PDC INC. ENGINEERS

May 17, 2007

INTRODUCTION

The Alaska Railroad Corporation has requested a study to develop and evaluate viable alternatives for connecting the proposed railroad alignments from the following studies: South Fairbanks Realignment, North Pole Realignment, and Fort Wainwright Realignment. The proposed alternatives for this 3-Mile Gate Alignment Study will provide a route that connects the realignments and accomplishes a major goal of removing the existing at-grade crossing just west of 3-Mile Gate.

DESIGN CRITERIA

The design criteria are based on ARRC, AREMA, ADOT&PF and AASHTO standards.

Table 1. Design Criteria

	Mainline Track	**Spur/Branch Tracks**	**Richardson Highway**
Degree of Curvature	6 deg–low speed 3.5 deg–high speed	10 deg (13 deg by cooling ponds – ARRC design)	2,050' radius
Maximum Grade	1%	1%	3%
Minimum Vertical Curve	AREMA Standards (100' minimum)		crest k = 247 sag k = 181
Spiral Length	210' max	100' max	N/A
Switches	#11	#11 desirable (#9 min)	N/A
Track Spacing	See attached concept drawings		N/A
Overhead Clearance	23.5' to obstruction 27.5' to OH utilities	23.5' to obstruction 27.5' to OH utilities	16.5' to obstruction 20.5' to OH utilities

In addition to the design criteria listed above, ARRC identified several other criteria for the development of alternatives. These include:

- The railroad/Richardson Highway crossing must be grade separated.
- Alternatives should be developed to address high speed options for both passengers and freight (50 mph) and low speed for freight only (<25 mph).
- Alternatives should allow for the construction of a future, adjacent track.
- Alternatives should provide for connections to the existing Airport Branch, the track to the Fort Wainwright (FTWW) Power Plant, and the proposed Stryker Rail Load-Out Facility.
- Alternatives should allow for the development of an at-grade crossing of the Richardson Highway for troops and equipment movement to the FTWW rifle range (highway overpass options).

ALTERNATIVES

The concept options meet the design criteria and stated objectives. See Table 2 for a summary of the impacts for each option.

Option 1 – High Speed Railroad, Highway over Rail

This option uses 3.5-degree curves on the mainline from 3-Mile Gate to the Tanana River Levee and requires a highway overpass. The alignment crosses the Richardson Highway at the same location as the existing at-grade crossing, but it is highly skewed (approximately 70 degrees from perpendicular). The railroad grades are minimal due to the flat terrain and will easily match existing grades at tie-in points. Spurs and branch lines follow the existing alignments where possible.

The Richardson Highway overpass fits between the Old Richardson junction and 3-Mile Gate, thus minimizing impacts to existing traffic operation, but the highly skewed crossing and allowances for a future second track and military access road creates a long bridge span. Several alternatives for the bridge design are possible.

Alternative 1: The alternative shown in Figure 1 consists of a long bridge span with deep girders to accommodate planned and future tracks and military access. A bridge girder depth of 8.5 feet was estimated based on local bridges with similar spans.

Alternative 2: A substitute to the deep girders in Alternative 1 would be to place center piers between the railroad tracks and the range access road. While this would create a slightly longer total bridge length due to horizontal clearance requirements from the tracks to the bridge support structures, the girders would span a shorter distance and girder depth would decrease.

Alternative 3: Another alternative would be to use a bridge to span only the two railroad tracks. A large diameter structural plate pipe could be placed near the bridge to act as a tunnel through the overpass embankment for military access to the firing ranges.

Several overhead utility lines will need to be raised or relocated. The 12.5kV power line that parallels the Richardson Highway will need to be moved slightly, out to the toe of the overpass embankment. A 69kV line from the GVEA substation crosses the railroad alignment in two places, and also crosses the highway overpass near the crest of the vertical curve. This line will have to be raised to provide adequate vertical clearances at the highway, and clearances at the rail crossings will need to be evaluated. In addition, vertical clearances will need to be evaluated for the 138kV line crossing the railroad mainline alignment south of the highway.

Option 2 – Low Speed Railroad, Highway over Rail

This option essentially uses the mainline alignment developed by ARRC for accessing the power plant after the FTWW Realignment Project removes access to the power plant from the north. Maximum 10-degree curves on the mainline are used to create a perpendicular crossing of the Richardson Highway at the same location as the existing at-grade crossing. Larger curves are used south of the Richardson Highway where there is more space available, but the mainline speed at the crossing will be limited by the 10-degree curves north of the highway. The railroad grades are minimal due to the flat terrain and will easily match existing grades at tie-in points. Spurs and branch lines follow the existing alignments where possible.

A highway overpass will be used for grade separation. The Richardson Highway overpass is essentially the same as Option 1, with minimal impacts to existing traffic operation. Because of the perpendicular crossing, the bridge span is much shorter than Option 1, which results in smaller, less expensive bridge girders. A bridge girder depth of 5.5 feet was estimated based on local bridges with similar spans. This option also allows for a future second track and a military access road.

Similar utility conflicts as the Option 1 overpass apply to this option, with relocation of the 12.5kV line and raising of the 69kV line for vertical clearance over the track and overpass.

Option 3 – High Speed Railroad, Rail over Highway

Option 3 consists of 3.5-degree curves and maximum 1% railroad grades to provide a rail-over-road crossing (overcrossing) of the Richardson Highway. The extents of the railroad grade raise are from 3-Mile Gate to approximately the Fairbanks Sand and Gravel spur. The mainline alignment crosses over the Richardson Highway in the "scissors" area, which allows center piers for the railroad bridge to be placed, reducing the span length for the bridge. The switches to the FTWW power plant and Fairbanks Sand and Gravel will be up on the embankment, and the spurs will slope down at 1% maximum. Long, essentially flat grades will be provided ahead of the actual facilities to aid train operations in these industrial areas (see Figure 3). In addition, there is nearly ½ mile of 0% grade on the eastern portion of the power plant wye that could be used if needed for train operations while off-loading coal at the power plant.

The spurs to the FTWW power plant cross Alder Avenue approximately 12 feet higher than the existing crossing. Alder Avenue will be reconstructed with 1% grades to allow for an at-grade crossing. This grade raise can be made between the GVEA substation and Meridian Road, therefore not impacting any existing access points. The four switches used for the spur to the power plant are #9's due to tight geometry constraints.

All three of the major power lines (138kV, 69kV and 12.5kV) within the track realignment area will need to be raised to provide appropriate vertical clearances.

Table 2. Summary of Impacts

	Option 1	Option 2	Option 3
Mainline Track (ft) New track req'd Existing track[1]	 11,000 2,200	 7,500 7,600	 12,500 1,800
Total alignment length	13,200	15,100	14,300
Spur/Branch Track (ft) New track req'd Existing track[1]	 10,500 6,000	 9,500 5,200	 13,000 3,000
Total alignment length	16,500	14,700	16,000
Switches (ea)	8	8	8
Bridge Span (ft)	230 (no center pier)	90	110, 170[2], 110
Highway Construction (ft) Richardson Highway Alder Avenue	 4,200 0	 4,000 0	 0 2,600
Embankment Qty (cy)[4] Road Railroad	 310,000 420,000	 380,000 330,000	 50,000 880,000[3]
Total	730,000	710,000	930,000
Utility Impacts	Raise 69kV Relocate 12.5kV Evaluate 138kV clearance	Raise 69kV Relocate 12.5kV Evaluate 138kV clearance	Adjust vertical clearance on all three power lines

[1] Existing track and embankment to be evaluated by ARRC to determine if it needs to be replaced. Embankment quantities do not account for any upgrades or reconstruction of existing embankment.

[2] The 170-foot span is in the open area of the divided Richardson Highway. This span could be broken into smaller spans with more piers.

[3] On the mainline railroad grade raise, this quantity reflects an embankment width for two tracks. All other railroad embankment quantities are for one track only.

[4] An estimating factor of 30% was used for concept level quantities.

P:\2007\F07019\5Rprts\3-Mile Alignment Concept Report_v3.doc