FAIRBANKS— NORTH POLE REALIGNMENT

Phase III Technical Analysis

May 2007

Alaska Railroad Corporation
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Anchorage, Alaska 99501

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EXECUTIVE SUMMARY

The Alaska Railroad mainline includes approximately 500 miles of track. The mainline is currently considered to terminate at the Fairbanks yards. Local freight service in the Fairbanks area is provided by the Airport Branch serving the airport and the industrial area of South Fairbanks. Service to Fort Wainwright, Eielson Air Force Base, North Pole and the North Pole Refinery is provided by the Eielson Branch. According to the report prepared by the Fairbanks North Star Borough (FNSB) Rail 2100 Task Force, some 45 percent of Alaska Railroad rail traffic moves through the Fairbanks Terminal.

The Alaska Railroad and the City of Fairbanks have coexisted for over 80 years. During that time, the City has grown from a trading post into a city that serves as the transportation and business hub for interior Alaska. The growth of this urban area has brought a corresponding expansion of the system of streets and highways and significant growth in vehicular traffic. Today, according to the Alaska Railroad Corporation (ARRC) Track Charts, there are approximately 52 public at-grade road/rail crossings within the most densely populated core area in and around Fairbanks. As trains move through the urban area there are two significant concerns: 1) the potential for train/vehicle collisions increasing is a very real safety concern; and 2) traffic congestion resulting from vehicles waiting for slow moving trains to clear the crossings. This contributes to considerable delay and to degradation of air quality. The mix of continued rail traffic and slow but steady growth in vehicle traffic throughout the urban area will only aggravate the issues of safety and congestion, unless action is taken to address the problem.

ARRC and the Fairbanks community have been working to identify potential solutions to the train/vehicle conflicts. Since 2000, at least three studies have been done:

- Fairbanks Bypass Realignment Reconnaissance, January 2001 prepared by Thomas Engineering in association with Peratrovich, Nottingham & Drage, Inc. for ARRC.
- Fairbanks to North Pole Realignment Project Phasing Report, March 2002 prepared by Thomas Engineering in association with Peratrovich, Nottingham & Drage, Inc. for ARRC.

- Rail Realignment and Extension Planning Report, March 2004 prepared by the FNSB Rail 2100 Task Force. (Not an adopted document)

The Fairbanks—North Pole Realignment, Phase II Technical Analysis presents a more in-depth look at the technical aspects of three of the most viable of the alternates presented in the reports listed above.

Study Purpose—At this time all of the rail traffic moving through the Fairbanks urban area is in direct conflict with the vehicular traffic using the Fairbanks streets and highways because of the 52 at-grade crossings, also mentioned above. Many of these involve high volume arterials and collectors. The mix of rail traffic integrating with vehicular traffic is a very real safety concern for the community due to the potential for motor vehicle/train collisions. This potential steadily increases as the greater Fairbanks area continues to grow with the resulting increases in vehicular traffic. The congestion that comes from the vehicles waiting for trains results in an accumulated delay that translates to a significant cost to the motoring public.

The purpose of this technical report is to provide information that can be used to assess the technical feasibility of realigning a portion of the ARRC's freight line to eliminate many of the at-grade rail crossings in and around the Fairbanks area as a way to improve traffic safety and reduce the traffic congestion resulting from rail operations. Of the several alternatives addressed by Thomas Engineering and the FNSB 2100 Task Force, there are three realignment concepts that appear to have the most promise. The three alternatives reviewed are:

1. The Parks Highway Alternate
2. The Chena Pump Alternate
3. The Trainor Gate Alternate

The Parks Highway Alternate—The Parks Highway Alternate begins on the mainline near the Sheep Creek Connector. The alignment quickly diverges southeast away from the mainline to merge with the Parks Highway. It then passes under realigned west bound (WB) lanes of the Parks Highway to occupy the Parks Highway median for ± 2.45 miles passing immediately east of the Fairbanks International Airport and at an elevation that is safely below the obstruction free surfaces for the airport. The alignment then leaves the Parks Highway median, passing under newly reconstructed east bound (EB) lanes and turning south to link east and west with the Airport Spur and extend on the Tanana River Levee system. Upon reaching the levee, the alignment turns and travels easterly along the Tanana River levee coincident with the Chena Pump Alternate.

The Parks Highway Alternate clearly meets the goals of the project in that many of the at-grade crossings in the urban area are eliminated resulting in improved traffic safety and reduced congestion. The alternate will also have impacts that must be considered, including:

- Reconstruction of half of the Parks Highway for ± 2.5 miles
- Acquisition of ± 65 parcels
- Impact on ± 93.5 acres of wetlands
- Snow removal and snow storage concerns for ARRC and ADOT&PF
- Incident management concerns for ARRC
- Maintenance access concerns for ARRC

The Chena Pump Alternate—The Chena Pump Alternate has two options. Both begin at the western limit near the Sheep Creek Connector, and through development of a new line change routing, cross under the Parks Highway moving south through the Chena Pump Road/Chena Ridge area. The basic difference between options 1 and 2 is that Option 2 moves further southwest along the toe of Chena Ridge before turning east to rejoin Option 1. Option 2 is 6,300 feet. (1.19 miles) longer that Option 1. Both options traverse an area currently developing as a relatively new “high end” residential neighborhood. The alignments have been selected to avoid currently existing homes; however, development continues in this area. Both alignments cross the Chena River and require a movable span bridge to accommodate operations of a tourist attraction river boat. The two options rejoin and follow the Tanana River levee system to near the east end of the south Fairbanks industrial area, where the alignment turns north to join the Airport Branch and ultimately crosses the Richardson Highway to rejoin the Eielson Branch near Badger Road. It should be noted that the Parks Highway Alternate is coincident with the Chena Pump Alternate from just west of Peger Road to the end.

The Chena Pump Alternate clearly meets the goals of the project in that many of the at-grade crossings in the urban area are eliminated resulting in improved traffic safety and reduced congestion. The alternate will also have impacts that must be considered including:

- Acquisition of ± 102 parcels with Option 1 or ± 115 parcels with Option 2
- Impact on ± 93.2 acres of wetlands with Option 1, and ± 129.5 acres of wetlands with Option 2
- This alternate does not have the snow removal and snow storage concerns for ARRC and ADOT&PF that the Parks Highway Alternate has
- This alternate introduces a new major transportation corridor into a developing neighborhood

The Trainor Gate Alternate—This alternate again begins near the Sheep Creek connector; however, considerably more of the existing mainline track is included in the Alternate without reconstruction. The Alaska Department of Transportation and Public Facilities (ADOT&PF) is currently moving forward with a project to construct a grade separated crossing at University Avenue that can, in some ways, be considered a first phase of this alternate. The primary work of this alternate is a change in grade of the ARRC's Eielson Branch between the Fairbanks yard and Fort Wainwright. This work is expected to begin approximately 1.1 miles west of the College Road grade crossing, and will extend to the east along the Railroad's Eielson Branch for a distance of ± 3.9 miles, just into Fort Wainwright, where it will connect with the Fort Wainwright realignment project. A new bridge over Noyes Slough will be required and the profile will be elevated a sufficient height to provide clearance for installation of grade separation structures at the site of the following existing railroad/roadway grade crossings.

- College Road
- A future Farmer's Loop Connector
- Old Steese Highway
- Steese Expressway

- Blair Road
- D Street
- F Street
- A future extension of G Street

The Trainor Gate Alternate clearly meets the goals of the project in that many of the at-grade crossings in the urban area are eliminated resulting in improved traffic safety and reduced congestion. This alternate does not require acquisition of additional right-of-way (ROW) nor does it impact wetlands. It may also have impacts such as:

- This alternate does have snow removal and snow storage concerns for ARRC and the City of Fairbanks, somewhat similar to those associates with the Parks Highway Alternate.
- This alternate has some of the incident management and maintenance concerns that the Parks Highway alternate has due to the restricted access associated with the elevated track.
- This alternate introduces a 20+ foot high embankment where there currently is none. It is this embankment; however, that provides the resulting improved vehicular and pedestrian safety.

Conclusion—Each of the three alternates evaluated in this report meet the stated goals of improving traffic safety and reducing congestion by eliminating at-grade crossings throughout the Fairbanks urban area. Each of the alternates also has potential drawbacks in terms of construction impacts, environmental impacts, operational considerations for the ARRC, ADOT&PF, the Borough and/or the City.

This report does not include a recommendation as to a preferred alternate. Rather, it is intended to provide data relative to each of the three alternates that should be useful to the decision makers in determining how to move forward in addressing the traffic safety and congestion issues in the Fairbanks urban area.

1. INTRODUCTION

1.1. Background

The community of Fairbanks began in 1901 with the establishment of a trading post by E. T. Barnette. Native Alaskans have lived in the Fairbanks area for thousands of years. Miners had been actively searching for gold in the area for several years, and in 1902, Felix Pedro discovered it. With this discovery and the resulting frantic activity, a new city grew up around Barnette's trading post and was incorporated in 1903.

Today, the City of Fairbanks (COF) is the population center of the Fairbanks North Star Borough (FNSB), and the economic center of interior Alaska. The population of the FNSB, according to the COF website, is approaching 85,000. Well over half of this population is concentrated in the 25-plus miles from west of the Fairbanks/Fort Wainwright area to, and including, North Pole and Eielson Air Force Base (AFB). The primary economic influences include the University of Alaska Fairbanks (UAF), Fort Wainwright, Eielson AFB, the North Pole (Flint Hills) refinery, the Fort Knox Gold Mine and the tourism industry.

Fairbanks was a major support center during construction of the Trans-Alaska Pipeline, and continues as a logistic support center for North Slope exploration and development activities. It is expected that Fairbanks will again be a major activity center should a major natural gas pipeline project come to fruition. The continued growth and success of these economic engines translates into population growth which, in turn, translates to growth in traffic volumes on the FNSB roadways, and more importantly, growth in vehicle miles traveled across the urban area.

The Alaska Railroad began as two independent, privately owned railroads, the Tanana Valley Railroad and the Alaska Central Railroad. Federal legislation in 1914 authorized the construction of up to 1,000 miles of track in Alaska. The Alaska Engineering Commission subsequently purchased the Alaska Central and Tanana Valley lines and completed the construction of track, connecting track already constructed by these two lines, to complete the track from Seward to Fairbanks in 1923.

The Alaska Railroad mainline includes about 500 miles of track and is currently considered to terminate at the Fairbanks yards. Local freight service in the Fairbanks area is provided by the Airport Branch serving the airport and the industrial area of South Fairbanks. Service to Fort Wainwright, Eielson AFB, North Pole and the North Pole Refinery is provided by the Eielson Branch. According to the report prepared by the FNSB Rail 2100 Task Force, some 45 percent of the Alaska Railroad rail traffic moves through the Fairbanks Terminal. According to the ARRC Track Charts, there are approximately 52 public at-grade road/rail crossings within the most densely populated core area in and around Fairbanks. As trains move through the urban area there are two significant concerns: 1) the potential for train/vehicle collisions increasing is a very real safety concern; and 2) traffic congestion resulting from vehicles waiting for slow moving trains to clear the crossings. This contributes to considerable delay and to degradation of air quality. The mix of continued rail traffic and slow but steady growth in vehicle traffic throughout the urban area will only aggravate the issues of safety and congestion, unless action is taken to address the problem.

The Alaska Railroad Corporation (ARRC) and the Fairbanks community have been working to identify potential solutions to the train/vehicle conflicts. Since 2000, at least three studies have been done:

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- Rail Realignment and Extension Planning Report, March 2004 prepared by the FNSB Rail 2100 Task Force.

The analyses below presents a more in-depth look at the technical aspects of three of the most viable of the alternates presented in the reports listed above.

1.2. Study Purpose

As stated above, it has been estimated that approximately 45 percent of the freight moved on the Alaska Railroad moves through the Fairbanks urban area. At this time, all of that rail traffic is in direct conflict with the vehicular traffic using the Fairbanks streets and highways because of the 52 at-grade crossings, also mentioned above. Many of the at-grade crossings involve high volume arterials and collectors. The mix of rail traffic integrating with vehicular traffic is a very real safety concern for the community, due to the potential for motor vehicle/train collisions at the crossings. This potential steadily increases as the greater Fairbanks area continues to grow, resulting in increases in vehicular traffic. In addition, the accumulated delay, resulting in very significant local congestion for vehicular traffic as a result of rail traffic, is a significant cost to the motoring public.

The purpose of this study effort is to provide information that can be used to assess the technical feasibility of realigning a portion of the ARRC's freight line to eliminate many of the at-grade rail crossings in and around the Fairbanks area, as a way to improve traffic safety and reduce the traffic congestion resulting from rail operations. Of the several alternatives addressed by Thomas Engineering and the FNSB 2100 Task Force, there are three realignment concepts that appear to have the most promise. These alternates: 1) the Parks Highway Alternate, 2) the Chena Pump Alternate and, 3) the Trainor Gate Alternate, are fully addressed below. ARRC may determine that currently unforeseen factors may prompt examination of additional alternatives as the project progresses.

1.3. Study Objectives

The primary objective of this analysis and report is to provide the ARRC, the Alaska Department of Transportation and Public Facilities (ADOT&PF), the City of Fairbanks (COF), the Fairbanks North Star Borough (FNSB), community leaders, and the citizens in Fairbanks the data necessary to evaluate potential infrastructure modifications that may result from realignment of the ARRC facilities. To do this, the strengths and weaknesses of each of the three realignment concepts will be discussed.

2. ANALYSIS

2.1 Study Area

On a gross scale, the study area encompasses the majority of the City of Fairbanks. For the purpose of this report, all three alternates presented herein begin at Railroad Mile Post 465.47, near the Sheep Creek Connector, and extend south and east through the urban area to rejoin the existing Eielson Branch Line near the east side of Fort Wainwright in the vicinity of Badger Road. Three basic alignment alternates were evaluated and are identified as 1) Parks Highway; 2) Chena Pump (including two options); and 3) Trainor Gate. They follow substantially different alignments and present substantially different challenges and opportunities. It should be noted that the eastern portions of the Parks Highway and Chena Pump Alternates are coincident. The differences between these alternates derive from the routing around Fairbanks International Airport (FIA).

2.2 Alternates

2.2.1 Parks Highway Alternate

The Parks Highway Alternate begins near the Sheep Creek Connector (Sta. 138+45), and, utilizing development of new line change routing, diverges southeast away from the existing mainline track towards the Parks Highway. Near Sta. 158+00, the alignment passes under the realigned westbound (WB) lanes of the Parks Highway to join the highway median at Sta. 171+38 ±. From that point, the Alternate travels within the Parks Highway median in a generally southeast direction, passing immediately east of FIA at an elevation that is safely below the obstruction-free surfaces for the airport (Sta. 475+00 ±). (This stationing includes an equation station 208+90.30 Bk = 382+19.23 Ahd.) The alignment leaves the Parks Highway median at this point, passing under newly reconstructed EB lanes and turning south to link east and west with the Airport Spur and extend on the Tanana River Levee system (Sta. 562+43). Upon reaching the levee, the alignment turns and travels easterly along the Tanana River levee, joining with the Chena Pump Alternate. The length of rail realignment from the beginning of project to the connection at the Tanana River is 25,070 feet, or 4.75 miles. The length of this alternate is coincident with the Chena Pump Alternate along the Tanana Levee system, for an additional distance of 26,300 feet or 4.98 miles.

2.2.2 Chena Pump Alternate

The Chena Pump Alternate has two options, which are laid out in Appendices D-4 through D-10. Both begin, at the western limit, near the Sheep Creek Connector (Sta. 95+52) and, through development of a new line change routing, cross under the Parks Highway at an angle of approximately 45º and move south through the Chena Pump Road/Chena Ridge area. The length of rail realignment considered herein is 67,700 feet or 12.82 miles for Option 1 and 73,300 feet or 13.88 miles for Option 2. Typical sections are shown in Appendices D-1 through D-3.

2.2.2.1 Option 1

After crossing the Parks Highway, Option 1 moves south, essentially parallel to Chena Pump Road for about a mile, to Old Chena Ridge Road (Sta. 198+54) then cuts west briefly (± ½ mile) before turning south for nearly 3 miles, where it turns east to cross the Chena river south of FIA at Sta. 310+86. After crossing the Chena River, Option 1 continues south, beginning a turn to the east at Sta. 351+00 ± and joining the Tanana River Levee system at Sta. 378+20 ±. Here, the Option traverses more or less along the Tanana River levee alignment until it reaches a point (Sta. 731+ 50 ±) where it turns north to connect into the existing north/south portion of the Airport Spur (Sta. 785+82), and continues to the end of the existing Airport Spur. From this point, the new option will extend north, passing under the Parks Highway and connecting north and east with the Eielson Branch in the vicinity of Badger Road. After turning north off of the Tanana River Levee, Option 1 follows the concept presented in the "Fairbanks to North Pole Realignment Project Phasing Report", March 2002 by Thomas Engineering. ARRC has determined that additional study of this segment is not required as a part of this study effort.

2.2.2.2 Option 2

Option 2 is nearly the same as Option 1, except that in the Chena Ridge area, it extends further to the southwest before turning east, between homes and the Tanana River, to cross over the Chena River and rejoin the Option 1 alignment. Option 2 is approximately 6,300 feet or 1.2 miles longer than Option 1.

2.2.2.3 Both Options

Both options are routed deliberately through as much vacant land as possible to avoid displacing homes through the ROW process. Property impacts are shown in Appendices D-11 through D-14. None the less, both Options take a new major rail corridor through the middle of a cohesive and developing residential community. In addition, both Options cross the Chena River in its lower reaches. The challenge here is the operation of a river tour boat, which is centered around an old stern- style wheel river boat such as traveled the inland river system for many years. This vessel is tall enough that the crossings of the Chena would require 1) a grade raise that would allow crossing of the Chena with at least 50 foot clearance during near bank full stream flows; or 2) a movable or lift span bridge that would provide sufficient waterway opening for river boat operations. For the purposes of this analysis, it is assumed a moveable span bridge would be used, requiring critical coordination between ARRC and the river boat operator.

2.2.3 Trainor Gate Alternate

This alternate also begins near the Sheep Creek Connector; however, considerably more of the existing mainline track is included in the Alternate without reconstruction. ADOT&PF is currently moving forward with a project to construct a grade-separated crossing at University Avenue that can, in some ways, be considered a first phase of this Alternate. The primary work of this Alternate is a reprofiling of the ARRC’s Eielson Branch. This work is expected to begin 5,950 feet or 1.13 miles west of the College Road grade crossing, and will extend to the east along the railroad’s Eielson Branch for a distance of 20,800 feet or 3.94 miles. An overview is shown in Appendices E-1 and E-2. A new bridge over Noyes Slough will be required, and the profile will be elevated a sufficient height to provide clearance for installation of grade separation structures at the site of the following existing railroad/roadway grade crossings:

- College Road
- Old Steese Highway
- Steese Expressway
- D Street
- F Street
- A future extension of G Street

After crossing the future G Street, the profile returns to existing ground elevation and continues on as the planned realignment of the Eielson Branch line through Fort Wainwright.

2.3 Design Criteria

Coordination with ARRC and ADOT&PF has been conducted to determine design criteria applicable to both rail and road facilities. Rail criteria conform to ARRC standards supplemented with information provided by the American Railway Engineering and Maintenance of Way Association (AREMA). Roadway design meets the requirements set forth in ADOT&PF's Highway Preconstruction Manual and the American Association of State Highways and Transportation Officials (AASHTO) Roadway Design Guide. In all cases, the most recent standards have been followed.

2.3.1 Roadway

Road/Highway design criteria are normally based on Average Annual Daily Traffic (AADT and facility classification). The streets and highways potentially impacted by any of the alternates under consideration include local streets, urban collectors, arterials and freeways. The critical impact, however, will be to the freeways and the arterial/collector system. Table 1-Roadway reflects these classes of roadway. Typical sections are shown in Appendices B-2 and B-3.

TABLE 1A—ROADWAY DESIGN CRITERIA (Common to All Three Alternates)

Element	Range (if applicable)	Used
DIVIDED HIGHWAY		
Design Speed		65 mph
Sight Distance (Stopping)		645 ft. @ 65 mph
Sight Distance (Passing)		2285 ft. @ 65 mph
Horizontal Curve (Degree)	1.00° - 3.25°	3.25°
Superelevation		6%
Vertical Grade	3 - 4%	3%
Lane Width		12 ft.
Clear Zone		30 ft.
Median Width		60 ft.
Median Slope	4:1 - 10:1	varies
CLEARANCES		
Railroad over Highway/Freeway		19 ft.
Railroad over Arterial/Collector	16.5 –18 ft	18 ft
Railroad over Local Roads/Streets		14.5 ft
Road Over Railroad		23 ft.
ARTERIAL ROADS		
Design Speed		50 mph
Horizontal Curve (Radius)	1,065 - 2,500 ft.	2,000 ft.
Horizontal Curve (Degree)	2.35° - 5.25°	5.00°
Vertical Grade	4% - 5%	5%
Lane Width	10 - 12 ft.	12 ft.
Shoulder Width	2 - 4 ft.	4 ft.
COLLECTOR ROADS		
Design Speed		50 mph
Horizontal Curve (Radius)	1,065 - 2,500 ft.	2,000 ft.
Horizontal Curve (Degree)	2.35° - 5.25°	5.00°
Vertical Grade	4% - 5%	5%
Lane Width	10 - 12 ft.	12 ft.
Shoulder Width	2 - 4 ft.	4 ft.

2.3.2 Railway

The railroad is intended for freight and passenger service. Its design speed is 50 miles per hour (mph). The maximum vertical grade is 0.5 percent. A typical section is shown in Appendix B-1.

TABLE 1B—RAILWAY DESIGN CRITERIA (Common to All Three Alternatives)

Element	Range (if applicable)	Used
RAILROAD		
Design Speed		50 mph
Rail Classification		ARRC Standard
Sub ballast Half-Crown Width		12 ft.
Spacing Between Double Tracks		16 ft.
Horizontal Clearance (Minimum)		9 ft.
Railroad over Highway/Freeway		19 ft.
Railroad over Arterial/Collector	16.5 –18 ft	18 ft
Railroad over Local Roads/Streets		14.5 ft
Road Over Railroad		23 ft.
Vertical Grade (Maximum)		0.5 %
Maximum Horizontal Curvature		3°15' *
Eu (Unbalanced Super)		2"
Ea (Maximum Actual Super)		4"
Vertical Curve (Minimum length)		$L=V^2D(2.15)/0.1$

* 4°30' is proposed on the Trainor Gate Alternative to match curvature on west end of the future Eielson Branch Realignment project.

2.3.3 Typical

ARRC may operate trains approaching 8,000 feet in length from North Pole. Slack action associated with railroad equipment necessitates changes in railroad grades be limited to no more than one each ascending and descending per train length.

Typical sections have been developed for both roadway and rail construction as discussed below.

Railway typical sections for track construction have been developed beginning with the standard ARRC grading section to provide for an initial double-track construction. This standard typical section has been modified to reflect the various conditions that may be encountered should any of these alternates be implemented. These modifications may include provisions of additional width to accommodate maintenance access, and, if required, a future second main track. Where retaining walls may be required, such as along Trainor Gate Road, the proposed sections reflect the site-specific conditions, as reflected in Appendices E-3 through E-5.

Parks Highway/Railroad Alignment typical section development is a blend of the typical sections appropriate to each transportation mode. One of the attractions of placing the proposed railroad alignment within in the median of the existing Parks Highway system is that it offers the potential of using existing public right-of-way for development of the rail system. This would theoretically reduce the property acquisition impacts normally associated with constructing a new railroad alignment.

In order for this approach to avoid relocation of existing Parks Highway infrastructure, it is necessary that the grading and bridge structures for the proposed alignment be constructed without encroaching on existing Parks Highway pavement, road overpasses and stream crossing structures. Doing so however, requires placing the railroad in the highway median. The median was designed as a "clear zone", normally required for highway safety and which, in northern climates, doubles as area for snow storage. Both functions are considered critical to highway operations.

The proposed railroad alignment cannot utilize grades as steep as the existing Parks Highway grades, and must also maintain longer distances between breaks in profile grade (a minimum of 8,000 feet) that cause reverses in gradient direction. This difference in operation criteria requires that the railroad grade be raised more than twenty feet over the existing highway grade. Side slopes on such a high earthen fill height would spill over onto the existing pavement, consequently requiring that the railroad alignment be supported on retaining walls for most of its length within the Parks Highway median.

Various retaining wall sections were developed for support of the elevated Parks Highway track profile. The intent of the various retaining wall sections was to minimize project impacts on vehicular traffic and the existing Parks Highway infrastructure, and simultaneously to satisfy the requisite rail alignment design criteria for alignment, profile and future capacity.

2.4 Discussion of Alternates

2.4.1 Parks Highway Alternate

Alternative Concepts

The original concept for using the median of the Parks Highway for a rail alignment, the "Median" alternate was first presented in the "Fairbanks Bypass Realignment Reconnaissance" dated January 2001 by Thomas Engineering. That concept envisioned a single track option constructed in the Parks Highway median on retained earth embankment. As proposed by Thomas Engineering, the construction would have occupied most of the highway median currently used by ADOT&PF for snow storage and clear zone. The profile grade proposed by Thomas tended to follow the variation is ground elevations and included quite a number of crest and sag vertical curves resulting in what can best be described as a "bumpy" profile by railroad standards.

The study team was originally tasked by ARRC with determining the extent of construction that would be necessary to place a rail facility in the highway median that would both meet the ARRC design criteria and; determine the highway modifications that would be necessary to enable the Parks Highway to continue to meet ADOT&PF and FHWA design criteria.

Public comment received during the study asked about three additional options for adding rail to the Parks Hwy corridor:

- Elevated but on a structure using a "Hammerhead" style pier
- Parallel but to the east side of the Parks Highway
- Use of a tunnel as opposed to being elevated

Each of these alternative concepts will be addressed below, beginning with the "Median" or original concept as suggested in the Thomas Engineering report.

The "Median" Option—As mentioned previously, the west end of this alternate is at Mile 465.47 near the Sheep Creek Road Connector. It then bends southeast into the median of the Parks Highway and stays within the median to a point roughly one (1) mile north of the Tanana River. From there, the route is due south to the levee along the north side of the river.

Field investigations have been performed to better characterize this Alternate. Five impact categories were considered: Utilities, Geometrics, Structural, Environmental, and Airport. Observations for each category are provided below. In general, the discussion flows from the north end to the south and southeast. An overall Construction Summary is provided in Table 3A.

Utilities

This alternate may impact numerous utilities depending upon the final design. Major utilities include the two Golden Valley Electrical Association (GVEA) lines near the beginning of the project and the power line across the Chena River. In each case, depending on the final profile grade, it may be necessary to raise or otherwise relocate the utility.

Parks Highway at UAF

- 1 – 138 kV Transmission Line
- 2 – 69 kV Transmission Line
- 1 – 7.2 kV Local Distribution Line

Parks Highway at Trinidad Drive

- 1 – 7.2 kV Local Distribution Line

Parks Highway at Chena River

- 1 – 69 kV Transmission Line

Parks Highway at University Avenue

- 1 – 138 kV Transmission Line
- 1 – 69 kV Transmission Line

Cartwright Road

- 1 – 7.2 kV Local Distribution Line

The clearance from top of rail (TOR) to the lowest part of the sag in an electrical line is calculated for the warmest days of the year, when the sag is at its greatest. For the 138 kV lines this clearance, according to the AREMA, the clearance criteria is ± 38 feet. The existing power line structures are timber construction. It will not be practical to attempt to raise these existing structures; rather, a new structure will be needed on either side of the crossing that is tall enough to provide the needed clearance. When this is done, the next structures in line may have to be replaced as well to avoid subjecting them to loads vastly different than the loads they were designed to accommodate. In addition, to provide the necessary length of cable to accommodate the taller structures, a section of the line may have to be re-conductored. If raising the elevation of the 138 kV Transmission Line at either location is not practical, than rerouting may be necessary; raising the elevation of the conductor is typically the more cost effective solution. Placing 138 kV Transmission Lines underground is not normally done if there are above-ground options available.

The required clearance between TOR and the conductor sag is, to some extent, a function of the operating voltage of the electrical lines. Therefore, the clearance required for the 69 kV crossings will be a bit less. With the lower voltage, placing the electrical lines underground becomes an option, subject to negotiations with GVEA. If possible, the more cost effective method of adjusting the 69 kV lines will be to replace the adjacent pole structures with taller poles and splice in an additional length of conductor. It should also be possible to bring the 69 kV lines into a concrete encased underground conduit for the crossings, if raising the lines is not practical.

When local distribution lines, such as the 7.2 kV lines are encountered, it may be just as simple to put them underground in a conduit for the crossing.

It should also be noted that there are various telephone cables, fiber-optic cables, TV cables, water lines, and sewer lines in place throughout the corridor. As the project develops, each of these will be located and either protected or relocated.

Geometrics

The existing Parks Highway median width is not sufficient to accommodate the addition of the railroad and maintain other functions previously mentioned. One side of the highway would need to be relocated. Modifications to existing structures would also be required.

Between North Pole and the Fairbanks yard, the ruling grade for ARRC is 0.5 percent due to the heavy tank car unit trains. The ruling grade from Anchorage to Fairbanks is 1 percent. Note that the maximum grade on the Parks Highway is nearly 3 percent, clearly steeper than is desirable or practical for track grade. As a result, the grade line for the proposed tracks within the Parks Highway median segment of the alignment must be elevated a significant distance (a maximum of 35 feet north of the Chena River) above the existing highway profile. This will require a track structure supported on retaining walls in order to keep the median width as tight as possible. Cast in place concrete, or precast tee-wall units are being considered for this application.

Considered but rejected options:

Initial consideration was given to developing typical sections to support the profile elevation increases required to accommodate bridge clearances, maximum allowable railroad grades and operational requirements to avoid excessive undulation in profile within the limits of existing highway median widths (42 feet north of and 36 feet south of the Chena River structure). This effort to maintain the railroad construction section within the highway median and thereby avoid construction impacts on existing highway lanes and structures was discontinued due to the following discussion of various highway and railroad issues.

Several initial retaining wall schemes were investigated, including systems with an inside wall spacing of 32 feet, and wall systems without the recommended standard clear-zone spacing from divided highway lanes of 30 feet. These minimal spacing systems still impact the ROW and all possessed significant short-comings, including such impacts as loss of snow storage from highway plowing operations, a reduction in safety due to a decrease in clear-zones for errant vehicles, an attendant increase in secondary accidents caused by vehicles forced back into traffic lanes, and a loss of storage room for disabled vehicles. Snow would also need to be cleared from the elevated rail system, and would be thrown directly into the travel lanes of high speed vehicles, necessitating coordination of railroad snow removal with closure of Parks Highway to avoid creating hazardous conditions for motorists.

Additionally, snow and ice could accumulate in "pillow" drifts along the retaining wall sections and this snow and ice could be dislodged from the passage of trains or during thaws and fall directly into highway travel lanes. The narrower width retaining wall systems and the wall systems without clear zones reduce capacity for future highway expansion and do not provide sufficient space for future rail expansion. All of the schemes utilizing placement of the track structure within the highway median could be impacted by the blinding conditions caused by headlight glare of the passage of trains at night, but the systems without clear-zones will cause greater impacts since they place the locomotive light source much nearer to existing highway lanes.

Considered but rejected options are shown in Appendices C-11 through C-13.

The recommended elevated track retaining wall system utilizes a 40 feet inner spacing between walls, and a 30 feet clear zone between the "edge of traveled way" on the median side lane and the outer edge of the retaining wall. This configuration conforms to comments included in letters received from ADOT&PF Commissioner Barton and from the ADOT&PF Northern Region Office. (Copies of the ADOT&PF letters are included in Appendix F.) The recommended space between "edge of traveled way" and the face of retaining wall conforms to the AASHTO clear zone criteria and will provide safer area where errant vehicles may safely recover, it will also a safe haven for disabled vehicles and much needed snow storage space along the highway, increased protection from railroad snow removal activities and from snow and ice dislodged from pillow drifts. The additional width between the walls provides a construction and maintenance access road, as well as a site for future track expansion. It will, however, require the relocation of an entire existing dual lane pavement, including the overpass bridges at Geist Road, the Chena River, and Airport Way.

Adoption of typical sections in the center median of Parks Highway will require relocation of one set of divided highway lanes and bridges. In addition, access ramps from the relocated highway lanes to crossing streets will have to be modified or relocated.

Examples of retaining wall sections are in Appendices C-1, C-3, C-6 and C-8.

The plan and profile drawings for the Parks Highway Alternate and the North and South Expressway modifications are shown in Appendices C-15 through C-19.

Structural

Eleven (11) bridges would need to be constructed for the Parks Highway Alternate. A summary of these bridges is provided in Table 2A.

- The “West End” highway bridge involves relocation of a segment of the northbound highway and a new highway bridge to pass over the proposed track alignment. Even with this alignment, the skew angle exceeds 45∀.

- The proposed profile passes the railroad over Geist Road. The proposed typical sections assume retention of one existing highway bridge, while requiring construction of both a new highway bridge and a new railroad bridge. Modified access interchange ramps between Geist Road and Parks Highway will be required.

- A railroad bridge over the Chena River will be required. This bridge, like the highway bridges, can be a relatively low level “fixed-span” bridge.

- The section of the Parks Highway alignment between Geist Road and the Chena River has well developed land uses on either side. In order to limit the about of ROW that would be required, retaining walls would be used, as opposed to building the railroad on embankment with earthen side slopes.

- A railroad bridge over Airport Way is required, as well as modified access interchange ramps between Airport Way and Parks Highway.

- The University Avenue intersection would need to be rebuilt to accommodate the railroad and allow access during construction. ADOT&PF Commissioner, Mike Barton, in his August 2, 2006 letter also raised the caution that, depending on elevations, there was a potential for conflict with the approach surfaces at FIA as a result of FAA safety requirements.

- What is referred to as the "East End" highway bridge is a structure to carry the eastbound Parks Highway traffic near, and after University Avenue, over the proposed railroad alignment. Note that this would require two bridges, one to carry University Avenue over both the Parks Highway and the railroad, and one to carry the eastbound Parks Highway traffic over the railroad.

- In order to prevent creation of a new at-grade crossing, a roadway bridge at Cartwright Road is needed. The crossing angle is good.

- To preserve existing drainage patterns, a railroad bridge over the slough south of Cartwright Road would be required. Again, the crossing angle is good and no special challenges are anticipated.

- During initial construction, it is anticipated that one railroad structure will be provided at the various bridge sites, but provisions should also be made to allow for the construction of an additional bridge structure at each site to accommodate the potential need for a future second main track. At Geist Road and Airport Way, Through Plate Girder (TPG) spans have been proposed to reduce profile undulations and impacts to airport runway clear zones. Since

TPG structures are wider than deck plate girders (22.5 feet vs. 15 feet), it may be necessary to widen retaining wall structures widths from 42 to 51 feet as the alignment approaches these sites, in order to allow sufficient crown width to accommodate an additional track compatible with the future construction of a second TPG structure.

TABLE 2A—BRIDGE SUMMARY (Parks Highway Alternate)

Location	Type	No. of Spans	Length (ft)	Width (ft)
"West End"	Highway	3	132	2 expressway lanes
Geist Road	Highway	1	107	2 expressway lanes
Geist Road	RR TPG	1	135	2
Chena River	Highway	4	520	2 expressway lanes
Chena River	RR DPG	4	540	15
Airport Way	Highway	1	126	2 expressway lanes
Airport Way	RR TPG	1	140	22.5
University Ave	Highway	4	450	2 highway lanes
"East End"	Highway	3	140	2 expressway lanes
Cartwright Road	Highway	1	60	2 highway lanes
Slough	RR DPG	1	75	15

Examples of typical bridge sections are shown in Appendices C-9 and C-10. Examples of specific bridge sections are shown in Appendices C-2, C-4, C-5 and C-7.

Environmental

Widening the roadway between Geist Road and the Chena River would occur through an area consisting of condominiums, apartments and lots averaging ¼ acre. This segment also passes along an existing elementary school. Through this same area, widening could impact an existing greenbelt area and the bicycle/pedestrian paths that exist along one or both sides of the road.

Review of the US Fish and Wildlife Service National Wetlands Inventory shows 93.5 acres of proposed property impacts with delineated wetlands, which is shown in Appendix A-2.

Visual impacts associated with an elevated railroad and roadway overpasses will be a concern to local residents and businesses. Assuming fairly constant existing ground elevations, the preferred typical retaining wall section will require that the existing northerly Parks Highway lanes, as well as the northern highway ROW, be relocated an additional 70 feet to the north more or less. Based on currently available ownership data, the number of parcels impacted and the total acreage is shown in Appendix C-14.

Airport

The Parks Highway Alternate, while elevated in the highway median, passes just east of the FIA runways. The concept was checked for possible conflicts with the runway obstruction-free surfaces. The obstruction-free surface data used for the existing main runway (1L-19R) and proposed runways (2R-20L and 2W-20W) was based on the December 2005 Masterplan for FIA. The improvements described herein do not appear to be in conflict, but further review with the airport and the FAA should be conducted as future project evaluation occurs. Runway approach surfaces are shown in Appendix B-4.

TABLE 3A—CONSTRUCTION SUMMARY (Parks Highway Alternate)

LF=Linear Foot / TF=Track Foot / EA=Each / LS=Lump Sum / SF=Square Foot / CY=Cubic Yard

Highway Construction	Unit	Amount
Relocate SB Lanes Parks Highway Section	LF	18,200
Construct SB Parks Highway Flyover Structure	LF	132
Relocate/Extend Geist Road Highway Overpass Structure	LF	120
Reconnect/Relocate SB Geist Intersection Ramps	LF	3,500
Relocate/Extend Chena River Highway Overpass Structure	LF	520
Relocate/Extend Airport Road Highway Overpass Structure	LF	126
Construct University Avenue Overpass Structure	LF	450
Relocate/Reconnect NB & SB University Avenue Intersection Ramps	LF	4,000
Construct NB Parks Highway Flyover Structure	LF	140
Reconnect NB Lanes Parks Highway for University/RR Flyover	LF	5,000
Construct Cartwright Road Overpass Structure	LF	60
Raise Cartwright Road Profile for Overpass	LF	1,300
Railroad Construction	Unit	Amount
Construct Retained Wall Elevated Section	SF	296,700
Construct TPG RR Bridge OP at Geist Road	TF	135
Construct DPG RR Bridge at Chena River	TF	540
Construct TPG RR Bridge at Airport Road	TF	140
Construct TPG RR Bridge at Cartwright Road	TF	60
Construct DPG RR Bridge at Unnamed Slough	TF	75
Embankment	CY	205,900
Excavation	CY	0
Sub-ballast	CY	38,370
Structural Fill	CY	232,300

Railroad Construction continued	Unit	Amount
Construct Parks Alignment M/L Track	TF	25,100
Construct # 15 TO at North End	Ea	1
Construct Parks Highway/Existing Yard Wye Connection Track	TF	2,000
Construct # 11 TO for Wye Connection Track	Ea	2
Remove Airport Spur For Parks Highway Track	TF	2,000
Construct Airport Spur Connection Tracks	TF	3,200
Construct # 11 TO for Airport Spur Connection Track	Ea	3
Property Impacts	Parcels	65
Drainage	LS	1
Lighting	LS	1
Utilities	LS	1

Elevated using a "Hammerhead" style pier—A number of comments were received suggesting that the section of rail alignment located within the Parks Highway median be placed on elevated bridge structure using "Hammerhead" style piers to minimize the impact on the clear zone and snow storage functions of the median. Appendix C-20 shows how this concept might appear. The median, depending on location, ranges from 36 to 42 feet in width. Optimum span length for a structure of this type would be in the 80-foot range. The AASHTO Roadside Design Guide recommendations governing the placement of guardrail would require continuous runs of guardrail on both sides of the piers. While the median functionality would not be completely eliminated, the functionality of the median would be significantly reduced. The distance from edge of median shoulder pavement to face of guardrail would vary from 10 to 13-feet on either side of the structure, depending on median width, assuming a pier width of 8-feet. At the Airport Way there would still be a ± 1300 foot section where railroad embankment would, for the most part, fill the highway median. Plan and profile views using "Hammerhead" piers are shown on Appendices C21 and C22.

It is expected that the horizontal alignment for this option would be essentially the same as for the "Median" concept using retaining wall supported embankment. Relocation of lanes for one direction of travel on the Parks Highway would be needed at each end of the section of railroad coincident with highway median and the same number of bridge structures would be needed.

The construction cost for elevated (bridge) construction of the type envisioned by use of “Hammerhead” type piers often approaches $20,000/ lf. The 10,320 + feet of elevated structure envisioned by this approach would carry a construction cost in the range of $207 million alone and would result in a significantly higher overall cost than the “Median” concept discussed above. While costs make this concept less attractive than other options, it may be addressed in greater detail should the project move forward to a NEPA environmental document.

East Side of Parks Highway—This concept, also brought up during public meetings, would have the realigned railroad remain east of and parallel to the Parks Highway until reaching the vicinity of University Avenue. There are two potential variations for this concept 1) keep the roadbed essentially at ground level to the extent possible; or 2) elevate the roadbed on a profile similar to the basic “median” option.

If the profile grade is kept as low as possible it will still be necessary to import significant volumes of embankment in order to cross the low ground and provide a vertical alignment that satisfies railroad design criteria. A low railroad profile would require reconstruction of the Geist Road, Airport Way and University interchanges and the Parks Hwy east of University to pass over the railroad resulting in increased impacts on existing facilities, utilities and requiring even more extensive ROW acquisition.

A high profile could be established that would meet railroad design criteria and pass over Geist, Airport Way, University and the Parks Highway. The horizontal alignment would cross the interchange elements, cross roads and Parks Highway on structure allowing the horizontal alignment to remain as close as possible to the east ROW line of the Parks Highway.

The east side of the Parks Highway was beyond the scope of this study as defined by ARRC. The option remains one that would be considered should the project proceed to the environmental document phase of project development.

Tunnel Option—Public comment also raised the question about using a tunnel and taking the railroad under the community as an alternate to any above ground construction. Aside from cost, technical issues abound that make a tunnel option unattractive.

- The tunnel would be a shallow, soft ground tunnel. Some sections may be cut and cover tunnel. Some, potentially, constructed using standard soft ground tunneling techniques and some sections, potentially on the surface depending on the terrain.
- A serious challenge to construction of a tunnel for all or part of the project is the presence of a high water table through out the entire area. The ground water elevation is directly tied to the level of the Tanana and Chena rivers and fluctuates with the river elevations.
- The soils through which the tunnel would pass are a mix of unconsolidated silts, sands and gravels that have been laid down by the rivers over geologic time. These soils are, for the most part, very conducive to the flow of groundwater and are clearly hydraulically tied to the rivers.
- The soils through which the tunnel would pass are, by their very nature, relatively unstable and would require continuous shoring and/or tunnel lining to avoid cave ins.
- The presence of shallow groundwater suggests the potential for sand boils and/or blow outs due to hydrostatic pressure during construction should excavation penetrate significantly below the water table. A tunnel passing under the Chena River would be particularly vulnerable to these potential construction challenges.
- A tunnel would, most likely, pass under the Chena River using a tunnel boring machine.

- ROW would have to be acquired above the tunnel so the cost and community impacts associated with ROW acquisition would not be avoided.

These issues really just begin to touch on the engineering and construction challenges that may be associated with use of a tunnel option. It would be possible to address the tunnel concept further as one alternate should the project proceed to environmental document preparation. It is quite likely however that cost alone would result in the tunnel option being dropped from further consideration early in the process.

2.4.2 Chena Pump Alternate

As previously stated, the Chena Pump Alternate has two options. Both begin, at the western limit, near the Sheep Creek Connector (Sta. 95+52) and, through development of a new line change routing, cross under the Parks Highway at an angle of ± 45º and move south through the Chena Pump Road/Chena Ridge area. Option 1 and Option 2 alignments are common on the far west and east ends. Only a small portion of the proposed alignments immediately west of the FIA varies between the two. The Option 1 alignment lies closer to Chena Pump Road, on lower altitude terrain, while Option 2 is routed farther west on higher elevation terrain, and is approximately 6,300 feet, 1.19 miles, longer. The alignments then progress in an easterly direction, each crossing perpendicularly over the Chena River and around the southern tip of the FIA, then onto and along the Tanana River Levee.

The alignment, which becomes common for Options 1 and 2 shortly after crossing the Chena River, would then more or less follow the levee, although it would have to swing inside of existing levee curves at times to avoid creating curvature in excess of the project standard. Since the existing levee as-builts show that the levee is only 12 feet wide across the top, a double track levee widening section, utilizing select fill equivalent to the original levee backfill scheme, should be employed. The alignment will be projected easterly along the levee, until a left hand 3°15' curve can be used to traverse to the existing north/south segment of the Airport Spur, then north to the End of Project located at the beginning of the Richardson Highway separation.

The alignments for both options were selected specifically to pass through unoccupied land as much as possible, although it is recognized that much of the land crossed between the Parks Highway crossing and the Tanana River Levee is privately held.

Field investigations have been performed to better characterize each option. Five categories were used: Utilities, Geometrics, Structural, Environmental and Airport. Observations for each category are provided below. In general, the discussion flows from the north end to the south and southeast.

Utilities

Both options of the Chena Pump Road Alternate encounter utilities as follows:

Parks Highway at UAF

- 1 – 138 kV Transmission Line
- 2 – 69 kV Transmission Line
- 1 – 7.2 kV Local Distribution Line

Chena Pump Road, Chena Ridge Area

- Various local electrical distribution lines, both above and below ground.

Chena Pump Road

- 1 – Unknown Voltage Transmission Line (greater than 7.2 kV)

Peger Road

- 1 – 7.2 kV Local Distribution Line

Required clearances and a discussion of options for adjusting electrical lines is included above, see Utilities in the Parks Highway section.

It should be noted also that there are various telephone cables, fiber-optic cables, TV cables, water lines and sewer lines in place throughout the corridor. As the project develops, each of these will be located and either protected or relocated.

2.4.2.1 Option 1

After crossing the Parks Highway (Sta. 131+50), this option runs essentially parallel to and west of Chena Pump Road through privately held, but so far, largely undeveloped property, until crossing the Chena River (Sta. 310+86) and passing a short distance west of FIA well under the obstruction-free surfaces. Once past FIA, the alignment turns east toward the Tanana River Levee at Sta. 378+20±. A complete Construction Summary is provided in Table 3Bi.

Geometrics

The horizontal and vertical alignments selected for this option and the entire Chena Pump Alternate conform to the design criteria for railroads as shown in Table 1. Track connections are provided so that operations can access the Chena Pump Alternate from both east and west ends so that full, two-way operations are possible and convenient. The roadways affected or crossed by the Chena Pump Alternate will be designed to conform with the stated design criteria for that particular class of roadway. This includes the Parks Highway, Chena Pump Road and a number of local streets. In each case, the roadways are planned to go over the tracks.

Structural

Eleven (11) bridges would need to be constructed for the Chena Pump Road Alternate Option 1. A summary of these bridges is provided in the Table 2Bi.

- The Parks Highway bridge requires a total of three new bridges: a set of standard highway dual structures to pass both the EB and WB lanes of the Parks Highway over the new Chena Pump Road Options, and a third structure over the EB exit ramp for the Chena Pump Road Interchange.
- Chena Ridge Road Spur will pass over the railroad
- Chena Ridge Road will pass over the railroad

- Old Chena Ridge Road will pass over the railroad
- Roland Road will pass over the railroad
- Midchena Drive will pass over the railroad
- The railroad will utilize a moveable bridge to pass over the Chena River. A moveable bridge is required to provide the required steamboat clearance of 50 feet above mean high water without creating an objectionable peak in the profile, or interfering in airport runway clear zones. Operation of the moveable span will require establishing crossing priority rights between river and rail operations, and may require hiring of new bridge-tender personnel.
- Peger Road grade separation along the Tanana Levee will be accomplished with construction of an auxiliary "balloon" levee built around and encapsulating the grade separation site.
- South Cushman Road grade separation along the Tanana Levee will be accomplished with construction of an auxiliary "balloon" levee built around and encapsulating the grade separation sites.

TABLE 2Bi—BRIDGE SUMMARY (Chena Pump Alternate, Option 1)

Location	Type	No. of Spans	Length (ft)	Width (ft)
Parks Highway	Highway	3	120	4 expressway lanes
Chena Ridge Road Spur	Highway	3	80	2 highway lanes
Chena Ridge Road	Highway	3	80	2 highway lanes
Old Chena Ridge Road	Highway	3	80	2 highway lanes
Roland Road	Highway	3	100	2 highway lanes
Midchena Road	Highway	3	100	2 highway lanes
Chena River	Moveable RR	4	300	N/A
Peger Road	RR	1	60	2 highway lanes
South Cushman Road	Highway	1	60	2 highway lanes

Note that most of these roadway structures are shown as three-span structures, and could also be designed as single-span highway structures.

TABLE 3Bi—CONSTRUCTION SUMMARY (Chena Pump Alternate, Option 1)

LF=Linear Foot / TF=Track Foot / EA=Each / LS=Lump Sum / SF=Square Foot / CY=Cubic Yard

Highway Construction	Unit	Amount
Modify SB & NB Lanes Parks Highway Section	LF	5,400
Construct SB & NB Parks Highway Flyover Structures	LF	240
Construct Chena Ridge Spur Overpass Structure	LF	80
Raise Chena Ridge Spur Road Profile for Overpass	LF	1,200
Construct Old Chena Ridge Road Overpass Structure	LF	80
Raise Old Chena Ridge Road Profile for Overpass	LF	1,200
Construct Roland Road Overpass Structure	LF	80
Raise Roland Road Profile for Overpass	LF	1,200
Construct Midchena Road Overpass Structure	LF	80
Raise Midchena Road Profile for Overpass	LF	1,200
Construct Levee/Road Grade Sep Approach at Peger Road	LF	220
Construct Levee/Road Grade Separate Approach at Cushman Road	LF	220
Railroad Construction	**Unit**	**Amount**
Construct Moveable Rail Bridge at Chena River	TF	300
Embankment	CY	602,400
Excavation	CY	343,400
Sub-ballast	CY	106,500
Levee Widening Embankment	CY	534,900
Construct Rail Bridge at Peger Road	TF	100
Construct Rail Bridge at South Cushman Road	TF	100
Construct Chena Pump Alignment Main Track	TF	65750
Construct Chena Pump Existing Yd Wye Track Connection	TF	15,000
Construct #15 TO at North End	Ea	1
Construct # 11 TOs for Wye Track Connection	Ea	2
Construct #15 TO for Airport Spur Connection	Ea	1
Upgrade Airport Spur to M/L Standards N/S Segment to Richardson Expressway	TF	2,600
Property Impacts	Parcels	102
Drainage	LS	1
Lighting	LS	1
Utilities	LS	1

2.4.2.2 Option 2

After crossing the Parks Highway (Sta. 131+50), this option runs essentially parallel to and west of Chena Pump Road through privately held, but so far, largely undeveloped property. At about Sta. 230+00, the alignment moves in a southwesterly direction, deviating from Option 1 to skirt further to the west and higher on the flanks of Chena Ridge before beginning to turn east near Sta. 300+00, crossing the Chena River (Sta. 388+10), and passing a short distance west of FIA, well under the obstruction-free surfaces.

Once past FIA, the alignment turns east toward the Tanana River Levee at Sta. 378+20±. Option 2 passes a bit closer to the end of the runways, although still comfortably below the obstruction-free surfaces. A complete Construction Summary is provided in Table 3Bii.

Geometrics

The horizontal and vertical alignments selected for this option and the entire Chena Pump Alternate conform to the design criteria for railroads as shown in Table 1. Track connections are provided so that operations can access the Chena Pump Alternate from both east and west ends, so that full, two-way operations are possible and convenient. The roadways affected or crossed by the Chena Pump Alternate will be designed to conform with the stated design criteria for that particular class of roadway. This includes the Parks Highway, Chena Pump Road and a number of local streets. In each case, the roadways are planned to go over the tracks.

Structural

Eleven (11) bridges would need to be constructed for the Chena Pump Road Alternate Option 2. A summary of the bridges is provided in Table 2Bii.

- The Parks Highway bridge requires a total of three new bridges: a set of standard highway dual structures to pass both the EB and WB lanes of the Parks Highway over the new Chena Pump Road options, and a third structure over the EB exit ramp for the Chena Pump Road Interchange.
- Chena Ridge Road Spur will pass over the railroad
- Chena Ridge Road will pass over the railroad
- Old Chena Ridge Road will pass over the railroad
- Roland Road will pass over the railroad
- Chena Point will pass over the railroad

- The railroad will utilize a moveable bridge to pass over the Chena River. A moveable bridge is required to provide the required steamboat clearance of 50 feet above mean high water without creating an objectionable peak in the profile, or interfering in airport runway clear zones. Operation of the moveable span will require establishing crossing priority rights between river and rail operations, and may require hiring of new bridge-tender personnel.

- Peger Road grade separation along the Tanana Levee will be accomplished with construction of an auxiliary "balloon" levee built around and encapsulating the grade separation site.

- South Cushman Road grade separation along the Tanana Levee will be accomplished with construction of an auxiliary "balloon" levee built around and encapsulating the grade separation sites.

TABLE 2Bii—BRIDGE SUMMARY (Chena Pump Alternate, Option 2)

Location	Type	No. of Spans	Length (ft)	Width (ft)
Parks Highway	Highway	3	120	4 expressway lanes
Chena Ridge Road Spur	Highway	3	80	2 highway lanes
Chena Ridge Road	Highway	3	80	2 highway lanes
Old Chena Ridge Rd	Highway	3	80	2 highway lanes
Roland Road	Highway	3	80	2 highway lanes
Chena Point Ave	Highway	3	80	2 highway lanes
Chena Pump Road	Highway	3	80	2 highway lanes
Chena River	Moveable RR	4	300	N/A
Peger Road	RR	1	60	15
South Cushman Rd	RR	1	60	15

Note that most of these roadway structures are shown as three-span structures, and could also be designed as single-span highway structures.

TABLE 3Bii—CONSTRUCTION SUMMARY (Chena Pump Alternate, Option 2)

LF=Linear Foot / TF=Track Foot / EA=Each / LS=Lump Sum / SF=Square Foot / CY=Cubic Yard

Highway Construction	Unit	Amount
Modify SB & NB Lanes Parks Highway Section	LF	3,150
Construct SB & NB Parks Highway Flyover Structures	LF	262
Construct Chena Ridge Spur Overpass Structure	LF	80
Raise Chena Ridge Spur Road Profile for Overpass	LF	1,200
Construct Chena Ridge Road Overpass Structure	LF	80
Raise Chena Ridge Road Profile for Overpass	LF	1,200
Construct Old Chena Ridge Road Overpass Structure	LF	80
Raise Old Chena Ridge Road Profile for Overpass	LF	1,200
Construct Roland Road Overpass Structure	LF	120
Raise Roland Road Profile for Overpass Structure	LF	1,200
Construct Chena Point Avenue Overpass Structure	LF	130
Raise Chena Point Avenue Profile for Overpass Structure	LF	1,200
Construct Levee/Road Grade Sep Approach at Peger Road	LF	220
Construct Levee/Road Grade Separate Approach at Cushman Road	LF	220
Railroad Construction	**Unit**	**Amount**
Construct Moveable Rail Bridge at Chena River	TF	300
Embankment	CY	862,300
Excavation	CY	453,100
Sub-ballast	CY	116,400
Levee Widening Embankment	CY	525,000
Construct Rail Bridge at Peger Road	TF	100
Construct Rail Bridge at South Cushman Road	TF	100
Construct Chena Pump Alignment Main Track	TF	72,500
Construct Chena Pump Existing Yd Wye Track Connection	TF	2,500
Construct #15 TO at North End	Ea	1
Construct # 8 TOs for Wye Track Connection	Ea	2
Construct #15 TO for Airport Spur Connection	Ea	1
Upgrade Airport Spur to M/L Standards for N/S Segment to Richardson Expressway	TF	2,600
Property Impacts	Parcels	115
Drainage	LS	1
Lighting	LS	1
Utilities	LS	1

Environmental

It is anticipated that for both Chena Pump options, the subgrade will be constructed primarily using standard grading operations in cut or fill, with little requirement for retaining walls. Both EB and WB lanes of the Parks Highway will have to be raised to carry the highway over the railroad. As either alignments are routed through the Chena Pump Road area, the grades of the surface streets will have to be adjusted to provide grade-separated crossings with the cross streets going over the tracks, although in comparison with establishing at-grade crossings with the roads, this practice can sometimes have the detrimental effect of creating increased impacts with green space and wetlands. Passing the track profile above the existing streets was considered, but not in depth since railroad profile design criteria would require very impractically large fills, cuts or retaining walls to pass over the various streets.

Airport

Both options of the Chena Pump Alternate are expected to be constructed near the existing ground surface, reaching their maximum elevation above natural ground when ascending to the top of the Tanana River Levee. Both options pass close under the west approach surfaces of the main runways at FIA, with Option 2 being a bit closer to the runway threshold. The concepts were checked for possible conflicts with the runway obstruction-free surfaces. The obstruction-free surface data used for the existing main runway (1L-19R) and proposed runways (2R-20L and 2W-20W) was based on the December 2005 Masterplan for FIA. The improvements described herein do not appear to be in conflict, but further review with the airport and the FAA should be conducted as future project evaluation occurs. Runway approach surfaces are shown in Appendix B-4.

2.4.3 Trainor Gate Alternate

As mentioned previously, the east end of this alternate begins about 5,950 feet west of College Road and extends east 20,800 feet into the limits of the Fort Wainwright Realignment. The proposed profile elevation will require a runoff length a distance sufficient to overlap the existing Chena River Bridge, as well as future track improvements planned on Fort Wainwright. Therefore, it is assumed that the aforementioned Fort Wainwright realignment improvements will be constructed prior to implementation of this project.

Field investigations have been performed to better characterize this Alternative. Three categories were used: Utilities, Geometrics, and Structural. Observations for each category are provided below. In general, the discussion flows from the north end to the south and southeast. An overall Construction Summary is provided in Table 3C.

Utilities

The track work for the Trainor Gate Alternate begins near a large GVEA substation. There are a number of transmission lines, 138 kV and 69 kV connecting to this substation, however there does not appear to be an immediate conflict.

There is a GVEA line in the south edge of the existing ROW that will limit the options for the location of temporary track needed for construction. The primary power line issue with the Trainor Gate Alternate is that there is a pole line in the ROW, and another south of the existing tracks east of Steese Highway. This line appears to be a 69 kV Transmission Line with a 7.2 kV Local Distribution Line underbuild. It appears that this line will have to be relocated to the south edge of the ROW for construction of the Trainor Gate Alternate. This Alternate may impact numerous other utilities depending upon the final design. In addition to the overhead line systems, there is a buried fiber-optic system on the south side of the existing railroad that should be relocated with the overhead power as near as is practical to the railroad's southern property line.

Geometrics

The horizontal and vertical alignments selected for this alternate conform to the design criteria for railroads as shown in Table 1. This alternate essentially replaces the existing track on the existing alignment, except that the track is elevated to eliminate a number of at-grade crossings. The roadways affected or crossed by the Trainor Gate Alternate will be designed to conform with stated design criteria for that particular class of roadway.

The proposed alignment will generally follow the existing ARRC railroad alignment. Final alignment location may vary somewhat from the original alignment due to the necessity to offset the proposed alignment centerline to allow for placement of retaining walls without disrupting existing train operations.

Proposed profile adjustments are based on providing standard clearance requirements between the low cords of bridges and existing pavement surfaces at overpasses. In this case, the controlling streets are College Road on the west and F Street on the East. For College Road, the desired clearance is 16.5 feet. At F Street the desired clearance is 14.5 feet. The clearance over Steese Highway will be slightly in excess of 18 feet. Due to the fact that the maximum allowable railroad grades are 0.5 percent, most of the proposed rail alignment must be elevated a significant height (20 to 25 feet for much of the length) above the surrounding terrain. The ROW constraints will require consideration of a variety of options for construction of the embankment necessary to support the track structure and avoid additional ROW acquisition.

Structural

Seven (7) bridges would need to be constructed for the Trainor Gate Alternate. A summary of these bridges is shown in Table 2C.

- Noyes Slough
- College Road - grade separation to replace four lane at-grade crossings
- Old Steese Highway - grade separation to replace two lane at-grade crossings
- Steese Expressway - grade separation to replace four lane at-grade crossings
- D Street - grade separation to replace two lane at-grade crossings
- F Street - grade separation to replace two lane at-grade crossings
- G Street - grade separation to replace proposed future two lane at-grade crossings

In general, it is anticipated that the railroad bridges will be typical Through Plate Girder construction. Although only one bridge structure at each bridge site will be installed initially, all approach embankments and retaining walls will be constructed with sufficient width to support a second bridge, if necessary.

TABLE 2C—BRIDGE SUMMARY (Trainor Gate Alternate)

Location	Type	No. of Spans	Length (ft)	Width (ft)
Noyes Slough	RR	1	75	15
College Road	RR	1	135	15
Old Steese Highway	RR	1	135	15
Steese Expressway	RR	1	135	15
D Street	RR	1	70	15
F Street	RR	1	70	15
G Street	RR	1	70	15

Trainor Gate Phasing

The proposed Trainor Gate Alternate may result in new embankment overlaying the existing roadbed. A phased construction plan will be developed that will allow rail and vehicular traffic operations to continue without undue restrictions.

TABLE 3C—CONSTRUCTION SUMMARY (Trainor Gate Alternate)

LF=Linear Foot / TF=Track Foot / EA=Each / LS=Lump Sum / SF=Square Foot / CY=Cubic Yard

Highway/Civil Construction	Unit	Amount
Relocate Pole Lines to Edge of ROW	LF	20,000
Close C and E Streets	Ea	2
Place Jersey Barriers to Isolate South Lane of Trainor Gate Road	LF	4,800
Replace Pavement in Vacated Crossing Panel Slots at D, F and G Streets	LF	90
Replace Pavement in Vacated Crossing Panel Slots at College, Old Steese and Steese Highway	LF	300
Remove Jersey Barriers and Resurface South Lane of Trainor Gate Road	LF	4,800
Replace Pavement in Vacated Crossing Slot of Trainor Gate Shoofly	LF	300
Railroad Construction	**Unit**	**Amount**
Construct Shoofly Embankment from Trainor Gate To EOP	CY	110,000
Construct Shoofly Track	TF	20,800
Construct Shoofly Grade Crossings at D, F, G and Trainor Streets	TF	390
Cutover Rail Traffic to Shoofly at Steese Highway to EOP	LS	1
Remove Grade Crossing Panels at C and E Streets	TF	60
Construct Retained Wall Elevated Section	SF	262,150
Construct RR Bridge Noyes Slough	TF	75
Construct RR Bridge Overpass at College Road	TF	135
Construct RR Bridge Overpass at Old Steese Highway	TF	135
Construct RR Bridge Overpass at D Street	TF	70
Construct RR Bridge Overpass at F Street	TF	70
Construct RR Bridge Overpass at G Street	TF	70
Embankment	CY	929,200
Excavation	CY	0
Sub-ballast	CY	30,400
Structural Fill	CY	213,800

Railroad Construction continued	Unit	Amount
Construct Trainor Gate Alignment Main Track at BOP to EOP	TF	20,800
Cutover Rail Traffic to Final Alignment	LS	1
Remove Isolated Original Main Track and Shoofly Track	TF	20,800
Remove Grade Crossing Panels and Signals at College Road	TF	75
Remove Grade Crossing Panels and Signals at Old Steese Highway	TF	100
Remove Grade Crossing Panels and Signals at Steese Highway	TF	100
Property Impacts	Parcels	0
Drainage	LS	1
Lighting	LS	1
Utilities	LS	1

2.5 Impacts

2.5.1 Operational Issues

There are potentially four modes of transportation, not counting recreational-type activities, that may by impacted operationally through implementation of any one of the subject alternates.

2.5.1.1 Railroad

Railroad operations may be impacted positively or negatively by implementation of one of the subject alternates as follows:

- The new alignment would allow higher operating speeds through the urban area, normally perceived as a positive impact and one of the objectives of the project concept.
- The elimination of at-grade crossings brings a significant increase in the safety aspects of rail operations.
- Access for routine track inspection and maintenance activities will be more difficult for those sections within the Parks Highway median and along the Tanana River Levee.

- The elevates section proposed for the Trainor Gate Alternate also presents access challenges for routine maintenance and inspection as well as for incident response.

- The moveable span bridge proposed for the Chena Pump Alternate is a critical coordination issue. Protocols will have to be established to coordinate operations of this bridge safely.

- The elevated sections with the Parks Highway median and/or along Trainor Gate Road are a concern for snow removal for the railroad. Plowing snow off the tracks and down on the adjacent roadways is a serious safety matter.

2.5.1.2 Highway

Highway operations may be impacted positively or negatively by implementation of one of the subject alternates as follows:

- The elimination of at-grade crossings throughout the urban area will have a very positive impact on air quality, traffic safety and traffic congestion.

- Normal highway maintenance and operations will not be greatly impacted, however, there will be a need for close coordination between ADOT&PF, FNSB, and/or COF maintenance staff and the ARRC where necessary activities are in close proximity to the railroad.

- The additional structures associated with the roadway overpasses will be an additional maintenance cost for the highway agency responsible for the particular route.

- The coordination of snow plowing operations on the Parks Highway and/or Trainor Gate Road will be more of a challenge because of snow coming off the elevated tracks.

- The potential for having to close the Parks Highway or Trainor Gate Road to vehicular traffic while ARRC plows the tracks.

2.5.1.3 Airport

Two of the Alternates, Parks Highway and Chena Pump, pass close to the either end of the main runways at FIA.

For the Parks Highway Alternate, the approach surfaces for the existing main runway (1L-19R) and proposed runways (2R-20L and 2W-20W) based on information provided in the December 2005 Master Plan for the Fairbanks International Airport, has been reviewed. The improvements described herein do not appear to be in conflict, but further review with the airport and the FAA should be conducted as future project evaluation occurs. Runway approach surfaces are shown in Appendix B-4.

For the Chena Pump Alternate, a check of the approach surfaces for the existing main runway (1L-19R) and proposed runways (2R-20L and 2W-20W) based on information provided in the December 2005 Master Plan for the Fairbanks International Airport, has been performed. The improvements described herein are not in conflict.

The Trainor Gate Alternate is some distance removed from FIA and does not appear to conflict with Fairbanks International Airport runway clear zones.

2.5.1.4 Chena River

Two of the alternatives presented herein include crossings of the Chena River. The Parks Highway Alternate crosses with the highway bridges and, other than coordinating the ADF&G, USF&WS and the USCG for permits does not present a particular challenge. The summer time tourist attraction River Boat concession operates from facilities downstream of this crossing. The two options for the Chena Pump Alternate, on the other hand, cross downstream of the base of operations for the River Boat. The two options of the Chena Pump Alternate have included a recommendation for a moveable span bridge to serve the railroad while allowing an opportunity for the river boat to pass unhindered. This operation will require that the ARRC and the river boat operators establish a very clear set of protocols governing their combined operations. There are precedents for movable span railroad bridges throughout the Lower 48; however, none exist on the Alaska Railroad to date.

2.5.2 Community and Environmental Issues

Table 4—Potential Impacts presents a brief summary comparison of the potential community and environmental impacts that may be associated with or result from implementation of each of the principal alternates addressed herein.

TABLE 4—POTENTIAL IMPACTS (A Comparison of All Three Alternates)

Impact	Parks Highway	Chena Pump Option 1	Chena Pump Option 2	Trainor Gate
Safety	Very positive benefit, Eliminates at-grade crossings	Very positive benefit, Eliminates at-grade crossings	Very positive benefit, Eliminates at-grade crossings	Very positive benefit, Eliminates at-grade crossings
Congestion Relief	Very positive benefit, Eliminates at-grade crossings	Very positive benefit, Eliminates at-grade crossings	Very positive benefit, Eliminates at-grade crossings	Very positive benefit, Eliminates at-grade crossings
Right-of-Way	65 Parcels Impacted	102 Parcels Impacted	115 Parcels Impacted	0 Parcels Impacted
Environmental				
Wetlands	± 94 Acres Impacted	± 93 Acres Impacted	± 130 Acres Impacted	0 Acres Impacted
Air Quality	Positive Benefit - Direct result of reduced congestion	Positive Benefit - Direct result of reduced congestion	Positive Benefit - Direct result of reduced congestion	Positive Benefit - Direct result of reduced congestion
Cultural Resources	No Cultural Resource Impacts Identified	No Cultural Resource Impacts Identified	No Cultural Resource Impacts Identified	No Cultural Resource Impacts Identified
Section 4(f)	May Impact Greenbelt and/or Bike Paths	May Impact Greenbelt and/or Bike Paths	May Impact Greenbelt and/or Bike Paths	None Known
Noise	Adds a noise source to the highway corridor	Adds a new noise source in developing area	Adds a new noise source in developing area	Should decrease noise by eliminating whistle blowing at crossings
Visual Impacts	The retaining walls supporting the embankment and tracks will be very noticeable, as will the trains when operating	The railroad will be at or near ground level, however cross roads will be grade separated and visually obvious in a developing residential area	The railroad will be at or near ground level, however cross roads will be grade separated and visually obvious in a developing residential area	The new embankment, with or without retaining walls will be large an obvious visual feature

Impact	Parks Highway	Chena Pump Option 1	Chena Pump Option 2	Trainor Gate
Socio-Economic	65 parcels are expected to be impacted, many of these acquired with families relocated to accommodate reconstructing one side of the Parks Highway	Introduces a new major transportation corridor into an area developing as a cohesive neighborhood. An estimated 102 parcels impacted where homes may be built prior to project construction	Introduces a new major transportation corridor into an area developing as a cohesive neighborhood. An estimated 102 parcels impacted where homes may be built prior to project construction	New embankment may be viewed as a stronger barrier - yet safety is improved by elimination of at-grade crossings
Land Use	Project not expected to result in significant change in adjacent land use	Project may impact land use in developing residential neighborhood	Project may impact land use in developing residential neighborhood	Project not expected to have significant impact on land use
Critical Habitat	No known critical habitat impacts	No known critical habitat impacts	No known critical habitat impacts	No known critical habitat impacts
Hazardous and/or Contaminated Sites	No known hazardous or contaminated sites	No known hazardous or contaminated sites	No known hazardous or contaminated sites	No known hazardous or contaminated sites

2.6 Public Process

The data presented in this report has been presented to the Fairbanks community through a variety of public process steps. As stated early in the report, the basis for this work is founded in two reports prepared by Thomas Engineering for the ARRC. These reports were presented to the Fairbanks-area community at the time they were being prepared. In addition, the FNSB 2100 Task Force Report was prepared by a group of Fairbanks-area interested citizens at the behest of the FNSB. The development of the 2100 Task Force Report was done with the aid of a very intricate Public Involvement process. The current study effort has included meetings with ADOT&PF, FNSB and COF and a public meeting in the fall of 2006. The findings of this analysis are scheduled to be presented to a Public Meeting at the end of January 2007.

3. SUMMARY

This report makes no recommendation. Rather, the purpose is to present the strengths and weaknesses of three potentially viable alternatives for improving traffic safety and congestion issues in the greater Fairbanks urban area so that the ARRC and others have a basis for determining a further course of action.

The Parks Highway Alternate, while effective at eliminating a number of at-grade crossings and providing for improved traffic safety and congestion relief, carries with it some significant drawbacks, including:

- Project cost resulting from the need to reconstruct one half of a section of the existing Parks Highway
- Impacts on an established residential neighborhood
- Snow removal and storage issues for both ADOT&PF and ARRC
- Incident response issues, particularly for ARRC
- The route creates a more circuitous route for rail traffic that needs to access the Fairbanks rail yard
- Routine maintenance access issues, particularly for ARRC

The Chena Pump Alternate, assuming either option, are also effective at eliminating a number of at-grade crossings and also provide for improved traffic safety and reduced congestion. This alternate also carries some significant drawbacks, including:

- Inserts a barrier into a developing residential area
- Requires a movable span bridge over the Chena River with all of the operations issues associated therewith

- The routes are longer and thereby create a more circuitous route for rail traffic that needs to access the Fairbanks rail yard

The Trainor Gate Alternate, also effective at eliminating at-grade rail crossings with the resulting improvements in traffic safety and congestion relief. Pros and cons include:

- Remains within existing ROW
- Does not required displacement of existing residences or businesses
- More direct route for rail traffic destined for the Fairbanks rail yard
- Creates a more prominent barrier in the established neighborhoods that the current tracks on this alignment create
- May be difficult to mitigate noise impacts
- Snow removal from the tracks will be thrown off onto a slope adjacent to Trainor Gate Road and, due to the slow train speeds, is not expected to have a significant impact on motorists.
- Snow storage from the tracks will be accommodated within the ARRC ROW, on embankment slopes. Storage of snow removed from Trainor Gate Road is expected to be much as it is today.
- Increased safety concern in the event of a derailment on the elevated tracks with the potential for rail cars impacting adjacent buildings and/or vehicles on Trainor Gate Road
- Increased difficulty with incident response