

## **KOTZEBUE HARBOR SEC 204**

### **COST ENGINEERING**

#### **APPENDIX OVERVIEW**

This Cost Engineering Appendix will be consolidated into the decision document Feasibility Report for Kotzebue, Alaska. The purpose of the feasibility study is to evaluate alternatives for a potential construction contract. The Appendix discusses the cost assumptions, methodology, materials, labor, and equipment, utilized in the contract construction cost estimates.

#### **PROJECT TYPE, FEATURES & ALTERNATIVES**

This project for Kotzebue, Alaska, is intended to construct navigation improvement measures. The City of Kotzebue, Latitude 66.8959 Longitude -162.5869, lies on a 3-mile long gravel spit at the end of the Baldwin Peninsula in Kotzebue Sound which ranges in width from 1,100 to 3,600 feet. It is located near the discharges of the Kobuk, Noatak, and Selawik Rivers in the Northwest Arctic Borough. It is the borough's seat, by far its largest community and the economic and transportation hub of the sub-region of Alaska encompassing the borough. It is approximately 549 air miles northwest of Anchorage and 26 miles above the Arctic Circle. Cape Blossom is a cape located on the Baldwin Peninsula in Alaska which occupies a point that extends southwestwards into Kotzebue Sound, 18 km south of Kotzebue.

Cape Blossom and Kotzebue fall within the arctic climate zone, characterized by seasonal extremes in temperature. Winters are long and harsh, and summers are short but warm. In the winter, average temperatures range between 15 and 20 degrees below zero; and in summer, temperatures range from 40 to 50 degrees with plenty of daylight. Days of above 70°F (21°C) can be expected an average of five days per summer. Precipitation is both most frequent and greatest during the summer months, averaging 10.1 inches per year. Snowfall usually falls in light bouts, averaging 39 inches each season. Extreme temperatures have ranged from -58 °F (-50 °C) to 85 °F (29 °C), with the latter occurring as recently as June 19, 2013. Kotzebue Sound is ice-free from early July until early October.

The City of Kotzebue is accessible by air, and water. Air is the primary means of transportation year-round. The state-owned Ralph Wien Memorial Airport supports daily jet service to Anchorage and several air taxis to the region's villages. It has an asphalt/grooved main runway that is 6,300 feet long. A seaplane base is also operated by the state. There are 26 miles of local gravel road used by cars, trucks, and motorcycles during the summer. Snow machines are preferred in winter for local transportation. The Alaska Department of Transportation and Public Facilities (ADOT&PF) is preparing for a proposed all-season road from Kotzebue to Cape Blossom. The gravel road, at just over 11 miles long, would provide access from the Kotzebue starting at the Electric Association Wind Farm to Cape Blossom, which is on the coast southwest of town on the Baldwin Peninsula.

Ocean and river barges are the preferred shipping for cargo, with air freight a common alternative when barge transport is impossible. The marine shipping season lasts 100 days, from early July to early October, when the sound is ice-free. Currently due to river sediments deposited by the Noatak River four miles above Kotzebue, its harbor is shallow. The average depth of the sound in front of the City of Kotzebue is 6 to 7 feet. This sediment makes it impossible for oceangoing barges to call directly on Kotzebue. Deep draft vessels must anchor 15 miles out, and cargo is lightered to shore and warehoused. Crowley Marine Services operates shallow draft barges to deliver cargo to area communities.

This project for Kotzebue is intended to investigate the potential fuel cost savings that would result from navigation efficiency improvements at Cape Blossom, 12 miles south-southeast of Kotzebue on the Baldwin Peninsula. Navigation improvements, including a dredged channel to a dock at Cape Blossom, could provide fuel and cargo transportation savings. The assumption of the analysis is that current and potentially other fuel providers would continue to deliver fuel to Kotzebue and to Cape Blossom as the Kotzebue Road is completed as planned by the State of Alaska.

All of the solution concepts have several components in common. Each of the concept plans would require a fuel header and pipeline to a bulk storage at Cape Blossom; fuel transfer pump/filter/valve system; lighting and power generators; and support utilities. The differences are between how far off-shore the dock/header would extend, and how long/deep a dredged channel access to the header at the dock would be.

### **COST ESTIMATE BASIS SUMMARY**

Documents Referenced for Scope of Work: Alternatives Drawings, Technical Specifications, and the Feasibility Report. Quantities and dimensions were verified with the project designers (see HYDRAULIC DESIGN APPENDIX). Project conditions and construction costing were based upon the alternatives presented. Lands and Damages costs, and quantities for Relocations were provided by the Real Estate Branch, POA. PED, SIOH and the Cultural Resources costs were provided by the project PM/PF.

The major project marine construction features at Cape Blossom are an uplands parking pad for cargo transfer equipment; a dock with a fuel transfer header and supporting the transfer of fuels and dry cargo; a dredged channel from deep water into a turning basin at the dock; a trestle and/or causeway built out from the uplands pad into the shallow Kotzebue Sound with valves and pipeline from the new dock header to an uplands fuel storage pad with bulk fuel storage tanks; and associated fuel transfer equipment (pumps, filters, valves alarms, etc.). These features are designed to allow a deep water transfer point to the uplands facilities for cargo vessels to eliminate the lightering transfer time and costs.

The minor project construction features at Cape Blossom are supporting utilities for the causeway/dock (water, electricity, lights); an uplands road connecting the pier/causeway to a 12 mile roadway from Cape Blossom to Kotzebue to be built by AKDOT; and a future fuel transfer pipeline from the uplands bulk storage to Kotzebue presumably following the new road. These facilities are intended to maximize benefits of the deep-water dock transfer.

The marine construction of docks, elevated roadways, pads, and dredged channels is well understood. The exact size, methods and materials for the roadway are uncertain as there are multiple constraints that will dictate the final design parameters. The long-term O&M costs are not well known because of lack of design data, however, Maintenance Dredging is assumed to require removal of 2 Ft of sedimentary material over the area of the dredged channel and basin.

The designs for bulk fuel and dry cargo storage are not developed past a preliminary stage as the Local Sponsor's needs and desires have not been refined into structural or mechanical designs of environmentally compliant fuel storage and transfer piping, and general storage space with incidental supporting facilities and utilities.

The pier/causeway/dock construction costs were based upon some general assumptions. The pier/causeway/dock could be constructed of pre-cast concrete wide-flange Tee beams with 5 Ft deck width typically used for roadways. The beams would span about 100 Ft and be supported on abutments consisting of driven steel piles with cast-in-place concrete pile caps. To protect the abutments from storm surge and ice flows, the supports would be enclosed by driven steel sheet pile hoops filled with gravel. The final design will be optimized during PED.

The project support utilities were presumed to be POL pipeline, power source, and roadway/area safety lighting at a minimum. A dual 8 inch POL transfer pipe from the dock header to the transfer station was presumed to aid efficient fuel transfers to/from barges at the dock, plus provide needed redundancy to ensure continuous fuel transfer capability, in the event of a pipe leak, which is critical to the project benefits and the area consumers. Electric power source and backup would be from local diesel generators at the uplands transfer station, but the new road may support primary power transmission from Kotzebue to Cape Blossom. Area lighting at the dock, pads and storage tanks; and roadway lighting along the pier/causeway; are considered necessary for safety since the arctic site is prone to long periods of darkness and stormy weather. Water supply and to the storage area, and to the dock would be beneficial, but not presumed necessary.

Remaining construction items were presumed to cover structural/mechanical/electrical design review and inspection services; buildings and facilities to shelter equipment and personnel; miscellaneous items providing for fire protection, alarm/communication, control systems, heating, cooling, and sanitary waste disposal; and uplands stabilization including seeding and revetments.

Construction advertisement/award is expected in late 2022; and construction execution is expected in 2023 and 2024 with possible completion as late as 2025 depending on delays.

Labor rates are based on Alaska Laborers' & Mechanics' Minimum Rates of Pay, 1 Sep 2018. Equipment rates are based on MII Equipment 2018 Region 09. On-Road Diesel was assumed at \$2.75/Gal. Fuel price is volatile in Alaska. Quarried material costs were assumed from historical data and previous quotes from quarries. There is no local material source and little competition for quarry materials.

Construction Prime Contractor Markups include Alaska payroll tax, and WCI for Pile Driving; a

15% FOOH, 5% HOOH, 8.73% PWG, and 0.66% Bond from tables. Major Sub-contractors were presumed to execute Dredging/Disposal, Earthwork, and Bulk Fuel Storage/Piping. Markups include Alaska payroll tax, and WCI for Excavation and Mechanical; a calculated JOOH, 6-8% HOOH, 9.08% PWG, and 0.70% Bond from tables. Minor Sub-contractors were presumed for the Uplands Earthwork, Topographic/Hydrographic Surveys, Electrical Power/Lighting, and Engineering Design/Inspection, with Markups including Alaska payroll tax, WCI, a 10% FOOH, 8% HOOH, 10.0% PWG, and 2.0% Bond as this work can be specialized.

Contingency for alternative selection was derived from the Abbreviated Risk Analysis. A Cost Abbreviated Risk Analysis (ARA) defined contingencies for the project budget. Construction Escalation is based on the Civil Works Construction Cost Index System (CWCCIS), EM 1110-2-1304, dated 30 Sep 2017. Please refer to the Total Project Cost Summary (TPCS) for cost breakdown.

The Construction Contractor will furnish all labor, equipment, supplies and materials to accomplish the work. Contract acquisition is presumed to be IFB. Uplands construction can occur throughout most of the year. Dredging and Pile Driving are presumed to occur in the approximately 100 to 120 days ice free period. Off-season work may be required, but rock revetment construction in freezing weather is not satisfactory.