

6.0 Cost Estimates

The cost estimates for the Port MacKenzie Rail Extension alternatives were prepared using the conceptual level designs that evolved through the alternatives analysis process. The basis for the ground surface elevations was 10-foot interval Digital Elevation Model (DEM) data obtained from the USGS. The design criteria for both railroad and roadway construction are as stated in Section 2.1. Table 6-1 details the cost estimates for each alignment.

6.1 Assumptions for Estimate Development

The concept designs and resulting cost estimates were based on the following basic assumptions:

- Typical sections for the primary elements of construction were prepared.
- Horizontal and vertical alignments were prepared for each alternative segment.
- All alignments and earthwork quantities were calculated using In-Roads software.
- A preliminary Hydrology and Hydraulic (H&H) analysis was done for the identified streams encountered.
- Concept level bridge designs were prepared for the crossing of Willow Creek and the Little Susitna River, based on actual field bridge site surveys, the preliminary H&H analysis and the conceptual track crossing profile.
- It was assumed that the smaller drainages would be crossed using appropriately sized culverts.
- Where culvert sizes to accommodate the design flow exceeded 72-inches, short span bridges were assumed.
- Where the stream was identified as an anadromous fish streams the culverts were arbitrarily upsized to either a 72 inch culvert or a short span bridge.
- The planed grade line was held approximately 7 feet above the surrounding terrain unless in a cut to provide for well drained roadbed.
- Grade breaks and vertical curves were spaced such that a train would be passing through only one crest or sag vertical curve at time.
- All unit prices are in 2007 dollars.

6.2 Estimate Items

Construction quantities and probable unit costs were developed as discussed below.

6.2.1 Civil

The Civil category of the estimate is comprised of four items.

Clearing and grubbing quantities were estimated on a “per acre” basis for each alternative. The acreage was estimated from the concept designs and calculated as the construction foot print area covering the entire area that would be disturbed by grading operations, either cut or fill. The unit price developed for this estimate is a blend of pricing from recent ARRC projects and ADOT&PF projects.

Aggregate base course is the layer of crushed gravel normally placed immediately below the pavement section in a roadway surface. For this project, aggregate base would be used, depending on alignment, when roads are crossed at grade as part of the construction of the road approach to the new crossing. Aggregate base would also be used if the Parks Highway is to be crossed as part of the reconstruction of the highway pavement section. The quantity has been estimated for a

6-inch layer placed the full width of the roadway base. The unit price developed for this estimate is a blend of pricing from recent ADOT&PF projects.

Asphalt concrete is the material to be used to provide the new driving surface in restoring pavements on the Parks Highway or other paved roadways or pathways. The unit price developed for this estimate is a blend of pricing from recent ADOT&PF projects.

Culvert pipe would be required for all alternatives. Because the hydrology and hydraulics analysis done to date is based on the DEM information rather than field measurements, the assumption was made that four pipe sizes would be used for the estimate. These are 24-inch, 36-inch, 48-inch and 72-inch round corrugated metal pipe. Unit prices for each, on a Linear Foot basis are based on information provided by ARRC and ADOT&PF.

6.2.2 Earthwork

The Earthwork category of the estimate includes three volumetric items.

Unclassified Excavation quantities were estimated by using In-Roads software to impose a template through the existing ground DEM, controlled by the design horizontal and vertical alignments. The software then calculated the amount of excavation associated with each alignment. Where areas of compressible soils had been defined by the geotechnical field reconnaissance described in Section 4, the excavation includes removal of all compressible soils within a width of 80 feet. The unit price developed for this estimate is a blend of pricing from recent ARRC projects and ADOT&PF projects.

Borrow quantities were calculated by subtracting the values for useable excavation from the total fill quantities. The total fill quantities were estimated using In-Roads software and are defined as the amount of material to construct embankment from the bottom of excavation as determined in the Unclassified Excavation calculation to the planned subgrade elevation. The useable excavation was calculated as the Unclassified Excavation quantities minus values for clearing and grubbing and compressible soils, both of which are assumed to be unsuitable for embankment. No adjustments have been made for shrink or swell factors. The unit price developed for this estimate is a blend of pricing from recent ARRC projects and ADOT&PF projects.

Subballast is the layer of granular material in the railroad structural section between subgrade and ballast. For this project the subballast would be one-foot thick covering the top of the subgrade. All subballast material is considered to be borrow material, screened at the source to achieve a specified gradation. No adjustments have been made for shrink or swell factors. The unit price developed for this estimate is a blend of pricing from recent ARRC projects.

6.2.3 Track

The Track category summarizes four items that relate to the completed track structure and associated grade crossings.

Track, concrete ties, Ballasted, 141 lb CWR – this item is an aggregation of crushed rock ballast, pre-cast and pre-stressed concrete ties, tie hardware and 141 lb/yd mainline continuously welded rail. This combined unit is typically bid on a per foot of ballasted track in place basis. The unit prices included for this item are based on information provided by ARRC.

Railroad turnouts, No. 15 – 141 lb, are the switch units that are an integral part of the track work and would be used at each siding and/or other track junction. The unit prices included for this item are based on information provided by ARRC.

For grade crossing – crossbucks, the cost of each installation includes standard advance warning signs, the crossbuck signs on each approach to the crossing, and the pre-cast concrete grade crossing panels and related site construction. There are a varying number of new grade crossings in each alternative. Traffic volumes are generally low on these roadways, often not more than 100 to 200 per day such that more sophisticated levels of crossing protection do not appear to be warranted. Prior to construction, each crossing location would be evaluated by a diagnostic team and the most appropriate level of crossing protection selected. The unit prices included for this item are based on information provided by ARRC and ADOT&PF.

For grade crossing – signals/gates, the cost of each installation includes standard advance warning signs and a combination unit at the crossing that includes both the cross-arm gates and flashers, both of which are activated by an approaching train. The cost also includes the related signal equipment, pre-cast concrete grade crossing panels, and related site construction. These installations are typically used where there is a higher volume of vehicular and/or rail traffic. Prior to construction, each crossing location would be evaluated by a diagnostic team and the most appropriate level of crossing protection selected. The unit prices included for this item are based on information provided by ARRC and ADOT&PF.

6.2.4 Structures

The Structures category of the estimate is comprised of four items that relate to the completed track structure and associated grade crossings.

River bridges occur in one form or another on the Willow and Houston alignments. There are no bridge structures expected over waterbodies on the Big Lake alignment. The Willow alignment crosses the Little Susitna River and Willow Creek. The Houston North alignment crosses the Little Susitna River and the Houston South alignment includes a Little Susitna River crossing on the siding that is part of the junction with the existing mainline track. Each of the bridges was laid out using concept level track profile elevations and field collected bridge site survey data. Each of the river bridges are, conceptually, standard ARRC deck girder structures with the exception of the Houston South structure which is a through girder, matching the existing mainline structure at the same location. Bridge costs were developed on a “Per Each” basis for the estimate and as they are very similar in layout they are estimated at the same “Per Each” price. The “Per Each” price has been developed using a weighted average of bid prices for comparable bridge structures in Alaska and in the Pacific Northwest.

Highway grade separation structures are anticipated at the Parks Highway for both the Willow and Big Lake alignments. The Big Lake alignment also has a grade separation with Big Lake Road. On the Willow alignment, the tracks are far enough below the Parks Highway grade in a through cut deep enough that there is sufficient clearance between the top of rail elevation and the bottom of girder elevation that the highway grade would remain essentially as it is today. The highway bridge is expected to be a conventional 3-span pre-stressed concrete girder highway bridge. On the Big Lake alignment at Big Lake Road the tracks are above Big Lake Road and provide the desired clearance between roadway surface and bottom of structure. The structure would be a standard 3-span deck girder railroad bridge. The Big Lake alignment meets the Parks Highway below highway grade however, it would be necessary to raise the highway approximately 9 feet to provide adequate clearance. This would require reconstruction of about 4,000 feet of the Parks Highway and relocation of the Hawk Lane/Parks Highway intersection. This intersection is the primary access to Houston Middle and High Schools. Relocation of the intersection also includes relocation of approximately 1,000 feet of Hawk Lane. The quantities of materials associated with the roadway construction are included in the grading, aggregate and paving quantities discussed above. The Parks Highway bridge would be a conventional 3-span

pre-stressed concrete girder highway bridge. The unit prices for the highway bridges are based on information provided by ADOT&PF bridge section.

Drainage Structures would be used at several locations where smaller drainages and waterbodies are either anadromous fish streams requiring a pipe larger than 72-inch diameter and/or where design flows suggest a pipe larger than 72-inch diameter. The drainage structures could possibly be designed as multi-plate culverts, precast concrete arches, or one or more spans of 28-foot standard ARRC deck girder bridges. The number of drainage structures varies from alignment to alignment. The “Per Each” price has been developed using a weighted average of bid prices for comparable bridge structures in Alaska and in the Pacific Northwest.

Trail grade separations would be used at a number of locations for each alignment. These trails are use by dog mushers and by snowmachiners.. For those locations where the rail grade is above the trail a multi-plate culvert or short ARRC standard deck girder bridge could be used. Where a combination of terrain and design profile makes it convenient for the trail to cross over the tracks, a trail bridge may be used. The unit price included in the estimate is a “Per Each” price and is based on recent experience in Alaska and in the Pacific Northwest.

6.2.5 *Right-of-Way*

Right-of way acquisition is a rough order of magnitude estimate per alignment segment of the cost to purchase and deliver ROW. This includes estimates of the cost to purchase land and improvements and the estimated costs of appraisals, title reports, acquisition and relocation staff and administration, and relocation benefits costs. Land and improvement values were based on 2006 MSB assessed values, adjusted to approximate 2007 fair market values. All 2006 improvements on impacted parcels were considered to be full acquisitions. Some of these improvements are likely to not be acquired, however, this tends to balance the circumstance that improvements entered onto the MSB tax rolls since 2006 were not known or considered. Where no MSB assessed value data was available, values were estimated based on surrounding values. No estimated costs were developed for ARRC-owned property.

It would be necessary for the ROW estimates to be adjusted as a result of market, salary, and operational cost changes over time. At this time it is reasonable to assume a 5% yearly increase of the rough order of magnitude ROW estimate. Major changes in the State or local economy, such as approvals of new major mineral extraction activities, greatly improved infrastructure, and/or residential and commercial development would have an unpredictable affect on the market and could make the forecast of a 5% annual increase in costs inaccurate.

6.2.6 *Additives*

Mobilization – This standard bid item covers the cost incurred by the contractor for a project office, communications facilities, relocating key staff and bringing construction equipment to the job site and placing the equipment in service. In this instance, due to the magnitude of the project, Mobilization is estimated at 8% of the total of all other items. This percentage is based on an averaging of information provided by ARRC, ADOT&PF, and the project team’s experience.

Engineering and construction management includes such activities as surveying and mapping, geotechnical investigations, detailed design of project elements, production of plans, specifications and estimates for soliciting construction bids, permitting, assistance during bidding, assistance during construction and may include full “Owners Representative”, materials testing and on-site inspection services. The 15% of other items for engineering and construction management included herein is based on an averaging of information provided by ARRC, ADOT&PF, and the project team’s experience.

Contingency – this is a cost included at the early stages of project development to provide a budget number for the multitude of smaller project elements that cannot be fully identified at the early stages of project development. It is a reserve amount included to cover “unknowns”. The 25% of all other costs, at this stage of any project, is a normal amount to be included as contingency. This is based on the practice of ARRC, ADOT&PF and the experience of the project development team.

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Table 6-1 Conceptual Opinion of Probable Cost

Categories	Alignments							
	Mac West - Willow	Mac West – Houston – Houston North	Mac West – Houston – Houston South	Mac West – Big Lake	Mac East - Willow	Mac East – Houston – Houston North	Mac East – Houston – Houston South	Mac East – Big Lake
Length (miles)	44.8	35.1	34.5	35.8	45.0	35.3	34.7	31.8
Civil	\$4,130,900	\$3,318,000	\$3,016,000	\$5,176,300	\$4,238,900	\$3,366,000	\$3,124,000	\$4,854,300
Earthwork	\$88,065,000	\$71,707,000	\$62,058,000	\$73,170,000	\$88,140,000	\$71,782,000	\$62,158,000	\$66,986,000
Track	\$69,200,000	\$53,750,000	\$53,600,000	\$56,950,000	\$70,000,000	\$54,550,000	\$54,400,000	\$51,700,000
Structures	\$20,600,000	\$11,100,000	\$9,800,000	\$12,100,000	\$18,000,000	\$8,500,000	\$7,200,000	\$12,100,000
Right-of-Way	\$3,890,000	\$5,360,000	\$3,330,000	\$6,790,000	\$3,030,000	\$4,500,000	\$2,470,000	\$5,120,000
Subtotal	\$185,885,900	\$145,235,000	\$131,804,000	\$154,186,300	\$183,408,900	\$142,698,000	\$129,352,000	\$140,760,300
Mobilization and demobilization (8% of subtotal)	\$14,871,000	\$11,619,000	\$10,545,000	\$12,335,000	\$14,673,000	\$11,416,000	\$10,349,000	\$11,261,000
Engineering and Construction Management (15% of subtotal)	\$27,883,000	\$21,786,000	\$19,771,000	\$23,128,000	\$27,512,000	\$21,405,000	\$19,403,000	\$21,115,000
TOTAL (With no contingency)	\$228,639,900	\$178,640,000	\$162,120,000	\$189,649,300	\$225,593,900	\$175,519,000	\$159,104,000	\$173,136,300
25% Contingency	\$58,000,000	\$45,000,000	\$41,000,000	\$48,000,000	\$57,000,000	\$44,000,000	\$40,000,000	\$44,000,000
TOTAL WITH CONTINGENCY	\$286,639,900	\$223,640,000	\$203,120,000	\$237,649,300	\$282,593,900	\$219,519,000	\$199,104,000	\$217,136,300

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