels using tide management strategies.

Increasing dredge requirements affects planned new PAMP construction differently than the existing facilities. The existing wharfs used a wide mix of structural pile installations. Some piles, including those on the seaward face of the wharf, have very shallow embedment. The wharfs were also retrofitted with fenders supported by pin piles, which are smaller diameter piles founded on the subfloor, to absorb vessel berthing kinetic energy. POA is currently renovating some of the existing wharfs with new, smaller diameter pin piles driven through the existing ones. The shallow structural wharf piles complicate deeper dredging in front of the existing wharfs. Structural piling modifications would be required. In addition, glacial silt marine deposits have occurred with time under and landward of the wharfs. Dredging would create an unconstrained and unstable face. Dredging or structural modification to contain the silts would be required.

Addressing the dredge depth issue for new PAMP construction is simpler because the new structural piling is being installed substantially deeper and dredging won't create the same type of problem. The new PCT will use a different fender system founded off the wharf structure without pin piles. There are, however, still program modifications that would need to be implemented in the future to accommodate deeper dredging that are not currently in the budget.

The PCT transitional dredging only went to about -38 MLLW and sloped up landward. Dredging to -45 MLLW with an allowance for over-dredging to -51 MLLW would create an unconstrained face of up to thirteen feet of unstable silt. Prior to more transitional dredging and being able to use the PCT for deeper draft ships additional work would be required. There are multiple potential solutions including but not limited to installing a combi-wall, a combination of structural piling connected to sheet pile off the fenders or dredging landward of the berth face and modifying the rip-rap embankment. Given that detailed design has not been done for the remaining PAMP structures, it's possible a different and less expensive solution could be developed if the decision to maintain the deeper draft were confirmed. Moving the berth face seaward for the remaining new construction would minimize/mitigate the issue by generally moving the face into deeper water. While there is conflicting information, the Project Team has stated the berthing line depths for the new facilities are about -42MLLW.

The draft affects vessel sizes, which has the potential to affect berthing and fender loads and could have a marginal cost effect. The issue was reviewed for the PCT where the design team used the Two Million Ways, a 74,000 Dead Weight Tonnage ((DWT) = carrying capacity)) long-range tanker as one of the design vessels. While this vessel has delivered to the POA in the past, its use has been infrequent. No long-range tankers delivered to the POA in 2018. The tankers using the POA in 2018 were typically medium-range vessels with 50,000 DWT capacity and nominal LOA of about 600' versus the nominal 750' LOA of the long-range vessels.

POL-1 and 2 were both designed for 35,000 DWT vessels but can accommodate larger vessels through tariff implemented berthing velocity restrictions. This solution has worked effectively for the POA where pilots typically plan berthing around tides and current velocities.

During the PCT VE meetings, the designers noted use of the larger design vessel increased berthing loads by about 15%. Berthing loads don't control any of the design loads for the nine PCT dolphins, but their loading nearly controls three of the dolphins. The PT could have similar issues, but because it is not programmed to receive seismic enhancements, it is more likely that some of its berthing dolphins are controlled by berthing loads.

In addition to increased berthing loads, the larger draft vessels have more mass and the potential for increased sail area, which complicates berthing operations during certain conditions. In the ship simulations, pilots supported procurement of specialized Dolphin Class tugboats with higher horsepower and shorter length than were available at POA at the time of the simulation.

The PAMP design also contemplates larger cargo vessels in the future based on potential future dredging increases. TOTE's ships are 839' LOA and larger than Matson's. The basis of design is for 1,000' LOA cargo ships. Berth costs could be reduced a nominal 10% if the size of the design vessels were reduced to vessels matched to the current dredge depth.

In summary, the POA ultimate draft depth was not fully vetted during the Roundtable and requires additional discussion.

### *Container Live Loads*

The project Seismic Design Manual provides guidance for container live loads on the cargo docks platform and trestles. Live loads are 1,000 pounds per square foot (PSF) on the structure, 250 PSF for the first 50' away from the wharf trestle and 1,000 PSF thereafter. 1,000 PSF generally equates to five fully loaded stacked containers filled to their legal road limits without any equipment access routes. While this criterion is reported to be consistent with many other facilities, it is conservative related to actual POA practice. TOTE uses ro-ro operations and typically doesn't stack the containers on their platform. While it is beneficial to have a heavy-duty dock there is a premium associated with the benefit, particularly given incorporation of the GAC seismic enhancement regulations. The requirement is also conservative to actual typical upland container storage.

Use of conservative BCF soil parameters coupled with conservative container storage assumptions could artificially lower the factor of safety for some of the future wharf facilities. Upland storage requirements could be regulated by tariff or Preferential Use Agreement.

## Design Parameters

While engineering codes can provide certain specific requirements and performance levels, engineering involves a significant amount of professional judgement. The project design team has made professional engineering judgement choices that have contributed to increased project costs. The following presents information on ice loads, berthing loads and geotechnical parameters that have affected the project design and cost.

### *Ice Loads*

Jacobs prepared a Seismic Design Manual which included a section on ice loads to be used in the PAMP design. The document provides guidance on assumptions to be used when designing PAMP structures.

Many of the ice load parameters are more robust than past POA projects. For example, the existing POL-2 was designed for 2' thick ice and 200 psi compressive strength. The Seismic Design Manual prepared for the program recommended use of 3' thick ice with 300 psi compressive strength. The PCT design used 2.5' thick ice with a 256-psi compressive strength. Ice is stronger in compression than in bending. The Seismic Design Manual included an ice bending strength of 100 psi, which is double the amount used in a DOT KABATA project planning document. A marine contractor experienced with work in Cook Inlet noted the extent of ice is much less than it was thirty to forty years ago and the duration of the ice season has shortened. He also made the observation that the PAMP is using both stronger ice parameters and a higher wharf deck level than on previous POA projects.

Discussions with professional engineers specializing in marine design and familiar with Cook Inlet ice indicate the design ice loads used for the PCT were conservative and could have been expected to cause failure in the existing POA structures. Similar observations were made by members of the marine contracting community familiar with POA construction. Other anecdotal evidence has been provided to support the conservative nature of the design. A tug dock installed just south of the Port has been in place for eight years with less robust members without ice problems. Single 48" diameter piles, exposed to ice floes and installed as part of the 2016 test pile program, withstood ice loads without plastic failure for two years before being removed. Discussions with a KABATA staff engineer indicate they evaluated the Port MacKenzie pile-supported structure to determine if there was any ice related piling damage. His recollection was the structure used 36" diameter pipe piles, 1" thick, and no piling ice damage was observed after more than 10 years of operation. He noted the Port MacKenzie current velocities were significantly greater than at the POA and the ice force on the piles was a function of the square of the velocity.

In addition, it appears unlikely that the south floating dock piling to be re-installed as part of the PAMP would be adequate to withstand the program prescribed ice loads. The Project Team has noted this is not a life safety concern as the dock is not used in the winter.

Discussions with COWI, the engineer of record for the PCT, during the value engineering (VE) effort confirmed the ice design requirements were conservative. The COWI engineer noted there had been discussions about potentially changing the prescribed criteria at the start of design and



a decision was made to not change them without having another coastal engineer stamp the revised requirements.

Past standard practice for POA dolphin design has been to use batter piles rather than vertical piles as currently contemplated in the PAMP program. While there are multiple considerations, the relative weakness of ice in bending is a relevant factor. Discussions with professional structural engineers indicate batter piles could cause ice failure in bending versus compression, which potentially could reduce member sizes in ice-controlled design conditions.

Discussions with the marine contracting community revealed that vertical ice loads on a Port wharf under construction in about 1965 caused major concrete piling failure on a very low tide.

### *Berthing Loads*

The PAMP has incorporated berthing velocities standards in the POA Seismic Manual based on California State Lands Commission Engineering Standards for Marine Oil Terminal Design and Maintenance (MOTEM) 31F-3-7, Berthing Velocity V (Normal to Berth).

One of the design vessels for the PCT was the Two Million Ways, a 74,000 DWT petroleum tanker. The vessel has berthed at the POA where both POL terminals were originally designed for 35,000 DWT vessels.

In 2013 the Port developed berthing velocity standards which were incorporated by tariff to allow vessels larger than the originally selected design vessels to use the infrastructure. While the engineers doing the analysis didn't have access to the original design data, they back calculated allowable berthing velocities including a 20% reduction in fender strength based on deteriorated pin piling, which are being renovated. The berthing velocity used in the PCT design for the Two Million Ways per MOTEM 31F-3-7 allowed normal berthing velocity of 0.46 feet/sec (ft/sec). The tariff-established berthing velocity for the same vessel is 0.18 ft/sec. The T3 ro-ro facility was designed for berthing velocities of 0.17 ft/sec. The berthing energy is a function of the square of the velocity. There have not been any fender failures since 2013 attributed to direct vessel fender contact. The PCT design berthing loads for the PCT are about 6.5 times those allowed in the tariff and about 7 times the berthing loads used to design the T3 ro-ro facility.

### *Geotechnical*

During the PIEP private party litigation between the MOA and certain private parties, there was substantial review, discussion, depositions and expert witness testimony related to the strengths of the BCF facies soils and how those materials would react under certain loads, including seismic. The experts on both sides of the litigation provided reports and testimony which presented different professional opinions on the appropriate design parameters for the different soil types. The PAMP program has developed design guidance that is more conservative than those presented by experts on the other side of the PIEP litigation.

Discussions with a professional engineer experienced in piling design and not involved in the PIEP litigation noted the BCF soil parameters could have had a material effect on the results of seismic and piling designs. While this is moot for the 2020 PCT contract, it could be relevant for

the remainder of the program. In the event funding is obtained to allow bidding the PCT dolphin work in the spring of 2020 as currently scheduled, it is unlikely there would be adequate time to investigate and implement any soil related parameter changes for this element of the work.

### **Combine Functional Elements**

Two primary options have been identified to reduce the planned PAMP buildout:

- Combine fuel headers in the cargo terminals in lieu of construction of a standalone new Petroleum Terminal
- Combine the lo-lo and ro-ro cargo operations into one joint-use berth in lieu of two separate cargo berths

#### *One Joint-Use Cargo Dock*

The current program eliminates one terminal (T3). Based on a utilization analysis, additional wharf consolidation is possible. During the June 2019 Roundtable, the Administration proposed a revised PAMP scope option to reduce the new buildout plan from four facilities to two. Their proposal was to construct the new PCT and one joint use cargo ro-ro and lo-lo terminal. The 2020 PCT work was bidding at the time of the proposal. The Administration has indicated this approach could save about \$285M.

Comprehensive discussions did not occur at the Roundtable on alternatives for the full scope of future PAMP buildout. While discussions did occur about the potential installation of cargo berth fuel headers and potential additional lo-lo use associated with the Ambler mining district, detailed discussion did not occur on what mix of facilities was needed to meet current and future POA demands.

The utilization rates for the cargo terminals are each currently at about 40%, which is about half of the maximum that can practically be accommodated from an operational perspective. While changing the cargo shippers' schedule would essentially double the cargo terminal utilization rate, it would require TOTE and/or Matson to reschedule their ships to arrive on different days. The cargo carriers do not support this option.

There are market issues at Tacoma and Anchorage that provide financial and competitive advantages for both carriers to stick to their existing shipping schedules. Matson has additional logistical considerations as their ships also serve Kodiak and Dutch Harbor in addition to Tacoma. The schedule change issue is wider than TOTE and Matson and includes other cargo carriers that don't use the POA but deliver cargo to MOA. Changing schedules could provide opportunities for other transport methods to gain market share with reductions to the current POA users and Port tariff revenue.

The POA has been approached by Trilogy Metals, which has expressed interest in using POA lo-lo cranes to export ore from the Ambler mining district starting around 2025. This mining opportunity has been progressing slowly forward for many years. A draft Environmental Impact Statement was issued August 23, 2019. The proponents continue to identify mineral reserves and obtain environmental approval for the roadway which is needed to cost-effectively access the

mining district. It is not clear that a single cargo berth could accommodate the two existing cargo carriers and the projected Ambler mining district ore if it were to materialize.

The Administration's proposal did not clearly address details of the joint use cargo facility or treatment of the remaining existing POA facilities. A joint use cargo terminal in the approximate location of POL-1 and T1 in a north/south orientation is generally consistent with the PAMP. If all existing wharf facilities were demolished as currently contemplated, this option would be less than the Military Surface Deployment and Distribution Command preferred number of available berths. If the Administration's intent was to renovate certain of the existing wharf facilities, moving the cargo facility 140' seaward would pose long term safety problems for vessels using adjacent berths such as POL-2 and T2. It would also create maintenance dredging issues and not be consistent with the USACE Section 408 authorization. If the Administration's intent was to renovate certain of these structures, dredging access complications would be mitigated by keeping the new joint cargo face in the existing POL-1/T1 location. This solution would not be consistent with the USACE Section 408 authorization.

### *Fuel Headers in Cargo Dock(s)*

Fuel suppliers generally support adding fuel headers at the general cargo terminals in lieu of new petroleum wharf facilities. The Project Team reports they are actively evaluating this option. This could result in significant PAMP cost savings. While this combination of cargo and fuel delivery capacity is used in other Alaskan and US ports, it has not been fully vetted for Cook Inlet's large tidal variation. POA's current petroleum facilities use static hose towers which would be problematic with Matson's lo-lo crane operations.

The PCT design includes six runs of 12" diameter piping which cross the platform deck and then cantilever along the trestle for burial towards the tank farm. Design solutions to implement fuel headers at the cargo docks would likely vary depending on other design choices.

Mechanical designers need to consider multiple factors during design, including gravity flow opportunities, pipe access, vehicle loading, ice, water intrusion and numerous other factors. The least complex cargo facility solution would likely occur in a trestles-only ro-ro facility. Piping could be surface mounted like at the PCT. Stand-alone cargo facilities would allow for deck mounted piping at the berth edges. This would avoid under-deck routing and consideration of under-dock structure ice forces, design and environmental issues related to enclosed and non-observable spaces, grade implications and operational complexities.

While the concept has not had the benefit of a formal concept design by a professional mechanical engineer, preliminary discussions with one have not identified any fatal flaws. The technical solutions may need to vary depending on deck height. Conceptually it appears it would be simpler to install piping above the maximum seawater level than have concrete at or below this elevation. Application of this concept on a stand-alone terminal with a deck elevation equal to the PCT would likely be easier and less expensive to accomplish than on a lo-lo facility built to the existing deck heights. The PCT design currently allows for six product types including methanol. Cost savings could be gained by reducing the number of fuel types at the headers.

Installation of a hose tower is more complicated on a lo-lo facility because of increased truck activity and crane presence. A mobile hose tower facility would likely be required. Installation of a fixed hose tower on a ro-ro facility is simpler. A fixed tower could be accommodated on a trestles-only ro-ro solution by building a separate tower platform. If T3 was renovated, structural reinforcement/renovation might be required for the added loading.

The current program allocates \$177M for the POL-2 replacement terminal. It's highly likely that meeting the throughput need by adding fuel headers at one of the cargo docks would be much cheaper than building the new PT facility planned in the PAMP. While detailed cost estimates haven't been done, it appears fuel header costs might be of the same order of magnitude of repair of POL-2.

There are many factors that go into the evaluation of the best solution. As previously discussed, there have been large historical fluctuations in the amount and makeup of petroleum products moved across the docks based on market factors outside POA control. Future tariff adjustments could affect demand and drive certain users to consider alternatives to moving petroleum across the POL dock face. Given that the PCT VE effort did not lead to a reduction in the trestle or platform size also affects the requirements equation. The PCT was designed to accommodate an existing ABI controlled cement unloader located in Portland. The discharge rate of this unloader is about 50% faster than the existing equipment, which translates to about an extra 15 to 20 available fuel berth days per year. This would reduce PT berth usage.

## Renovate in Place

There are multiple factors that could enter into a decision on how to advance the PAMP. A rational approach would be to perform a master plan to identify the need, identify options to meet the need, and then perform a life cycle cost analysis to evaluate the options. That approach is outside the scope of this study and is not consistent with the current program status and funding reality. The Project Team has said they have employed PAMP life cycle analysis.

While there are many benefits associated with all new facilities, renovation of some facilities could significantly lower the initial capital cost of the program. The following presents past efforts, renovation need, and options.

### *History*

Renovation in place was considered for Concepts A and B of the 2014 PAMP planning efforts. Rebuilding POL-1 was presented as \$15M in the August 2014 charrette. Performing a T1 structural retrofit was presented as \$21M in the same exercise. Parametric costs were presented as \$500/SF for wharf and trestle structural retrofits and \$1,000/SF for new construction. The basis of the parametric information was not provided.

While the POA, and one of their long-term engineering consultants, have looked at and tried many different methods to repair corroded piling, a comprehensive evaluation of renovation options for existing marine structures has not been recently performed. The Port did contract for major wharf structural repair in the past. This was done on T1 after the 1964 earthquake. Replacement pilings were installed, and concrete epoxy work was done in about 1972 and 1973 by Stout and Stout. Based on a discussion with one of the workers, this effort installed new

piling adjacent to existing pile caps after drilling through the deck. Scaffolding was installed below the deck and the piles were tied into the pile caps using rebar and concrete. Concrete epoxy grouting was also performed. Piles were cut off at mudline and capped with steel plates.

### *Pile Thickness*

The major driver behind wharf facility replacement is deteriorated piling. By modern standards, relatively thin wall piling, typically 7/16", without corrosion protection was installed. While visual inspections have been performed, a detailed actual piling thickness evaluation hasn't been done. The most significant effort appears to have been done in 2014, when 22 piles on the five wharf facilities were inspected using ultrasonic testing (UT) to measure steel thickness.

This represented about 1.6% of the reported total 1,400 POA wharf and trestle piles. Readings were taken using a 1/2" inch diameter transducer around the nominal 75" pile circumference at three pile elevations, for a total of nine locations per tested pile. While this provided useful information, it was a small fraction of the total pile area and corrosion is not uniform. Cook Inlet's highly turbid waters complicated testing and had the potential to skew results, as surface preparation grinding was required for accurate results. Pile thickness information was presented at the June 2019 Roundtable. A Port User closely reviewed the information in depth and raised questions and issues with the presented data. The observation led to additional review and focus.

Through coordination with the Project Team, POA's engineering term contractor provided the following guidance. Pile capacity is not generally affected by the deepest observed pit, but usually by the average thickness. The same engineer further noted the ASCE Waterfront Facilities Inspection and Assessment manual provides certain guidance related to pile degradation, stating, "ASCE gives an **element rating** of 'severe damage' with section loss exceeding 50% and 'major damage' with section loss between 30% and 50%. Location, quantity and intended performance of the damaged elements would be considered in providing a structural unit **condition rating**. A condition rating of 'critical' has been recommended by some for portions of the Port. According to ASCE this will mean there exists advanced deterioration, possible overstressing, and possible local failures; load restrictions should be implemented as necessary and repairs should be carried out on a high priority basis with urgency." The engineer also noted replacement of the facility is a judgement call.

A summary of the average pile thickness and average loss data using corrected formulas as calculated by the Port User follows.

#### 2014 POA Wharf Pile Thickness and % Loss Measurements (Elevations are MLLW)

Wharf	El -2' to -4'	-12'	Mudline
POL-1	0.25" 42%	0.24" 46%	0.20" 54%
POL-2	0.28" 36%	0.30" 32%	0.29" 34%
T1	0.25" 42%	0.32" 28%	0.37 16%
T2	0.37 34%	0.35" 26%	0.42 20%
T3	0.33 38%	0.36" 18%	0.37 15%

Red = Average Severe Damage

Yellow = Average Major Damage

Green = Less than Average Major Damage

Review of the aggregate average data reveals POL-1 was the only one of the five existing wharf facilities with an average of Severe Damage, with the rest of the facilities having at least one test location with average thickness in the Major Damage category. All but one facility had the worst average measurements at elevations -2 to -4 MLLW. One had the most damage at the mudline.

Evaluation of the average data at each individual tested pile revealed some additional insights. Half the POL-1 piles had Severe Damage while the rest all had at least some Major Damage. The latter piles all had at least one location where the average reading was within 1% of being considered Severe Damage. All the POL-2 and T2 piles had locations with Major Damage but none with Severe Damage. A quarter of the T1 piles had a maximum of Severe Damage, half had Major Damage and a quarter less than Major Damage. A quarter of the T3 piles had Severe Damage and the balance had Major Damage.

Additional piling review was done in July 2019 using sonar, UT and tactile methods. No areas of major new damage were identified.

### *Considerations*

While it's clear the existing wharf piling has suffered corrosion damage, some lateral capacity remains. The facilities recently withstood a magnitude 7.1 earthquake with an epicenter less than ten miles away. Local peak horizontal ground accelerations measured in the Ship Creek valley at a monitoring station near the old railroad depot were more than double those attributed to the 1964 earthquake in CH2M Hill's Suitability Study. The 2018 earthquake, while much shorter duration than the 1964 earthquake, had a peak acceleration at the Ship Creek sensor that was above the PCT CLE mudline PGA and 77% of the mudline MCE. While POL-2 had more damage, failure was detected in less than 2.2% of the total POA wharf piles.

One of the most complex elements related to PAMP delivery was sequencing of the work to accommodate operations. Two major complexities that needed to be addressed were providing for continuity of cement deliveries and providing the infrastructure to allow ro-ro and lo-lo operations. The Assembly decision to award the 2020 PCT ITB is consistent with the general PAMP sequencing plan and likely simplifies future decision making.

As contemplated in the PAMP program sequencing, once the PCT has been completed, the space currently occupied by POL-1, T1 and the port building becomes available for installation of the new lo-lo terminal. When considering the existing wharf locations for construction of a new terminal, this seems to be a reasonable location.

The current program essentially meets user needs and wants through construction of new facilities. Incorporation of renovation in place solutions could create conditions where different users in the same business line operating on facilities with different quality levels. This consideration will likely need to be addressed as part of the Plan of Finance discussions.

Renovation in place of the existing facilities would not be consistent with the USACE Section 408 authorization. Additional negotiation, discussions and sediment modeling would need to be done in conjunction with the USACE. Based on the initial PAMP Section 408 authorization this likely would be an expensive and time-consuming process. A new authorization could involve

discussions with the Federal delegation related to the USACE maintenance and operations budget. Designation of the POA as a Department of Defense National Strategic Seaport could potentially factor into the discussions.

### *Facility Candidates*

The amount of existing pile damage would be one factor in a life cycle cost evaluation. Another major consideration for that type of analysis would be to compare the costs to renovate an existing structure to meet user needs, compared to the cost to build a new structure to meet those needs. This perspective can add another screen to help identify which facilities are renovation candidates.

If a decision is made to keep wharf lines in the existing location, renovation of the ro-ro berth is a clear potential option. Construction has been reported to have been completed in about 1977, with one trestle added in 2001. TOTE recently issued an RFP and selected a structural engineer to evaluate the T3 condition. After this initial effort is completed, they expect to authorize an additional effort to evaluate renovation options. This information is expected to be available in the November 2019 timeframe.

The replacement cost for T3 is \$448M and includes the enhanced seismic capacity requested by the GAC. The T3 demolition cost is an additional \$48M for a total of \$496M. It's likely replacement piling could be installed to add life to the facility at a small fraction of the cost of constructing the currently envisioned replacement.

There are factors that could cloud a simple analysis. T3 is currently subject to significant siltation due to eddy currents in the lee of the North Extension. Pilots would prefer removal of a portion of the North Extension from a berthing safety perspective. While this has been manageable to date, the analysis could change if North Extension removal became perceived as an immediate need. TOTE's conversion to LNG powered ships will add about 2' of draft. Currently over-dredging is done in front of the berth at the end of the fall dredging season, with winter silt removal at the berth occurring as needed. The frequency of interim maintenance silt removal would likely increase with deeper draft vessels. It's possible modifications could be made to the seaward face of the wharf to allow deeper dredging. Possible design retrofit solutions could include adding deeper piling in the near face bents and/or installation of a combi-wall as contemplated at the PCT.

POL-2 is another renovate in place candidate. Its current and future anticipated use is for petroleum transfer. The current replacement cost estimate is \$177M. It appears all the POL-2 piling could be replaced for a fraction of this amount. Two potential conflicts were identified with using POL-2 on a long-term basis. The first was that the northern PCT dolphin could conflict with safe POL-2 access. The situation was modeled using simulation technology in 2017 and determined to not be a problem. The second issue was that the easterly location of the POL-2, as compared to the future PAMP proposed PT, could be problematic to long-term dredging issues. USACE's primary dredging equipment could have difficulty dredging directly adjacent to POL-2 after installation of the PCT dolphins. Maintaining the current location also increases the total amount of dredging performed by USACE as compared to demolition and seaward reconstruction as contemplated in the Section 408 authorization.

The existing T2 is currently used for lo-lo operations with the trestles configured for those operations. The terminal is not well suited to meet either TOTE's or Matson's future cargo needs. The trestles and electrical busbar are not consistent with TOTE's operations. Matson's ships are at the tail end of their useful life and a conversion is anticipated. While details have not been determined on conversion specifics, it appears likely that any potential vessel solution will increase the vessel length and draft and would require major modifications to the existing T2 infrastructure. The existing 38-gauge cranes would not likely have adequate reach for the new vessels. T2 renovation costs associated with any potential lo-lo vessels would likely be equal to or greater than the conversion costs to upgrade T2 to accommodate the TOTE vessels.

### *Renovation Options*

As noted earlier, a comprehensive evaluation of options to renovate existing wharf facilities in place has not been performed. The following presents some considerations and possible renovation options based on discussions with interested stakeholders.

The major structural elements of the terminals under renovation consideration include piling, pile caps and decking, for both the trestles and wharfs. Fenders on the wharf face do not support vertical dock loads but do take ship berthing loads and typically need replacement over the life of a facility.

Of all the elements listed directly above, fenders typically have the shortest life span. The POA is performing a piling replacement project outside the PAMP this year. The contract allowed use of Manitowoc 3900 T and W cranes. The general capacity of these machines are approximately 100 tons. Larger cranes with additional capacity could potentially be employed using crane mats to distribute loads. It's noted that the POA engineering team would need to evaluate crane capacity in advance of any renovation ITB.

With respect to the existing wharfs' main structural elements, the pilings have the most systemic damage. While there may be other options, discussions with the contracting community have focused on installing piling and potentially replacing portions of the pile caps and decking.

The Port has done major structural repairs to its marine facilities in the past. Replacement piling could be installed by drilling through the deck and attaching piling to the existing pile caps using rebar and concrete like the 1970's T1 earthquake repair. It's possible other deck drilling solutions and ways to integrate the piling into the existing pile cap structure could be viable. Discussions with the presidents of two Anchorage-based marine contractors who have worked at the POA support the viability of renovating existing facilities in place to extend longevity. Input was also obtained from a retired marine construction superintendent who worked on the post-1964 earthquake T1 repair. All three individuals spoke to the benefits of using the existing structure for work access and templates and being able to install piles from the dry rather than having to work off equipment on barges in Cook Inlet's high tidal variation environment.

POA's long term engineering contractor submitted a 2013 proposal for about \$180K to do a more comprehensive evaluation of piling at T1, POL-1 and POL-2 in accordance with the ASCE manual of practice. It would be beneficial to have this type of information for facilities under consideration of renovation in place to better develop potential incremental replacement options.



ASCE Manual 130 recommends 100% inspections be done every two years on elements that are in Serious condition and every year on elements that are in Critical condition. While some larger pilings were employed in the existing wharfs, much of the piling is 24" diameter as compared to the 48" diameter piling typically used in the PAMP designs. A pile replacement program would also need to evaluate and consider whether to reinstall piling per the original design diameter and/or upsize the piling. The existing pilings were installed to much shallower tip elevations than the current design.

Multiple options exist to install replacement piling. A decision could be made to leave the existing piling in place or remove them. Leaving them in place would add lateral and vertical capacity but would increase density and ice accretion forces. While there is significant piling degradation and reduced strengths which could complicate removal, the shallower piling could potentially be pulled. Decisions could also be made to cut and cap piling at the mudline, as was done in the 1964 Earthquake repair. Alternatively, and less likely, piling could be cut below mudline as was done when removing the test piling.

On larger scale replacements, demolition could include silt removal which would reduce required pile extraction forces and reduce soil liquefaction risk during a future earthquake. Leaving piling in place would contribute to increased impressed current demands and increased maintenance costs but would aid in addressing vertical and lateral load demand. As earlier noted, while the recent 7.1 magnitude Port MacKenzie earthquake had a PHGA in excess of 0.2g, less than 2.2% of the wharf piles were found to have visible structural damage. In addition to the previously mentioned GEER report, discussion with a professional structural engineer indicates this is indicative of the existing pilings, including those with jackets, having some remaining lateral load capacity.

Suggestions of a possible means and methods approach from one marine contractor follow. The existing infrastructure should be left in place during initial pile construction. Installation could be done north to south or west to east and would be like painting the floor of a room: start at one end and work your way out of the room. In POA's case, it would be working your way off the wharf unless deck load restrictions required starting on the landward side to create added crane capacity. Prefabricated steel components could be used on the seaward side of the wharf to minimize installation time and reduce seismic mass. Changed conditions conflicts arising from earlier work could be addressed through creation of a contingent sum bid item for re-driving. The existing pilings are much shallower than the current design and could likely be pulled.

Recommendations were provided that the design should accommodate commonly available materials and equipment. The majority of the 48" PCT pilings are not standard materials, with limited mills willing to provide rolled piling quotes.

Recommendations were provided that the piling should be designed to be able to be installed with Manitowoc 3900 or 4000 class cranes, or possibly 4100 if structurally acceptable to the POA engineering team, to increase bidder competition. These are generally 100 Ton to 200 Ton class machines. Crane mats would be anticipated to be used for the larger machines to distribute loads during construction.

As part of their response to the proposed 2020 PCT construction award, the Port Users had proposed installing a 20' to 30' seaward extension off the face of POL-1 to take the berthing and ice loads and allow some of the cement offloading equipment to be founded on new structure. This would have resulted in the POL-1 face to be offset from T1, T2 and T3. Given the July 30, 2019 Assembly decision to proceed with the PCT, the proposed concept is likely moot for POL-1, but the general concept and following discussion remains relevant to other potential facility renovation. While PCT construction eliminates the need to address the cement ship as an operational constraint, POL-1 is not well suited for conversion to ro-ro or lo-lo operations and removal of POL-1 offers a ready solution for the next major construction effort. The Port Users' proposal focused primarily on the extension and didn't clearly address repairs and upgrades required to maintain the existing facility. It's likely some of the latter would have been required given the pile conditions.

A variation of the Port Users' proposal would be to completely replace the first two or three seaward pile bents, pile caps and deck of the existing facilities under renovation consideration. This would strengthen the portion of the wharf with the highest operational berthing loads while keeping the face of the wharf in the existing location. An added benefit of doing this at T3 would be to mitigate the dredge depth issue generated by TOTE converting their ships to LNG. A downside to the approach would be that reconstruction might be required for the recently renovated fender systems.

A more robust reconstruction option would be to perform more significant and incremental rebuilding of the pile caps and decking over a larger area. One contractor felt it might make more sense to fully rebuild structures in place from a longer-term cost benefit perspective as compared to pile replacement. The same basic process as described above would be used, but the deck structure would be removed, and existing piling cut off at mudline or below. Dredging of the silts could be done under the dock prior to deck reconstruction. This would simplify pile removal and minimize potential pile changed conditions installation risk. It would also reduce liquefaction risk from a future seismic event. This approach would be more expensive and disruptive to operations than pile removal.

Suggestions from the contracting community were to review multiple options at a conceptual level to frame the advantages and disadvantages of the different options and more clearly define the costs.

While there are clear cost efficiencies resulting from performing a full rebuild in place versus accomplishing the same effort on an incremental basis, the lack of a full and visible revenue stream is a POA reality. A renovate in place program would likely be aligned with the most highly flexible funding, such as tariffs. Grants at the federal and potentially state level could have strings that could complicate use for this type of project.

The PAMP contemplates demolition of all the wharf facilities and construction of new facilities in a relatively short, 10-year time frame. POA's existing corrosion protection system has many challenges and the impressed current system is being operated at a fraction of the electrical load needed to significantly minimize the corrosion rate. While the current approach is rational under the baseline PAMP plan, the economics change if some of the facilities are renovated in place.

Improvements to the corrosion protection system are needed for renovated facilities. This will increase operating expenses in addition to the initially required capital improvements. The issue is complicated by the interconnected nature of the wharf facilities.

A meeting was held between the Port Users and Project Team on July 19, 2019 to discuss the Port Users POL-1 proposal. Building code, environmental permitting and construction deck loading constraints were discussed.

The MOA has adopted the International Building Codes for building structures. Discussions with a past Building Official indicate marine structures, where there is not continuous human occupancy, are not directly addressed by the International Building Code (IBC). The PAMP team has designated a mix of codes for different facets of the marine facility design. Best engineering practices for marine facilities have evolved since design of the five primary POA marine terminals. While these terminals have survived recent OLE and near CLE magnitude earthquakes, it's clear that replacement designs using current PAMP design codes would be much different than the designs of the existing structures.

Marine structures need to accommodate vertical and lateral loads. The existing structures handled vertical loads by typically using densely spaced and typically smaller diameter piling, many of which were installed to much shallower depths than current design approaches. Lateral loads were accommodated by batter piling, which is piling installed at an angle from vertical. Per discussions with a professional structural engineer, batter pile are less prevalent under current design practices given current code requirements which generally do not provide the same lateral load benefits to batter pile as earlier codes. In addition, batter piles have larger environmental permitting monitoring radiuses due to several factors. While there is piling corrosion, the general design approaches have worked for MOA for the past 50-plus years.

While the PAMP has defined certain codes for design of the marine facilities, their use is discretionary and subject to owner decision. This is particularly relevant to renovation in place of the existing structures. Most construction in the MOA is governed by the IBC. This is defined at Title 23 (Building Code) of the municipal Code. The IBC basically requires structures be designed to current codes if more than 50% of the structure is being renovated. Based on discussions with a past MOA Building Official, Title 23 is silent to renovation/repair of wharfs and piers and it could be reasonable to say they should be held to the same standard as other nonconforming structures in Anchorage, i.e. Title 21.

The practical relevance of this is that it's potentially possible MOA could use the original design, or greater, to renovate a much larger portion of the structure than would be allowed under the IBC. A controlling requirement is presented at Anchorage Municipal Code AMC 21.12.040 D and is based on replacement of up to 50% of the *replacement value* (emphasis added) of a new facility. This means MOA could potentially choose to replace a significant portion of the existing facility piling using similar, or larger, piling than detailed in the original design.

The MOA-approved Building Code does not specifically address wharves and piers. In a comment to the draft of this report the Project Team noted the MOA Building Official and POA are in the process of codifying ASCE 61-14 and other associated codes to address replacement of

compromised wharves and piers. The Project Team recommends ASCE 61-14 be adopted for the local pier and wharf facilities. Implementation of revised requirements could affect the potential for the MOA to renovate existing structures in place.

Installing new piles using conventional means would have more applicability in addressing vertical loads versus lateral loads due to current environmental permitting noise requirements and restrictions. Use of larger, heavier walled piling or higher strength steel could add to the lateral load capacity of the structure but could affect lateral load transfer over the entire structure.

Take POL-2 as an example. The current budget has allocated \$177M for the PT replacement facility. Title 21 would allow up to \$88.5M be spent using the original design or greater. POL-2 has about 56 piles. At the June 2019 Roundtable the POA's long term contractor engineer, R&M, said piles could be replaced for about \$70K each. Given the lack of specificity and clearly defined design concept, a value of \$300K per pile is used as a conservative cost to do a high-level check of the cost effectiveness of the concept. That equates to a nominal \$17M to replace all the piles, which is much less than the \$88.5M maximum per Title 21.

The cost per replacement pile was tested with an experienced marine contractor to validate the relative cost per pile assumptions. Discussions occurred on possible design solutions and means and methods that would be required to install the piling. The contractor confirmed it was likely piles could be replaced for less than \$100K each. The discussion assumed use of 24" diameter piling having 1" wall thickness installed to the same depth as the PCT. The PCT piles were installed much deeper than the existing typical wharf piles.

Renovation costs would be less with shallower piles. It's also possible there are design issues with the test scenario pile that would necessitate a different solution. While the discussion looked at single pile replacement costs, unit costs could be minimized by installing piling on either side of the pile cap and using a steel beam to span below the existing cap to simplify attachment.

A key consideration for any Cook Inlet pile driving work is to minimize impacts to beluga whales, an endangered species. The following presents construction means and methods that would reduce environmental impact and be relevant to permit acquisition and mitigation of construction related environmental risk. By performing work outside the primary salmon run season, say in the late April to early June period, potential impact and associated permitting risks could be minimized. Renovation in place likely involves less in-water pile driving work than what is contemplated in the current program, and the use of smaller vertical piling would have smaller monitoring radiuses. The batter pile installation timing could be prescribed to occur in the periods typically having low beluga sightings to minimize beluga "takes." Spreading out the pile replacements over multiple years is potentially consistent with funding availability and has the added benefit of allowing installations to be done in the lowest risk beluga take periods.

Most marine piling is installed using vibratory or impact hammers. Technology is also available to install replacement piling for most of the existing POA piles using drilling technology which potentially has improved sonification impacts as compared to conventional pile installation techniques. If this technology were to be employed it's likely an additional test piling program would need to be employed to determine production and noise information.

From discussions with marine contractors, the cranes currently working on the POA docks installing fenders could install the original design size piles. They also believe it is likely it would be possible to gain engineer approval for use of cranes capable of installing larger piles up to 40” or 48” diameter, 1” wall piles. This considers the possibility that the installation method would require installing the piles in two pieces and then field-welding the pieces. While it’s more efficient to install the piles full length, it’s common practice to install part of the pile, do a weld splice overnight and continue driving the remainder of the pile the next day.

Most renovation in place is anticipated to be done from the dry without the use of marine barges or temporary trestles. This will simplify and reduce safety risks when berthing vessels adjacent to ongoing construction. Certain berthing operations during the PAMP construction period require tugboat assistance. Renovation in place would generate additional savings by reducing tug support costs included in the current program budget.

## Alternate Design Concepts

Port Users have expressed initial support for several concepts that could significantly reduce the required program buildout. This section analyses four design options that differ from the current thinking and have the potential to reduce costs.

- Ro-ro berth trestles only
- Wharf face location
- Lateral load transfer
- North Extension

### *Ro-Ro Berth Trestles Only*

Discussions have occurred with TOTE about construction of a new ro-ro terminal with trestles and dolphins but no platform dock. Loading ramps would be used on trestles like their current POA operations. This configuration is used at the TOTE Tacoma facility which loads POA bound cargo. Implementation of this solution would add dolphin costs but would significantly reduce the amount of pile-supported deck and overall project costs.

The July 2019 program budget includes \$446M for T2 ro-ro. The current T2 ro-ro design has about 63,000 SF of platform dock and about 9,000 SF of trestles for a total of 72,000 SF of total deck area. If the platform was removed, the trestles would need to be extended another 66’ adding about another 2,000 SF. The total for three trestles would be 11,000 SF or about 15% of the area of the current program. In the event the wharf face was kept in the existing location, and not moved out 140’ as contemplated in the current program, the three trestles would require less than 7,000 SF or about 10% of the current program. While the actual design solution would likely grow from this analysis, it does suggest significant savings could be accomplished by this approach.

This solution would be consistent with installation of fuel headers, although it’s likely a small section of platform deck would be required for a hose tower. It would reduce long term operational costs for the berth given the substantially reduced area. Deleting the deck would likely complicate using the ro-ro dock to satisfy the GAC enhanced seismic cargo dock recommendation. It would also reduce the amount of platform dock space for other users

including federal entities. Depending on other program decisions, this could potentially complicate meeting the Surface Deployment and Distribution Command preferred berth requirements and reduce the potential for direct federal funding for this berth.

Implementation of this concept at the proposed 140' seaward location would likely be viewed as being consistent with the USACE Section 408 authorization as it would likely reduce sedimentation from the current design given less piling. Installing the solution to east of this location could require additional USACE review.

### *Wharf Face Location*

A decision was made in the current program to extend the wharf face 140' seaward. Other options, including keeping the wharf face in the current location, were considered.

The seaward wharf extension was done in conjunction with cutting back the North Extension. Modifying both areas improves current flow on the ebb and flood tides, minimizes sedimentation deposition issues, and could reduce future annual dredging costs which are currently paid for using federal funds. The current design solution solves the T3 deposition issue by eliminating the eddies developing in the lee of the North Extension. In the current design concept, the more the face of the North Extension is moved landward, the more dredging needs to be accomplished, which increases costs and reduces the amount of uplands available for other Port operations. Moving the face seaward also shifts the majority of the new T1 lo-lo and T2 ro-ro berth construction into more "green field" areas which reduces risks related to construction-changed conditions from old piling or other obstructions.

Extending the wharfs seaward increases other costs. Trestle lengths and associated utility runs increase. The costs for seismic resiliency also increase. The increased current velocities would increase berthing complexity, and potentially the loads experienced by the fender systems and structure.

It appears the initial analysis may not have fully considered two other relevant factors. During the June 2019 Roundtable marine pilots expressed safety concerns with the lo-lo and ro-ro terminal sequencing. T1 lo-lo and T2 ro-ro need to be constructed sequentially to accommodate operations. The current plan requires three years of lo-lo berth construction followed by two-plus years of ro-ro construction.

Construction berthing operations were simulated at Seward's Alaska Vocational Technical Center after the 2014 baseline program presentation. The 140' face difference between the new and existing works would be problematic for safe piloting operations under normal summer conditions and exacerbated during high tide events with higher current velocities and winter ice floes. The risk exists when construction equipment is in the initial work area and after the initial structure is completed and in operation.

In order to construct the current plan, the pilots stated the south half of the North Extension must be removed before extending new terminal replacement works from the current location to facilitate safe berthing operations.

**What is of particular concern, the pilots said, and Jacobs confirmed, is that the PAMP needed to complete the south portion of the North Extension reconstruction and have all the money in hand for the two container berths before starting the first cargo berth construction.**

Having full funding in hand was a risk mitigation strategy designed to minimize the period the pilots had to work around the 140' difference between the new and existing berths. This was intended to limit the risk of harm to personnel involved in the berthing operations and minimize the potential for damage to the wharf infrastructure and ships costing hundreds of millions of dollars. Having partially completed terminals not under active construction for an extended period was deemed an unacceptable risk.

Based on the current cost estimate, about \$1.3B in new funding beyond the \$81M needed for the PCT needs to be raised prior to starting the cargo terminal work. This is problematic from both the magnitude of the total funding requirement and from the current perspective that the bulk of the funding may come from state and federal sources, which will likely be incrementally received over time. \$160M has been raised in the last seven years. While it is possible the program costs could come down significantly if CMAR and P/D/B-influenced costs are reduced and/or a T2 ro-ro trestles-only solution were implemented, it doesn't change the situation that a very large amount of funding would need to be in hand prior to starting the cargo berth.

Shifting the wharfs seaward simplifies berthing after program completion, as it reduces problems associated with water cushioning developing from limited volumes behind the berth face. During construction it increases the berthing complexity and the need for additional tugboat support.

Two support tugs are required to safely berth under certain conditions, with an additional tugboat required in the winter to clear ice near the berth. Tens of millions of dollars in tug costs have been included in the PAMP budget estimate.

At least two other options are available in lieu of the currently designed wharf face location: the wharf face could be left in the existing location or it could be moved out some lesser distance between zero and 140'.

Reduced seaward face movements would likely have many of the same safety-related issues as the current plan. Safety issues and tug support requirements would increase in relation to the distance from the current location. North Extension reconstruction costs would react inversely if optimized current and sediment flow were considered the primary factor. It should be recognized that any easterly North Extension change would likely improve the current and sedimentation situation existing the last ten years after the North Extension construction. Given the ro-ro berth is much narrower than the lo-lo berth, the changed conditions pile risk would incrementally increase as more of the new structure is founded in the existing dock footprint.

Maintaining the current wharf face location would have some significant benefits as well as tradeoffs. A primary benefit relates to the Plan of Finance. Obtaining full funding for T1 lo-lo, T2 ro-ro and the south part of the North Extension prior to construction of the first cargo berth would not be required.

Incremental improvements could be performed in smaller work packages as funds became available. While this creates loss of scale inefficiencies, additional mobilizations and increased management overhead, it does have the benefit of increased competition with contractors having local equipment fleets and typically leaner management structures, which could lower costs. Given that construction equipment will not be operating in the winter, construction of facilities at the same wharf line will reduce berthing complexity and reduce tugboat assistance costs.

A drawback would be continued siltation at T3 until completion of the North Extension reconstruction. The post construction siltation impacts would be a function of the extent of North Extension reconstruction. If required by sequencing, a temporary dolphin could be installed south of the new T1 lo-lo to provide additional separation between the Matson and TOTE vessels.

Any modification from the existing program would require new USACE Section 408 authorization. The USACE PCT permit limits the intersection angle between the PCT and the south limit of the new cargo to a maximum of 11 degrees. This pushes the south end of T1 lo-lo about 700' north of the existing POL-1 location. This requirement complicates construction sequencing.

Building the work from the landside would simplify maintaining operations during construction. One potential approach could be as follows: After POL-1 and partial T1 demolition, a temporary mooring dolphin, possibly two if required, could be installed in the current POL-1 berth line location. Construction of the south end of a new cargo berth could occur in the area south of Matson's current vessel docking location. Once construction of this area was completed and activated, construction of the remainder of the berth could progress incrementally to the north with shutdowns concurrent with vessel operations. There likely would be several logistical operational comprises that would need to be considered and optimized if this approach were employed. Employment of the Lateral Load Transfer solution discussed below would simplify some of the logistical issues versus a trestle solution.

Consideration should also be given to negotiating a modification to the 11% permit requirement. The basis of the permit requirement was to minimize sedimentation at the intersection line of the two berth lines and simply dredging operations.

A 140' extension of one or more of the wharfs is not consistent with renovation in place of any of the facilities or using a sheet pile structure to provide lateral support of the lo-lo berth as discussed below.

### *Lateral Load Transfer*

Earlier design codes and practice supported use of batter piles to support lateral load demands. The PCT was designed to withstand lateral loads through bending of the steel piles, which is in some ways structurally inefficient but consistent with current codes. The vertical piles also have marine mammal permitting benefits.



Consideration of alternative design solutions could save significant costs. The current structural design solutions resist lateral loads through increased pile thickness. Alternate solutions are available.

The Kodiak Pier 3 was designed to a PHGA of 0.43g, which is 96% of PAMP's 0.45g Design Earthquake. The Kodiak pier was designed to handle the same container ships Matson uses in Anchorage, but the volume is much less. Most of the wharf was founded on piles, but an OCSP solution was used under the landside crane rail and was structurally used to resist lateral earthquake loads.

The Kodiak project had 50' by 15'8 1/8" piling grids and primarily 36" diameter piling with a 1" thick wall. For comparison, the PCT platform primarily used 20'5" by 20'4 1/2" grids with most piling thickness between 1.25" and 1.375" with a fraction at depth being 0.75" thick. Much less steel and concrete was used in Kodiak to meet the seismic requirements. Part of the difference in the pile grid sizes and pile thickness is incorporation of the GAC seismic resiliency recommendation and the added thickness to accommodate the 75-year design life.

The most likely application of this replacement solution south of the North Extension would be for the Matson lo-lo replacement berth. While a sheet pile structure could be used over a range of wharf face locations, complexity would be reduced by keeping the wharf face in the existing T1/POL-1 location. This minimizes the sheet pile height and loading of the fill on the BCF.

The existing PAMP design solution includes an additive alternate for a sheet pile wall east of the wharf. As designed, it's not part of the wharf structural solution. Its primary purpose is to create additional uplands and create more of a uniform uplands face.

Using a sheet pile structure to assist in lateral load transfer has certain general similarities with Kodiak's Pier 3 and PND's North Extension solution presented to the Assembly Enterprise Committee in February 2019. Some contrasts between construction of this type of facility at the existing wharf location versus the North Extension follow:

- Significantly more demolition including POL-1, T1 and the port building.
- Construction of low height sheet pile bulkhead and backfill.
- No sheet pile repair.
- No potential icebreaking dolphin(s).
- Likely no soil stabilization, although design review is required.

Incorporation of a bulkhead into the design solution has other capital cost and operational benefits. Connecting the wharf directly to the uplands simplifies operations and provides flexibility. It eliminates the capital and operational costs of trestles and the 37' X 750' addition used for crane hatch storage. POA already has some sheet pile materials that could be used. Potentially Northern Extension materials could also be repurposed. A drawback of this solution is the sheet piles, even if new, would likely have a shorter life span than the pipe piling. Sheet pile structures have been previously designed to a 50-year design life. This is less than PAMP's current 75-year standard. Some of the sheet pile structure would need to be installed under the wharf concrete deck and sheet pile replacement would be difficult. Careful consideration and life cycle analysis should be employed prior to incorporating existing materials.

Another major benefit of this concept is the construction can be done from the dry, eliminating the temporary trestle requirements and having to install piling from barges and work around Cook Inlet tides. Construction of the DBB was successfully constructed from the land side. Discussion with the contractor who successfully repaired portions of the North Extension said shallow height walls could likely be successfully installed from land. A key consideration would be keeping the fill away from the face sheets during driving.

Similar to the Administration's proposal, use of a bulkhead combined with a pipe pile-supported platform would physically be able to accommodate ro-ro and lo-lo vessels at a common use berth. The approach would likely be much cheaper than the currently envisioned facility employing trestles.

### *North Extension*

Interested parties generated three alternate concepts for the North Extension between the DBB and T3 in lieu of demolition and reconstruction.

The most defined proposal was from PND Engineers, the designer of record for the original North Extension. PND developed three concepts with detailed cost estimates and did a brief presentation to the Assembly Enterprise Committee at their February 2019 meeting. All concepts included three components to stabilize the existing structure:

- New sheet pile bulkhead at areas with existing gaps behind the wharf face.
- Soil cement stabilization behind bulkhead face to about -15 MLLW.
- Engineered embankment fill sloping about 4H/1V seaward from about -5 MLLW at face.

Further information on each of the three concepts follows:

- Option 1 – Minimal Concept. Construct new 950' by 115' pile-supported dock and 100-gauge crane rail off NE2 location. Add new abutment near OCSP face sheets. Estimated cost = \$186M.
- Option 2 – Minimal Concept with ro-ro trestles. This concept was like Option 1 but added another berth with four trestles and a dolphin. A note stated, "Match TOTE Port of Tacoma geometry." Cost = \$186M + \$64M = \$250M.
- Option 3 – Full Build T1 lo-lo and T2 ro-ro. This concept was like Option 1 but added an 850' by 60' pile-supported dock with five trestles. Cost = \$186M + \$115M = \$301M.

While the drawings did not show exact dimensions for all the elements, approximate parametric costs for the facilities are as follows.

- Lo-lo = \$1,703/SF = \$195,789 per face lineal foot
- Ro-ro trestles only = \$2,836/SF
- Full ro-ro = \$1,936/SF = \$135,294 per face lineal foot

Some observations follow:

- PND's Option 3 has similarities to Option 3 of the 2012 charrette which was not priced because it would have exacerbated shoaling at T3 and because it was like Option 4 of the

charrette. Option 4 of the 2012 charrette had the same general concept except the top portion of the existing sheet pile was cut back limiting the seaward extension and T3 siltation. The 2012 concept had a ten foot wider lo-lo platform and both the lo-lo and ro-ro berths were the same width.

- Marine pilots, including Southwest Alaska Pilots Association (SWAPA) and TOTE, have expressed concerns about berthing at the North Extension in winter ice conditions. The level of concern increases with seaward movement of the berthing line. Any use of the North Extension would likely require additional operational simulations. Matson has said they are having conversations with their pilots on berthing at the North Extension.
- The SWAPA pilot concerns increased as the berth face moved out from the existing North Extension location. While no engineering analysis has been done, it appears that employing Option 4 of the 2012 charrette coupled with PND's suggested soil improvements would lower berthing velocity, provide more vessel maneuvering area during operations and potentially improve global and static stability calculations as compared to PND's Option 3.
- As a comparison, Kodiak Pier 3 escalated program costs are \$1,147/SF.

Input was obtained from other marine contractors. One marine contractor with extensive sheet pile and design build experience thinks it would be cheaper to stabilize the North Extension rather than demolish and rebuild as currently planned.

His suggestion was to install a combi-wall-type system comprised of high modulus king piles and sheet piles in front of the existing OSCP face and provide soil stabilization within the OSCP sheets. He noted the corrective work could be done from the land side in lieu of from barges on the water side.

The advocacy of this position was to minimize program soil, sheet pile and rebuild costs and to maintain full use of the uplands and not from the perspective of future use of the facility for cargo transfer operations.

In comments to the draft of this report the Project Team noted they had done some preliminary analysis of the combi-wall concept and did not think it was feasible. No details of their analysis were made available. The comment referenced a 90' free height. While this is the general face sheet heights, the design condition would be much less if the area was not used for berthing vessels and dredging was not performed per the revised USACE Section 408 dredge limits.

The contractor who repaired the North Extension believes it would be cost-effective for MOA to repair and reclaim the condemned facilities through additional sheet pile repairs and installation, and soil enhancements.

## **Other Design Options**

The following discuss possible ways to reuse some existing POA assets.

### North Extension Materials Repurposing

The demolished sheet pile could also be repurposed in the current PAMP design. While not part of the current base program, several of the wharf replacement designs have additive alternatives to fill certain existing tidal areas that are east of the existing wharfs. The fill would be retained by a sheet pile wall. The design anticipated that contractors could use extra sheets purchased during the PIEP, some of which are still available. While the comparison is not exact, the design concept has some similarities to the potential solution discussed in the Lateral Load Transfer section above. Both solutions include fill and low height sheet pile walls. Design life for these structures would not meet the 75-year standard contemplated in the current program.

The current North Extension plan is to demo the WBB, NE1 and NE2 structures and reconstruct the area. Removal of the sheet pile and fill has practical complexities. The OSCP is designed so the sheet pile interlocks become fully engaged by the weight of the soil behind the sheet pile. To eliminate “iron binding” of the sheets and allow their removal, much of the soil adjacent to the sheets needs to be removed. This means removal of the sheets and fill must be thoughtfully sequenced with removal occurring from both the land and sea sides.

While the portion of soil removed from the uplands could potentially be a marketable commodity, most of the fill will likely be removed from the water side. While it ultimately would be a matter of contractor means and methods unless a prescriptive specification requirement is provided, one contractor speculated about a third of the material would be removed from land and two-thirds from the water. The contractor also speculated the economics would dictate offshore disposal of the marine dredged soils rather than reuse on the uplands. The art of many heavy civil excavation-related projects is cost effectively using excess materials among different projects and reducing haul and material costs so other cost-effective solutions could potentially be cheaper.

While there are costs associated with the sheet pile, there are also opportunities. Brad West, the president of the construction firm that performed the 2010 and 2011 North Extension OSCP repairs, and who has extensive other OCSP installation and removal experience, believes much of the installed Northern Extension sheet pile could be reused on other POA and non-POA projects. The sheets have been in the ground for 8 to 11 years without full cathodic protection and have likely suffered galvanization degradation, which has shortened their lifespan. The sheets could potentially also be resold. Additional sheets which have been stored at the Port and exposed to ambient weather would also be available.

West speculated some of the sheets would be damaged and unusable but thought the vast majority would be reusable, especially those that had been installed in the tail walls, which he indicated included most of the sheet pile tonnage.

His recommendation on how to implement repurposing follows:

The contractor should pull the sheets and lay them out for a third-party inspection program. Some will be scrap, but even a moderately damaged sheet could be used in a tail wall by cutting off the damaged area. If the interlock is OK, the sheet could serve its purpose.

Suggested repurposing removal procedure:

- Excavate inside the sheet wall to equalize the pressure on the face sheets.
- Install a temporary template and tack the sheets to the template so they are stable.
- Finish excavation inside and outside of the cells.
- Use a vibratory hammer to gently extract the sheets.
- Take care in laying them down so they do not suffer more damage. This can be done by installing a vertical restraint, for example.
- Some sheets may come out in groups and may not be usable if the interlocks were overstressed. This can be one of the tests on whether the sheets are reusable or not.

It's recognized that in-water vibratory hammer use will trigger National Marine Fisheries Service (NMFS) permitting requirements. This will limit the opportunity to employ this method.

It should be noted that this suggested sheet pile removal approach is significantly different than the method proposed by the selected P/D/B contractor. The Project Team has noted that there were reported problems with adequate galvanization on some of the PIEP sheet pile and that the North Extension did not have a functional cathodic protection system. Careful consideration and life cycle cost evaluations should be prepared if existing project sheet pile is to be employed.

## Sequencing Options

The decision to proceed with the PCT simplifies sequencing of follow-on work in the existing wharf areas by providing a location for cement ships and fuel vessels. This frees up the POL-1 and T1 areas for demolition and reconstruction while allowing the Matson and TOTE ships to remain at their berths. While there are multiple positive benefits with this sequencing, the following provides some thoughts on other options and opportunities.

### *Start Cargo Berth Construction Earlier*

During the PCT VE process the Administration re-evaluated available PAMP funds and costs and projected about \$81M in new funding would be required to complete the PCT. While it would create additional long-term costs, there are alternatives to immediately completing the PCT to allow earlier terminal reconstruction elsewhere.

ABI could use the PCT prior to installing all the remaining work elements. Interim use would at the minimum require installation of dolphins, catwalks, fenders, bollards, capstans and other miscellaneous platform deck appurtenances. The Administration has estimated this level of completion would require \$61.5M in new funding.

In addition to the PAMP funded elements, ABI needs to modify their existing equipment and install new distribution piping and electrical service at their cost. The shift to the new facility will require a significant ABI cash outlay. In the event a decision was made to renovate the ro-ro facility in place, a hose tower could be added to T3. That would facilitate decommissioning the POL-1 fuel lines and allow demolition and reconstruction to start at POL-1.

While it's possible to use the PCT berth for cement delivery prior to full completion, it likely would add costs as contractors would have to work around ABI operations. This could be minimized by "super loading" ABI facilities as described in the next paragraph.

While the most likely scenario to address the cement ship sequencing constraint is to use the PCT, other related options have been identified and are presented below:

- “Super load” ABI cement storage capacity to reduce the number of shipments and minimize or eliminate summer delivery requirements.
- Import cement in “supersacks” or railcars.
- Relocate cement unloader directly south of POA building.

### *Allow Early T2 or T3 Work*

The following provides an alternative solution to allow construction or reconstruction at T2 and/or T3. It has not been discussed with TOTE or the marine pilots and may not be acceptable to them. A temporary TOTE ro-ro only berth could be installed on the Northern Extension. Costs for this option would be reduced if it were done in conjunction with a Bailey bridge cargo dock seismic solution. Temporary piling would be installed in widely separated bents. Batter piles would be used to help resist bending ice loads. TOTE and SWAPA pilots have expressed concerns about Northern Extension use, particularly in winter conditions. The Project Team has said the solution is not viable is and unrealistic because of past structural suitability findings.

If this option were to be considered, it’s likely TOTE operational use would be restricted to summer months only. It would only be appropriate for construction that kept the wharf face in the existing location.

Work would need to be structured so that the extent of seasonal construction had adequate float to ensure high likelihood of ice-free completion. Bailey bridges would be removed in the winter. There would be risk of ice floe pile damage. Shortening the construction duration and the length of time the temporary piling are exposed to ice floes would reduce the risk. Major renovation in place would be faster than full demolition and replacement. Use of Bailey bridges in lieu of full elastic construction would also shorten the duration.

### *Renovation in Place*

Renovation in place allows for many other sequencing options. TOTE is evaluating the possibility to temporarily use only two instead of three trestles. This could allow renovations to be accomplished on an incremental basis over the entire T3 structure.

Utility construction in roadway traffic areas sometimes uses steel plates to allow traffic to pass over open excavations. Similar methods could be used to facilitate isolated pile repairs.

### *North Extension*

Completion of the south part of NES1 is a critical first step if the new cargo wharfs are extended 140’. This element could be moved to near the end of the program if the existing T1 – T3 wharf face stayed in its existing location. Depending on the buildout scenario, a temporary dolphin may need to be installed south of the new T1 lo-lo location. While deferring NES1 would allow funds to be allocated directly to wharf resiliency, the increased siltation at T3 would continue for a longer time. The problem will increase in 2021 after TOTE converts to LNG vessel power.

## Other

The following presents some other possible program development considerations.

### *Drilling*

The current program envisions installing piling primarily with impact hammers and a small amount of vibratory hammer use. Impact hammers impart higher peak sound levels than vibratory hammers, but the noise is in a pulse form as compared to the continuous noise from a vibratory hammer. Impact hammers are generally viewed as causing less harm to marine mammals than vibratory hammers by permitting agencies for similar installations.

The Project Team had investigated using drilling methods to install piling earlier in the program development phase, but the existing technology was not aligned with the contemplated design solution. Drilling methods primarily generate continuous noise like vibratory hammers, but industry sources have reported the drilling decibel levels are lower which could reduce permitting concerns. Drilling can also produce pulse noise which industry sources have noted is significantly lower than an equivalent impact hammer. One study which was cited during industry discussions comparing drilling versus impact hammers indicated the drilling pulse noise was about 20 decibels less than the impact hammer. This exceeds the bubble curtain benefits associated with impact hammer use as documented in the POA test pile program.

The program has multiple elements where drilling might be feasible including future deck platforms, trestles, dolphins and renovation in place. With respect to new wharf and trestle construction, there have been recent developments in the pile installation industry to increase the drive head available torque used to advance piles when drilling. Much of the existing wharf piling is 24” diameter which would require much less torque than larger piling. Lower noise generation would mitigate the need for bubble curtains and simplify permitting efforts.

Use of helical drilled piles could provide additional vertical and lateral load capacity as compared to conventional pipe piles. Some of the benefits of the helical structure would be offset by installation impacts to the over-consolidated BCF soils. A test pile program could help refine the pile capacity and noise signature.

### *Standard Pile Size*

The PCT was designed for enhanced seismic resiliency and used 48” piling of varying wall thickness. One-inch wall is the thickest size that is typically fabricated in the US without using the more expensive rolled sheet method. The PCT design concept changed as the designers incorporated the seismic Minimal Damage elasticity and strain requirements. Piling designs for the other PAMP wharfs have not been updated with PCT lessons learned. If the future designs for the non-seismically enhanced facilities change from the reinforced concrete piling concept, a change in typical piling size may be warranted. Discussions with the marine development community noted “piles with a 1” wall thickness can be considered to be non-compact and potentially subject to buckling failure.” Use of 36” or 40” diameter piling were reported to avoid this concern.

There are many Alaska-based contractors that have equipment capable of installing piling up to 48” in diameter and 1” thickness. Several marine contractors opined that installing piling with wall thickness thicker than 1” wall is generally expensive and a mistake. One contractor experienced in design-build marine construction and who has worked in Cook Inlet said the same thing about piling greater than 60” in diameter.

### *Design and Contract Structuring*

The Project Team must balance multiple factors when creating a design and establishing contract provisions. Design and contract decisions affect the number of contractors capable and interested in bidding the work. The 2020 PCT bid is an example. While the pre-bid included five general marine contractors, and another marine general contractor attended the site visit, ultimately only one contractor submitted a bid. Participation included members of the CMAR joint venture team which was not awarded the PCT contract because an acceptable price could not be negotiated.

Discussions with marine contractors who chose not to bid the 2020 PCT work, including those who attended and did not attend the pre-bid, gave a variety of reasons for not bidding. The piling thickness and weight designed to accommodate the seismic demands was a factor for some contractors. The Project Team’s design choice resulted in the requirement for the contractors to employ very large marine equipment. The required pile installation equipment is larger than what some local contractors and other West Coast firms doing work in Alaska have in their fleets. PPM, the low bidder, had large cranes and equipment available to perform the work, yet spent a significant amount of money to modify their marine equipment to perform the work.

Other contractors expressed concern over contract risk transfer allocations and the lack of willingness to consider alternatives. Payment for fabricated offsite materials was one factor that was cited by multiple contractors. While the original request to change this request was denied, it was later modified prior to bidding. Insurance requirements were another cited example. The latter was identified as a PCT VE item. The Project Team has accepted one of the two PPM proposed insurance modifications. One contractor expressed concern on the lack of collaboration that was exhibited during the bidding period. He indicated he would not bid on any future Port projects unless there was a change in approach.

More than one contractor expressed concerns about choices made by the Project Team during the permitting process which restricted vibratory hammer use except in very limited circumstances. Several members of the contracting community said they believe it is cheaper to allow use of vibratory hammers and extend marine mammal monitoring distances rather than restrict the use of vibratory hammers as contemplated in the PCT permit and contract documents. The Project Team perceives the current approach reduces owner financial risk. They note while allowing use of vibratory hammers could lower the initial bid price, the owner bears significant amount of financial risk if the level of actual beluga takes exceeds the Incidental Take Authorization (ITA) granted under the Marine Mammal Protection Act.

Another consideration relates to how intersection of the Plan of Finance, funding availability and design affects the universe of contractors willing and able to construct the work. This applies to the PCT and the balance of the program. The 2020 PCT ITB required contractors to submit five



separate bid schedules. The intent of this reflected uncertainty in the estimated cost of the work and was structured to allow the maximum amount of construction with the funds available.

This required the contractor to analyze and price multiple scenarios. Despite requests from the contractor community to define the funds available for award and clarify the decision-making process for award of the alternates, this information was not provided to the contractors.

This process created significant uncertainty for the bidding community. Was the project award anticipated to be a \$30M or a \$60M project? How would the owner choose to award the alternates? A contractor could be low on all the individual bid schedules but one and still not get the work. While there are several West Coast contractors that work in Alaska and could do the work, the contracting package created risk and uncertainty. In addition, the lost opportunity cost is a factor. The amount of net revenue for a competitively bid smaller project is generally less than a larger project. The West Coast marine market has numerous other opportunities for contractors to deploy their large marine equipment.

The PH 1 ITB could have been a relatively small or intermediate-size opportunity for some of the contractors. Even if they were successful in being the low bidder, the potential for net revenue associated with the marine assets could be small in relation to other opportunities.

The Plan of Finance revenue component will likely be a major factor in the extent of bidder interest on the remainder of the PAMP program unless there is a major shift in the timing of how funding will be identified and acquired. The 2021 phase of the PCT is an example. Prior to the initial PCT award, the Administration indicated an additional \$100M from a new fund source was required to complete the PCT. During the PCT VE effort about \$6.3M was identified as being potentially available to allocate towards the remaining PCT work and other 2021 work efforts. The Administration has also recently lowered the amount of estimated new funding to complete the work to \$81M.

While there is hope that federal grant funding or low-cost Alaska Industrial Development Export Authority (AIDEA) funding could be obtained to allow 2021 construction, neither is certain. Discussions have occurred about creating a reduced bid package to include dolphins, catwalks, fenders, bollards, power capstans and other elements that would allow the terminal to be occupied by vessels during a seismic event.

The current 2021 PCT design includes 12' diameter monopiles at nine dolphins. The Assembly has received recommendations from the contracting community at PAMP work sessions to provide contractors with an alternate batter pile design for bidding of the dolphins. This idea has not received support from the Project Team for multiple reasons including potential schedule benefits, environmental permitting risk, and reduced capital and operation and maintenance cost savings with the monopiles. A VE analysis was done on the issue during the early stages of the CMAR effort that led to the current design and Project Team perspective.

Two of the main reasons given for not developing an alternate design relate to perceived capital cost savings and monopile environmental benefits.

The VE exercise was done on an early design concept. The amount of steel in the batter pile design was reportedly reduced about 30% from the VE analysis concept which would have reduced the cost difference. In addition, the batter pile design was done using ice bending strengths that were two or more times the strengths cited in an ADOT KABATA bridge study. This had no effect on the monopile design but could have increased the batter pile concept demand loads.

BCF soils assumptions could have contributed to a pile size increase. The CMAR estimate had higher mobilization and management costs than the ICE estimate. The latter biased the cost analysis in favor of the monopiles as there are larger pile schedule benefits. The Project Team is reevaluating some of the cost differences based on use of different ice and seismic assumptions as part of the PCT VE effort.

There are reportedly only two hammers in the world available to drive the monopiles and limited West Coast marine equipment capable to install them. This will potentially limit competition and provide certain contractors competitive advantages. Mobilization costs will be expensive. While it's possible rental equipment may be available, the equipment owners will have a large amount of leverage in setting the rates and the cost risk increases accordingly.

The equipment fleet needed to install 48" batter piles is less than the monopiles and many more contractors would have the required equipment or be able to rent it at a low risk competitive rate. It also allows for contractors with leaner overhead requirements to offer competitive pricing.

If a reduced and partial 2021 PCT project is pursued, it will face similar issues that occurred in the 2020 work but will be magnified by the increased equipment requirements driven by the design decision to employ 12' diameter monopiles. This would result in a relatively small dollar project in relation to the equipment requirements and other opportunities in the West Coast market. This is not aligned with a competitive bidding scenario.

The program manager has stated that early in the program they received direction to assume that funding is not a schedule constraint. That is not aligned with the program reality and has led to multiple decisions that have contributed to the PAMP cost increase. The Project Team has noted they've been "driving toward designing and building the cheapest port that serves our needs."

The permitting strategy is based on a large program mentality unconstrained by funding. Shifting the perspective could result in other solutions. One of the key reasons given against proceeding with a batter pile dolphin solution is the environmental permitting risk where beluga takes could shut down construction. It's perceived there is a maximum number of beluga takes that would be permitted in one year. It is not clear that funding will be obtained to construct the balance of the PCT in 2021 and the timing of the next phase of PAMP construction is even more uncertain.

The dolphin pile work doesn't need to be done in one year. It could be spread out over multiple years and the work prescribed to be performed in the low beluga risk periods. This would necessitate a revision to the permitting strategy including the general type of ITA. This would increase bidding competition while mitigating permitting and high margin scarce equipment risk.

While it's possible performing all the work at one time could minimize equipment and mobilization costs, that is not a given.

The Project Team is pursuing the NMFS ITA for the 2020 and 2021 work and anticipates receiving approval around the end of the first quarter of 2020. Given the need for 2020 work approval, it would not be prudent to modify the current permit application to add an alternate method at this time, in order to avoid any permit delay. Given funding availability there would likely be limited time between receipt of NMFS authorization and the 2021 work bid period which complicates use of an alternate method. Alternate permit strategies become more realistic if funding is not available for 2021 in water work.

### *Collaboration*

Assembly Resolution AR 2019-263 requested the Administration work with the Port Users on value engineering and cost savings on the PCT and the rest of the program. This was a positive step towards increasing collaboration between those two parties which is needed to achieve alignment on the program scope and Plan of Finance.

### **Port User Priorities and Costs**

Port User requested changes and costs were addressed in the Cost Growth - User Requested Changes section. ABI's requested changes are being incorporated in the PCT. Matson has indicated they are willing to reevaluate their previous trestle, electrical distribution and cargo hatch requests. TOTE is evaluating renovation in place of their current facility and considering the opportunity of a trestles-only ro-ro solution.

The Port Users appear to have a very different perspective than the Administration on multiple program elements. From discussions, there is almost no user support for 75-year design life, although this is some support for enhanced piling resiliency. There is widespread user support for less expensive fuel transfer solutions including fuel headers on the cargo terminals and/or repairing POL-2 in lieu of constructing the PT terminal. While TOTE is still evaluating the opportunity, there is significant general Port User support for the concept of renovation in place for certain of the facilities such as T3 in lieu of new construction. These items all have several similarities:

- Potential for significant program cost reduction
- Shorter capital life than existing program
- Actual solutions are not developed, and realistic costs are not known

## **Potential Funding Sources and Financing Scenarios**

### **Funding Options and Methods**

On the following pages we describe various funding sources and methods, probability of the type of funding based on current events, opportunities and challenges as well as basic timelines. This is intended to be the start of an overall strategic approach and action plan to manage each funding track over the next three to five years. There are things outside the control of the project that may change the dynamics of the funding sources, so timing and the ability to execute an effective plan is critical to funding success.

*FUNDING TYPE: Municipal General Obligation Bonds*

**PROBABILITY: LOW - MEDIUM**

### **POSSIBLE FUNDING FROM LOCAL BOND SOURCES**

- Transportation Bond - General Obligation bond

### **OPPORTUNITIES FOR GENERAL OBLIGATION BOND**

- Public process for bonds provides opportunity for garnering public support.
- MOA voters have supported most recent bond measures with good campaigns when the property tax burden and bond repayment schedule are explained well.
- Can get public buy-in through an education campaign.
- Gives Anchorage Assembly control over possible funding.
- Could raise \$60-\$75M over three to five years.

### **CHALLENGES OF GENERAL OBLIGATION BOND**

- Bond measures require educational campaigns and outreach.
- MOA property taxpayers may be nervous about taking on a new tax burden in this strained statewide economy.
- Transportation Bond requires approval by at least 50% of MOA voters voting in the municipal election.
- Will need to fundraise, educate, and develop a public campaign.
- It is not aligned with the desire to make this a statewide project.

**PROCESS & TIMING OF GENERAL OBLIGATION BOND.** These dates are based on starting this process this year.

- Bond proposal submitted to Anchorage Assembly October 2019 (already passed)
- Assembly Approval needed for bond ballot language Jan/Feb 2020
- Municipal election for voter approval April 2020
- Funds released, if approved, July 2020

**MOA Budget Process and Timeline** - for adding General Obligation and Revenue Bonds to the Budget

- Budget preparation begins – Summer (already passed)
- Preliminary mayoral budget to Assembly September 2nd (already passed)
- Mayor sends proposed operating and capital budget to Assembly October 2<sup>nd</sup> (already passed)
- Budget Approved – no later than mid-December
- We suggest \$10 to \$15M each year for the next 5 years

*NOTE: An amendment to the budget can be added by the Anchorage Assembly at any time, so even though some deadlines have passed, it is still possible to add for next year's budget.*

*FUNDING TYPE: Municipal Revenue Bond*

**PROBABILITY: HIGH**

**OPPORTUNITIES FOR REVENUE BOND**

- Revenue bonds linked to Port User tariffs as noted below.
- Does not require a vote of the people.

**CHALLENGES OF REVENUE BOND**

- Requires buy-in from user groups.
- Impact on consumers and increase in cost of goods.
- Tariffs are typically reviewed every 5 years – deadline coming up. This deadline can be modified by Assembly action but needs discussion with user groups.

**PROCESS & TIMING OF REVENUE BONDS:**

- Can be prepared anytime.
- Requires Assembly Approval.

*FUNDING TYPE: Port User Tariffs Supporting Revenue Bond*

**PROBABILITY: HIGH**

### **FUNDING SOURCE DESCRIPTION**

- Revenue rates for Port of Alaska are established in the POA Terminal Tariff No. 8.2 and through contractual Terminal Preferential Usage Agreements.

### **OPPORTUNITIES FOR THIS FUNDING METHOD**

- There are several oversight layers for Port tariffs and the Anchorage Assembly is part of that process. Changes to the tariff require promulgation by the Anchorage Port Commission, and approval by the Assembly and the Federal Maritime Commission. (source: <https://www.portofalaska.com/business/finances/>)
- The Port currently charges a tariff of 16.4 cents per barrel on petroleum products, which equates to 0.39 cents per gallon. For cement, the tariff is currently \$1.67 per ton. The total Port revenue stream was about \$14.6M in 2018. Based on a \$200M bond issue, about \$24M in annual revenue would be required by 2023.
- In order to maximize financial benefit, increased tariffs dedicated to Port repair and renovation projects must start as soon as possible so reserves can be built up and Port projects can be planned and built based on funds available.
- Potentially raise \$200M or more.

### **CHALLENGES OF THIS FUNDING METHOD**

- According to the Virginia-based economic consulting firm Parrish, Blessing and Associates Inc., tariff charges levied on basic commodities at the POA would have had to increase fivefold or more if the Municipality was forced to rebuild the PCT using only municipal funds. In addition, the July 2019 proforma said the tariff rates would need to be increased by 45 percent per year until 2023 — when they would reach \$1.01 per barrel and 2.4 cents per gallon — to cover the debt service on the bonds. This was based on a \$200M bond issue. Subsequent to issuance of the draft of this report, the MOA has clarified the current projected need for additional funds is about \$81M as the MOA allocated other state funding to the PCT and the 2020 PCT bid well under budget. Using a combination of short-term funding, 40-year revenue bonds and 50-year AIDEA funding coupled with a smoothed allocation, the Administration projected cement and petroleum rates would need to increase 283% after seven years. Rates for the last five of the seven years increased 12.95% annually. This rate structure was promulgated by the Port Commission on October 23, 2019.
- Internal alignment among Port User groups must exist in order to seamlessly move forward with tariff increases.
- Higher tariffs will be paid for by businesses and consumers across the state and if done poorly, too much too fast, could impact market basket goods – the goods and services that are bought and sold as staples in Alaska. If the cost of living and doing business increases too rapidly, the Alaska economy could be further strained especially in the current fiscal climate. Higher tariffs on some goods such as aviation fuel could drive business out of Alaska.
- The Port of Alaska serves the entire state, yet tariff increase decisions are made by local entities only. We see funding as a statewide obligation – not just municipal taxpayers.

- There are concerns that raising fuel tariffs too much could cause air cargo and other types of air transportation to avoid the Anchorage International Airport.
- Fuel is brought to Anchorage from different sources. Tariffs across the POA wharfs do not equally touch all suppliers leading to competitive advantages to not use the Port.

### **PROCESS & TIMING OF FUNDING SOURCE**

- Tariffs typically approved by Port Commission in 10-year increments. Currently coming to the five-year mark. The October 23, 2019 promulgated tariff had a 10-year term.
- Assembly approves.

### **ADDITIONAL TARIFF COMMENTARY AND OBSERVATIONS**

The Capstan Financial Advisory Services report provided preliminary financial models for two of the five program phases. They provided three tariff scenarios. The first two looked solely at the PCT with two separate debt service coverage requirements. The third scenario looked at phase two of the program, which included the cargo terminals and the south half of the North Extension. The funding requirement was presented as \$1.773B and was based on a total program capital cost of \$1.885B. The funding requirement would be \$1.82B using the July 12, 2019 PAMP budget amount.

Scenario 1 looked at a debt service coverage ratio (DSCR) of 2.0 for a \$128M bond issue for the PCT. Annual revenue requirements increased 190%, from \$11.3M to \$32.8M, after ten years.

Scenario 2 had a 1.0 DSCR and a \$170M bond issue. Annual revenue requirements increased to \$26.2M after 10 years, a 131% increase. The low DSCR was conditioned on an assumption of a state debt guarantee.

The scenario 3 proforma envisioned a \$1.2B bond. The revenue requirements increased from \$11.3M to \$197.7 after 10 years, a 1,646% increase. It should be noted that the Capstan report identified five phases and their tariff modeling only addressed the cost of the first two phases.

The July 12, 2019 Assembly meeting PowerPoint presentation by the Administration included two \$200M bond issue proformas prepared by Parrish, Blessing and Associates. One had 2019 revenue requirements of \$14.9M in 2019, a 1.30 DSRC after three years and \$24.1M in revenue requirements in 2023, four years. This reflects a 62% increase. The other showed a 2019 revenue requirement of \$13.8M, a 1.30 DSRC, \$15.3M in revenue requirements in 2023 and \$16.6M in revenue requirements in 2026. This reflects an 11% revenue requirement increase by 2023 and 12% by 2026. The latter proforma was conditioned upon receipt of a low interest, 0-0.25%, loan from AIDEA and would require State of Alaska legislative approval.

As can be seen above, there is a wide revenue requirement range based on funding terms. Debt service requirements will increase based on the bond size, interest rate and required DSCR and decrease as the bond term increases. The Administration's July 12, 2019 PowerPoint presented revenue increase and potential bond sizes information. Based on this data, a 4% loan with a 1.3 DSCR would require about \$6.6M in annual revenue to support a \$100M bond issue. Assuming POA's 2018 annual revenue requirement is \$13.2M, which is near the average of Capstan and Parrish, Blessing and Associates, every \$100M of net bond proceeds would increase total tariffs

about 50%. While this is a rough approximation, it shows the general magnitude of impact of changing the bond debt amount.

The Administration's July 12, 2019 PowerPoint showed a \$16.00 surcharge for each twenty-ft equivalent (TEU) cargo container would raise about \$106M in debt service and increase the cost of a gallon of milk by \$0.02.

Discussions on increasing the tariffs and issuing strawman proposals have caused some Port Users and other effected stakeholders to explore other options. Port Users who sell petroleum products have expressed concerns that raising fuel tariffs will increase costs to the point that cargo carriers using Ted Stevens International Airport as a fuel stop will change their fuel/cargo mix and overfly Anchorage. They have asserted this could lower demand and result in a cycle of ever-increasing rates to meet the fuel business line revenue requirements. Certain fuel-related businesses have noted that the fuel tariff increases released through the Capstan report have led to increased evaluations of alternate solutions to delivering fuel across POA wharfs. Many of the Port Users have invested significant capital in Ship Creek, both on and off POA property, which would factor into their business decisions. Raising Port tariffs has the potential to motivate some shippers to seek alternate arrangements to transport their products, so they don't go across the POA wharfs.



*FUNDING TYPE: State General Obligation Bonds*

**PROBABILITY: MEDIUM**

### **FUNDING SOURCE DESCRIPTION**

The State of Alaska legislature can initiate General Obligation (GO) Bonds for transportation infrastructure including, but not limited to, the Port of Alaska. About \$50M in state GO bond funding was provided to the POA in 2013.

### **OPPORTUNITIES FOR THIS FUNDING STATE GENERAL OBLIGATION BOND**

- Could discuss this next session that starts January 2020 for the statewide ballot in November 2020.
- A statewide draft Alaska Municipal League resolution has been developed.
- The bond cost could be stretched over a long period for repayment and it would be paid by the State of Alaska rather than the Port of Alaska.
- Responsibility for Port of Alaska can be distributed across all legislative districts and all voters.

### **CHALLENGES OF THIS FUNDING STATE GENERAL OBLIGATION BONDS**

- State GO Bonds require public vote, education campaign, marketing, strategy.
- A statewide educational campaign may cost between \$250,000 to \$1M. Most statewide bond campaigns have not allocated adequate public education money.
- For a state GO bond to appear on the 2020 Alaska General Election ballot, it must be introduced, go through the committee process and receive legislative approval by the end of the 2020 session.
- The current financial situation and public perception of the economy may cause the bond to fail.
- The capacity of the state to sell bonds and its recent bond rating reduction may increase the bond costs.
- Because the money would be transferred to the MOA to manage, it might be viewed once again as just an Anchorage project.

### **PROCESS & TIMING OF STATE GENERAL OBLIGATION BOND**

- State GO Bonds could be presented as a two-to three-year long process. Voters can see the funding arc over time and know the repayment schedule and what it will cost the state over time. If the educational piece to this campaign is done well, voters across the entire state will see the benefits of approving this funding method.
- We suggest: \$100M each year for three years to raise \$300M in bonds.

*FUNDING TYPE: Legislative Appropriation*

**PROBABILITY: - LOW - MEDIUM**

**FUNDING SOURCE DESCRIPTION**

- Governor’s Budget
- Capital Budget
- Legislative direct appropriation

**OPPORTUNITIES FOR THIS FUNDING METHOD**

- Possible \$25-\$50M in capital budget. We suggest \$25M each year for five years.
- Planned resources and commitment from a statewide perspective.
- Money that has no debt repayment and cost to the Port, users and consumers.

**CHALLENGES OF THIS FUNDING METHOD**

- Likely appropriations for POA projects could be in the \$25-\$50M range, based on recent history.
- Given recent economic challenges at the state level, capital budget timing and scope has been uncertain.
- Will need user support to help garner support within both Alaska legislative bodies.
- Will need to build a statewide support base to be successful and ensure no legislator feels like they are carrying the load and that this is statewide project, not an Anchorage project.

**PROCESS & TIMING OF FUNDING SOURCE**

- Governor releases state budget for fiscal year 2021 in December 2019.
- Session starts in January 2020.
- Capital budget Spring of 2020 for FY 2021. The precise schedule depends on legislative process.

*FUNDING TYPE: Alaska Industrial Development and Export Authority (AIDEA) Loan*

**PROBABILITY: MEDIUM - HIGH**

### **FUNDING SOURCE DESCRIPTION**

- AIDEA is a public corporation of the State of Alaska, constituting a political subdivision under the laws of the state. It was created by the Alaska Legislature to "promote, develop and advance the general prosperity and economic welfare of the people of Alaska, to relieve problems of unemployment, and to create additional employment." AIDEA accomplishes this through its Credit and Development Finance Loan Programs.
- According to AIDEA, Port development project financing could be structured using several scenarios, including a municipality or borough issuing a bond for the public needs from the Port; the military provides capital for a share of the Port to be used by military vessels; and AIDEA provides financing that is backed by revenue from resource developers.

### **OPPORTUNITIES FOR THIS FUNDING METHOD**

- Based on recent infrastructure project funding history, AIDEA funding for the POA in the amount of \$200M with legislative approval is a possibility.
- In a recent Fairbanks natural gas fuel distribution line project, the 50-year AIDEA loan had an initial 15-year period of 0% interest followed by 0.25% interest.
- Typical portfolios are in the 4% interest and 20-year term range.
- Flexible funding.
- Aligns with AIDEA's mission.

### **CHALLENGES OF THIS FUNDING METHOD**

- Should get initial request prepared by year end.
- Any loan amount will be paid by the POA and therefore may not have the full statewide repayment.
- A legislative solution would be required for a low interest rate like the Fairbanks loan.

### **PROCESS & TIMING OF FUNDING SOURCE**

- Could be 1 – 1.5 years to put funding package together.

*FUNDING TYPE: Federal Funding*

**PROBABILITY: LOW+ to MEDIUM**

### **FUNDING SOURCE DESCRIPTION**

Grants from federal agencies such as:

- Department of Defense.
- Department of Homeland Security.
- Federal Emergency Management Administration.
- Other possible agencies.
- Work with federal Congressional Delegation to make programmatic changes to move money to Alaska.

### **OPPORTUNITIES FOR THIS FUNDING METHOD**

- Alaska delegation know urgency of this project.
- POA is a “STRATEGIC PORT” with Pacific military importance. Strategic Port designation requires large amount of dock space to be available for rapid deployments from Alaska’s military installations.
- Create coalition of other similar ports.

### **CHALLENGES OF THIS FUNDING METHOD**

- Need to increase awareness of POA being a statewide and national Arctic and the Pacific Rim asset. The POA is seen as an Anchorage ask and an Anchorage problem. When this changes and POA gains regional and statewide support, there will be a higher probability of federal process support.
- Need a full look at federal opportunities and availability plus grant application timelines for each agency.
- Lack of cohesive federal effort to ensure POA can receive the federal dollars and “be at the right place at the right time” to fully leverage funding opportunities.
- Lack of Washington DC team to promote and track POA opportunities.

### **PROCESS & TIMING OF FUNDING SOURCE**

Brief Federal Budget timeline:

**Early fall:** Federal agencies, which have been engaged in internal budget planning for at least six months — as much as 18 months before the fiscal year begins — submit their proposals to the Executive Office of the President’s Office of Management and Budget (OMB) for review.

**February 15:** The Congressional Budget Office (CBO) submits its analysis of the President’s budget request to the House and Senate budget committees, with emphasis on long-term fiscal and economic outlooks.

**April 15:** The Congressional deadline to pass its budget resolution to guide decision-making for 12 appropriation subcommittees, which begin hearings on specific proposals that can last into the summer. Authorizing committees also address potential changes to mandatory spending or tax

laws. Committees submit bills to respective chambers for adoption, eventually forming a comprehensive budget.

**June 10:** The House Appropriations Committee deadline to submit its last annual appropriation bill to committees.

**September:** There is no deadline for Congress to submit its final proposed budget to the President other than a Constitutional mandate that the President must either approve or veto it within 10 days of receipt. A veto means the process must start again.

**Oct. 1:** The new fiscal year begins with, or without, a budget. If a budget has not been adopted, Congress passes a continuing resolution (CR) to ensure federal agencies have the money to operate.

It's noted that due to the inconstancy of the federal government budget process and ensuring their budget process "regular order," there will be many timeline changes. Having presence to ensure opportunities are monitored and acted upon at the right times will be critical.

*FUNDING TYPE: Private Sector Investment*

**PROBABILITY: MEDIUM - HIGH**

### **FUNDING SOURCE DESCRIPTION**

Traditionally known as public-private partnerships (P3).

### **OPPORTUNITIES FOR THIS FUNDING METHOD**

- Currently, private companies seeking long-term, stable income are interested in investing in the POA. These include hedge funds, pension funds, life and health insurance funds, retirement funds and more.
- These investors are looking for long term investments with a stable rate of return.
- Private funders are eager to invest in design, construction, and operation of marine terminals such as barge operations and possibly others.
- Potentially up to \$200M.

### **CHALLENGES OF THIS FUNDING METHOD**

- Puts public infrastructure into the hands of the private sector.
- Reduces local government and tariff payer's control.
- Without clear quality metrics and maintenance requirements the POA infrastructure could diminish by the end of the private group contract.

### **PROCESS & TIMING OF FUNDING SOURCE**

- Private dollars will help leverage other private and public dollars and are more quickly accessible than public tax dollars as the public process is outlined by state/federal statute or city code.
- In order to determine the correct timing, the Assembly needs to determine if there is interest and then work into the long-term funding plan.
- Timing likely two+ years out.

*FUNDING TYPE: Litigation Settlement*

**PROBABILITY: MEDIUM - HIGH**

**POSSIBLE FUNDING SOURCES**

- Litigation settlement funding from MOA vs. MARAD

**OPPORTUNITIES FOR THIS FUNDING METHOD**

- It is understood that any settlement proceeds could be used for the POA.
- The amount of settlement is not clear, but the amount could be multiple millions.
- The damage request is for \$300M+.
- The proceeds from any settlement could be leveraged against other sources and have a multiplier effect.

**CHALLENGES OF THIS FUNDING METHOD**

- No trial date scheduled.
- Trial may be set by end of 2019.

**PROCESS & TIMING OF FUNDING SOURCE**

- Trial possibly in 2020.
- Could take 1-3 years.

## Abbreviated Summary of the Identified Potential Fund Sources

Funding Type	Probability	Opportunity	Timing
Municipal General Obligation Bonds/ Transportation Bond	LOW - MEDIUM	\$60 - \$75M over 3 to 5 years.	8-month cycle from Assembly introduction to funds available.
Municipal Revenue Bond	HIGH	Revenue bonds linked to Port User tariffs.	12 - 18 months after Assembly tariff approval.
Port User Tariffs (Supports Revenue Bond)	HIGH	Up to \$200M or more.	Port Commission approved tariff increase 10/23/2019.
State General Obligation Bonds	MEDIUM	\$50 -100M per year for three years. Up to \$300M.	Possible statewide ballot in November 2020.
Legislative Appropriation	LOW - MEDIUM	Possibly multiple \$25-\$50M per year. Up to \$125M or more.	6.5 months from Governor's budget to fund availability.
Alaska Industrial Development and Export Authority (AIDEA) Loan	MEDIUM - HIGH	\$50 - \$200M. Possibly low interest loan with legislative approval.	Up to 1 – 1.5 years to put funding package together.
Federal Funding	MEDIUM - HIGH	\$50 - \$400M. POA is a "STRATEGIC PORT" with Pacific military importance.	Cycle starts a year in advance of October 1 fiscal year start.
Private Sector Investment Public-Private Partnerships (P3)	MEDIUM - HIGH	Up to \$200M or more.	Varies. Likely 2+ years out.
Litigation Settlement	MEDIUM - HIGH	Up to \$300M+.	Trial possibly in 2020. Could take 1-3 years.



## **Approach Methods for Spending, Procurement & Construction and Project Management**

While there is a continuum of options, for simplicity, we present two discrete ways to approach next phases and projects at the POA. We call these two options the standard municipal bid process and the Design-Build Maximum Guaranteed Price Bid (DBMP) process. The latter is part of a larger framework which we refer to as Design to Budget. These methods assume adequate funding has already been procured and/or a plan that creates a reasonable approach and likelihood to secure certain levels of funding.

One typical construction delivery approach is to use the design team to design a project, attach a price tag, put it out to bid and begin a project using funds available at that time. We call this the “Standard Municipal Bid Process.”

### **Standard Municipal Bid Process**

Once the Municipality has received funds from any of the sources we have outlined, these funds may be spent with Assembly approval and through the municipal procurement process. The MOA can issue an ITB or RFP through the municipal Purchasing Department for any phase of project. Selection for an ITB is typically the lowest bid from a qualified bidder. RFP’s typically include a broader range of selection criteria.

The municipal bid process requires public notice, the bid openings follow a public process and Anchorage Assembly must approve the expenditures.

### **CHALLENGES OF THIS METHOD**

- Contractors may use change orders to alter the scope of work, final price to the MOA and completion date. Under a normal municipal bid process, a firm submits a price proposal in order to meet the scope of work, based on a design prepared by the POA. Price caps are not usually included, and costs can increase due to unforeseen circumstances.
- MOA purchasing process must start in 2019 for 2020 work.
- Funds acquired in 2020 will most likely be available to spend in 2021 or later.
- Project proposal draft language due January/February 2020.

### **PROCESS & TIMING OF FUNDING SOURCE**

- For the sake of this report, we will assume the MOA receives additional funds from sources identified in this report in 2020.
- Once fund amounts are known, bid documents and proposals must follow municipal procurement rules and timeline.
- Funds received in 2020 could be made available for the 2021 construction season. For construction to occur in one season, funds must be received in a timeframe that allows material procurement and mobilization in addition to physical construction.

### **ANCHORAGE BUDGET PROCESS &TIMELINE**

- Administration Budget preparation begins – Summer ( deadline has passed)
- Preliminary mayor budget to Assembly September 2<sup>nd</sup> (deadline has passed)

- Mayor sends proposed operating and capital budget to Assembly October 2<sup>nd</sup> (deadline has passed)
- Budget introduced to Assembly – first week of October (deadline has passed)
- Budget Approved – by December 10
- New fiscal year - January 1
- Revised budget due - March/early April

Note: Even though there are budget deadlines and standard timelines, the budget is a planning document that can be amended anytime.

### **Design-Build Maximum Guaranteed Price (DBMP) (*Design to Budget*)**

The DBMP is a Best Value approach. It would have an accountability element like the Dena'ina Civic and Convention Center project. This concept creates an opportunity to maximize cost control. The concept is simple. The POA details their needs and defines the total amount of money they have available to spend for the project, based on cash in hand, cash in process and planned dollars over the life of the project. The MOA then enters into a contract that creates cost control by the contractor guaranteeing costs and controlling cost overruns. This is a change from current methods. It defines the amount of available funding for each phase and then requires the contractor to deliver within that level of funding and timeline. This concept shifts risks to the contractor that they are best able to manage and limits the design effort by directly hired MOA engineers. If this approach is to be successful, it's critical the POA stays at the higher level of definition of the need and does not create prescriptive design requirements that limit options. In other words, the POA Anchorage describes the functional needs and then challenges the design and contracting community to meet that need within the POA's cost constraints.

If there is a desire to limit POA risk, the project could segment DBMP packages based on money available. This could be accomplished by having the developer cost and define solutions for the entire program but only authorize construction for elements with funding in hand.

The DBMP bid process would require the contracting entity, potentially a Port Developer, to understand the general needs of the POA and then team up with an engineering firm, contractor and other professionals they believe they will need to submit their proposal. They will be provided the total amount available for the project or an element of the project.

The Port Developer would be required to guarantee the price they bid without change orders and guarantee the quality and completion timeline. The POA would be required to provide the general elements they will need and the maximum funds that would be available for the project or the element of the project.

The POA could add another element used on the Dena'ina Convention Center. The owners of the entity that bid on the project had to personally guarantee there would be no cost overruns. If there were any cost overruns not agreed on by the POA, then the Port Developers would be personally responsible to pay them. If they met the timeline and project requirements, any Contingency balance would be split with the Port Developer and owner.

While there are multiple ways the contract could be structured, two DBMP opportunities would be the Matson and TOTE berths. Matson's request has the highest capital needs, currently at \$747M in the current cost estimate, which is conservative. The program team has attributed hundreds of millions of dollars to user requested cargo berth upgrades. The basic root issue is whether they get a wharf that can handle a 50' crane or a 100' crane with room for hatch covers. The cost of the latter is basically double the former.

TOTE's berth is estimated at \$448M plus another \$48M for T3 demolition for a total of \$496M, but their needs could be satisfied substantially cheaper if they went to a three-trestle no-wharf solution or if their terminal was renovated and not fully replaced. There is a "want versus need" component to the overall POA. This is where a DBMP can play a role; it gets to what is really needed versus what everyone wants where there is no cap to the amount available. While it is possible to get to an affordable solution using the current process, DBMP helps force the hard decisions.

Contractors and developers can manage risk differently than owners. They can proceed on multiple fronts and make changes to adapt to future decisions outside their direct control much nimbler than an owner pursuing a project using conventional design-bid-build methodology. The key for a successful project is establishing the procurement documents and contract in a way that allows the contracting team to be successful, for example, if the contractor is required to assume permitting risks, allow additional time, but no additional money, to complete the work to allow for timing and outcome uncertainty.

This is significantly different than the traditional model but could give the greatest control of costs and limit risk to the POA, Municipality of Anchorage, user groups and ratepayers.

#### **CHALLENGES OF THIS METHOD**

- Project Team would have to determine the project needs in conjunction with the Port and governance committee and users, understand the budget and stick to it. It will be a longer-term project since time will be needed to accomplish the goal mentioned earlier, if chosen, to prefund portions and get financing to fund other portions of the project.
- It could cause a front-end project delay.
- The USACE Section 408 authorization and NMFS ITA are complexities that will require careful consideration and procurement structuring.

#### **PROCESS & TIMING OF FUNDING SOURCE**

- Budget will depend on what is available and amount available from each source.
- If there is private sector funding for the project or elements for the project, it will be used to leverage other money. Entire funding model including potential tariffs, bonds, grants will be mapped out with funding timeline and schedule.

#### **OPPORTUNITIES FOR THIS METHOD**

- Identify next phases and projects that can be funded and built to completion.
- Identify funding sources that have certainty.
- Plan out the funding phases for 2020 – 2024.
- Determine cost of each phase, create process to have a responsive bidder.

## **PROCESS & TIMING**

- PCT – if funding is identified in 2019 for 2021 work, continue with current process in the traditional model. If funding is not available to complete the work, consider alternate dolphin design and procurement strategies.
- PCT – continue to employ Value Engineering.
- Remainder of major Port facilities – DBMP. This is dependent on timing and engineering and contractor capacity.
- The DBMP process by design should lower costs. It's unlikely an \$1.9B program will get built. Use of DBMP will define available funding and then allow forward movement with a backstop that will allow the project to be completed.
- This solution will have less frills than the current design but will be affordable.

## **Port Users Funding and Alternate Delivery Discussions**

The User Group has acknowledged that increased tariffs are needed for the PAMP. They envision tariffs should be part of the Plan of Finance, but not be the primary capital funding source. They desire clarity on what is going to be built, what it will cost and how their tariffs will increase over time.

There is significant interest in lowering the overall program cost including reducing the design life, lowering the level of seismic enhancements, evaluation of renovation in place versus new construction, and installation of cargo berth fuel headers. Many users would like to see the program costs be reduced by at least of 50% from the latest cost estimates. There has been Port User support expressed for changing the project management philosophy to a “manage to budget and funds available approach.” The MOA has used this approach on the Dena’ina Civic and Convention Center.

In simplistic terms, the current PAMP program selected an initial scope, at an estimated cost, and then raised the budget over time as the design progressed. The revenue side of the Plan of Finance was never clearly defined, and the appropriating authorities didn't have a say in changes to the program affecting time and cost. An alternate approach, with support from many of the Port Users, is to identify a realistic revenue stream as a primary step in the development process and then align the scope of the program and the associated costs to match the available revenue. Once the revenue target is identified, the program would be managed to that revenue stream and budget. The key is having the scope and cost of the project aligned with the revenue stream and then making the hard decisions as the program progresses to keep the elements in alignment.

For example, if costs went up because a decision was made to add seismic resiliency, offsetting scope modifications would need to be found to balance out the added costs. In the same example there would not only need to be an evaluation of the capital costs associated with the alternatives, there would need to be a comparison of the benefits of the addition in relation to the drawbacks associated with the program elements reduction. The process forces cost implications of decisions to be recognized and addressed on a real time basis.

Very cursory discussions have occurred with TOTE and Matson about possible privatization models where the carriers would have an equity interest in their wharf structures. No clear and obvious forward paths have been identified. Matson had previously expressed interest in use of

the North Extension for vessel operations. Brief discussion has occurred about the potential for them to capitalize their future facility in a negotiated fashion outside the current tariff and preferential use terms. Similar discussions have also occurred with TOTE related to the existing T3 in some sort of similar arrangement. TOTE has noted it is premature to have that sort of discussion prior to evaluation of T3 and understanding the opportunities for renovation in place.

Discussions occurred with ABI and some of the fuel tenants about P3 opportunities. No clear forward paths were identified.

Preliminary discussions have occurred with the User Group about the benefits of committing to a tariff increase as part of the messaging to other stakeholders who either benefit from and/or could be potential capital funding partners.

While there is recognition of the need and some general support has been received for increased tariffs, there have also been discussions of various preconditions, including having a clearly defined Plan of Finance, significantly reduced overall program costs and improved management control.

Discussion has occurred with Matson on MOA's desire to have Matson fund what MOA considers to be enhancements to the base program, including increasing the deck platform to accommodate a 100-gauge crane, adding hatch cover storage and two trestles, and changing electrical distribution to a Panzerbelt system. This issue has never been brought to closure and the current Matson leadership did not have a clear perspective of the MOA's intent until near the submittal of the draft of this report. Matson has stated the wharf structural costs to safely accommodate 50 and 100-gauge cranes are equivalent. They have developed an analysis supporting this position.

## **Recommendations**

The following presents a series of recommendations to be considered for implementation into the program. The recommendations are separated into the following unprioritized categories.

- Project Management
- Funding
- Planning
- Programming
- Design
- Construction
- Port Governance/Operational Management
- Other

## **Project Management**

### *Enhance Project Management Structure*

As explained in the Plan of Finance section of this report, there are two fundamentally different approaches to building the POA. We call these the "Standard Municipal Bid Process" and "Design Build Guaranteed Maximum Price" (DBMP), a design to budget method. The latter

approach would include an accountability element, limit risk to the Municipality and reduce the POA direct design costs.

It needs to be noted that in any new or continued approach for managing the project you must have the owner or developer manage to the Plan of Finance. If the developer has this responsibility, then there needs to be strong incentives, penalties or combination to ensure they have a vested interest to manage to the budget. It is also understood that the Plan of Finance will be based on the funding and cash flow reality; anything different could cause the project cost to increase beyond what is realistically available to complete the project.

Recognizing that there is concern with the size of the project and divided roles and responsibility within the POA and the Municipality, it is critical that additional internal resources be dedicated to advance the project. A new structure will be required under the new governance model and appropriate staffing will be necessary.

## Funding

**Create and then implement a tactical funding plan to achieve the revenue component of the Plan of Finance.** This study has identified a range of potential funding opportunities. These elements need to be vetted and the paths to achieving the funding defined. This should be performed as a priority with the initial draft completed in 2019.

**Fully integrate the Plan of Finance into the program.** Both the PIEP and PAMP were implemented under a basic “others pay” assumption for most of the capital project costs. The process has been to define a program and associated capital costs and then refine the revenue sources over time. The ability to obtain state and federal grant funding has changed dramatically since starting the PIEP and PAMP programs. While there has been a clear shift on recognition of the need to integrate “self-pay” into the revenue model, there is still an overall “others pay” mindset. An alternate approach is to create a balanced Plan of Finance as the foundational element of the program and ensure the program remains in balance as it’s implemented.

While a definitive funding plan has not been generated, the users and Administration have both been supportive of a plan where most of the required PAMP funding would come from sources other than tariffs, including state and federal funding. Both the users and Administration have noted the importance of working together in a collaborative and unified effort to procure grant funding. The Port of Alaska benefits the entire state and it’s anticipated a stakeholder coalition would be developed to advocate at the state and federal levels.

It’s critical to have a full understanding of the consumer impacts of any tariff increase. The Administration provided some helpful information here, but there needs to be a better explanation and presentation to the public for their support.

In order to achieve funding concepts, we recommend the following:

1. **Build a funding plan.** A funding plan and timeline must be made and then followed. The Port should begin construction once adequate funding is in hand or a solid income stream that can pay for the project or phase in its entirety is developed. If this isn’t done, the Port

will remain a topic of political debate and public trust will further erode. An initial step would be to create general schedules for all possible funding sources, starting from application to possible award.

2. **Identify and choose financial model to pursue.** After mapping out all realistic possible funding sources and timelines, we suggest ranking them from most to least realistic with amounts attached.
3. **Determine engineering concept for next project.** At the same time, while we understand the difficulty to make plans without money in hand, it is essential the scope of the remaining phases be determined by what is realistically needed and is feasible.
4. **Internal alignment.** Develop a vetted, agreed upon budget that is necessary, feasible and is aligned with Port Users and statewide supporters. This can happen at any point – the sooner the better.
5. **Use a Design-Build Maximum Guarantee Price bid.** When it's time to implement Port construction, there is great benefit in changing the way project solicitations are written, executed and funded. We recommend using a “design-build guarantee” process, as was used for the Dena'ina Civic and Convention Center construction project

## Planning

**Perform a new comprehensive Master Plan with a 20-year planning horizon.** At the minimum, prior to the Roundtable, it would be beneficial for Port staff to document vessel use, berth utilization, and other relevant parameters over the last 10 years and provide some future projections to aid a more rational facility planning discussion.

**Reevaluate vibratory hammer use and permitting conditions strategy.** The Project Team should consult with the contracting community about ways to minimize the amount of beluga takes and explore ways to equitably allocate the project shutdown risk due to exceeding the Incidental Take Authorizations. Consider the available revenue component of the Plan of Finance to realistically project potential annual construction. Use future pre-bid meetings as an opportunity to align understandings by sharing the rationale behind the permitting decisions and pile hammer restrictions. Consider delegation of this risk to the private sector as they have many tools that can help them manage this risk.

**Reconsider the Geotechnical Advisory Commission's recommendation to install strong motion earthquake monitoring elements directly at the Port.** This will help understand actual seismic risk of existing structures, optimize future design decisions and aid in the long-term performance monitoring of the POA structures.

**Investigate the feasibility and logistical requirements for a 100-acre JBER land conveyance.** The POA abuts JBER and is land-constrained as compared to many other regional ports. The POA is designated as a Department of Defense National Strategic Seaport and the military uses the POA for deployments and training exercises. As part of the next Master Plan development, it could be beneficial to consider possible conveyance of adjacent JBER property to the POA. While federal funding would benefit the Plan of Finance, a contribution in kind could be mutually beneficial. This could be done as part of a Master Plan evaluation.

**Update the program cost estimate using the 2020 PCT bid results to help inform the estimate.** This will provide a more realistic presentation of the current program cost and assist in downsizing the program. Care should be taken to account for and eliminate the enhanced seismic resiliency premiums in the lo-lo and PT berths. The Engineer's Estimate for the 2020 PCT bid was more than 30% above PPM, the only contractor. The ICE estimate performed at the 95% design stage was within about 5% of PPM's bid. Consideration should be given to have the revised estimate prepared by the independent cost engineer. It will be difficult to effectively shape the future program without realistic parametric costs.

**Perform a cargo logistics study.** Combining ro-ro and lo-lo cargo operations onto one joint use terminal as proposed by the municipal Administration could significantly reduce program capital requirements. Doing a deeper review of the existing constraints and alternatives could result in a clearer path on the potential ways to implement a single joint use cargo terminal. The benefit of this study is less if T3 is renovated. This could be performed as part of a Master Plan evaluation.

**Create stakeholder engagement and communications plans.** The program will likely go through a major reshaping and the messaging will need to be modified accordingly. It will be critical to align the messaging with the Plan of Finance to generate the advocacy needed to obtain funding support at the state and federal levels. The messaging will change as the scope of the program is reduced and the Port Users shift into full alignment with the program.

## Programming

**Perform a concept design and costing study to evaluate renovation in place options for facilities under consideration to remain for the intermediate term.** This could potentially include T2, T3 and POL-2. As part of the effort, investigate T1 repair as-built documents done to correct 1964 Great Alaska Earthquake damage. Prior to implementing this effort, evaluate TOTE's T3 evaluation and option report, anticipated to be available in late November 2019.

**Perform a concept design and costing study to evaluate cargo berth fuel headers.** Evaluation would include review at T3 and at a trestle-only ro-ro berth.

**Perform a concept design and costing study to evaluate a trestle-only ro-ro berth.** This would not be required if a decision was made to renovate T3.

**Pursue obtaining Port User and other stakeholders facility requirements.** Surveys were sent out to Port Users and other stakeholders in advance of the June 2019 Roundtable. The response was reported to be less than 12%. While the actual meetings were well attended, and information was shared in the meeting, it would be advantageous to get more comprehensive information to optimize the forward path. Certain action items were developed during the meeting and should be pursued. The reason for the low questionnaire response has not been identified. It would be beneficial for the Project Team to reach out to the major users who did not submit information to understand why this occurred and what remediation is needed. This may result in changing the questions or finding a work-around for potential competition related issues. It would be helpful to have this information in advance of the next Roundtable to optimize meeting outcomes.



**Hold another Roundtable with the Port Users.** Change the dynamic from a focus on what the Project Team has done in the past, to a clean slate of how to move forward in the future. Fully involve the Port Users in the creation of the agenda and anticipated outcomes. Maximize the benefits of the effort by ensuring 100% Port User participation in responding to pre-workshop data gathering. Use the successful outcomes of this meeting as a springboard for education and advocacy development of other stakeholders.

## Design

**Commission a review of the Seismic Design Manual and other major program guidance to be performed by independent Professional Engineers.** Perform reviews of program guidance related to ice, berthing load, seismic, container live loads and geotechnical, including the Bootleggers Cove Formation (BCF) soil strength parameters. As part of the study evaluate what factors drove the increases in steel quantities used in the PCT batter pile dolphins designs as compared with earlier installed POA dolphins. Evaluate the compounding effect of the potentially conservative program guidance assumptions for reasonableness and possible reduction. Administration of the reviews could be done by Project Management and Engineering (PME) staff to increase program evaluation independence.

**Reevaluate the additional following design decisions.**

- -45 MLLW dredge depth. Confirm Port Users' current and likely future requirements.
- Moving cargo berth face 140' seaward. Integrate the Plan of Finance revenue requirements into the decision-making process. Compare and contrast the benefits and tradeoffs associated with the current thinking and keeping the wharf face in the existing location.
- Cargo dock enhanced seismic solution. Reconsider decision to design entire ro-ro platform and trestle to elastically resist seismic loads. Reconsider using Bailey bridge type solutions to provide post-earthquake platform access. Consider ways to comply with GAC's basic intent to provide a dedicated cargo terminal that can be used within seven days of the design earthquake, including enhancing a portion of the structure.

**Tailor designs and construction bid packages to align with available funding and the universe of contractors who will be interested in and capable of pursuing the bidding opportunity.** This will involve structuring bid packages to increase contractor interest and capacity. The revenue and timing components of the Plan of Finance should be at the forefront of the decision process and not an afterthought.

**Perform an updated as-built survey on North Extension sheet pile wyes.** The wyes are the point where the face and tail wall sheets connect. An updated survey of the sheet pile wyes and a comparison to 2011 post reconstruction surveys will identify structure movement associated with the 2016 Iniskin and 2018 Port MacKenzie earthquakes. It could be performed for about \$5,000. This data should then be used to help validate the strength of the Bootleggers Cove Formation soils underlying the POA and the program seismic models.

**Provide an alternate dolphin design using batter piles in the event funding for 2021 in water work is not identified by the end of 2019.** This should be done after re-evaluating ice strength and load assumptions.

**Re-evaluate use of pile drilling methods for new wharf and trestle structures, renovation in place and dolphins.** If potentially viable, consider a test pile program to refine pile capacity and sonification parameters.

**Consider alternatives to minimize sedimentation and obtain revised USACE Section 408 authorization.** Work with federal delegation to increase the USACE funding increment.

## Construction

**Investigate ways to increase bidder interest.** The Project Team should perform a “lesson learned” analysis on why they only received one bid on the 2020 PCT ITB procurement, and then implement the findings in future procurements.

**Consider incorporation of a Disputes Review Board (DRB), particularly for projects employing conventional design-bid-build contracts.** DRB’s mitigate risk by providing a forum for early detection and proactive resolution of issues that can arise during construction projects. The MOA has successfully employed this mechanism as have other Alaskan owners administering large and complex projects.

## Port Governance/Operational Management for the Future

Throughout this process, we have heard from many individuals and groups suggesting long-term POA governance restructuring. This is different than what was discussed in the project management section. To meet its funding needs, the POA must be viewed as the port for all of Alaska, and for this to happen, the governance of the Port must change.

It’s clear the POA has an incredibly talented workforce and continues to work under enormous pressure to keep the POA operating while they renovate, repair and modernize the Port.

If it’s confirmed a new port governance structure provides long term Port benefits, we suggest one or more of the following changes:

### *Ordinance Modification - Quasi Public Authority*

This is the simplest option. To meet the goals of more statewide support and Port understanding we recommend changes to POA existing governing ordinances.

1. Expand the Port Commission makeup. Add statewide consumer and user representatives. Existing Code AMC 11.50.030 para. A.2 allows two members from outside MOA. Currently 1 of these seats is filled by a marine pilot.
2. Expand the Port Commission role to include more regulatory control, budget approval and other duties needed to meet the new POA requirements. The Anchorage Telephone Utility is an example of an Authority that expanded its role and added non-Anchorage members.

### *Public Development Authority*

One successful model for ports and other transit entities has been formation a public development authority (PDA). These are also known as a public or government-owned corporation. The Anchorage Community Development Authority (ACDA) is one such model.

A PDA is legally separate from the establishing government entity. Under municipal, state and federal law, PDA contracts must specify that corporation liabilities must be satisfied exclusively from their own assets. This arrangement allows public purpose activities to be accomplished without making them regular municipal government functions. The PDA is governed by a volunteer board overseeing PDA activities and staff, much like the Anchorage ACDA.

A PDA or Port Authority could be developed by the State or Municipality only, depending on the more thorough advice of the appropriate legal departments and bond council, etc. Port oversight is currently done by the Anchorage Port Commission, the structure of which is governed by municipal code. This may be changed by local ordinance. The body may even assume more regulatory powers. This has been done before. Alaska Telephone Utility (ATU), Anchorage Water and Wastewater Utility (AWWU) and the ACDA are all examples.

PDA's can use the IRS 63-20 tax-exempt debt program as a funding tool. The US Department of Transportation Office of Innovative Program Delivery features the IRS 63-20 tax-exempt debt program as an opportunity for financing transportation infrastructure projects. This same tool was used to finance the Dena'ina Civic and Convention Center.

Two primary models have emerged for using 63-20 tax-exempt debt to finance transportation projects procured through alternative project delivery or a public-private partnership.

For revenue generating projects, the 63-20 corporation can issue debt by leveraging future toll or farebox revenues, with the public benefit corporation entering into an agreement with a private contractor to design, build, operate, and/or maintain the project for a pre-determined period. In these cases, the private partner usually assumes financial arrangement responsibility but doesn't issue the debt. The financing package would be approved by the 63-20 corporation board and the debt would be issued by a financing agency. This model is worthy of consideration.

#### *MOU with other Regional Ports*

This is more complicated and would require all participating ports to have their own local political body enter into a Memorandum of Understanding that would lead to an Authority. MOA and the Mat-Su Borough did something similar for commuter rail many years ago. A transit authority was created to establish a governing body to manage commuter rail between the two jurisdictions.

#### *Legislative Approach*

This approach would require state legislature involvement. There have been past attempts to create a State of Alaska Port Authority. These proposals have taken many different forms, sometimes just including the water ports, other times including both air and water ports.

The legislative process requires committee hearings and must balance legislator concerns with local views and outside interests with political arena influence. This is likely why this has never been accomplished. In the current political environment, it's unclear the State has the capacity to undertake such an endeavor.

It would be mandated by and operate under state law. This could limit the local governing bodies' role in managing their own port. To complete this, it would take legislative action and hearings, and the Governor's support. The state cannot unilaterally take local government or port assets and there would need to be an agreement between the involved ports using the state law.

### *Other Items Regarding Management Structure*

We believe the best approach is a stepped, one starting with the Ordinance Modification. This would allow the POA to be viewed as the Port of Alaska, not just Anchorage. It would take a small step toward a new governance model, yet still have positive impacts.

If the Assembly and Administration later believe there needs to be a role and responsibility expansion, further PDA concept evaluation could be done. Both approaches would give more Port staff stability and remove political instability from decisions. This would send a strong message that the Assembly and Administration have heard the public and are taking steps to give Port staff management flexibility rather than simply being a MOA department.

Expanding the Port Commission membership to ensure representation from outside Anchorage and expanding its regulatory powers and its role and responsibility with oversight of the project is a good first step. The latter could be accomplished through creation of a Commission sub-committee made up of at the minimum POA staff, Users and Commission members.

This will ensure continued project oversight beyond any individual staff or elected position. A MOA staff person should be assigned responsibility for PAMP Program delivery and be its liaison between the Commission and the Port. This position should not have day-to-day port operational responsibilities and should be for an appointed term of five years to transcend the Mayor's office and Assembly members' terms and provide continuity.

## **Other**

**Reevaluate corrosion protection expenditures.** The POA wharfs have corrosion protection systems, but they are problematic with some elements not functional. The impressed current systems are being operated at a small fraction of the current need. This is consistent with the understanding the berths will be demolished within 10 years but the POF is not aligned with the facility replacement assumptions. In the event the program is modified to renovate some of the existing structures in place, the POA should evaluate and then implement a revised program to prolong the life of the existing piles through use of enhanced cathodic protection or other means.

## **Next Strategic Action Steps**

Based on our findings, establishing the Port of Alaska as a statewide priority and lowering the overall project costs is possible. For this to happen, the Recommendations section steps including project management, funding, planning, programming, design, construction and Port governance/ operational management, should be systematically reviewed and acted upon as soon as possible. In order to develop a realistic Plan of Finance, change is required on multiple levels. A challenge will be that some of these steps will overlap and at times may conflict with each other, which could delay project advancement.

One consistent theme is the need for a realistic Plan of Finance. Without this, there isn't a way to determine the overall budget, who is responsible for what and how long will it take to complete project elements. To achieve a balanced Plan of Finance, both expenses and revenues need to be identified and the revenue stream must be aligned with the program delivery schedule.

With Municipality Fiscal Year 2020 budgets in the approval stage, FY 2021 being planned at the state level plus an upcoming state legislative session and 2021 federal budget activity, time is of the essence for creating a Port Plan of Finance. We recommend a full review of funding timing and opportunities presented in this report as soon as possible, preferably with an initial general revenue portion of Plan of Finance developed within 2019. It is important to note that while general timelines exist for the state legislature and federal government, budget agreements often come together late in the fiscal year and that uncertainty must be considered while going through the funding planning process.

The Port of Alaska funding requests will be highly competitive with other important infrastructure projects across the state and nation. The more the Port is perceived as a statewide priority, the better. Internal alignment of all stakeholders and generation of public support is a key element.

The Plan of Finance needs to be flexible. Cost estimates will change with time as more detailed design information is developed. Revenues may vary up or down from initial projections. Some potential sources will be determined to not be viable. Other unforeseen opportunities will materialize. This could require program changes to maintain a balanced Plan of Finance.

Once funding is identified and acquired, the next planned PCT phase should be completed using the traditional bid process including the value engineering change clause outlined in Assembly Resolution no. 2019-267. This assumes available funding has been identified in 2019. At a minimum, elements needed to berth vessels could be completed. While not the perfect solution, it keeps that portion of the project moving forward.

The revenue side of the Plan of Finance work should start now even without a detailed project scope. The balance of the project scoping work should also begin now. These two facets are intertwined and must be balanced to be implemented. That is why we recommend they both start this year.

Developing the revised project scope should include Port Users, Project Team, Administration and other stakeholders. To increase the likelihood of success the process should be different than the June 2019 Roundtable. A suggested process is as follows.

- Establish a Port Users and Project Team working group well in advance of the meeting to discuss the agenda, timing, process, participants, presentations, expected outcomes, facilitator and other elements as mutually agreed to by the parties.
- Obtain the baseline information needed to make informed decisions including but not limited to:
  - Port User and other stakeholder facility requirements
  - Final June 2019 Roundtable report
  - Complete and report on June 2019 Roundtable action items
  - Revised current program cost estimate
  - Concept designs and cost estimates for renovation in place of T3, T2, POL-2, and any other facilities to be considered for renovation
  - Concept design and cost estimate for a ro-ro trestle-only berth
  - Concept designs and cost estimates for fuel headers at the existing T3 and/or new ro-ro trestle-only berth
  - Realistic parametric costs for major program elements for both new construction and renovate in place elements
  - Refined Plan of Finance revenue information
  - North Extension as-built survey and seismic model evaluation
  - Cargo logistics study
  - Independent Professional Engineer review of major design assumptions and program guidance
  - Updated evaluation of cargo dock seismic enhancement options

This list of baseline information doesn't include all the deliverable elements listed in the Recommendations section. While some bullet items presented above will be available in the short term, some of them could realistically take four to six months to acquire, possibly even longer. Pushing out this process has other benefits. It allows the parties time to work through and plan out the Roundtable and gain a substantial amount of information. This information will be critical to optimize the design and create a process to accurately determine the cost. It allows the Port Users and Administration to complete the PCT VE effort which is anticipated to complete by the end of December 2019. It is also after the expected completion of MOA's MARAD PIEP lawsuit, which could play a material role in the revenue side of the Plan of Finance. A process extension drawback is that it complicates funding requests, particularly at the state level.

While the final program scope will involve much more discussion and consideration, the following presents one strawman discussion scenario. The PCT should be completed in its current general form with some value-engineering modifications done to the remaining work. Evaluations of ways to decrease USACE dredge prism sedimentation should be evaluated. Discussions should occur with the federal delegation and USACE regarding the Section 408 authorization and funding increment. Construction of the PCT allows demolition of POL-1, Terminal 1 and the port building. Prior to port building demolition, a replacement structure is installed south and east of the current location. A replacement lo-lo wharf is constructed in the general current POL-1/Terminal 1 location. The wharf berth line remains in the current location

and the southerly location is adjusted to comply with USACE dredging and basin flow considerations. The majority, if not all, of the berth is structurally connected to a shoreside sheet pile structure to provide lateral stability and allow vehicle access and hatch cover storage. The solution is consistent with joint ro-ro and lo-lo use if desired in the future. Container load limits are established for the shore-based land 250' east of the pile supported structure. A portion of the wharf is constructed with enhanced seismic resiliency per the GAC seismic recommendations. A \$50M renovate in place program is initiated for Terminal 3. A \$25M renovate in place program is initiated for POL-2 to provide a secondary fuel location. Alternatively, fuel headers could be added at T3 to increase berth utilization and decrease future O&M costs.

While the Plan of Finance is being developed and the scope of services process is underway it is important to start project management structure and Port governance discussions.

We recommend simple changes to the municipal code to create a new POA Advisory Board structure to reflect a statewide prospective with incremental powers and a more active Port policy setting approach. Implementing a structural change as soon as possible would help “re-branding” and “re-setting” the POA Project.

As has been previously stated, the general public’s Port of Alaska understanding is limited. Many people understand the Port importance but recent issues regarding funding and cost increases have eroded public opinion. Full statewide support and understanding is needed. Creating a better understanding and branding of the POA will be important to develop support and funding from the revenue sources we have identified in the report.

The campaign to generate stakeholder support will need to move to another level with broader visibility and more focused messaging. Concerted efforts will need to be undertaken at the regional, Railbelt, state, Pacific Northwest and federal levels. These efforts should start now. There are many steps that need to be taken and many milestones achieved to deliver this project. Following the report recommendations will build a new image and confidence in the POA. Getting the public to see the need and the vision is critical to meet the funding needs. Additional resources are required.

Throughout this process, our team was able to survey many aspects of the Port, break it down into specific topics and investigate the best steps to move forward. We recognize the magnitude of the future POA requirements and the constraints facing the Assembly including limited staff and the breadth of topics, including the city budget, that must be addressed both this year and next. We recommend the Municipality seek the assistance of an entity dedicated to these actions and strategic advisement to help the Assembly and Administration to take advantage of funding opportunities and to build the Port of Alaska into the kind of port it should and can be.

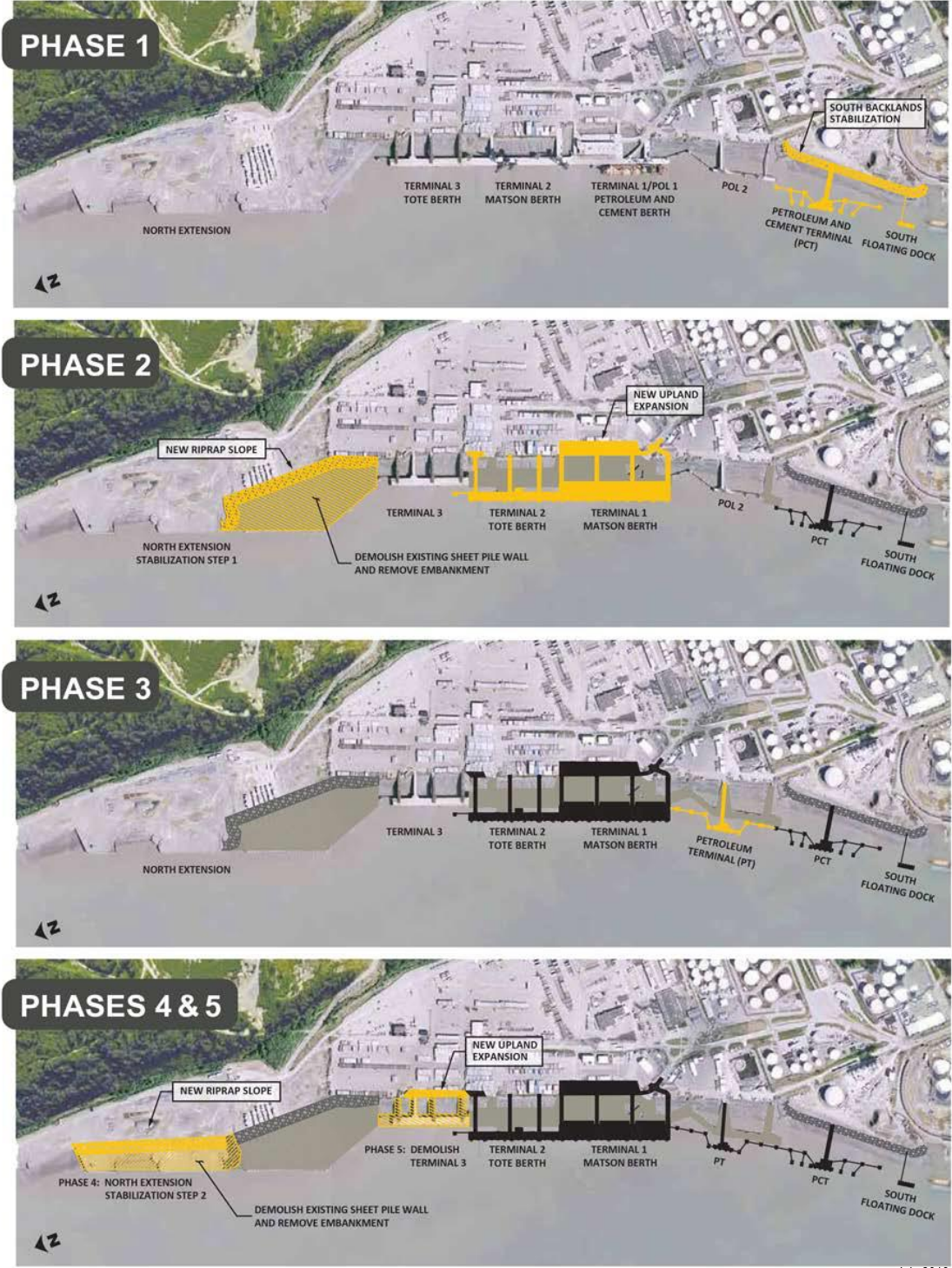
**Appendix**



A-1 General Phasing Plan



# Port of Alaska Modernization Program



July 2018

A-2 Port of Alaska Operations Area



 **PORT OF ANCHORAGE**  
JUNE 2010

— AREA OF OPERATIONS

A-3 Committed Cost Breakdown as of August 2019

Committed Cost Breakdown			
August 2019			
Category	Committed	Incurred	Description
Program Management Consultant	\$33,780,720	\$28,823,635	Planning, Scheduling, Preliminary Design, Estimating, Permitting, Design and Construction Management
Program Management Support	\$1,786,291	\$1,710,946	Survey and Geotechnical Support to PMC During Preliminary Design
Test Pile Project Construction	\$5,813,224	\$5,813,224	Kiewit Infrastructure Northwest
Independent Cost Estimator (SBS/NES1)	\$130,216	\$63,374	Moffatt & Nichol
South Backlands Stabilization Construction	\$12,994,583	\$8,250,093	Kiewit Manson Joint Venture
SBS Builders Risk Premium	\$56,500	\$56,500	RISQ (insurance carrier for MOA)
PCT Design	\$7,400,643	\$6,917,522	COWI
Independent Cost Estimator (PCT)	\$313,788	\$254,417	Moffatt & Nichol
CMAR Preconstruction Services	\$1,520,256	\$1,453,957	Kiewit Manson Joint Venture
PCT Builders Risk (Soil Improvements, Transitional Dredging)	\$29,662	\$29,662	RISQ (insurance carrier for MOA)
Soil Improvements Construction	\$6,269,050	\$6,269,050	Kiewit Manson Joint Venture
South Floating Dock Relocation Construction	\$2,795,249	\$0	Kiewit Manson Joint Venture
Transitional Dredging Construction	\$21,368,400	\$10,421,497	Kiewit Manson Joint Venture
PCT 2020 Construction	\$42,156,000	\$0	Pacific Pile & Marine
NES1 Design	\$2,017,239	\$2,005,207	Kiewit Manson Joint Venture
<b>Total</b>	<b>\$138,431,821</b>	<b>\$72,069,084</b>	