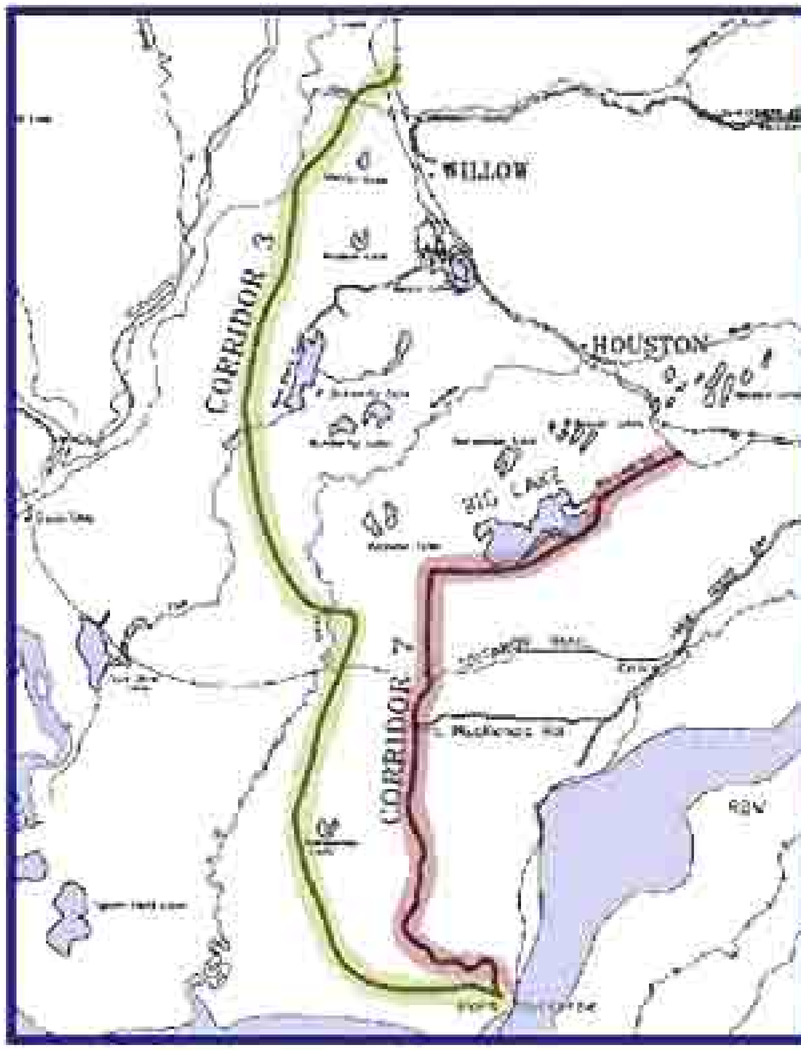
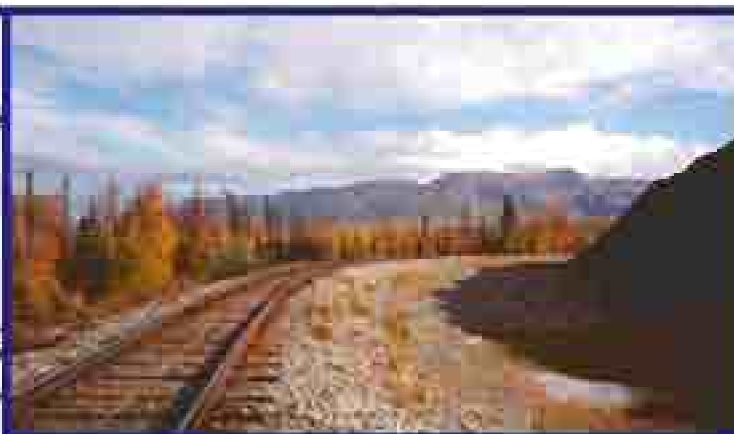
MATANUSKA-SUSITNA BOROUGH
RAIL CORRIDOR STUDY

JUNE 2003





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MAT-SU RAIL CORRIDOR

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EXECUTIVE SUMMARY

Introduction

A deep-water port near Point MacKenzie has long been a dream of the Matanuska-Susitna Borough (MSB). Planning documents as far back as 1978 pointed to the desirability of a port in the Point MacKenzie area. The general thinking was that such a port facility would complement the already well-established Port of Anchorage. Numerous studies through the 1980s and 1990s looked at various aspects of developing a port in that area. These planning efforts culminated with the construction of a sheet pile type barge dock in 1999. Plans are currently underway to provide an access trestle extended off the upstream corner of the barge dock to access moorage facilities suitable for deep draft vessels, which would be necessary for the export of bulk cargo such as wood chips or coal. There are also plans under way to use Port MacKenzie as one terminus of a ferry system proposed to operate between Anchorage and Point MacKenzie.

Through all of the previous work, one common thread was present, the need to provide good surface transportation access if a port at Point MacKenzie was to be a viable facility that would grow to be a strong economic engine for the MSB.

The purpose of the MSB Rail Corridor Study was to determine a mix of railroad and highway options for surface access to Port MacKenzie that would:

1. Provide the level of surface transportation access necessary to allow for the safe and efficient movement of material into and out of the MSB and the rest of Alaska.
2. Provide that access in a manner that was generally acceptable to the residents of the project area.
3. Keep the environmental impacts of this major project to a manageable level.

An additional complication for the study was the potential for development of the Knik Arm Crossing (KAC) project by the KNIK ARM BRIDGE AND TOLL AUTHORITY (KABATA). While addressing the impact of the KAC was not part of the study scope, the team was ever cognizant of the potential for that project and attempted to accommodate that potential whenever possible.

Data Analyses

Over the years since a port at Point MacKenzie was first envisioned, there have been numerous studies done which address access to the site and, as early as 1992, the MSB Assembly adopted a resolution selecting a specific route. In view of the previous work, this study effort began with a thorough review of the previous studies and of the construction projects the MSB had in project development. These studies and already programmed improvements formed the foundation for the remainder of the study. A total of eleven basic alternatives were identified from this research and presented to the public to show “this is what has been done to date.”

A key question at the outset of the study centered on the issue of how much material was likely to move through Port MacKenzie. To address that question, a “Commodities Flow” study was done as part of the project. The consensus was that there would be little or no arriving freight passing through Port MacKenzie. Virtually all materials moving through the port would be exports. As shown in the table below, Petroleum products and Wood Chips are the most likely exports in the near future. Developments occurring after completion of the Commodities Flow Study suggest that sand and gravel mined on or near port property and coal trucked from Sutton and also pass through Port MacKenzie in the near future. It should be noted that Petroleum products only become a factor when the rail spur has been constructed and if storage is needed that exceeds the ability of the Port of Anchorage to accommodate them or if public concerns over safety issues lead to relocation of the existing fuel storage. There has been no discussions to date between Port MacKenzie and the Port of Ancorage relative to fuel storage. It is also important to note that at the time the Commodities Flow Study was done, the Usibelli coal mines at Healy had lost their overseas contracts and there was no coal being exported overseas, however talks were underway at time of this writing aimed at resuming coal export from Healy.

Commodity	Base	Low	High
Petroleum and Chemicals (thousands of short tons)	870	50	2608
Cargo Containers	0	0	0
Wood Products (thousands of dry tons)	300	200	400
Coal (thousands of short tons)	800	200	1500
Sand and Gravel (thousands of short tons)	800	200	2000
Oil Field Modules	1	0	3
Manufactured Homes	98	45	147
Selected Minerals	0	0	0
Natural Gas	0	0	12

* Data relative to Coal, Sand and Gravel, and Oil Field Modules provided by the Port MacKenzie Manager subsequent to completion of the Commodities Flow Study.

Recognizing that port and industry based near the port will have employees, customers and deliveries of materials and supplies coming in from the surrounding areas, a Traffic Study was done to help understand the potential impacts on the surrounding roadway system that may result as the port grows. The Traffic Study also converted tons of commodities from the Commodities Flow Study to numbers of rail cars and/or trucks that would be necessary to move these commodities into the port area for loading onto vessels and shipment to the final destination. The Traffic Study also recognized that efforts are underway to establish a commuter ferry connection between the MSB and Anchorage and looked at how this traffic might distribute itself through the MSB area. Table 2-2 in Section 2, summarizes the rail and vehicular traffic impacts expected as a result of port development. The study indicates that without a Knik Arm Crossing being constructed, the vehicular traffic generated by port activities will be such that it can be comfortably accommodated, in addition to current traffic loads, on a well-constructed two-lane rural highway.

The most likely rail haul will be wood chips originating north of Willow and with the production zone extending well into the interior. It is expected that this market will take time to develop and the demand for rail service will be toward the end of the 20-year planning period. It also appears that the rail line, when constructed, will be an investment in future growth rather than a response to current demand. Again, if the Knik Arm Crossing is constructed, the picture changes for the rail line in that the Alaska Railroad is on record stating that “Corridor three has the added benefit of appearing to align with the Knik Arm Crossing more favorably especially as a transportation link from Anchorage to Fairbanks."

Environmental Review

The focus of this study was to locate corridors for roadway and railway access to Port MacKenzie. The scope of the study did not include an in-depth analysis of the environmental impacts of the project. Rather the study team established a baseline of existing conditions and looked at probable impacts. The intent was to determine if there were any "deal breakers" associated with any of the corridors that were reviewed. The primary areas of concerns ultimately were reduced to the amount of wetlands being impacted and the amount of private property to be acquired for right-of-way (ROW). It is clearly understood that prior to construction of major improvements, particularly a new corridor for the railroad, an environmental document must be prepared.

The environmental review began with an agency meeting and a review of the controlling state and federal regulations. Because any project of this magnitude will most likely be constructed with federal funds, it is assumed that the full NEPA process will have to be followed.

There are no known threatened or endangered species within the study area.

There are a number of anadromous fish streams in the study area and each corridor crosses one or more of them. Corridor 3 crosses both the Little Susitna River and Willow Creek. These crossings will be bridges. All other stream crossings are expected to be culverts and will be designed to accommodate fish passage.

There were no critical habitat areas identified within the study area.

Wetland impacts may be significant. As currently defined, Corridor 3 impacts approximately 295 acres of wetland, 266 acres of that area are "scrub shrub wetlands." Corridor 7 impacts approximately 25 acres of wetlands. As the project develops, the actual alignment for each corridor may be adjusted to reduce wetlands impacts. However, it is recognized that it will not be possible to totally avoid any wetland encroachment.

Wildlife impacts are relatively limited. No critical habitat is being taken, although there will be some loss of habitat, the impact is expected to be minor.

Fisheries impacts are relatively limited. No critical habitat is being taken. Stream crossings are with bridges or culverts designed to accommodate fish passage.

It is not likely that construction of either corridor alternative will generate long-term population growth unless there is significant resource development beyond the level currently forecast. As a result, impacts on housing are expected to be short term primarily due to increased demand during construction. Both corridor 3 and 7 have been defined to minimize, if not totally eliminate, the need to take any homes, although some private land will be required. Hence, it is not expected that the project will have a negative impact on housing stocks.

Lands required for either project falls into one of six ownership categories – Private, Borough, Native Corporation, State, Alaska Mental Health Trust and the University of Alaska. Private land and Native Corporation land must be purchased for use as ROW. The state land, including Mental Health and University lands, can be acquired through land swaps. Construction of either corridor is not expected to have large impacts on adjacent lands, although there may be some increase in land value.

Recreational facilities abound within the study area. There is a trail system that covers the area like a spider web. These trails are used year round. The intent is to grade separate rail or roadway from the trails.

Recommendations

The Rail Corridor Study evolved through an intense study effort over a period of just over a year. The study team was charged with developing a recommended mix of roadway and railway access to Port MacKenzie that were:

1. Feasible and constructible from a technical perspective.
2. As gentle on the environment as constructing a major transportation corridor could be.
3. Generally acceptable to the residents and business community through which the corridors would pass.

The recommendations presented in this report satisfy each of these three charges.

Corridor 3 is recommended primarily as a railroad corridor. The alignment was selected specifically to meet the railroad requirements for grades and curvature. Input received during the public meetings and through discussions with the MSB staff suggested that the ROW for Corridor 3 should be wide enough to accommodate a major highway and to provide space for the wide range of utilities that often seek location within public transportation corridors. While the study did not address the potential impacts of the proposed Knik Arm Crossing, Corridor 3 includes a recommendation that an 800-foot wide corridor be preserved so that there is space available within the ROW for the railroad, with sidings, utilities, bicycle pathways and a four-lane divided highway. This would then provide a corridor that ADOT&PF could use should KAC be constructed.

Corridor 7 is recommended as the highway access. This alternative was selected as the highway access because it is essentially the completion of a series of projects that the MSB has already programmed and started work on. It includes the least amount of new alignment construction and the overall least impact on private property and wetlands because significant sections of Corridor 7 can be constructed within existing ROW. Where new ROW is required, a 300-foot ROW is recommended so that there is sufficient width to accommodate the roadway, pathway and the utilities that so often occupy public ROW. Where new ROW has been acquired, no additional ROW should be acquired for this phase of project development as a cost control measure and to avoid causing ill will in the community.

Public Process

The public process for the Mat-Su Rail Corridor Study included three public meetings and extensive mailings. All three public meetings were evening meetings held at the Houston High School.

The first meeting in May 2002, summarized the various studies that had been done over the 30-year period preceding the current effort. This meeting generated a significant volume of public comment. This public comment was then used together with technical analysis to reduce the number of alternatives to be studied.

The second meeting was held in November 2002. At this meeting, five corridors were presented in an open house format. Those presented included Corridor 3 as rail only; Corridor 4 as the one which had the least impact on private property and with the potential to be either roadway, rail or both; Corridor 5 as the one that was a balance between private property impacts and environmental (primarily wetlands impacts). This corridor was presented as potentially being roadway, rail or both. This corridor closely follows the one that was adopted by Borough assembly resolution in 1992. This meeting also drew a large volume of public comment with strong support for Corridor 3 as a rail route and with mixed preference for a roadway, but Corridor 7 was a slight favorite.

The third meeting was held in April 2003. At this meeting, Corridor 3 was presented as a rail corridor with provision for ADOT&PF to add a highway in the future. Corridor 7 was presented as the roadway access. Corridor 7 was presented as a two-lane facility based on the study traffic analysis showing traffic increases resulting from Port MacKenzie operations being in the range of 2,250 per day, well with in the capacity of a two-lane facility even when added to the current and expected future traffic without KAC construction.

1.0 INTRODUCTION

The Matanuska-Susitna Borough (MSB or Borough) undertook a study to examine routing options for a rail and road corridor connecting Port MacKenzie with the Alaska Railroad Corporation (ARRC) mainline track. The Location Study Report (LSR) chronicles the process used to complete the study. It describes the purpose of the project, the alternatives studied, the process by which the alternatives were selected, a brief discussion of alternatives not evaluated, and the reasons for not pursuing them. The LSR includes a discussion of the possible environmental consequences and a concept level design for the rail and highway alternatives that best meet the goals and objectives of the project. In addition to the LSR, the following reports were prepared as stand-alone documents and are referenced as appendices to the LSR:

- Geotechnical Investigations Report
- Environmental Geographic Information System (GIS) database
- Commodities Study (also an appendix to the LSR)
- Traffic Analysis (also as an appendix to the LSR)
- Preliminary Environmental Review (PER) document
- Land Status Maps
- Public Involvement Report

1.1 Background

Some years ago, the leaders of the Mat-Su Borough realized that conditions at the Port of Anchorage were such that significant expansion would not be feasible and the Borough embarked on a program to provide an alternate deep-water port facility easily accessible by both rail and highway. This facility, known as Port MacKenzie, is now in limited service and is located almost directly across Knik Arm from the Port of Anchorage. Port MacKenzie has long been the preferred site for a deep-water port for the Borough. The location has access to deep water, there are both Borough and state uplands available for port and industrial development, and the site is close to the Anchorage port and airport systems that could be linked through the Knik Arm Crossing or by other transportation modes.

The Borough is now focused on improving the access to Port MacKenzie. Currently, Knik-Goose Bay Road and the Point MacKenzie Road serve the port. Knik-Goose Bay Road is a two-lane, paved facility with 4-foot shoulders. For the most part the facility operates under a 55-mph rural speed limit with frequent driveways, side road intersections and frequent passing restrictions from both vertical and horizontal alignment. The route is a total of approximately 22 highway miles which extends northeasterly to connect with the Parks Highway and the Alaska Railroad in Wasilla. The bulk of the freight movement for the Alaska Railroad is in the Anchorage-Fairbanks corridor passing through Wasilla. A transportation system connection that facilitates north-south movement of freight will be necessary to make Port MacKenzie a competitive shipping operation. ADOT&PF has scheduled a rehabilitation project for Knik-Goose Bay Road to be constructed in 2005. The proposed project will improve the northerly 19.8 miles, providing a new typical section with two 12-foot lanes throughout. The northerly 4+ miles will have 6-foot wide shoulders while the remaining 15.8 miles will have 4-foot shoulders. There will also be turn lane channelization at the appropriate locations.

1.2 Study Purpose

Industrial development was first evaluated in 1978 with the Point MacKenzie Industrial Siting Study prepared by Environmental Services Limited. Port development appears to have been initially addressed in April 1981 with the Matanuska-Susitna Borough Port Study prepared by Peratrovich & Nottingham, Southwest Alaska Pilots Association and Alaska Development Consultants. Since that time, additional studies have addressed roadway and/or rail access to the Point MacKenzie area. Some of these study efforts have created considerable resistance from area residents and businesses.

The MSB has moved to begin development of a deep-water port facility at Point MacKenzie. Initial construction of an open cell sheet pile barge dock was completed in August, 2000. Additional development work has been on-going since that time and there has been some initial export activity, along with industrial manufacturing beginning in the Point MacKenzie uplands area with the AMC Modular Home plant.

The real issue remains - in order for there to be a viable and competitive port facility at Point MacKenzie or anywhere else in the MSB, there must be good surface transportation facilities serving the port. The purpose of this study is to identify a corridor or corridors that will provide the level of surface transportation access necessary for Port MacKenzie to be successful. That access must, logically, include both rail and highway access and should, to the extent possible, gain the support of the residents of the MSB.

1.3 Study Objectives

The Mat-Su Borough Rail Corridor Study is intended to serve as a Location Study Report (LSR) addressing the options for a surface transportation system to serve Port MacKenzie.

The LSR has the following objectives:

1. Identify roadway and rail access corridors that would provide the appropriate level of surface transportation access to the port.

2. Identify roadway and rail access corridors that would be acceptable to the majority of the area residents.

3. Identify a surface transportation system that would serve the Port with or without Knik Arm Crossing being constructed, but one that would work with the crossing should that project progress forward.

4. Provide a route location analysis that would serve as the beginning point for any future project development including environmental studies and/or design.

To accomplish these objectives, the study was designed to do the following:

- ✓ Evaluate the types of commodities that may be moving through Port MacKenzie and where, within Alaska, these commodities are originating from or going to.
- ✓ Identify issues and concerns of landowners, residents, business and industry, and local, state, and federal agencies regarding rail and road routes in the study area.
- ✓ Describe the environmental, socio-economic, and engineering characteristics and constraints of the potential rail and road corridor options.
- ✓ Develop a route recommendation for both rail and highway that provides a balance between apparent environmental impacts, property impacts, development costs and service to the port.

There were three major phases to the study including:

Phase One: Issues Identification

The first phase of the study focused on defining one or more corridors through which rail and/or highway facilities could be routed. Issues and concerns by landowners, residents, business and industry, and local, state, and federal agencies were identified. Environmental and engineering baseline conditions were documented and potential corridors were defined. During this phase, the study team reviewed the previous studies and used the data presented in these studies as a beginning point. A preliminary informational meeting was held with the Federal and State agencies and a public meeting was held in an effort to identify issues of concern for both the agencies and the public. As a result of public input during this phase, an additional alignment, Corridor 3, was added to the scope of work.

Phase Two: Route Alternatives and Analyses

The second phase of the study included a refinement of the corridor options based on public comment, land ownership, and environmental and engineering constraints. During this phase, additional studies were prepared including:

- ✓ An economic study which evaluated the potential for materials that may be expected to flow through Port MacKenzie during the next 20 years, including where within the State of Alaska these materials may come from or go to.
- ✓ A preliminary traffic study which looked at how Port MacKenzie traffic might distribute through the study area. The data from this effort also was used to help select the design criteria for the roadway and railway elements of the project.
- ✓ A preliminary geotechnical review of the study area was made to provide input as to the soils conditions that may be expected along each of the alignments. This work

consisted of a review of available data and a windshield type field reconnaissance. The results of the effort were documented in a brief report.

- ✓ Working with the MSB tax records, an evaluation was made as to the classification of land ownership by parcel, whether it was private, native allotment, state or federal. Land values for the different classifications were determined from comparable sales within the study area.
- ✓ A preliminary environmental review was done which focused on a review of the literature and available mapping and aerial photography to determine if there were critical environmental issues and to quantify the potential impact on wetlands and/or the various categories of land ownership.

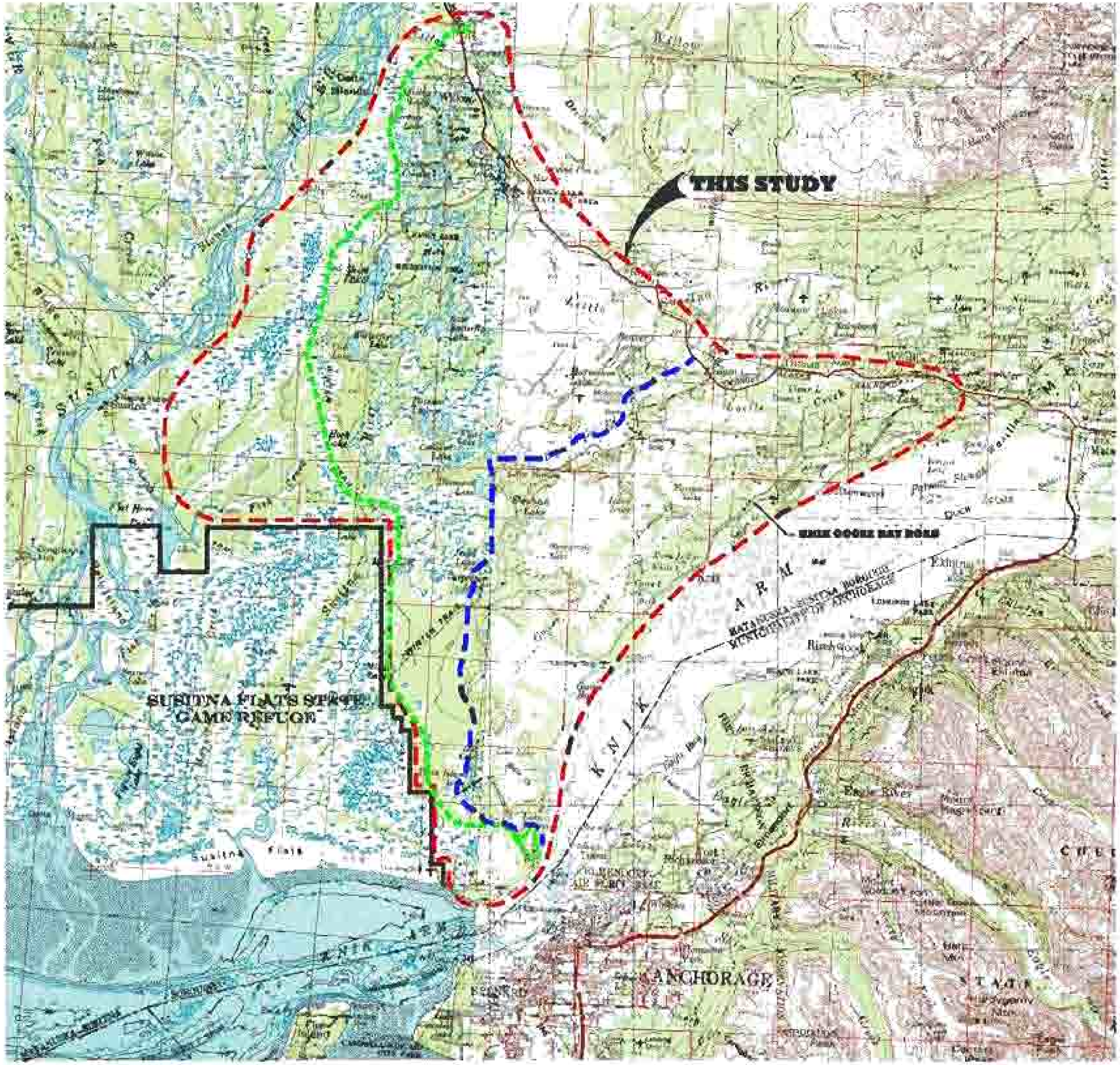
These data, together with the input received from the public during the initial public meeting, were used to conduct a constraint analysis and thereby select alternatives that either minimized impacts on wetlands or on private property or defined a balance between these two issues. This analysis resulted in refining the number of alternatives under review to five, including the "no-build" alternate. The analysis leading to the selection of these alternates, including property and environmental impacts, construction costs and other factors was then presented at a second public meeting held within the project area. The project area, because of the addition of Corridor 3 was expanded to include the Willow area during this phase of the work.

Phase Three: Preferred Route Recommendation

The third phase of the study, working with the input received during the second public meeting, included preparation of preferred route options. Two options were presented. The roadway alternate, without construction of the Knik Arm Crossing is an upgrade and/or realignment of existing MSB roadways. The alignment follows the Point MacKenzie Access Road, Burma Road and South Big Lake Road connecting with the Parks Highway near Big Lake. This alternative is viewed as a two-lane highway. The MSB is currently working to upgrade these roadway sections and this alternative does nothing more than utilize a facility that was already scheduled for improvements.

The railroad alternative follows Corridor 3 across the Little Susitna River and north along a glacial morain lying west of Red Shirt Lake, crossing Willow Creek west of the Parks Highway, crossing the Parks Highway north of Willow Creek and tying into the existing mainline track. This is a spur of over 40 miles in length. The majority of the right-of-way for this alternative crosses public land and the recommendation includes retaining a right-of-way wide enough that a major highway could be built within the same right-of-way should the Knik Arm Crossing be constructed.

The recommended alignments were presented at a third public meeting.



LEGEND

STUDY AREA BOUNDARY

CORRIDOR 3 (RAILROAD)

CORRIDOR 7 (ROADWAY)

ENGINEERS, PLANNERS, SURVEYORS & LANDSCAPE ARCHITECTS
TRYCK NYMAN HAYES, INC.

FIGURE 1
CORRIDOR STUDY LOCATION

SCALE: N.T.S.

1.4 Historical Studies – Point MacKenzie and Knik Arm Crossing

The impetus for the entire project is the development of a deep-water port at Point MacKenzie on the MSB side of the Knik Arm of Cook Inlet, generally across Knik Arm from the Port of Anchorage. From the beginning, Port MacKenzie has been viewed as a bulk cargo port because the area designated as uplands is virtually undeveloped leaving space for a wide range of commodities and/or industrial uses whereas the Port of Anchorage currently has very little land available for uses that require large amounts of land. Early thinking seemed to be that the two facilities may be developed to be complementing each other to the benefit of the upper Cook Inlet region rather than being competing facilities. The following is an overview of past studies:

1. The Point MacKenzie Industrial Siting Study, 1978 by Environmental Services Limited addressed Industrial development in the Point MacKenzie area. This study identified a number of potential industrial uses for the Point MacKenzie area.
2. The Matanuska-Susitna Borough Port Study, 1981 by Peratrovich & Nottingham, et al, evaluated port sites and recommended Point MacKenzie as the preferred site.
3. The Comprehensive Development Plan: Transportation, 1984, Mat-Su Borough, built on the previous studies. Two possible port locations were evaluated, Point MacKenzie (Site A) and a location directly across from Cairn Point (Site B). This study looked at the bathymetry, currents, ice and other pertinent factors, developed a decision matrix and ultimately recommended Point MacKenzie. The study states that the Point MacKenzie site is suitable for large-scale industrial development and that "anticipated users include mining, petroleum and transportation interests." The study addressed surface access using Knik-Goose Bay Road and an old existing gravel road that extended to the Point MacKenzie area. Rail access was included in terms of "a 23-mile railroad spur" that would connect Point MacKenzie to the Alaska Railbelt to provide a means of moving heavy bulk cargo to and from the port area. This study also contained brief mention of a ferry system connecting Point MacKenzie with Anchorage.
4. A study entitled "The Essential Elements of a Master Plan for the East Port Area at Point MacKenzie," 1989, VEI, et. al focused on two critical aspects of the Port MacKenzie development: 1) anticipated freight movements through the proposed Port and the transportation facilities that would be needed to facilitate these freight movements. This report clearly showed that the primary freight would be bulk cargo such as coal, logs, wood chips, sand and gravel, petroleum and other similar materials. It also restated the need for both improved roadway access and new rail access to the Point MacKenzie area to facilitate these freight movements.
5. Economic Evaluation of the Port of Alaska, March, 1990, Temple, Barker & Slane, Inc. – This report focused strictly on the economic potential of a Port and Point MacKenzie. The conclusions were that a port facility was economically viable in the long term and that the primary exports may be expected to be coal and wood chips although there was also a potential for other materials.

6. The “Economic Evaluation and Planning of a Cook Inlet Marine Transportation System” report, June, 1990; BST Associates, et. al, documents an indepth look at the potential for ferry service throughout Cook Inlet. Port MacKenzie was just one of a number of potential ports of call. However, the report further emphasized the need for improved roadway access into the port area.

7. In 1993, the MSB Assembly adopted the “Point MacKenzie Area Which Merits Special Attention Plan” (Point MacKenzie AMSA). This study added to the database and analysis supporting development of a deep-water port at Point MacKenzie and refined the proposals for roadway access to the area. In the short term, road access was envisioned as improving and using the existing Point MacKenzie access road, Burma Road and South Big Lake Road. A long-term alternative crossed the Little Susitna River and extended north to the Willow area.

8. In 1998, a master plan for Port MacKenzie was adopted by the Borough. The plan describes port site and facility characteristics, potential uses, a land use plan, a port operating plan, and recommendations, guidelines, and procedures for future Borough actions to implement port management. The purpose of the master plan was to help the Borough work with potential users and also to obtain assistance in developing the port facility. A key recommendation of the master plan was the need to improve access to the port facility.

9. “Matanuska-Susitna Borough Long Range Transportation Plan (LRTP); September, 1997, MSB. This document is a Borough wide transportation plan which includes elements addressing the development of a deep-water port at Point MacKenzie and improved roadway and rail access to that facility. This document states that the MSB approved the East Port site (Point MacKenzie) as the preferred deep-water port for the Borough. Access to the port area included in the LRTP echos the recommendations of the 1993 Point MacKenzie ASMA. The LRTP re-emphasizes the need for rail connection between the port and the Alaska Railroad if the port is to be viable. That access was identified as extending northward from the port to connect with the Alaska Railroad south of the Little Susitna River near Houston. The LRTP also states that development of a pipeline into the port area could be beneficial if not necessary if any extensive bulk fuel storage may be contemplated for the port. The LRTP briefly mentions the potential for ferry service between Anchorage and the port.

10. In 1999, the initial construction at Port MacKenzie was done. This work consisted of construction of an Open Cell design sheet pile barge dock.

11. In 2000, the first industrial user moved into the Point MacKenzie area when AMC constructed a plant for the construction of modular homes and buildings specifically designed for export to western Alaska. AMC has exported homes each of the past three years over the Port MacKenzie dock.

12. Efforts have been on-going to improve the roadway access. The Point MacKenzie access road has been widened and straightened to provide an upgraded gravel road into the port and that facility is scheduled for paving in the near future. The MSB has also been moving ahead with the design for reconstruction of Burma Road and plans

to acquire some or all of the right-of-way for this work in 2004 - 2005. They have also initiated design and ROW acquisition for sections of South Big Lake Road and will move ahead with construction when funds are available.

There have been two “Knik Arm Crossing” studies conducted by State of Alaska Department of Transportation and Public Facilities (ADOT&PF) – one in 1972 and the second in 1984. A number of smaller studies were also conducted by the Borough. The Knik Arm Crossing project is once again under study, this time by the KABATA. The significance of the Knik Arm Crossing was recognized early in this study effort and while truly addressing the full impact of implementation of the Knik Arm Crossing was beyond the scope of this effort, the study team has developed a port access plan that provides the needed access with or without the Knik Arm Crossing, yet provides an option for a major highway route extending north from the crossing should ADOT&PF choose to use it. Design criteria were selected for both roadway and rail. The criteria selected for roadway provide for an improved two-lane facility if the crossing is not constructed and a four-lane divided facility if the crossing is constructed in recognition of the higher volumes and operating speeds that could result. Design criteria prepared for the rail access were selected so that the facility would serve heavy freight traffic as the Alaska Railroad is on record that this alignment may become their new mainline should the Knik Arm Crossing be constructed.

The 1984 study considered a combined rail/highway bridge with some alternatives. Rail and/or highway connections between the port and the Parks Highway/Rail corridor to the north have a direct impact on travel times and consequently freight costs. Current conditions result in travel times between Anchorage and the Parks Highway at Houston approaching 2 hours, exclusive of time lost meeting other trains. The corridors previously studied suggest that a route connecting near Houston could cut the travel time between tidewater and the Houston area in half.

The ARRC has embarked on an ambitious program to improve mainline train operations. The original track alignment from Anchorage north included many curves that were, and still are, 25 mph curves, limiting train speeds to 25 mph for much of the distance between Anchorage and Wasilla with other shorter but similar sections further north. With all planned track improvements completed, the anticipated train trip time, Anchorage to Willow, the northerly terminus of Corridor 3, will be reduced by approximately 30 minutes. Model studies conducted by ARRC suggest that routing trains across the KAC and up Corridor 3 to Willow will shorten the travel time between Anchorage and Willow an additional 30 minutes, resulting in a total trip time reduction, Anchorage to Willow, of approximately one hour over current conditions and 30 minutes over the best time to be achieved through just a realignment of tracks within the existing rail corridor.

The significance of a one-hour travel time reduction is in the long-term operational cost benefit to the railroad and to the long-haul trucks with the greatest benefit being to the railroad. Additionally, if ARRC operating costs decrease, there should be a beneficial impact on freight tariffs. The study indicates that the time-savings to be realized hauling from Port MacKenzie rather than from Anchorage could have an even greater impact on freight costs. Significantly lower freight rates could make Port MacKenzie an attractive alternate to the Port of Anchorage for the movement of freight through the Railbelt.

2.0 DATA ANALYSES SYNOPSIS

2.1 Description of the study area and the route options analyzed

A basic premise of the study is that the majority of material that may move through Port MacKenzie will have an origin or destination in the interior of Alaska rather than in the major metropolitan areas of Wasilla, Palmer and Anchorage. This is based upon the economic analyses that have previously been done and was confirmed by the economic analysis prepared as part of this study. With this in mind, connecting to the Parks Highway Corridor north of Wasilla will serve to keep the bulk of port traffic separated from the growing traffic and circulation issues in the Wasilla area. This separation is felt to be desirable in view of both capacity and safety concerns.

The study area is roughly triangular with Point MacKenzie at the southern tip. On the east, the area is bounded by Knik-Goose Bay Road. On the west, by the Susitna River and on the north by the Parks Highway corridor. Within this study area a total of eleven different corridors were identified that had been studied in some depth in the 1982 Knik Arm Crossing study and/or other previous studies. Each of the eleven corridors identified included additional specific alignment alternatives, however, the variations were considered to be relatively minor and adequately addressed by the corridors shown.

Corridor 1 – This alternate begins at Point MacKenzie and moves west to skirt the east boundary of the Susitna Flats State Game Refuge. The alignment turns west across the top of the refuge meeting the Susitna River near the community of Susitna. From there it follows the east shore of the Susitna River to connect with the Parks Highway Corridor north of Willow Creek. Corridor 1 has the advantage of providing access to lands north of the refuge currently designated by the State of Alaska as a potential agricultural development, however, it is also the longest of the alternatives and traverses considerable amounts of wetlands.

Corridor 2 – This corridor is coincident with Corridor 1 from Point MacKenzie up to the crossing of the Little Susitna River near the northeast corner of the refuge. From that point, Corridor 2 turns north and follows a glacial moraine that lays west of Red Shirt Lake and then ties back into Corridor 1 north of Rolly Creek. This corridor is shorter that Corrior 1 and has less encroachment on wetlands. Corridor 2 is also quite close to Corridor 3 and was combined with Corridor 3 as the analysis went forward.

Corridor 3 – This corridor initially was a westerly extension of the end of the Little Susitna River access road and extended into the northeast corner of the Susitna Flats State Game Refuge (SFGR) before turning north. After turning north, the corridor follows the glacial moraine traveling west of Red Shirt Lake and skirting west of the boundary of the Nancy Lake Recreational Area, ultimately tying back into Corridor 1 before crossing Willow Creek and rejoining the Parks Highway Corridor north of Willow Creek.

Corridor 4 – This corridor as originally defined left the port area in a westerly direction passing into the SFGR before turning north around Middle Lake before passing back out of the SFGR to pass between Crooked Lake and the Papoose Twins Lakes, northwest of Horseshoe Lake and across the bogs to connect with the Parks Highway Corridor at Houston. This corridor, as originally defined, appears to have the largest impact on wetlands and encroaches on the SFGR.

Corridor 5 – This corridor extends west from the port area about four miles then turns north up a section line through the Point MacKenzie agricultural project and west of Carpenter Lake and Diamond Lake before passing between Crooked Lake and Flat Lake and between Big Lake and Horseshoe Lake and north of Beaver Lakes to meet the Parks Highway Corridor a bit south of Houston. This corridor passes through a relatively large amount of private property and a significant amount of wetlands.

Corridor 6 – This corridor leaves the port area following the existing Point MacKenzie access road north to the Little Susitna River access road to the north on the east side of Carpenter Lake, along Burma Road, to pass across the isthmus between Big Lake and Flat Lake, tying back into Corridor 5 south of Horseshoe Lake. The corridor then follows Corridor 5 onto the Parks Highway Corridor south of Houston. This corridor also impacts significant amounts of private property although it appears to be on better ground until nearing Big Lake.

Corridor 7 – This corridor is coincident with Corridor 6 up to the Little Susitna River access road. It then follows a slightly different route than corridor 6 to a point just north of the South Big Lake Road where it reconnects with and follows Corridor 6 to the Parks Highway.

Corridor 8 – This corridor is coincident with Corridor's 6 and 7 up to the South Big Lake Road then follows South Big Lake Road easterly around the south side of Big Lake and through the community of the same name and northeasterly about four miles to a connection with the Parks Highway Corridor. Much of this corridor is already programmed for improvement by MSB as funds become available. Design has been done on sections of the Point MacKenzie access road, Burma Road and South Big Lake Road and the MSB is moving ahead with ROW acquisition and construction working from the port area northward.

Corridor 9 – This corridor is coincident with Corridor's 7, 8 and 11 leaving the port area and following the Point MacKenzie access road north to the Little Susitna access road. From that point, Corridor 9 goes to the northeast and is positioned roughly half-way between Corridor 8 and Corridor 10. The corridor passes through a large amount of private property and connects with the Parks Highway Corridor at Pittman Road.

Corridor 10 – This corridor follows the Point MacKenzie access road and Knik-Goose Bay Road to the Parks Highway in Wasilla. This corridor was carried forward as the "no build" alternate in that it is the current access to Port MacKenzie and would continue in that role if no other action were taken. This facility has the capacity to handle the projected increases in traffic generated by Port MacKenzie and is already programmed for improvements by ADOT&PF and by the MSB. This corridor does not serve to keep increases in freight traffic away from the Wasilla urban area, rather it draws additional traffic into the heart of the Wasilla area.

Corridor 11 – This corridor is not new but an aggregate of Corridor's 5 and 6. This corridor was approved by the MSB assembly in 1992.

Each of these corridors, including variations, has been studied as part of the 1982 Knik Arm Crossing and other subsequent studies. This project began with the team going to the public initially to state, "this is what has been studied to date and please tell us your views on any or all of the alternatives."

During the initial public meeting there was strong public sentiment expressed that the routing selected for either a road or a railroad should be one that minimized the need to take private property. Following this meeting, the team initiated a constraint analysis and used that technique to adjust and/or eliminate alternates. The primary constraints turned out to be private property and wetlands. Obviously there are a number of socioeconomic impact issues associated with development of a major transportation corridor through an established community, even one with the rural to semi-rural characteristics of the Big Lake area of the Mat-Su Borough. Figure 2 shows the original corridors and boundary of the study area.

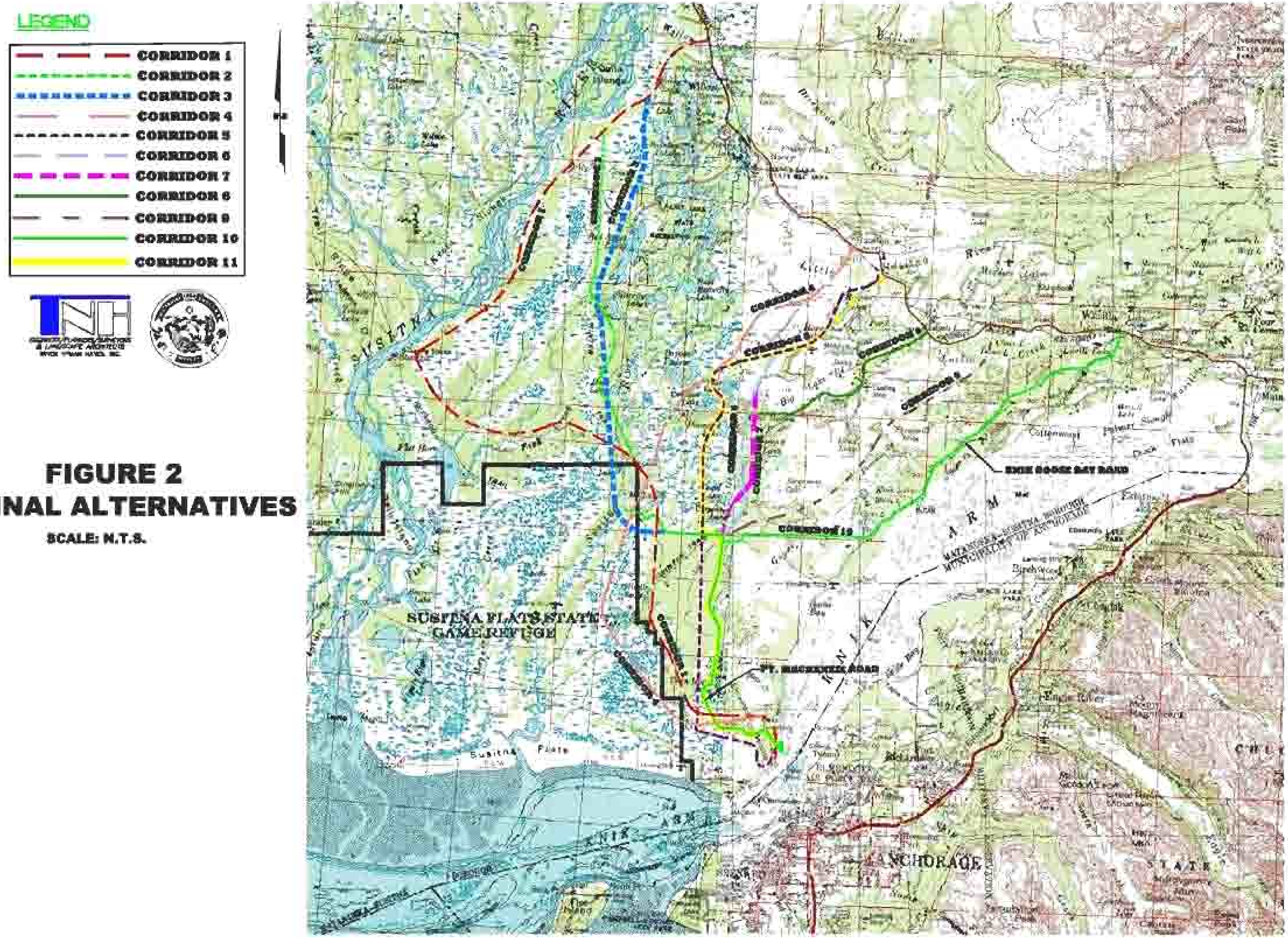


FIGURE 2
ORIGINAL ALTERNATIVES

SCALE: N.T.S.

As a result of the constraint analysis the number of alternates was significantly reduced and additional analysis was done on each of those remaining. The remaining corridors were:

Corridor 3 – This corridor was modified from the original so that as it left the port area the alignment shifted to the west near but outside of the SFGR boundary then extending north to cross the Little Susitna River, following a moraine deposit north on a line west of Red Shirt Lake and the boundary of the Nancy Lake Recreation Area (NLRA), crossing Willow Creek and connecting with the Parks Highway/ARRC corridor north of Willow Creek. Although Corridor 3 was viewed as a rail only corridor at this point, discussions with the MSB staff it was determined that this corridor width should be planned as a multimodal corridor providing sufficient ROW width for highway, rail, pathway and a full range of utilities. The suggested width for this corridor was determined to be 800 feet. Much of this corridor is public land, although it is a mix of borough, state and federal with some private land mixed in. Much of the private land is located immediately north of Point MacKenzie and near Willow Creek. The highway element of the corridor was included to provide a location for an alternate to the Parks Highway should the Knik Arm Crossing be constructed. This corridor received considerable public support at the second public meeting and there were numerous comments recommending that a roadway be included in the corridor.

Corridor 4 – This corridor was modified from the original to avoid conflicts with the SFGR and minimize the impact of private property. The trade off to private property impacts for this alignment was to maximize the amount of wetland area impacted. As modified, Corridor 4 left the port area northward following the Point MacKenzie access road north to the Little Susitna River Access Road, then followed the Little Susitna Access Road westerly about one mile turning north to follow a section line alignment west of Carpenter Lake, leaving the section line to pass immediately west of Diamond Lake and between Crooked Lake and Flat Lake then moving north of Horseshoe Lake across large wet areas to connect with the Parks Highway corridor at Houston. The wetland areas west and north of Horseshoe Lake average 8 to 10 feet of organic soils over competent material according to data obtained from MSB for roadway improvements recently constructed in adjacent areas. This corridor was, for a time considered as potentially a combined roadway/ railway corridor. This corridor received considerable opposition at the second public meeting and was ultimately dropped due to the adverse public reaction and the amount of wetlands impacted.

Corridor 5 – This corridor remained much as discussed earlier. Analysis of the alternate suggested that it provided a reasonable balance between wetland impacts and private property impacts. It followed very closely an alignment approved by the MSB Assembly in 1992 and was presented at the second public meeting as roadway only. Based on input received during the second public meeting Corridor 5 was subsequently dropped from further consideration based on adverse public reaction, the amount of private land that would have been needed and the still significant level of wetland impacts.

Corridor 7 – This corridor originates at the port and follows the Point MacKenzie Access Road north, crossing the Little Susitna River Access Road, following and realigning portions of the Burma Road to connect with the South Big Lake Road and then following South Big Lake Road east through the community of Big Lake to connect with the Parks Highway. This corridor was presented as roadway only that was deliberately designed to take advantage of roadway improvements already under design and/or ROW acquisition. With this approach, Corridor 7 appeared to have the least private property impacts and limited wetlands impacts. It also appeared to have the least construction costs of any alternative other than the No-Build. This corridor received good support at the second public meeting although not overwhelming.

Corridor 10 – This corridor, as previously stated, followed the Point MacKenzie Access Road north to connect with Knik-Goose Bay Road then followed Knik-Goose Bay Road to the Parks Highway in Wasilla. It was presented as a roadway option only and as the “No-Build” option in that it is the current roadway access to the port. Knik-Goose Bay Road is a state facility and is included in the STIP for improvement. The primary drawbacks to this alternative is that it brings all of the port traffic into and through the Wasilla urban area with all of the associated traffic and safety issues and it would involve nearly 10 miles of additional travel for all truck haul materials with an origin or destination north of Big Lake. Overtime that constitutes a significant increase in vehicle miles travels with the associated impacts on air quality both from additional travel and additional delays in passing through the more congested Wasilla urban area. This corridor did receive significant support during the second public meeting.

LEGEND

CORRIDOR 3 (RAILROAD)

CORRIDOR 4 (RAILROAD AND ROADWAY)

CORRIDOR 5 (RAILROAD AND ROADWAY)

CORRIDOR 7 (ROADWAY)

CORRIDOR 10 (ROADWAY)

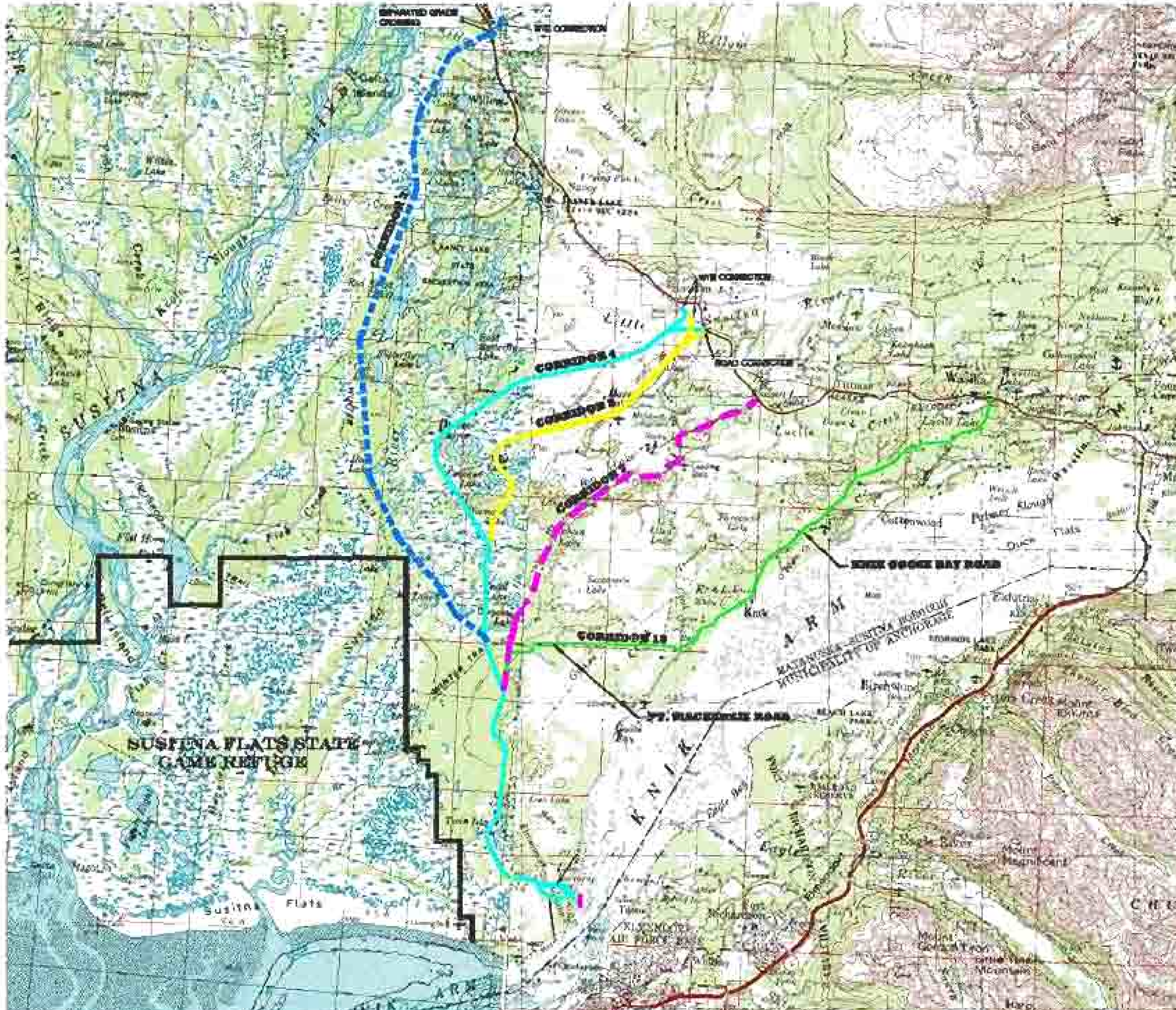


FIGURE 3
CURRENT ALTERNATIVES

SCALE: N.T.S.

Following the second public meeting, November 20, 2002, an analysis of public input, functionality, and potential environmental consequences a decision was made to narrow the alternates down to two corridors as follows:

Corridor 3 – This would be the railroad alignment, however, the ROW reserved for the corridor should be 800 feet wide to accommodate a highway, pathways, and utilities.

Corridor 7 – This would be roadway only access and would serve as the vehicular access until the Knik Arm crossing is built. Selection of this alternate eliminates the need for an entire new roadway corridor through areas that are felt, by the area residents, to be sensitive.

Figure 4 shows the recommended routes by corridor.

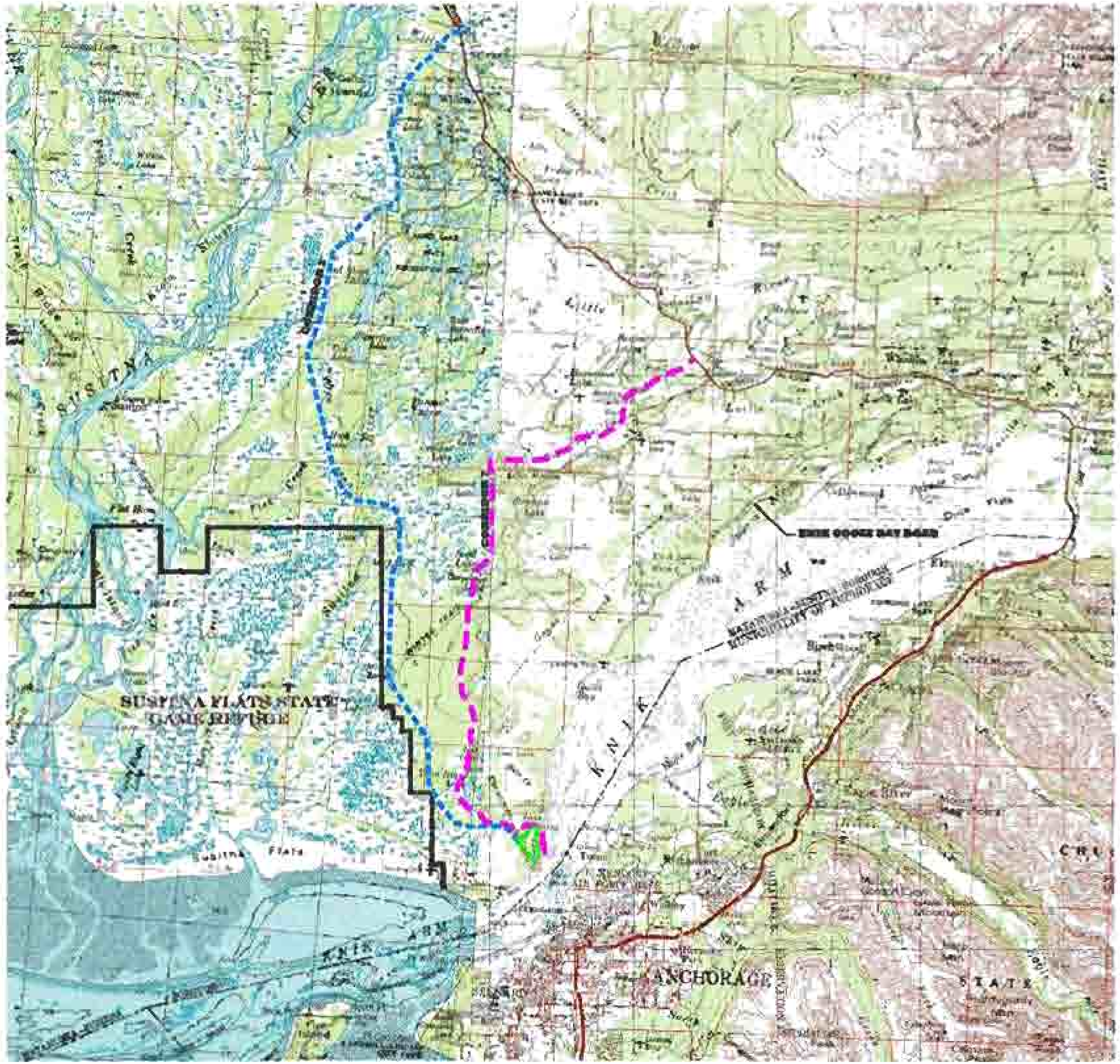
LEGEND

CORRIDOR 3

CORRIDOR 7

FIGURE 4
CORRIDORS 3, AND 7

SCALE: N.T.S.



2.2 Field Reconnaissance and Baseline Geotechnical Engineering Report

The purpose of the report was to compile existing subsurface information along the various proposed corridors, to verify the accuracy of this information by ground proofing in the field, and provide baseline geotechnical observations regarding the constructability of a new rail spur along two corridors: East and West. The primary goal of the report was to determine the correlation of existing, mapped soils with observed soil conditions in the field. Field reconnaissance was conducted during three different times. The first exercise was conducted May 31, 2002 along the proposed East corridor; the second from November 5th to 9th along the southern two-thirds of the West corridor; and January 14, 2003, along the remaining northern section of the West corridor.

The report concluded that the literature sources and observations made in the field reconnaissance are in good agreement. According to the report, there is a strong correlation between hydric soils from the NRCS survey and deposits delineated in the ADOT study as organic deposits and other low-lying, potentially silty deposits like marine, glaciomarine, fluted and lowland tills, and abandoned floodplains. Observations made during the field reconnaissance agree strongly with the existing literature in that many of the low-lying areas are poorly drained and (especially in the northern and western extents of the East corridor) in these areas, many lakes and peat bogs have formed. The report also found that while the correlation between the literature sources and the field observations was generally good, observations made in the field suggest a weaker correlation in specific areas. These weaker correlations occur in the extreme north and west portions of the study area, specifically along the West corridor.

The geotechnical reconnaissance report (Appendix G) includes photographs representative of the soil conditions that may be expected throughout the area.

Once preliminary studies have been completed, more extensive subsurface exploration should be conducted in the design phase of the project.

2.3 Archeological and Historic Resources Summary

Previous Research

Throughout the study area, there have been numerous cultural resource inventories and reconnaissance studies dating from 1930 to the present. A complete analysis of previous research is in Appendix H, Cultural Resources.

Prehistoric and Historic Cultural Sequence

The Alaska Heritage Resource Survey (AHRS) sites recorded thus far in the vicinity of the two proposed transportation corridors consist of 43 separate entries representing primarily two types of sites: standing buildings or ruined cabin sites, and clusters of large and small depressions most of which are the remains of traditional Native dwellings and cache pits. In the identified constraint analysis, these cultural resources were avoided.

2.4 Commodities Study Summary

The Rail Corridor Commodity Flow study includes descriptions and market analysis of the types and quantities of goods that could pass through Port MacKenzie. The purpose of the study was to assess the volume of goods and materials that might move across the port if a rail link were available connecting the port with the Alaska Railroad main line near Willow or Houston.

Low, base and high case forecasts for the state and region were used to guide the assessment. These forecasts came from the Institute of Social and Economic Research (Scott Goldsmith, 2001).

Low	Base	High
✓ Paved road to Port MacKenzie by 2005. Rail link established by end of study period	✓ Paved road to Port MacKenzie by 2003. Rail corridor established and operations commence about 2015	✓ Paved road access to Port MacKenzie by 2003. Rail service commences about 2010
✓ Electricity and gas available at Port MacKenzie	✓ Electricity and gas available at Port MacKenzie	✓ Electricity and gas available at Port MacKenzie
✓ Port of Anchorage expands to handle anticipated cargo, cruise ship traffic through 2020	✓ Port of Anchorage has limited expansion of cargo handling capabilities and reaches limit of cargo capacity before 2020	✓ Port of Anchorage has limited expansion of cargo handling capabilities and reaches limit of cargo capacity before 2020
✓ No direct transportation link across Knik Arm between Anchorage and Point MacKenzie	✓ Ferry service links Port MacKenzie and the Port of Anchorage	✓ Bridge links Point MacKenzie and Anchorage about 2010
	✓ There is no Knik Arm bridge, hence no change in rail or highway access between the MSB and Anchorage	✓ Highway access to the MSB via Knik Arm bridge.
	✓ A fuel pipeline from Port MacKenzie to the POA is constructed late in the study period	✓ Spur from natural gas pipeline to the Lower 48 states serves Port MacKenzie
		✓ Air cargo handling operations at Anchorage International Airport shift to new airport at Point MacKenzie

Under the base and high case scenarios, the prospects for some economic development and significant cargo handling seem likely for Port MacKenzie by 2020. Below is the commodity flow summary for various development scenarios for Port MacKenzie in 2020.

Commodity	Base	Low	High
Petroleum and Chemicals (thousands of short tons)	870	50	2608
Cargo Containers	0	0	0
Wood Products (thousands of dry tons)	300	200	400
Coal (thousands of short tons)	800	200	1500
Sand and Gravel (thousands of short tons)	800	200	2000
Oil Field Modules	1	0	3
Manufactured Homes	98	45	147
Selected Minerals	0	0	0
Natural Gas	0	0	12

* Data relative to Coal, Sand and Gravel, and Oil Field Modules provided by the Port MacKenzie Manager subsequent to completion of the Commodities Flow Study.

2.5 Review of Design Criteria

Design criteria have been selected for the rail line and for two classes of roadway, a two-lane rural highway and a four-lane divided rural highway. The design criteria selected for the rail line conform to AREMA and to the design criteria controlling the design of current Alaska Railroad track improvement projects. The design criteria selected for both roadway sections conform to AASHTO and ADOT&PF requirements for the respective class of facility.

The table below describes the design criteria used for analyzing a future two-lane highway, a future four-lane highway, and a future railroad.

Table 2-1
Design Criteria for Matanuska-Susitna Borough Rail Corridor Study

ROAD NAME:	FUTURE TWO LANE HIGHWAY	FUTURE FOUR LANE HIGHWAY	FUTURE RAILROAD
DESIGN YEAR:	N/A	N/A	2025
PRESENT ADT (& YEAR):	NONE (5,000 TO 20,000 FUTURE ADT	NONE (20,000 TO 40,000 FUTURE ADT)	0-NO RAIL LINE
DESIGN YEAR ADT (& YEAR)	TO BE DETERMINED	TO BE DETERMINED	TO BE DETERMINED
DESIGN SPEED:	65 MPH	65 MPH	60 MPH
MINIMUM LANE WIDTH:	12 FEET	12 FEET	N/A
MINIMUM NUMBER OF LANES (EACH WAY):	ONE	TWO	N/A

MINIMUM SHOULDER WIDTH (INSIDE & OUTSIDE):	10 FEET	10 FEET	N/A
MINIMUM HORIZONTAL RADIUS:	1660 FEET (WITH SUPERELEVATION)	1660 FEET (WITH SUPERELEVATION)	N/A
MAXIMUM GRADE FOR DESIGN SPEED:	4%	4%	N/A
STOPPING SIGHT DISTANCE:	645 FEET	645 FEET	N/A
PASSING SIGHT DISTANCE:	2285 FEET	2285 FEET	N/A
MAXIMUM SUPERELEVATION:	6%	6%	N/A
TYPE OF TERRAIN:	ROLLING	ROLLING	N/A
RATE OF VERTICAL CURVATURE:	SAG 157	SAG 157	
	CREST 193	CREST 193	N/A
SIDE SLOPE RATIOS:	FORESLOPE 3:1	FORESLOPE 5:1	
	BACKSLOPE 3:1	BACKSLOPE 5:1	N/A
ILLUMINATION:	NEW LIGHTING SYSTEM AT SELECT INTERSECTIONS	NEW LIGHTING SYSTEM AT SELECT INTERSECTIONS	NEW LIGHTING SYSTEM PORT LOOP TRACK ONLY
DESIGNER/CONSULTANT:	NORM GUTCHER-TRYCK NYMAN HAYES	NORM GUTCHER-TRYCK NYMAN HAYES	TED TRUEBLOOD – TRYCK NYMAN HAYES
APPROVED BY:	MAT-SU BOROUGH	MAT-SU BOROUGH	ARRC
DESIGN LOADING:	N/A	N/A	E-80
RULING GRADE:	N/A	N/A	N.B/S.B. 0.5% (ULTIMATE MAX 1%)
MINIMUM RADIUS OF CURVE:	N/A	N/A	2.0 DEGREES MAINLINE=2864.93 FEET (5.0 DEGREES WYE CONNECTION TO MAINLINE AND 7.5 DEGREES FOR PORT LOOP TRACK
RAILS/TIES:	N/A	N/A	141 LB TIE: CONCRETE
SIDING:	N/A	N/A	6,200 FEET CLEAR SIDING EVERY 10 MI UPGRADE WILLOW SIDING AT CONNECTION TO MAINLINE POWER SWITCHES WITH ABS & CTC
NUMBER OF TRACKS:	N/A	N/A	1 PLUS SIDING @ 10 MI INTERVALS
DEGREE OF ACCESS CONTROL:	PARTIAL	PARTIAL	GRADE SEPARATE ALL ROAD AND TRAIL SYSTEM CROSSINGS OUTSIDE OF PORT AREA

2.8 Rail and Vehicular Traffic Analysis Summary

The traffic estimates complied for this report are directly derived from Northern Economics, Inc. (NEI) *Rail Corridor Commodity Study*, dated September 2002, the *Knik Arm Crossing Draft Environmental Impact Study* by ADOT&PF, dated August 1984 (KAC ADOT&PF 1984 study), assumptions on traffic movement and existing traffic counts. The economical land based modes of transportation viable for commodities and general public travel to and from the proposed Port MacKenzie development are by roadway and/or railroad. The origin for most commodities exported through the Port is expected to be from within the Mat-Su Borough (MSB) for the short-term condition. As development continues within the state of Alaska, specifically the interior and northern regions, additional commodities are expected to contribute to the exporting progression at Port MacKenzie. Many of the exports would be nationally and internationally bound. A portion of the exports would be bound intrastate.

Traffic with a trip end at Port MacKenzie will primarily fall into three categories:

1. Employees of the port and/or associated businesses maintaining facilities at Point MacKenzie.
2. Freight moving into or out of Port MacKenzie. This may be freight moving by either truck or rail.
3. Commuter traffic. Without either a bridge or a ferry system, there will be virtually no commuter traffic. The proposed ferry system is expected to bring additional vehicles through the port area, depending on the trip frequency and other factors.

The primary focus of the study is the movement of freight into and out of the port area. The NEI study identified several possible bulk commodities with associated quantities that could be exported through Port MacKenzie up to the study period of 2020. The commodity flow through the Port is presented in Table 1 from the executive summary of the NEI report. The commodities listed are petroleum and chemicals, cargo containers, wood products, coal, sand and gravel, oil field modules, manufactured homes, select material and natural gas. The NEI report identified these commodities as possible exports, however, market conditions will ultimately dictate which materials will move through the Port and in what quantities. The NEI report listed commodities and their associated quantities based on a low, high and base level of development. Imports identified by the NEI report are containerized cargo, petroleum products and logs. These imports were only considered and not realized as potential goods that would be transported into the MSB. No commodities were identified within the study period as import commodities, however, future market conditions will determine when commodities will begin to move through the Port.

Table 2–2
Traffic Volume
Based on Bulk Commodity Flow and Port Commuters

CASE I

	Train	Vehicle			
		Trucks (per/day)	**Commuters (per/day)**	**Other (per/day)**	**TOTAL (trips/day)**
Wood Products	n/a	54	12	n/a	**66**
Gravel Products	n/a	22	8	n/a	**30**
Manufactured Homes	n/a	14	22	n/a	**36**
Ferry Transport	n/a	see note[1]	1056	n/a	**1056**
Petroleum Products	n/a	n/a	n/a	n/a	n/a
TOTAL (Trips/day)		**90**	**1098**		

CASE II

	Train	Vehicle			
	Cars (loads)	**Trucks (per/day)**	**Commuters (per/day)**	**Other (per/day)**	**TOTAL (trips/day)**
Wood Products	(per/week) 187	111	32	n/a	**143**
Gravel Products	(per/mo) 6	11	12	n/a	**23**
Manufactured Homes	n/a	14	45	n/a	**59**
Ferry Transport	n/a	see note[1]	2108	n/a	**2108**
Petroleum Products	(per/day) 96	n/a	14	n/a	
TOTAL (Trips/day)		**136**	**2211**		

Notes:
1 Commuter counts would have to be converted to truck counts.
Case I - Occurs within 1 to 5 years of 2003
Case II - End of study timeline, year 2020

The commodities likely to be moved through Port MacKenzie will initially be moved exclusively via truck using existing or improved roadways and by conveyor system within the Port District for sand and gravel. Port employees for the various export businesses and dock operations will travel to work by this new or improved roadway. Without implementation of the Knik Arm Crossing project, anticipated vehicular volumes are in the range of 2,350 vehicles/day with an estimated 6% of the vehicles being trucks. These volumes are well within the capacity range of a two-lane rural arterial road.

Completion of the rail spur and the need to expand beyond the local area for resources, such as wood and gravel, will promote rail transport to the Port instead of truck haul. Commodities that would most likely be transported exclusively by rail are petroleum products from the North Pole refinery and potentially coal from the established Usibelli Mines and the Wishbone Hill Mine. In addition, future mining of select minerals from interior Alaska could also be transported by the rail to the Port.

The potential for petroleum products being transported to and through Port MacKenzie is included in the recognition of the current, relatively limited space available in the Port of Anchorage for expansion of existing tank farms. The residents of the Government Hill area of Anchorage for years have been actively urging relocation of the existing tank farms. These objections, coupled with limited land availability may make Port MacKenzie an attractive alternate for additional tankage with a pipeline under water across Knik Arm to connect with the existing tankage and distribution system in Anchorage. Should these changes occur, the nearly daily petroleum train from the North Pole refinery could off-load at Port MacKenzie instead of in Anchorage.

Wood Chips seems to be the most likely significant bulk commodity with a potential for export through Port MacKenzie at this time. The Commodities Study prepared by Northern Economics provides estimated tonnage of chips, these figures have been used to generate estimates of rail car and/or truck loads of chips. The tables included above suggest that initially approximately 54 truck loads per day may be expected while late in the 20 year planning period the volume may be expected to increase to an estimated 187 railcars per week and 111 truck loads per day. This would equate to two trains per week in addition to the truck traffic. It should be noted that Port MacKenzie has negotiated agreements with a chip exporter to begin the export of chips as soon as the loadout facilities can be constructed. The Port is moving ahead with design of an extension of the existing barge dock that will allow moorage of deep draft vessels suitable for chip export and that a conveyor load out facility is also being planned.

Gravel products are thought to be a long-term possibility for export. The Port controls sizable deposits of sand and gravel suitable for construction and feels there are opportunities to mine and export those materials. Doing so will not generate traffic into the port area other than the employees involved in the mining and export operations. As development continues in South Central Alaska, the need for sand and gravel construction materials will grow while the development will tend to occupy the surface of deposits. The net effect may be that in the longer term, these materials may be brought from deposits further afield.

Manufactured Homes is an existing industrial use at Point MacKenzie today. The presence of this industry brings raw materials by truck to Point MacKenzie, estimated at 14 truck loads a day. This is expected to remain static over time. The plant is not currently operating full time. The feeling is that as demand increases, they will respond by increasing the number of days of operation and that the material deliveries will remain at about the same level on a daily bases, but experiencing a net increase in the number of days of operation.

Ferry Transport is a very likely function for Port MacKenzie. The MSB is currently moving ahead with planning, environmental studies and design of a prototypical vessel and with the terminal facilities for both Port MacKenzie and Anchorage. Operations could begin in two to three years but are subject to availability of funding.

These activities are felt to be the predominate trip generators involving Port MacKenzie during the next 20 years. The Traffic and Circulation Study used the projected movement of goods and people to generate anticipated rail and vehicle trips included in the tables above. This information was used as input to the selection of design criteria for both the railroad and the roadway elements of the project.

2.9 Right-of-Way Costs

Corridor 3

The Right-of-Way for Corridor 3 impacts seven different types of property ownership as determined by the study team in a detailed analysis. These property types are listed on the following page with the heading of PROPERTY COST FOR RIGHT OF WAY ACQUISITION OF CORRIDOR 3. The cost of property for the local area of Corridor 3 was based on sale prices for comparable parcels in and around the project area and includes pricing for several area sizes and improved/unimproved land values. The specific area of the matrix relating to Corridor 3 is T14N to T17N of 05W. In general, the cost of each property increases as the property size decreases. The information describes the cost of property per property size and location versus the property type. The complexity involved in estimating land values exceeded the level of effort planned for this element of the work, therefore an assumption was made to provide average land costs by property type.

The majority of the 4556 acres Corridor 3 will impact is publicly held. This includes the 'N/A or No data' property that is most likely held by a public entity. The cost to acquire these public lands will presumably be on a non-cash basis where property is exchanged for compensation or some other formal agreement is made between the public entities. This would require the developing entity of Corridor 3 be a public entity with sufficient land holdings.

Based on the available data determined from this study, assumptions were made to calculate the property costs for Corridor 3.

- Private property and Native property will be purchased on cash basis.

- All property excluding private and Native will be acquired through land swaps rather than through direct purchase.
- The cost of private property per acre will be based on values shown in Table 2-3. The cost will be an average of improved land versus unimproved land and an average of the five-acre cost and the 100-acre cost. This is based on impacted areas comprising of a combination of large parcels and smaller residential lots.

Calculations:

Unimproved land
5 acres = $6152 per acre & 100 acres = $500 per acre
Average = $3326 per acre

Improved land
5 acres = $29,638 per acre & 100 acres = $41 per acre
Average = $14,840 per acre

Combined Average of above averages = $9083 per acre

Corridor 7

The Right-of-Way for Corridor 7 also impacts seven different types of property ownership. These are the same property types as listed on the page with heading of PROPERTY COST FOR RIGHT OF WAY ACQUISITION OF CORRIDOR 3. The cost of property for the local area of Corridor 7 was based on the sale prices for comparable parcels in and around the project area and includes pricing for several area sizes and improved/unimproved land values. The specific area of the matrix relating to Corridor 3 is T14N to T17N of 05W. In general, the cost of each property increases as the property size decreases. With Corridor 7, the majority of the ROW acquisition will be strips of land rather than an entire parcel. This tends to also increase the per acre price. The information presented describes the cost of property per property size and location versus the property type. The complexity involved in estimating land values exceeded the level of effort planned for this element of the work, therefore, an assumption was made to provide average land costs by property type.

The majority of the ROW for Corridor 7 is already owned by the MSB or ADOT&PF because the route follows existing facilities and lies largely within existing ROW. The strip takes from private property that will be required and is estimated at 180 acres. Corridor 7 will impact largely privately held land, although there also is some publicly held land. The large ROW costs for this corridor will be the New Burma Road segment and the 2.2 miles of South Big Lake Road planned for total realignment. The ROW costs for these two sections are excluded from the figures presented in this report because that ROW has already been acquired or is programmed for acquisition during 2004 - 2005. The estimates do not include any ROW costs for the section from Big Lake to the Parks Highway either, as it appears that any proposed improvements would be easily contained within the existing ROW in this section. The cost to acquire any public lands will presumably be on a non-cash basis where property is exchanged for compensation or some other formal agreement is made between the public entities.

Based on the available data determined from this study, assumptions were made to calculate the property costs for Corridor 7.

- Private property and Native property will be purchased on cash basis.
- All property, excluding private and Native, will be acquired through land swaps rather than through direct purchase.
- The cost of private property per acre will be based on values shown in Table 2-3. The cost will be an average of improved land versus unimproved land and an average of the one-acre costs. This is based on impacted areas comprising of strip takes off of existing developed and undeveloped land.

Calculations:

Unimproved land
1 acre = $11,308 per acre

Improved land
1 acre = $50,810 per acre

Combined Average of above averages = $31,059 per acre

Table 2-3
Mat-Su Corridor
Estimated Cost by Parcel Size
11/11/02

UNIMPROVED LAND VALUES

TOWNSHIP	RANGE	<= 1 ACRE	<= 5 ACRE	<= 10 ACRE	<= 20 ACRE	<= 50 ACRE	<= 100 ACRE	>= 100 ACRES	> = 300 ACRES
T16N	03W	$ 7,938.00	$ 6,759.00	$ -	$ -	$ 674.00	$ 550.00	$ -	$ -
T17N	03W	$ 14,747.00	$ 6,247.00	$ 3,197.00	$ 2,307.00	$ 1,701.00	$ 3,689.00	$ 7,863.00	
T18N	03W	$ 10,320.00	$ 6,442.00	$ 3,742.00	$ 2,154.00	$ 1,180.00	$ 711.51	$ 476.00	
T14N	04W	$ 6,095.00	$ 9,298.00	$ 6,921.00	$ 2,723.00	$ -	$ 619.00	$ -	$ 203.00
T15N	04W	$ -	$ 2,041.00	$ -	$ 708.00	$ -	$ 630.00	$ -	$ 187.00
T16N	04W	$ 11,853.52	$ 6,336.05	$ 2,065.00	$ 2,202.00	$ 118.52	$ 715.89	$ -	$ 578.00
T17N	04W	$ 27,932.00	$ 8,433.90	$ 3,716.50	$ 2,978.07	$ 1,694.47	$ 1,286.08	$ 525.12	$ -
T18N	04W	$ -	$ -	$ -	$ -	$ -		$ 2,290.60	$ 1,010.60
T14N	05W	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
T15N	05W	$ -	$ -	$ -	$ -	$ -	$ -	$ 500.08	$ -
T16N	05W	$ 4,285.71	$ -	$ -	$ -	$ 459.08	$ 400.16	$ -	
T17N	05W	$ 18,330.59	$ 6,152.95	$ 800.00					
	AVERAGE	**$ 8,458.49**	**$ 4,309.16**	**$ 1,703.46**	**$ 1,188.37**	**$ 529.73**	**$ 860.16**	**$ 1,059.53**	**$ 247.33**

IMPROVED LAND VALUES

TOWNSHIP	RANGE	<= 1 ACRE	<= 5 ACRE	<= 10 ACRE	<= 20 ACRE	<= 50 ACRE	<= 100 ACRE	>=100 ACRES	> = 300 ACRES
T16N	03W	$ -	$ 88,742.00	$ -	$ -	$ 1,771.00	$ -	$ 158.24	$ 357.80
T17N	03W	$ 137,689.00	$ 52,852.00	$ 17,459.00	$ 10,038.00	$ 5,309.00	$ 1,860.00	$ 114.00	$ -
T18N	03W	$ 66,364.00	$ 37,130.00	$ 12,592.00	$ -	$ -	$ 2,056.00	$ -	$ -
T14N	04W	$ 46,773.00	$ 24,922.00	$ 4,555.00	$ -	$ 1,305.00	$ -	$ 405.00	$ 432.00
T15N	04W	$ -	$ 10,265.00	$ -	$ 7,364.00	$ 1,556.00	$ -	$ 486.00	$ 484.00
T16N	04W	$ 50,819.00	$ 23,342.00	$ 125,278.00	$ 4,812.00	$ 2,340.00	$ 1,285.00	$ 666.00	$ -
T17N	04W	$ 194,867.63	$ 107,508.00	$ 13,828.59	$ 7,024.00	$ 5,092.00	$ 1,112.00	$ 1,206.00	$ -
T18N	04W	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
T14N	05W	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 158.00
T15N	05W	$ -	$ -	$ -	$ -	$ -		$ 358.00	$ 203.00
T16N	05W	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
T17N	05W	$ 50,810.81	$ 29,638.40	$ -	$ -	$ -	$ -	$ 41.52	$ -
	AVERAGE	**$ 45,610.29**	**$ 31,199.95**	**$ 14,476.05**	**$ 2,436.50**	**$ 1,447.75**	**$ 573.91**	**$ 286.23**	**$ 136.23**

2.10 Construction Costs

Conceptual level project costs were estimated for each of the five alternatives presented at the second public meeting, November 20, 2002. However, these costs were not used as a major decision factor in selecting the recommended alternatives. The alternatives presented at that meeting included a number of differences that made a fair cost comparison unrealistic. For example, Corridor 3 was railroad only. Corridors 4 and 5 were presented as rail only or as both road and rail, and Corridor 7 and 10 were presented as roadway only.

Differences between the alternatives that significantly impacted costs included length, the amount of wetlands crossed, the amount of private property crossed and the amount of new construction versus the amount of reconstruction of an existing facility. Construction costs were estimated based on unit prices applied to estimated quantities. Earthwork, the single largest cost item, was estimated by creating a Digital Terrain Model based on available topographic data and superimposing horizontal and vertical alignments together with typical sections. Schematic drawings were prepared for each of the bridges. Culverts were estimated based on available data for local streams plus providing relief culverts at appropriate locations. Base and sub base materials were estimated based on neat line calculated volumes with appropriate unit weights applied to convert to weight. Unit prices experienced by ADOT&PF and by ARRC on recent projects were applied to the estimated quantities to develop estimated costs.

The Railroad work, Corridor 3 (43.7 miles in length) was estimated at a total project cost of $165,825,000.

The costs for the Railroad include $14,338,000 for track work within the Port MacKenzie uplands area. These costs also include $3,524,000 for an additional siding on the mainline at the location where the spur track joins the mainline. These costs include grade, sub-ballast, ties, rail, power switches, controls and signals, bridges and culverts, and separated grade crossings.

The roadway work was estimated in three sections as follows:

• Point MacKenzie Access Road (13.3 miles)	$ 25,372,000
• Burma Road (6.6 miles)	$ 16,822,000
• South Big Lake Road (10.7 miles)	$ 28,100,000
Total estimated project cost for roadway improvements	$ 70,294,000

The costs estimates included here include the following:

- Estimated cost of construction with contingency
- Preliminary Engineering
    - Environmental Clearance
    - Surveying and Mapping

- Geotechnical Investigations
- Design
- Preparation of Plans, Specifications and Estimates
- Assistance with the Bid Process

- Construction Administration
- Utility Relocation
- Right-of-Way Acquisition

The details of the cost estimates are included in Appendix C.

2.11 Review of Agency Issues

An agency meeting was held at the beginning of the study in May 2002 to introduce the study objectives, review past studies, present the schedule and to identify issues. Local, state, and federal resource agencies were invited. Below is a table summarizing the attending agency issues:

Agency	Issues
Alaska Railroad Corporation	✓ Consider double track design ✓ Consider more than just access to the Port; look at signalization, crossings, trails network, and expansion of Wasilla community
City of Wasilla	✓ Consider trail and road corridors accommodating utilities ✓ Limit access and driveways to "new" road ✓ Consider wider corridor options
ADOT&PF	✓ Updated group on the regional transportation planning authority currently considering the Knik Arm Crossing
U.S. Army Corps of Engineers	✓ Stay out of the wetlands ✓ Keep corridor as narrow as possible ✓ Look at the whole project – no "piece-mealing" ✓ Prepare for mitigation ✓ Consider practicable alternatives once the NEPA process commences
Alaska Department of Fish and Game	✓ Mitigate impacts to wetlands ✓ Fish passage is very important: bridges versus culverts

	✓ No piece-mealing ✓ Consider Goose Bay habitat
Matanuska-Susitna Borough	✓ Trails will be very important ✓ Looking at immediate need to replace Knik Goose Bay Road ✓ Existing roads could be upgraded to design speed and used as part of the system ✓ New road will be part of National Highway System ✓ Need to work with ARRC and ADOT&PF on appropriate design criteria

Several federal, state, and local permits and approvals may be required before either a new rail or road access project could be initiated. The majority of federal, state, and local permitting processes require public review and solicitation of public comment. Some permits require public notification for review of a proposed project, while other permits, primarily local government permits, require public hearings within the community that could be affected.

2.12 Federal Requirements

Federal regulatory and permitting requirements described in this section include:

- National Environmental Policy Act (NEPA).
- Environmental and Section 4(f) DOT Documentation – Administered by the Federal Railroad Administration (FRA).
- National Pollutant Discharge Elimination System (NPDES) – Administered by the U.S. Environmental Protection Agency (EPA).
- Spill Prevention, Control and Countermeasure (SPCC) – Administered by the EPA.
- Section 106 National Historic Preservation Act – Administered by the State Historic Preservation Office (SHPO).
- Section 401 and 404 of the Clean Water Act– Administered by the U.S. Army Engineer District, Alaska (COE).
- Section 7 of the Fish and Wildlife Protection Act – Administered by the U.S. Fish and Wildlife Service (USFWS).
- FLPMA--Grant of Right-of-Way – Administered by the BLM.
- Executive Order (EO) 11988 – Floodplain Management
- EO 11990 – Protection of Wetlands
- EO 12898 – Environmental Justice

- EO 13084 – Government to Government Coordination

National Environmental Policy Act (NEPA): NEPA (Public Law 91-190, 42 USC 4321 et seq.) establishes policy, sets goals, and provides means for carrying out the policy of protecting the nation's environment. The Council on Environmental Quality (CEQ) in 1978 issued regulations to implement the procedural provisions of NEPA (40 CFR Parts 1500-1508).

Because the proposed project includes a federal action that could significantly affect the human and natural environment, it requires consideration under NEPA. "Federal actions" include projects and programs entirely or partially "financed, assisted, conducted, regulated, or approved by federal agencies." The proposed railroad track realignment is partially funded by federal funds, and would involve federal lands and numerous permits and approvals from federal agencies.

NEPA requires the designation of a federal lead agency to oversee preparation of the EA and to issue the Decision Record; for this project, the lead agency would likely be FHWA or FTA.

Section 4(f) Documentation: A Section 4(f) evaluation must be prepared for each location within a proposed project before the use of Section 4(f) lands can be approved (23 CFR 771.135(a)). Section 4(f) applies to recreational lands managed by the BLM, National Park Service, National Wildlife Refuge System, and determinations of adverse effects for Wild and Scenic Rivers. Lands subject to 4(f) evaluation include sites eligible for the National Register of Historic Places (NRHP) and any significant, publicly-owned recreation area, public park, or waterfowl or wildlife refuge.

COE Section 401 and 404 Permit Requirements: COE permits anticipated for the proposed project include:

- COE Section 401 Permit, which is required when the project includes the potential to affect water quality.

- COE Section 404 Permit, which is required when the project includes the potential for filling, construction, or placement of structures in wetlands and waters of the United States.

SHPO Section 106 Consultation: Section 106 Consultation, required by the National Historic Preservation Act, assesses the potential impacts of the project to cultural resources. The consultation is conducted by Alaska's SHPO in the Office of History and Archaeology, in conjunction with the review of the Section 404 Permit by federal resource agencies.

Section 106 is a requirement of the federal land manager for any federal land crossed. The land manager must present the Proposed Action and discuss potential impacts on cultural resources. Mitigation measures to reduce or lessen the impacts on cultural resources must be provided by the land manager. The SHPO reviews the documentation and either agrees with the plan or provides comments otherwise. The latter may require a follow-up meeting with the SHPO and agreements to modify or change the plan and mitigation for the project.

USFWS Section 7 Consultation: A Section 7 Consultation with the USFWS is required when a project has the potential to effect threatened and endangered species. Since this project would not involve any T&E species, it is unlikely that this consultation would be required.

NOAA Fisheries EFH Consultation: Under the Sustainable Fisheries Act, consultation with NOAA Fisheries is required when a project has potential for adverse affects on habitat important (EFH) to a federally managed species such as salmon. Any activities that involve potential impacts to anadromous fish streams would require EFH consultation.

EPA Related Requirements: A NPDES General Permit for storm water, which applies to non-point sources associated with construction activities, may be required depending upon the extent of construction and development of additional facilities. The NPDES General Permit would apply to construction of a railroad. The General Permit would also necessitate the creation of a Storm Water Pollution Prevention Plan during the construction phase of the project.

A SPCC Plan for the storage of large amounts of fuel (greater than 1,320 gallons [4,997 liters] cumulative, or 660 gallons [2,498 liters] in a single tank) would be required in the event that fuel for construction equipment is stored onsite during the construction phase of the project.

Executive Order 11988: EO 11988 directs each agency to take actions to reduce the risk of flood loss; to minimize the impacts to human safety, health, and welfare; and to restore and preserve natural and beneficial values of floodplains.

Executive Order 11990: EO 11990 directs each agency to take actions to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for acquiring and disposing of federal lands and facilities or federal activities affecting land use.

Executive Order 12898: EO 12898 directs each agency to take actions to address Environmental Justice in minority and low income populations to determine if any minority or low income communities could potentially be disproportionately affected by the Proposed Action or Action Alternatives.

Executive Order 13084: EO 13084 directs each agency to establish regular and meaningful consultation and collaboration with federally recognized tribal governments on federal matters that significantly or uniquely affect their communities.

2.13 State of Alaska Requirements

State of Alaska permitting requirements described in this section include:

- Alaska Coastal Management Program (ACMP) Consistency Review processes directed by the Division of Governmental Coordination (DGC).
- Review permits by the Alaska Department of Natural Resources (ADNR).

- Review and consultation with the Alaska Department of Environmental Conservation (ADEC).
- Review and consultation with the Alaska Department of Fish and Game (ADF&G).
- Review and consultation with the Alaska Department of Transportation and Public Facilities (ADOT&PF).

Alaska Department of Natural Resources: ADNR has four divisions with regulatory power over a project of this type, under AS 38 and 11 AAC. The approvals required from ADNR for the proposed project include:

- Material Sale Permit for the use of state materials, such as sand and gravel, would be granted by the Division of Land.
- Land Use Permit and ROW would have to be issued by Division of Land for any use of or construction on state lands.
- Fish Habitat Permit under Title 41 from the Alaska Department of Natural Resources, would be required for any structures placed below the ordinary high water line or for equipment crossing fish-bearing streams

Division of Governmental Coordination (now under ADNR): Due to a change in responsibility for permitting at the State level in 2003, the lead coordinating agency for the state's permitting review of the project within the state's coastal zone is the ADNR. The process is the same as under the Division of Governmental Coordination for the time being but the function is under ADNR. Each coastal district defines the extent of its coastal zone. The MSB manages the district coastal management program within the project study area.

ADNR is directed by the Alaska Coastal Management Act and ACMP to coordinate the state's review of projects requiring more than one state agency's permit, or federal permits requiring state concurrence. ADNR coordinates permitting by initially holding "pre-application" meetings and reviewing permit application packets for completeness. Once the packet is considered complete, the Department starts the state's review program. When the application has been submitted, the applicant receives a review number and schedule. The state must complete the review in 30 to 50 days, depending on the review requirements. However, if a final determination cannot be agreed upon, the review may be elevated, resulting in a longer review period lasting up to 15 days. The COE also receives notice that the state's review has begun.

Upon completion of the state's review, the Department issues a "Consistency Determination," which triggers the issuance of state permits and also allows any federal permits to be finalized. Issuance of federal permits in the state's coastal zone requires concurrence on the part of the state that the project is consistent with the ACMP. The Department may extend the review time frame if there are information requests from reviewers.

The COE coordinates the federal review of a project if a Section 401, 404, or Section 10 permit is required. The COE then issues the Section 401, 404, or 10 permit after receiving notice that the state has found the project consistent with the ACMP.

Alaska Department of Environmental Conservation: A range of ADEC permits is generally required under AS 46 and AS 18 AAC, including:

- Wastewater Discharge Permit for any direct discharges of wastewater to waters of the United States.
- Certificate of Reasonable Assurance (Section 401) is necessary when any federal permit is issued under the Federal Clean Water Act. In this case, the COE Section 404 permit will trigger the need for state certification.
- An Air Quality Permit to Construct and Operate may be required if more than 100 tons (110 metric tons [MT]) of criteria pollutants are emitted. This would typically only occur if construction activities are likely to generate considerable dust. The most likely air pollutant would be particulate matter emitted during ground disturbing activities (i.e., ROW clearing and road construction). If road dust is to be controlled by oiling during construction, ADEC may require a Surface Oiling Permit.
- Burn Plan is required when more than 39.5 acres (16 hectares) of land are to be cleared and the slash burned during the construction phase of the project.

Alaska Department of Fish and Game: ADF&G permits for the proposed project would include:

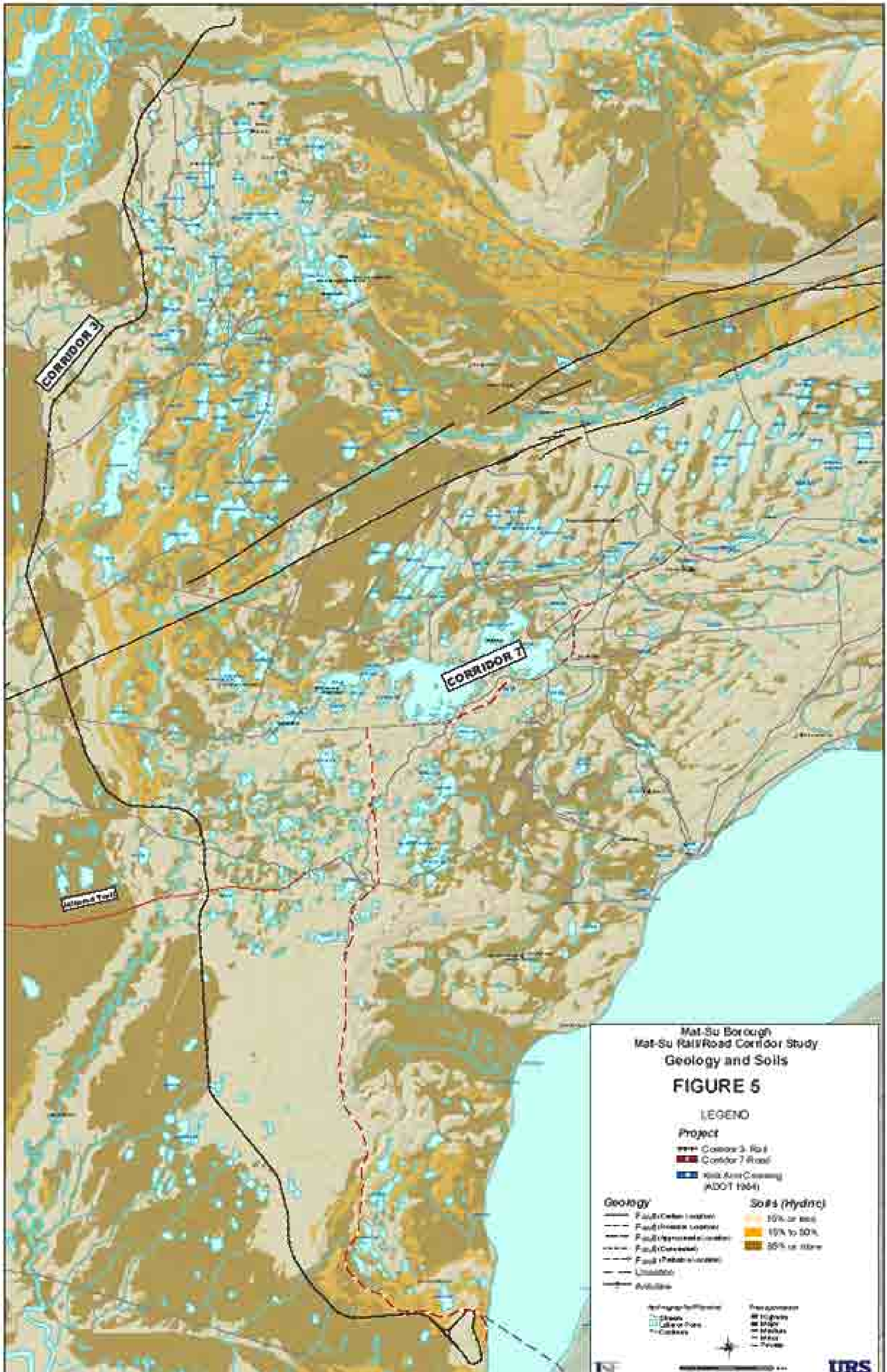
- Activities in any Special Management Area managed by the ADF&G are controlled through AS 16.20 and 5 AAC 95.

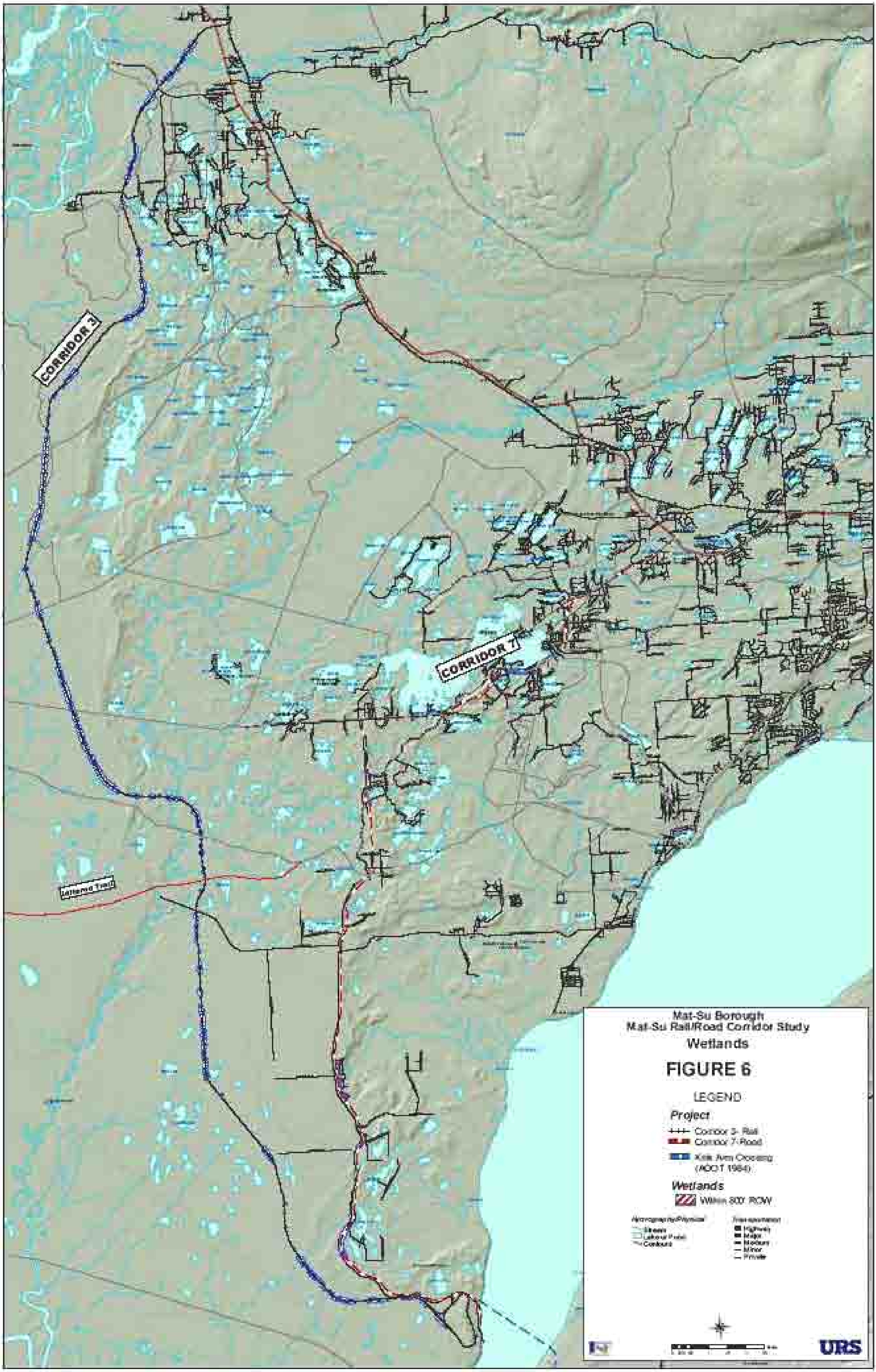
Alaska Department of Transportation and Public Facilities: ADOT&PF would require the completion of an Environmental Check List to identify specific project requirements.

2.14 Environmental Characteristics Summary

<u>Physical Environment</u>

Geology and Soils: The geology of the project areas is dominated by glacial landforms include nearly level and undulation outwash and till plains, pitted outwash plains, steep hills and wind deposited sand sheet (USDA, Natural Resource Conservation Service (NRCS), 1998). One of the prominent geologic features in the project area is the Castle Mountain Fault, which is the only active fault in the MatSu region with an obvious surficial expression but is not expected to be a constraint to construction of either a road or rail route to Port MacKenzie. Organic or peat soils, which have limitations for construction of road and building, are found on both Corridor 3 (183 acres) and Corridor 7 (18 acres) and are closely associated with forested and scrub shrub and emergent wetlands (Figures 5 and 6).


CORRIDOR 3
CORRIDOR 7
Mat-Su Borough
Mat-Su Rail/Road Corridor Study
Geology and Soils
FIGURE 5
LEGEND
Project
Corridor 3- Rail
Corridor 7 Road
Geology
Soils (Hydric)
15% to 50%
Anticline
URS


CORRIDOR 3
CORRIDOR 7
Mat-Su Borough
Mat-Su Rail/Road Corridor Study
Wetlands
FIGURE 6
LEGEND
Project
Corridor 3- Rail
Corridor 7-Road
Wetlands
Within 800' ROW
Highway
Major
Minor
Private
URS

Water Resources: Surface water resources in the Project Area include non-glacial rivers, such as the Little Susitna River and Willow Creek, small perennial streams, which drain the moraine deposits, and numerous small lakes and ponds, and large lakes. Lakes within ½ mile of the centerline of Corridor 3 include Lorraine Lake, My Lake, North Rolly Lake, Vera Lake and Little Lonely Lake.

For Corridor 7, non-glacial perennial streams cross the corridor include Fish Creek, Meadow Creek and one unnamed tributary to Meadow Creek. Small and large lakes within ½ mile of the centerline of this corridor include Lorraine Lake, Twin Islands Lake, Lost Lake, Carpenter Lake, Jewell Lake, Anna Lake, Big Lake and Echo Lake. The only waters affected by Corridor 7 would be the extension of the culverts at the existing stream crossing.

Goundwater resources in the general project area have been described from well data by Montgomery (1990). Regional water tables in the central Matanuska Valley generally slope towards the Matanuska River. Water well logs indicate that goundwater in the Big lake area is typically less than 60 feet whereas in the Knik Road and Goose Bay regions, groundwater is from 120 to 150 feet deep. Impacts to ground water resources are not expected with development of either corridor.

Floodplains: Corridor 3 intersects the floodplains of both the Little Susitna River and Willow Creek. The alignment would cross approximately 1000 feet of Little Susitna River floodplain and approximately 3,800 feet of the Willow Creek floodplain. The engineering of the floodplain crossing would need to take the 100-year flood events into consideration so that the rail bed would not adversely alter flood flow and impact adjacent properties and public safety. The existing road alignment in Corridor 7 passes through the floodplain of both Fish Creek and Meadow Creek and floodplain would likely not be an issue. The additional new sections of road, which would need to be built to straighten several curves, are outside of the floodplains of these streams.

<u>**Biological Environment**</u>

Vegetation: Vegetation communities affected by both corridor alignments are primarily deciduous and mixed deciduous/needleleaf forests in upland areas and black spruce (bog and muskegs) in lowland areas. Assuming a 150-foot right-of-way, Corridor 3 would require as much as 560 acres needing to be cleared of the tall vegetation. Clearing for the development of Corridor 7 would require substantially less clearing since the ROW is currently developed but would likely require clearing of over 100 acres in adjacent areas and new sections of road.

Wetlands: Wetland communities within both corridors are generally similar and dominated by palustrine and emergent wetlands (Figure 6). Development of Corridor 3 would results in the loss of approximately 294 acres of wetlands, primarily scrub shrub wetlands. Loss of this area of wetlands would likely be considered a significant adverse impact due to the loss of wildlife habitat function of these areas. Development of the access road in Corridor 7 would affect approximately 25 acres and these wetlands would be primarily shrub wetlands. Wetlands would only be affected in new sections of the road and in areas adjacent to the existing road where the road surface would need to be widened.

Fisheries Resources: Anadromous fish in streams crossed by the alignments include all five species of salmon. Development of Corridor 3 would require the crossing of the six anadromous streams: the Little Susitna River and two unnamed tributaries, Fish Creek, Willow Creek and an unnamed tributary. Some lake habitat could be affected by fill for the rail bed near Little Lonely Lake, but final design could potentially avoid this area. Corridor 7 crosses only three anadromous fish steams: Fish Creek, Meadow Creek and an unnamed tributary of Meadow Creek. All of these streams are presently crossed by the existing road alignment. Some extension of the culverts would likely be required in upgrading the road.

Wildlife: The terrestrial and aquatic habitats of the Project Area support a wide range of both small and large mammals as year-round residents or as seasonal migrants from other areas in the Matanuska and Susitna River watersheds. Moose are the most abundant large mammals in the area and occur as residents in these areas, with higher concentrations during the winter as snow forces animals out of the higher elevations of the Talkeetna Mountains to the north and the Alaska Range. The development of Corridor 3 would result in direct habitat loss and some unknown level of increased moose mortality from collisions with trains. However, effects are not expected at the population level. Corridor 7 would affect a relatively small area of habitat but increased traffic could result in some increase in moose mortality for vehicle collisions. Overall, impacts to moose would be minimal.

For Corridor 3, waterfowl, songbirds and raptors, which presently use the habitat within the corridor, would be affected by the loss of habitat and disturbance during construction. However, since the corridor is relatively narrow and projected traffic would be relatively light in the near term, wildlife would likely be displaced to some degree into adjacent areas. Overall effects on wildlife populations are expected to be minimal. For corridor 7, upgrading the existing road and constructing new sections of road would result in some minor wildlife habitat loss and some species would be displaced due to disturbance from construction and road traffic during operation. The amount of habitat loss is relatively small since the corridor follows the existing road for much of it's length, therefore, the overall effects of developing Corridor 7 on wildlife are expected to be minimal.

Threatened and Endangered Species

There are no threatened or endangered wildlife species within the project area. The Steller's eider (*Polysticta stelleri*), is listed as threatened under the Endangered Species Act (62 FR 31748). This small sea duck winters in lower Cook Inlet and could potentially occur in the upper Cook Inlet area, but would not be expected to occur in the vicinity of the project area. There are no threatened or endangered plant species that occur in this area of Alaska.

3.0 SOCIOECONOMIC ENVIRONMENT

3.1 Affected Environment

Area Demographic Profile

Population: In the 1960s, the MSB had a population of just over 5,000 people. Between 1980 and 1990, the Borough population more than doubled from 17,816 to 39,683. During the past decade, the population grew forty-nine percent, compared to thirteen percent statewide and fourteen percent in Anchorage. The following is a table of Federal Census Designated Places (CDPs) within the MSB for the year 2000.

Table 3-1
Federal Census Designated Places – Population Figures

2000 CDPs	Year 2000
Big Lake	2,635
Buffalo Soapstone	699
Butte	2,561
Chase	41
Chickaloon	213
Farm Loop	1,067
Fishhook	2,030
Gateway	2,952
Glacier View	249
Houston City	1,202
Knik River	582
Knik-Fairview	7,049
Lake Louise	88
Lakes	6,706
Lazy Mountain	1,158
Meadow Lakes	4,819
Palmer City	4,533
Petersville	27
Point MacKenzie	111
Skwetna	111
Susitna	37
Sutton-Alpine	1,080
Talkeetna	772
Tanaina	4,993
Trapper Creek	423
Wasilla City	5,469
Willow	1,658
Y	956
Remainder of Borough	5,101
TOTAL	**59,322**

MSB 2002 Fact Book

The locations in the borough closest to the two project corridors include the following CDPs: Big Lake, Houston City, Point McKenzie, Wasilla, and Willow. The potentially affected population is the sum of these CDPs, which are 11,075. Estimated MSB population for 2008, based on Department of Labor figures, is 77,074.

Age, Sex, and Race Breakout in the year 2000: The median age in the MSB for the year 2000 was 34.1 years, compared to 32.4 in the state and 35.3 in the nation. Thirty-five percent of the MSB population is under that age of 20, and six percent over the age of 65. The retirement age category has been relatively stable over the past 10 years. Fifty-two percent of the MSB population is male and forty-eight percent female. About eighty-eight percent of the population is white and six percent American Indian or Alaska Native. The remaining population is listed as other races or two or more races.

Area Housing Profile

The MSB has a higher owner occupancy rate than the state. About seventy-five percent of the 20,556 occupied houses are owner-occupied, the remaining are renter-occupied. The average number of persons per household is nearly three. The vast majority of the unoccupied units in the MSB are considered seasonal, recreational, or occasional use units.

About half of the MSB population is located in the "core area," which encompasses approximately 100 square miles between and around the cities of Palmer and Wasilla. Other MSB residents live along or near the Glenn Highway and the Parks Highway, which provide access to Fairbanks and Anchorage.

Within the study area, housing can be roughly broken into four categories: primary residences located in Wasilla and along main road systems such as the Parks Highway; primary residences located along secondary road systems and more developed areas such as Big Lake; primary residences located in more rural or remote areas; and second or vacation homes located in Big Lake and more remote or rural areas, primarily on lakes. The area along Corridor 7 includes a mix of all four types of housing. The area along Corridor 3 primarily includes residences located in more rural or remote areas, and second/vacation homes located in more remote or rural areas. The number and density of housing is much greater along Corridor 7 than Corridor 3.

Area Economic Profile

Employment: As with population, and in many cases directly related to population growth, employment has grown considerably faster in the MSB than elsewhere in the state. During the past decade, employment in the MSB grew at nearly six percent per year, three times faster than the rest of the state. Two-thirds of the growth came from retail and services. Services represent one quarter of all wage and salary employment in the MSB. Health care is one of the fastest growing service industries, with business and social services close behind. As population and second home use has grown, retail and service establishments have also grown, particularly in areas outside the primary cities of Palmer and Wasilla. Year 2000 employment data for the MSB is listed in Table 3-2.

Table 3-2
Area Employment

Employment	Number
Total Potential Work Force (Age 16+)	42,705
Total Employment	25,356
Civilian Employment	24,981
Military Employment	375
Civilian Unemployed (seeking work)	2,867
Percent Unemployed	10.3%
Adults Not in Labor Force (not seeking work)	14,482
Percent of All 16+ Not Working (unemployed + not seeking)	40.6%
Private Wage and Salary Workers	16,925
Self-Employed Workers (in own not incorporated business)	2,734
Government Workers (City, Borough, State, Federal)	5,186
Unpaid Family Workers	136

MSB 2002 Fact Book

In 2001, the unemployment rate in MSB was listed at 7.7 percent, compared to 6.3 percent for the state and 4.8 percent for the nation.

Wage and Income: In 1999, the average annual wage in the MSB was $26,893 compared to $35,557 in Anchorage. The primary reason for the discrepancy can be found in a higher percentage of employment in sectors such as services and retail compared with a higher Anchorage percentage in the sectors of oil, government, and transportation.

Table 3-3
Employment by Industry

Industry	Number
Agriculture, Forestry, Fishing and Hunting, Mining	1,413
Construction	2,841
Manufacturing	594
Wholesale Trade	606
Retail Trade	3,217
Transportation, Warehousing and Utilities	2,046
Information	977
Finance, Insurance, Real Estate, Rental and Leasing	924
Professional, Scientific, Management, Administrative and Waste Management	1,659
Education, Health and Social Services	5,312
Arts, Entertainment, Recreation, Accommodation and Food Services	2,059
Other Services (except Public Administration)	1,348
Public Administration	1,985

MSB 2002 Fact Book

The following list represents income statistics for families in the MSB:

Per Capita Income	$21,105
Median Household Income	$51,221
Median Family Income	$56,939
Persons in Poverty	6,419
Percent Below Poverty	11.0%

3.2 Area Quality of Life Considerations

Many people chose to have primary or secondary residences in the MSB because of quality of life values. These include larger lots and rural residential settings, less traffic and other urban problems (such as noise and air quality), and access to recreation opportunities such as hunting, fishing, boating and snowmobiling. The locations of the two corridors under consideration have been adjusted to a certain degree to minimize adverse effects on quality of life considerations.

Many quality of life issues are discussed elsewhere in this document (for example, noise and recreation). However, further research may need to be done to determine impacts to other quality of life issues like 1) facilities and activities; 2) annual local events; and 3) open space.

3.3 Environmental Consequences

Area Demographic

Development of either Corridor 3 and 7 are not likely to generate long-term population growth unless there is significant resource development, which is not currently forecast. Some short-term population increase associated with construction employment could occur, but would not be permanent.

Area Housing

Effects on housing would come from short-term increased demand from the construction workforce. Due to its more remote location, development of Corridor 3 may require construction of a construction camp to house the workforce. Construction crews working on widening the route for Corridor 7 will likely use existing facilities for lodging during construction periods. Widening the route for Corridor 7 might involve some property takes that would affect housing.

Area Economic

Construction of the proposed project in both Corridors 3 and 7 would generate construction employment, and would likely result in increased earnings for materials suppliers. The number of positions and length of employment will vary depending on the route chosen, the contractors selected, and the construction schedule. Corridor 3 would generate some operation employment and associated income. Construction crews working on widening the route for Corridor 7 will likely use existing facilities for food and lodging during construction periods, which would likely have a positive economic benefit to the area. Widening the road for Corridor 7 might involve some property takes that would affect local businesses.

Area Quality of Life

There are obvious short and long-term quality of life effects from construction traffic, noise and dust, and operation traffic and noise. Widening of Corridor 7 would affect more people than construction of Corridor 3. The railroad associated with Corridor 3 will represent a significant change in the nature of the area and likely interfere with valued aspects of rural living (for example recreational values like trails, and quiet and solitude). Many social impacts, such as quality of life issues, are subjective in nature and cannot be accurately quantified.

4.0 LAND USE

4.1 Affected Environment

Land Ownership/Status

The two potential corridor routes evaluated traverse private, Borough, Native Corporation, State, Alaska Mental Health Trust Lands, and University of Alaska lands. No Federal lands are involved in either corridor route.

Private: For the purposes of this study, private land holdings are properties owned by individuals or businesses, but not by Native Corporations, certified Alaska Native Allotments, municipal governments, or the state or federal governments. Concentrations of private lands are located primarily along Corridor 7, although some private lands are located in the vicinity of Corridor 3.

Borough: Borough-owned properties were conveyed by the State of Alaska as Municipal Entitlement Lands (MEL), and also were acquired through tax foreclosure, purchase, and donation. MEL lands are used to generate revenue through sales, leases, and permits; to provide sites for public facilities; and to offer public recreational opportunities. Both corridors pass through lands owned by the MSB.

Native Corporation: Under the Alaska Native Claims Settlement Act of 1971, Native Corporations were allowed to select lands from federal land holdings. These selections were then adjudicated and conveyed to the Native Regional and Village Corporations. Cook Inlet Region Incorporated (CIRI) is the Native Regional Corporation for the Cook Inlet area. CIRI owns lands within the study area. Corridor 7 is the only route that passes through CIRI owned land.

State: The State of Alaska was granted over 100 million acres of land when it achieved statehood in 1959. The State owns land in both study corridors, although Corridor 3 impacts more State land.

Alaska Mental Health Trust Lands: State of Alaska Mental Health Trust Lands were granted to the territory by the federal government prior to statehood to generate revenue to support Alaska's mental health programs. In 1978, the state legislature waived the trust status of these lands, allowing land to be leased, sold, and transferred to municipalities. In the 1980s, mental health advocates sued, and the state was ordered to "reconstitute, as nearly as possible, the holdings which comprised the trust when the 1978 law became effective." A new Mental Health Trust Land Unit under ADNR has been created to manage these trust lands. Both corridors minimally involve Mental Health Trust Lands within the study area.

University of Alaska: The land owned and managed by the University of Alaska was originally granted to the University by the federal government in accordance with two Acts of Congress dated March 4, 1915, and January 21, 1929. This property, and other trust land which was subsequently deeded to the University by the State of Alaska, is for the exclusive use and benefit of the University of Alaska, and therefore, is not state public domain land. Both corridor routes pass through a minimum acreage of University land, although Corridor 3 potentially affects more land.

4.2 Generalized Land Use

Land uses in the study area are a mix of public recreation use and wildlife habitat on state lands, low-density residential uses; light industrial uses; commercial enterprises, commercial and noncommercial aviation uses; forestry; agriculture; and mineral resource development. The study area is also commonly used for subsistence and sport hunting, fishing, and gathering. Land use along Corridor 7 includes more residential and commercial use, due to the existing road access and development near Port MacKenzie. Land use in the vicinity of Corridor 3 includes more public recreation and wildlife habitat, with some rural residential use.

Recreation is one of the area's major land uses. The study area is the focus of much recreational activity on the part of the MSB and Anchorage residents and tourists (see section 7.0 Recreational Resources). Wildlife habitat is abundant in the study area.

4.3 Formally Classified Lands

Formally classified lands include nationally or state designated lands, such as wildlife refuges, national parks, and other areas. No nationally designated lands exist in the project area. Corridor 3 will pass adjacent to Nancy Lake State Recreation Area and the Susitna Flats State Game Refuge, and will traverse Willow Creek State Recreation Area and Little Susitna State Recreation Area. Corridor 7 will pass adjacent to the Goose Bay State Game Refuge. Both corridors pass over the Iditarod Trail route.

4.4 State and Local Plans

State and Local land management plans that may affect the planning area include the following:

- Matanuska-Susitna Borough Coastal Management Plan (State and local)
- Willow Sub-Basin Area Plan (State)
- Susitna Basin Recreation Rivers Management Plan (State)
- Susitna Flats State Game Refuge Management Plan (State)
- Matanuska-Susitna Borough Comprehensive Development Plan: Transportation
- Matanuska-Susitna Borough Comprehensive Development Plan: Public Facilities
- Matanuska-Susitna Borough 1990 Solid Waste Management Plan Update (local)
- Point Mackenzie Area Which Merits Special Attention Plan (State and local)
- Big Lake Management Plan
- Other lake management plans

These plans address allowable uses and provide guidance for potential development projects.

4.5 Environmental Consequences

Private: Private lands owners are expected to be more sensitive to construction and operation of a railroad route on their property than State or MSB land management agencies. Privately owned lands in the study area are primarily used for residences and small businesses. Construction and operation of the proposed project would create temporary impact on existing land uses for Corridor 7 during construction, but would not result in any change in land use outside of the ROW, except potentially at the Point Mackenzie port site. The land use most sensitive to siting of a railroad is low density residential. The land use that is typically least sensitive to siting of a railroad is industrial. Between these two extremes, various land uses are more or less sensitive to a railroad siting, depending on the specific area. In this study area, the highest potential land use conflicts occur in the residential areas of Corridor 7 as private land “takings,” and the residential and recreational areas of Corridor 3 (especially in and around the state recreational set asides).

State and Borough: State and Borough lands are more often managed to allow multiple uses that are in the public interest, including rail projects. The proposed project would primarily require ROW permits for construction and operation of the project across state lands for both corridors, although Corridor 3 impacts more state land. Corridor 3 will traverse the Willow Creek State Recreation Area and Little Susitna State Recreation Area, which is land dedicated to recreational pursuits. Both corridors pass through lands owned by the MSB.

State and Borough lands within the project area are primarily managed for wildlife habitat and recreation. Construction and operation of the railroad are not expected to substantially affect the use of the study area for wildlife habitat, particularly because the habitats crossed are abundant locally, and a small percentage of total available habitat will be lost. There is also a substantial amount of recreational use of the area, including use by hunters, fishermen, trappers, skiers, boaters, snowmachiners, and many others. Limitations on access to wildlife and recreation are the most likely issues. Construction and operation of the railroad are not expected to substantially affect recreation, as discussed in Section 4.3.3, Recreational Resources.

Mental Health, University, and Native Corporation Lands: Both corridors minimally impact Mental Health Trust Lands within the study area. Both corridor routes pass through a minimum acreage of University land, although Corridor 3 impacts more land. Corridor 7 is the only route that passes through CIRI owned land. These lands are generally undeveloped and project development would not create land use conflicts at this time. However, should any of these lands be required for the proposed project, property acquisition or obtaining ROW will be required.

5.0 RECREATIONAL RESOURCES/TRAILS

5.1 Affected Environment

Recreational Resources

Recreation is one of the area's major land uses. The study area is the focus of much recreational activity on the part of the MSB and Anchorage residents and tourists. In almost every plan reviewed for this report, recreational resources were listed as one of the primary reasons for living in the MSB. The area's abundance of surface water is an important recreational feature which is used for fishing, water sports, and winter travel. Corridor 3 will pass adjacent to Nancy Lake State Recreation Area and the Susitna Flats State Game Refuge, and will traverse Willow Creek State Recreation Area and the Little Susitna State Recreation Area. Nancy Lake State Recreation Area, Willow Creek State Recreation Area, and the Little Susitna State Recreation Area offer year-round opportunities for fishing, canoeing, cross-country skiing, snowmobiling, and camping. Corridor 7 will pass adjacent to the Goose Bay State Game Refuge. In addition to these designated recreations areas, there are numerous lakes, rivers, trails, and roads that are used for recreation purposes.

The rivers, lakes, and wooded areas are accessible through numerous trails and are actively used for the following activities:

- dog mushing
- skiing
- sport fishing
- sport hunting
- trapping
- flightseeing
- river and lake boating (including airboating, power boating, kayaking, and rafting)
- snowmachining
- hiking
- berry picking
- wildlife observation
- photography
- camping
- backpacking
- canoeing
- OHVs
- horseback riding
- golfing at Settlers Bay
- other private and commercial recreation activities

Trails

Land and lake trails play a key role in the enjoyment of residents and visitors alike in the project area. Many trail opportunities exist for those who enjoy hiking, OHVs, horseback riding, biking, and canoeing in the summer, or snowmaching, skiing, and dog mushing in the winter.

A largely undeveloped trail network serves non-road-accessed areas. The most notable of the many trails is the historic Iditarod Trail. The Iditarod National Historic Trail, which crosses the project area, was the winter route used to transport mail and supplies from Seward to Nome during the early part of the 1900s. The Iditarod National Historic Trail and the Iditarod Race Trail cross the project area on borough and state lands near Yohn Lake. The race trail has used alternate routes in recent years. Trails in the immediate vicinity of the two corridor routes are as follows:

Corridor 3

- Susitna West Trail
- Rolly Creek, Ramp Hill
- West Gateway Trail
- Red Shirt Lake Trail
- Iditarod Trail
- Four primitive trails

Corridor 7

- West Parks Highway
- Iditarod Trail
- Big Lake Road Trail
- Hollywood Road Trail
- Three Mile Lake Trail
- Burma Road Trail
- South Big Lake Trail
- One primitive trail

5.2 Environmental Consequences

The project area as noted earlier, especially Corridor 3, has a high value in terms of recreational resources. Numerous trails exist in the area and people enjoy the outdoors through hiking, camping, boating, fishing, hunting, skiing, snowmaching, airboating, flying and other means. The project would be expected to have some direct impacts on recreation, especially trail use and limiting access to recreation sites, particularly if mitigation measures such as below or above ground crossings over trails for example are not utilized. Users who are seeking a natural landscape for their recreational activity may experience visual or noise impacts from the presence of the railroad corridor. Much of the area crossed is remote, and although it is actively used for recreation, users are typically spread out through the area, and impacts are expected to occur for few people and on an infrequent basis. Indirect impacts such as increasing the number of people accessing the area are not expected unless, or until, a road is added to Corridor 3. When that happens access may be significantly increased.

During public involvement for this project, public concern was expressed over the potential recreational and developmental pressures that might be imposed on local fish and wildlife habitat, game refuges, and resources of the area as a result of development of Corridor 3. In the past, the public expressed concern over the potential recreational and developmental pressures that might be imposed on local fish and wildlife habitat, game refuges, and resources of the area as a result of the development of new residential areas, support facilities, and new transportation corridors. Improved access to the area around Corridor 3 could generate conflicts between habitat management and seasonal and weekend visitor-industry demands in the surrounding area. Sports fishing and hunting pressures are anticipated to increase over time as the population of the area grows, and corridor development could potentially infringe on limited open space areas.

Construction impacts to recreation users are expected to be of short duration. Wintertime construction could cause some temporary disturbance to hunters, trappers, snowmachiners, and skiers recreating on the Willow Creek State Recreation Area and the Little Susitna State Recreation Area. Summer construction in the same area could potentially impact backcountry hikers, fishermen, hunters, and trappers where Corridor 3 crosses rivers and trails. However, because much of the rail corridor area is relatively remote and users of these areas are dispersed, the number of people impacted should be low.

As mentioned earlier, mitigation of potential recreation impacts will be important. Mitigation should include providing above or below ground passage for recreation trails, and scheduling construction to minimize potential effects. With proper mitigation, Route 3 is expected to have minimal impact on recreational uses.

Development of Corridor 7 is expected to have minimal impacts, primarily due to construction activities. Construction may delay access to recreation areas along the corridor such as Fish Creek and Settlers Bay and result in some noise and dust, but will be temporary for the duration of construction.

6.0 RESOURCE USE (SUBSISTENCE, PERSONAL USE, SPORT, AND OTHER)

6.1 Affected Environment

Important uses of fish and game in Alaska include subsistence, sport fishing, personal use fishing, and general hunting including trapping. Subsistence refers to the customary and traditional non-commercial use of wild resources (ADF&G 1990). Subsistence hunting and fishing are closed in non-rural areas of Alaska by both federal and state programs. The Alaska Joint Board of Fisheries and Game and the Federal Subsistence Board have determined that the areas around Anchorage, Mat-Su, Kenai, Fairbanks, Juneau, Ketchikan, and Valdez are non-rural areas, where fish and game harvests may be allowed under sport or personal use but not under subsistence regulations. No federal lands exist in the project area. No State of Alaska-recognized subsistence occurs on the state lands in the project area.

Personal use fishing is similar to subsistence fishing with nets, except that it is allowed in areas generally closed to subsistence and is for residents of urbanized areas. Sport fishing and hunting both contribute food to urban areas, but differ from subsistence because they are primarily conducted for recreational values and not as a major part of a family's nutritional requirements.

The project area supports sport fishing, personal use fishing, general hunting including trapping, and other resource use including use of berries, bird eggs, and wood and roots for fuel and art. Although the project area is closed to subsistence uses, fishers and hunters have harvest opportunities via general fishing and hunting regulations, and personal use net fisheries.

The following plants, animals, and fish are taken for sport, personal, and other use near or in the project area: bear, moose, all five species of Alaska salmon, rainbow trout, dolly varden, beaver, muskrat, mink, marten, lynx, red fox, bird eggs, berries, and roots. Fish Creek along Corridor 7 is particularly important for personal use fishing.

6.3 Environmental Consequences

Corridor 3

Construction activities may temporarily disrupt wildlife and reduce resource use opportunities in the areas adjacent to the rail corridor. Because the duration of construction activities in any one location would be short, no substantial construction effects on use of resources beyond one season is expected. There is the potential for obstruction of access by creating an elevated rail embankment. Mitigation is likely to result in providing access through or over the embankment. Placement of access should involve consultation with local residents.

The minimal clearing of vegetation along the ROW is not expected to reduce access to berries, roots, and other vegetation used within the study area. The amount of vegetation lost through clearing is expected to be negligible compared to the available vegetation.

The clearing of vegetation along a ROW may in some cases reduce or diminish habitat quality for some wildlife species, while enhancing habitat for other species. The area crossed is currently used for sport and personal use fishing, general hunting, and other resource use, and access exists throughout the year. Because of controls placed on public access along rail corridors, Corridor 3 is not expected to increase access into areas.

Operation of the line is not expected to have a substantial impact on resources. There may be occasional temporary disturbance to localized wildlife populations during rail maintenance, but based on the intermittent nature of these activities, resource use activities should not be substantially impacted.

Corridor 7

Minimal disruption of use of resources is expected. The road systems along this corridor are used for access to Fish Creek when it has been open for personal use fishing, and to Point

Mackenzie. Any interference with access to resource use activities will be temporary during construction improvements to the road system.

7.0 RECOMMENDATIONS

Potential highway and railroad *route options* were identified and analyzed for present and future performance in areas of connectivity, congestion, safety, impacts to property owners, impacts to adjacent land use, and potentially the socio-economic and environmental impacts. From these analyses came key findings regarding the present and future performance and impact of the potential routes. These findings formed the basis for a *route recommendation.* Some of the route corridor options required refinement in order to resolve particular land use, land ownership, engineering, environmental or other issues. More in-depth analysis than ordinarily required to prepare a location study report will be conducted once the final route is recommended.

LEGEND

CORRIDOR 3

CORRIDOR 7

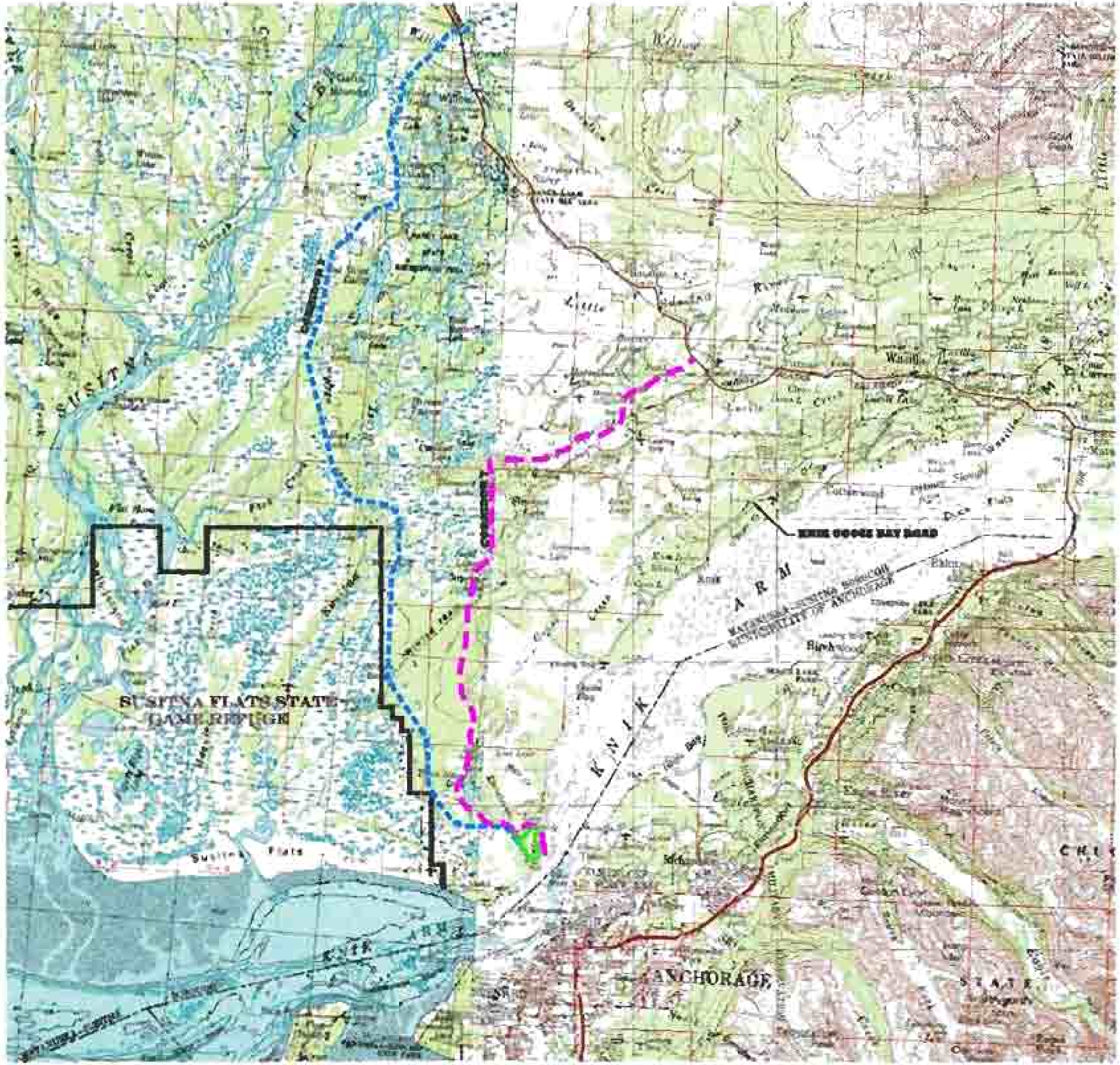


FIGURE 7
CORRIDORS 3, AND 7

SCALE: N.T.S.

7.1 Rail

The recommended rail access to Port MacKenzie that evolved through this study effort extends from Port MacKenzie north to intersect the ARRC mainline tracks north of Willow Creek, a distance of approximately 44 miles. Rail traffic estimates based on the potential freight movements identified by the Commodities Study do not appear to provide an economic justification for the construction of the rail line. That being said, it should be noted that there are other factors at work in this decision process.

Probably the outside factor having the most direct influence on the details of the rail alignment is the potential for implementation of the Knik Arm Crossing project and including rail as part of that project. The Alaska Railroad is on record stating that this alignment would likely be their new mainline between Anchorage and Fairbanks. The Port MacKenzie to Willow alignment is a much more direct route north from Anchorage than the existing alignment (approximately 25 miles shorter) and could be expected to reduce travel times between Anchorage and Fairbanks by perhaps an hour or more. Because of the potential for this, the design criteria selected for the railroad alignment meets the following ARRC mainline track design criteria.

- Design Speed – 60 mph
- Ruling grade – 0.5%
- Maximum curvature – 2º
- Siding every 10 miles – 6,200 feet clear
- Remote controlled powered switches with signals
- 141 lb. rail
- Concrete ties

The south end of the rail alignment is a loop track in the port uplands area. The alignment shown works with the existing terrain in that area. There is space available for stockpiling wood chips, coal, sand and gravel, mineral ore and other bulk materials. There is also space available for a large tank farm should that option develop. The Port Director has indicated that the conveyor system being planned for the wood chip program is one that can be used for other bulk items such as gravel and coal. This can be accomplished by properly cleaning the conveyor belt at each change in product. To accomplish this, the port uplands area will have to be graded to essentially a flat area that will allow operation of a movable conveyor system. The loop track will be very flat grade and designed for yard speeds. Details of the loop track and uplands layout were not part of this study. The data presented was taken from a previous report, Matanuska-Susitna Borough Port Study by Peratrovich & Nottingham, Southwest Alaska Pilots Association and Alaska Development Consultants, April 1981.

From the port area, the alignment moves west and north through the edges of the Point MacKenzie agricultural area and staying just outside of the boundary of the SFGR. Just north of the SFGR, the alignment turns west and crosses the Little Susitna River then turns back north essentially following a glacial moraine deposit that is largely granular soil well suited to the construction of a railroad. The alignment is located west of Red Shirt Lake and moves west to the toe of the moraine to avoid conflict with recreational properties before moving back to the upper slopes of the moraine and staying west of the Nancy Lake Recreation Area boundary.

The alignment crossing the Willow Creek road and Willow Creek west of the Parks Highway then crosses the Parks Highway to connect to the existing ARRC mainline tracks.

Soils in the port area are predominately gravel. Between the port area and the Little Susitna River the same holds true except that there are localized pockets of organic soils. These tend to be relatively shallow and it is expected that the shallow organics will be excavated and replaced with granular material. On either side of the Little Susitna River crossing, the soils are more fine-grained sands and/or silts. These soils will require geotextiles and gravel embankments. Moving north from the Little Susitna River, the alignment crosses some small areas of wetlands where shallow organic soils may be expected. The organic soils may be removed or the embankments may be constructed using geotextiles and gravel fill. As the alignment moves northward, it traverses the west slope of a moraine deposit known to be generally good quality sand and gravel. Approaching the Cow Lake area, the alignment drops off of the moraine to go west of recreational properties along Fish Creek then, after crossing the creek, it moves back up onto the side slope. It is expected that there will be some wetlands and shallow to moderate depth organics for a relatively short section. Again, where the organics occur, the most probable method will be to use geotextiles on the surface of the organic soils and construct embankment over it using good quality gravel. Near the north end of Red Shirt Lake, the moraine deposit becomes less well defined and the area flattens out. There are scattered shallow lakes and bogs throughout the area up to Willow Creek, but the materials generally are good gravels. North of Willow creek is much the same. The area east of the Parks Highway where the tie into the existing ARRC mainline will occur is in one of the wet areas. It is expected that construction in this area will be geotextile placed on the surface and the necessary embankment constructed over that.

As a policy, all crossings are planned to be grade separated. Typically, the roadway will go over the railroad unless the terrain is conducive the taking the road under. Figures 8 shows the typical grade-separation with the roadway over. The initial planning includes roadway grade separations for Ayshire Road, Susitna Parkway, Willow Creek Parkway and the Parks Highway. The only exception to grade-separated crossings may be in the Port MacKenzie upland area where at-grade crossings may be appropriate.

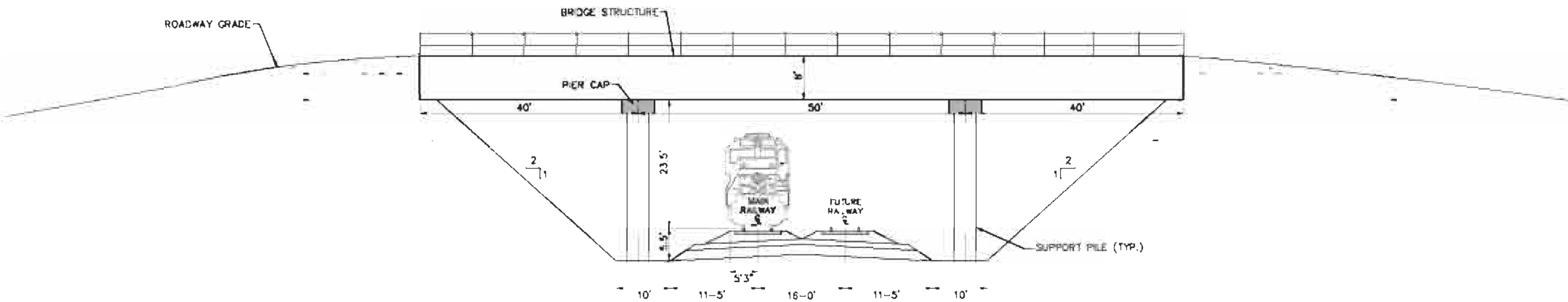


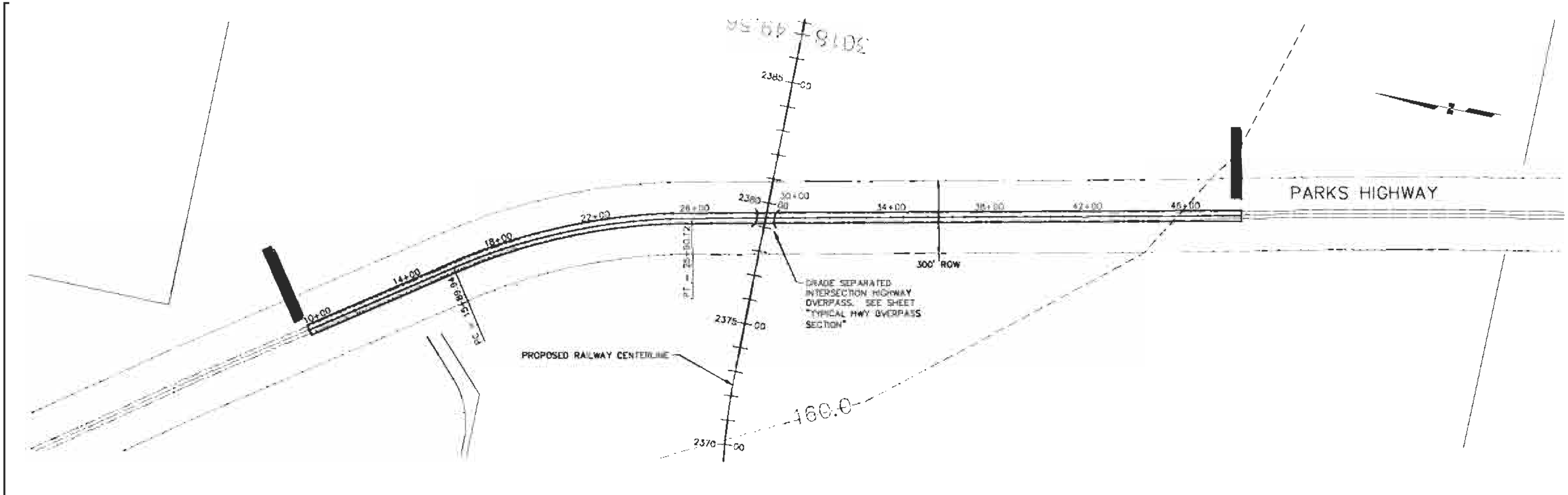
FIGURE 8

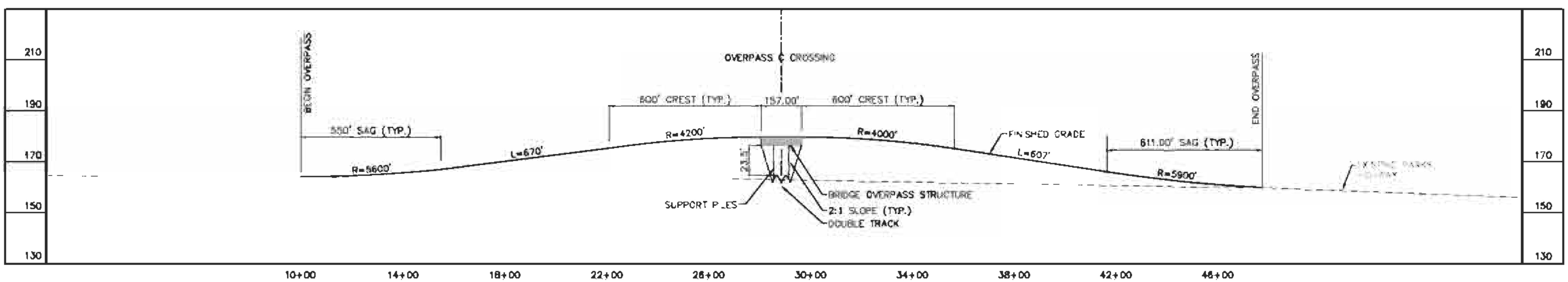
MAT-SU RAIL CORRIDOR STUDY

TYPICAL OVERPASS SECTION

FIELD BOOKS	MKS		SHEET
–	JDG		
–	MKS		
–	03/31/03		
SCALE NTS	–		FILE NO. 01228.000
	01228.000		

REV.	DATE	BY	REVISION





*NOTE: DRAWING SCALES REFERENCED ARE FOR HALF SIZE SHEETS

FIGURE 8

MAT-SU RAIL CORRIDOR STUDY

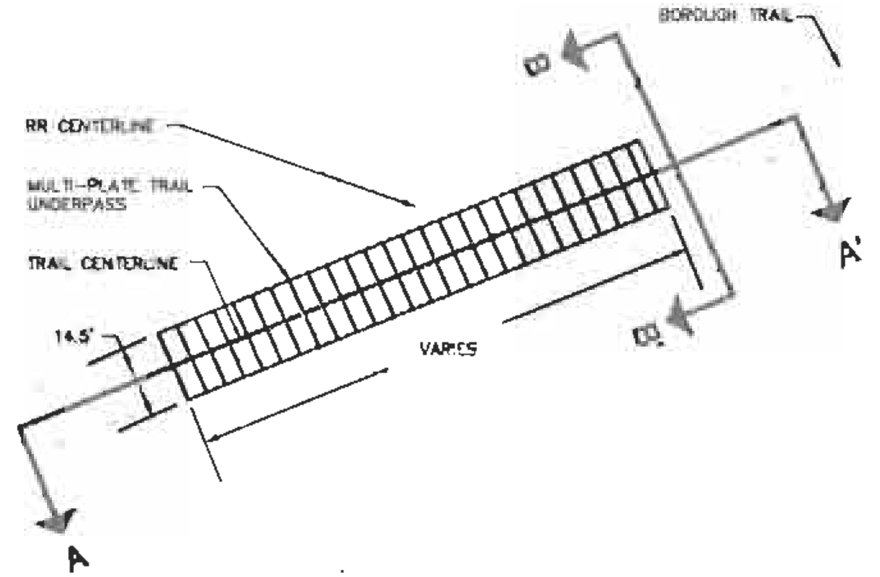
TYPICAL ROAD OVERPASS PLAN & PROFILE

DRAWN	JDG/BED
CHECKED	MKS
DATE	03/31/03
SCALE	H: 1"=400' V: 1"=40'
JOB NO.	01228.000

Tryck Nyman Hayes, Inc.

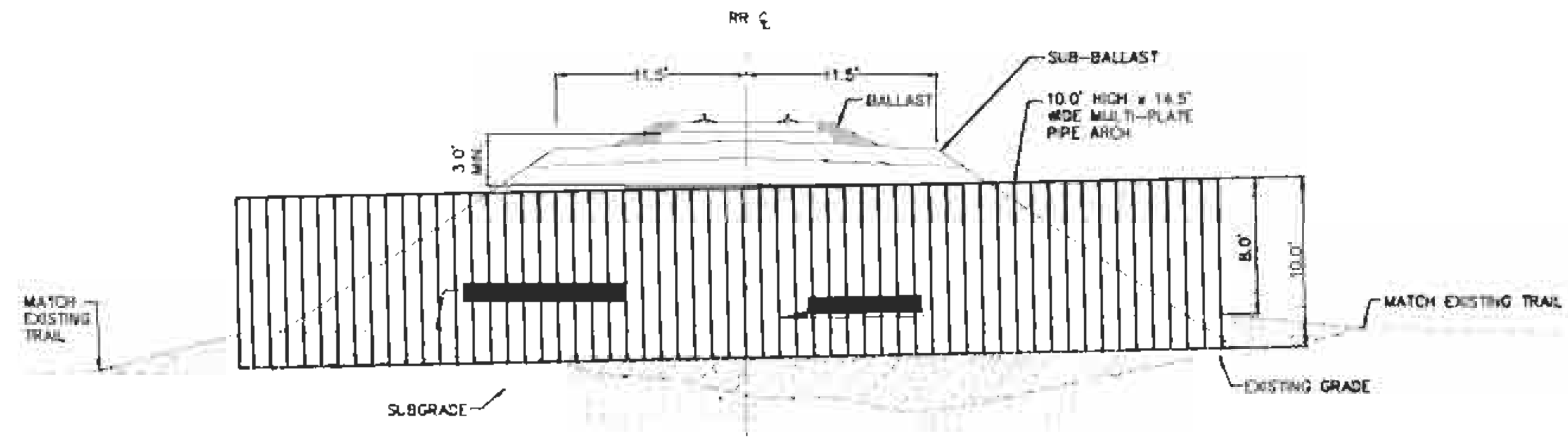
FILE NO. 01228.000

The rail alignment crosses a number of active winter trails, including the Iditarod Trail. Throughout the study effort there was concern regarding the safety of the trail crossings. The study team used the MSB Trails Plan to identify key recreational trails that pass through the study area. Where trails cross the rail alignment, grade separations will be provided. Figure 9 shows a prototypical trail grade separation with the trail going under the railroad. These structures envision use of multiplate culverts as the primary underpass structure. The surfacing section of the trail will be carried through the invert of the culvert to provide trail surface continuity.



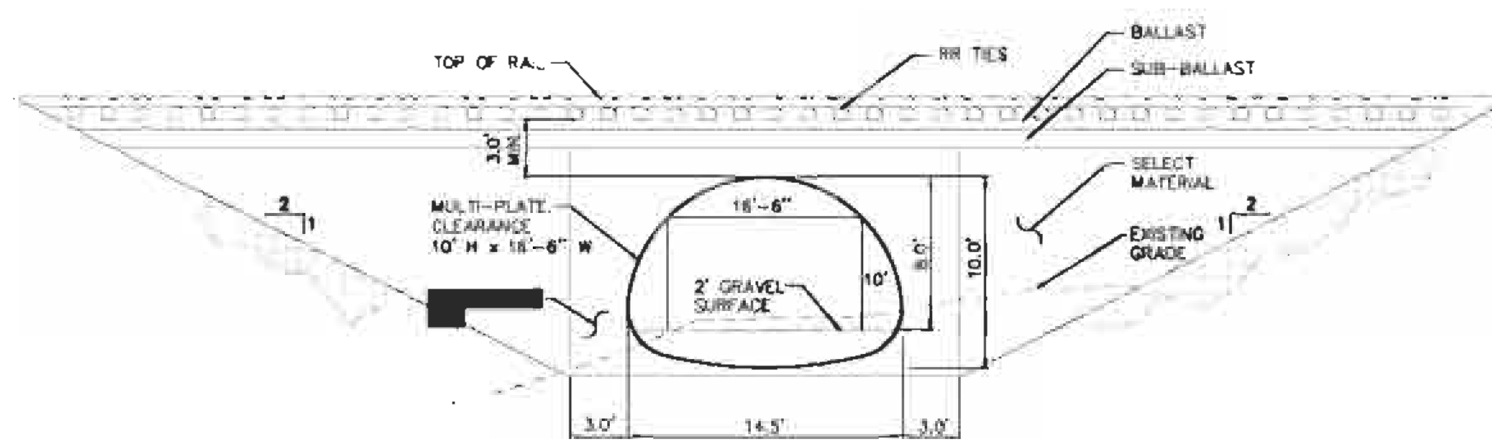
SEPARATED GRADE RECREATIONAL TRAIL CROSSING PLAN

SCALE: NTS



A-A' SEPARATED GRADE RECREATIONAL TRAIL CROSSING PROFILE

SCALE: NTS



B-B' MULTI-PLATE CROSS-SECTION

SCALE: NTS

FIGURE 9

REV.	DATE	BY	REVISION	FIELD BOOKS			
					–		MKS
					–	DRAWN	JAB
					–		MKS
					–	DATE	04/01/03
				SCALE			–
					–		01228.000

TNH

MAT-SU RAIL CORRIDOR STUDY

RECREATIONAL TRAIL CROSSING

SHEET x / x

FILE NO. 01228.000

The rail corridor crosses two major streams, Little Susitna River and Willow Creek and a number of smaller streams, several of which are anadromous fish streams. The Little Susitna River will require a bridge, which is currently envisioned as a 380-foot pile supported structure using a concrete ballasted deck design, see figure 10. The Willow Creek Bridge is currently envisioned as a 280-foot concrete ballasted deck design, see figure 11. The remaining stream crossings are currently planned as culverts. Each will be designed to accommodate fish passage in accordance with ADF&G and USF&WS requirements.

A total of four sidings are planned, each with a clear length of 6,200 feet, sufficient to accommodate a full standard length freight train. This length is the current ARRC standard. All switches will be remote controlled power switches with signals, identical to those currently being installed by the ARRC. The first of these sidings is planned to occur about eight miles north of Port MacKenzie. The second siding is planned to occur approximately four miles further to the north in the Point MacKenzie agricultural area. The third is about eleven miles further north and north of the Little Susitna River and a short distance north of the Susitna Parkway road crossing. The fourth siding is seventeen miles further north, just short of Willow Creek.

The plan view included in Appendix A show additional details for the railroad construction.

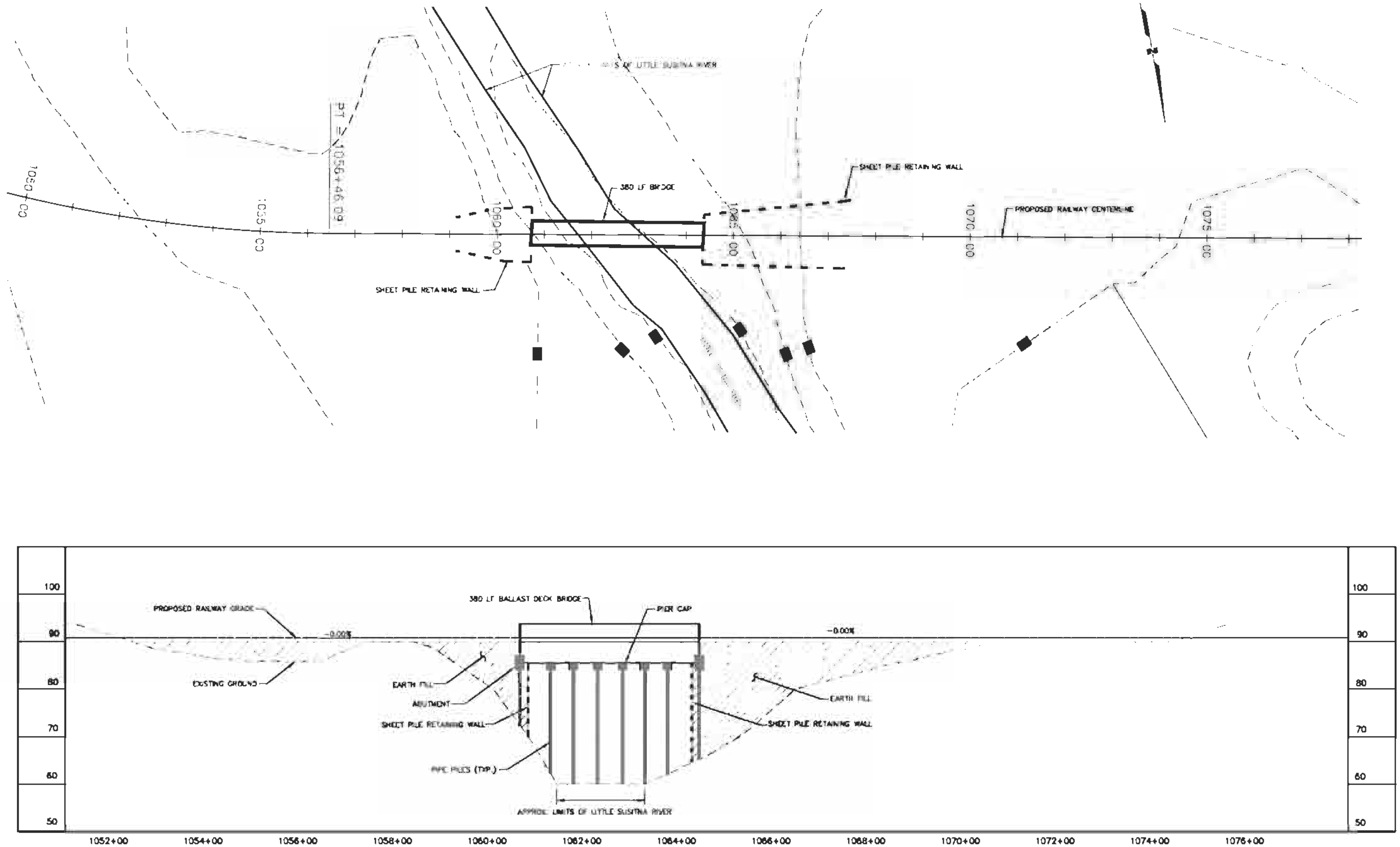


FIGURE 10

MAT-SU RAIL CORRIDOR STUDY

LITTLE SUSITNA BRIDGE CROSSING

STA 1051+00 TO STA 1078+00

SCALE 1" = 200' / 1" = 20'

DATE 04/02/03

FILE NO. 01228.000

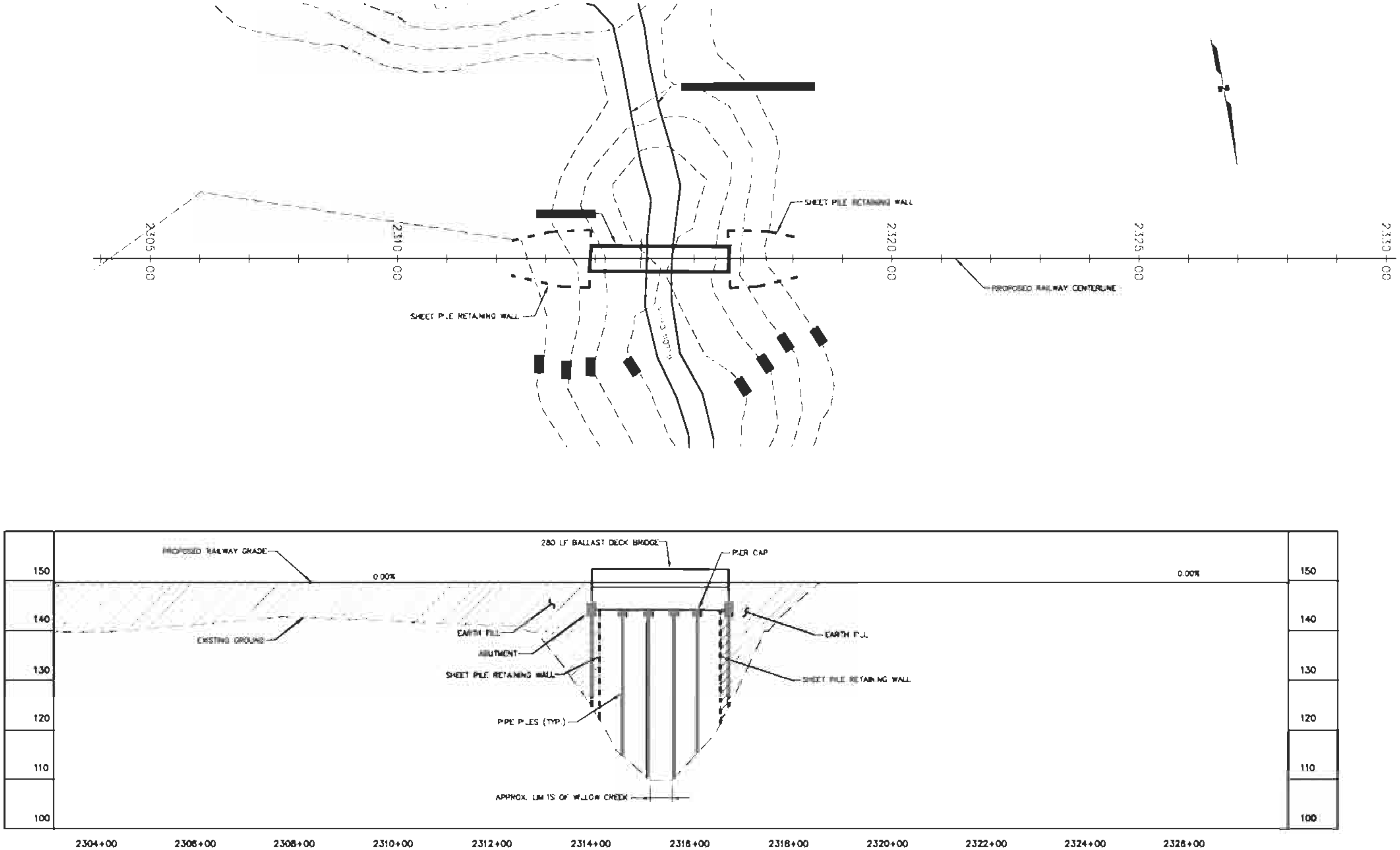


FIGURE 11

REV.	DATE	BY	REVISION

FIELD BOOKS | SCALE HOR. 1"=200' VER. 1"=20' | DATE: 04/02/03 | JOB NO. 01228.000

MAT-SU RAIL CORRIDOR STUDY

WILLOW CREEK BRIDGE CROSSING

STA 2303+00 TO STA 2328+00

FILE NO. 01228.000

7.2 Highway

The roadway element of the project is an improved roadway providing direct access between Port MacKenzie and the Parks Highway. The selected alternative, Corridor 7, is not a new corridor but rather an upgrade with some straightening of existing facilities. The traffic study suggests that, at least within the 20 year planning horizon, the amount of freight and people, assuming implementation of the proposed ferry system, moving through Port MacKenzie will be of a nature that a two-lane rural arterial cross section will provide sufficient capacity to carry port traffic and anticipated increases in local traffic combined. The typical section for this roadway is shown on figure 12.

Beginning at the Port MacKenzie uplands, the roadway follows the existing Point MacKenzie access road northward for 11.4 miles. At that point, the Point MacKenzie Road turns east to connect with Knik-Goose Bay Road. The Point MacKenzie Access Road was designed and constructed as a low volume gravel road, therefore, through this first section, the horizontal and vertical alignments will have to be changed to bring the section into line with the desired 65 mph design speed. These changes will entail ROW acquisition to accommodate larger radius curves and, in some locations, wider cut and fill slope limits.

Between the Point MacKenzie Access Road and the South Big Lake Road, a distance of 6.6 miles, follows the alignment selected by the MSB for improvement of the Burma Road. This alignment passes northerly between Carpenter Lake and Cann Lake then northeasterly to a section line. It then follows the section line north, skirting the west edge of Marilee Lake to connect with the South Big Lake Road. The MSB has been moving ahead with the design and ROW phases for the construction of the Burma Road section as part of their road improvement programs, independent of the Port MacKenzie access issues. The Burma Road/South Big Lake Road intersection is expected to be a standard four-way stop sign controlled intersection with a north bound to east bound right turn lane to facilitate an expected heavy turn movement in the quadrant. A concept is shown on sheet 17 of Appendix B. Soils in this section are largely good gravels, however, near the southern end, the alignment crosses some wetland areas with moderate to deep organic soils. The organic soils are typically in the eight to ten foot depth range with occasional fossil channels that range to over 25 feet deep. Construction in the organic soils areas is expected to require the use of geotextiles with gravel embankment place over the organics. Due to the depth of the organic soils, surcharging may be desirable in order to reduce the potential for settlement issues later. However, the predominate soil type for the section is good gravel and should provide good service.

From the Bruma Road/South Big Lake Road intersection the route turns east and follows the South Big Lake Road. The first two miles of this section follows the existing South Big Lake Road along a section line. The vertical alignment will be improved to provide the sight distances necessary to conform with the desired design speed and a wider typical section will be constructed. The history of this section, in terms of the original Burma Road is that the section is wet silty soils with frequent areas of organics. There is generally gravel underlying the surface at some depth, however, generally shallow. It expected that the surficial organic soils will be removed, the underlying silts will be sub excavated sufficiently to provide an adequate pavement structure and a well drained subgrade, the structural section will be gravel taken from cut sections or imported borrow. The pavement section will be as shown in the Typical Sections, figure 12.

The next 2.2 miles will be construction of a new, improved segment of the South Big Lake Road. This is a section that the MSB has been moving forward on with design and ROW acquisition. The new construction will bypass a section of the existing roadway that is narrow, very crooked and sharply rolling with a safe operating speed of 30 mph or less. The improvements already proposed by the MSB will be a significant safety improvement and generally conform the desired design criteria. The soils through this section are similar in nature to the Burma Road section. The terrain has more relief and preliminary analysis suggests that there will be greater cuts and fills through this section. It is expected that much of the gravel will be taken from the cuts or areas immediately adjacent to the ROW.

The next 2 miles is the west approach to the community of Big Lake. The existing alignment is slow and crooked. The proposed alignment smoothes these curves and enters the Big Lake commercial district in a sweeping curve. The Big Lake commercial district is approximately one mile in length and is characterized by numerous wide driveways. The existing roadway through the commercial district is a rural section with shoulders and no curbing. The proposed improvements would be similar in nature, although traffic data at the time of final design may suggest the need for turn lanes and/or additional control of driveway access. The soils through this section are similar in nature to the previous two sections. The impact on wetlands is expected to be very limited as the proposed alignment closely follows the existing, although there is some smoothing of curves. This section also crosses Fish Creek just downstream of the outlet of Big Lake. This is an important anadromous fish stream. The crossing will require, as a minimum, culverts designed to accommodate fish passage and may require a bridge, depending upon agency input.

The last 3.3 miles extends from the Big Lake commercial district to the intersection with the Parks Highway. This section has good line and grade and, while the shoulders are less than shown in the recommended design criteria, this section will provide the desired level of service for some time. When improvements are warranted, a project to provide the additional shoulder desired width and a pavement overlay would be most appropriate. Soils through this section are good gravels as evidenced by the existing cut slopes.

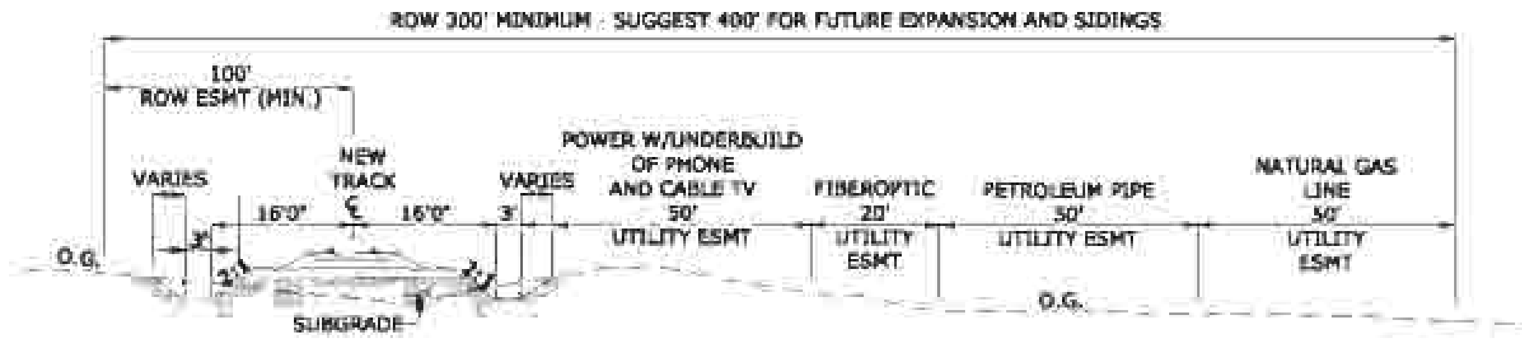
Roadway drainage will be accommodated with roadside ditches in the cut sections, relief culverts where appropriate, and culverts for all streams encountered. Culverts for streams will be designed to accommodate fish passage should there be evidence of fish resident in that stream. The Fish Creek crossing will be a culvert designed to facilitate fish passage unless the regulatory agencies force construction of a short bridge during the design and permitting phase of project development.

Roadway construction is expected to be in general conformance with the typical section shown on figure 12.

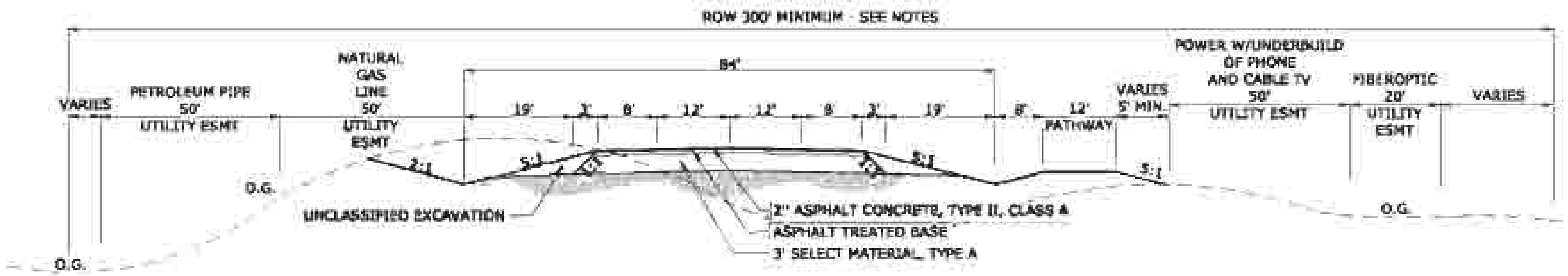
In recognition of the probability that the Knik Arm Crossing will be constructed, the study team has included provision for a future four-lane divided highway from the Point MacKenzie area to

Willow coincident with Corridor 3 as shown on the typical sections, figure 13. The public comment during the three public meetings supported keeping any high volume roadway in the same corridor as the railroad to minimize overall impacts to the area. Implementation of that high-type facility will be left to ADOT&PF. If Knik Arm Crossing is constructed, the advantage of having a high-type facility in Corridor 3 is the manner in which it would facilitate area circulation as the southern Susitna area develops in future years. With this facility in place, and working in conjunction with the existing Parks Highway there would be two primary feeders for the future local arterial system. This should be a very real advantage in the long term.

Refer to Appendix A and B for plan and profile detail.



TYPICAL SINGLE TRACK RAILWAY SECTION



NOTES

1. SUGGESTED MINIMUM RIGHT-OF-WAY IS 300 FEET; HOWEVER, 300 FEET IS PROPOSED FOR FUTURE ROAD EXPANSION AND ADDITIONAL UTILITIES. PREVIOUS ROAD DESIGNS FOLLOWING A PORTION OF THE PROPOSED CORRIDOR 7 ROADWAY MAY OBSERVE DIFFERENT RIGHT-OF-WAY WIDTHS THAN THIS DESIGN. THE MATANUSKA-SUSITNA BOROUGH MAY ADOPT A SINGLE WIDTH RIGHT-OF-WAY OR A VARIED WIDTH RIGHT-OF-WAY THROUGHOUT CORRIDOR 7 DEPENDING ON CONSTRAINTS.

2-LANE
TYPICAL ROADWAY SECTION

INITIAL CONSTRUCTION

FIGURE A

ENGINEERS PLANNERS SURVEYORS & LANDSCAPE ARCHITECTS
TRYCK NYMAN HAYES, INC.

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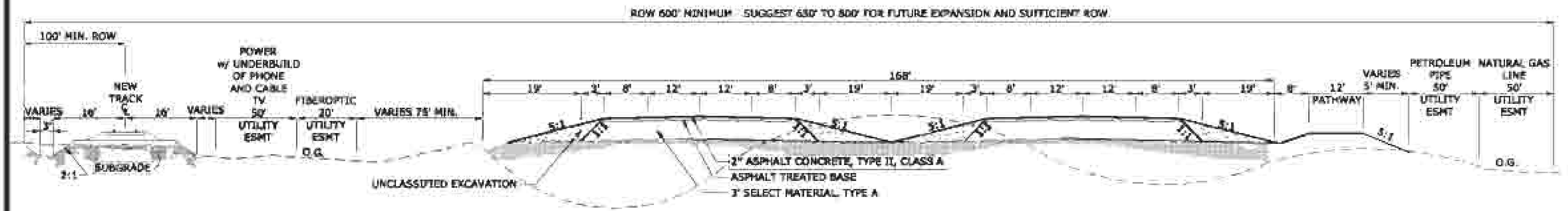

4-LANE
TYPICAL ROADWAY SECTION W/SINGLE TRACK RAILWAY SECTION

ULTIMATE BUILD OUT IF KNIK ARM CROSSING IS CONSTRUCTED

FIGURE B

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8.0 HAZARDOUS AND CONTAMINATED SITES

A search of EPA and ADEC hazardous and contaminated sites was conducted to determine if these facilities would be affect the siting of either the rail road or road alignment from Port MacKenzie to the existing transportation facilities. All recorded sites were plotted on the GIS project area map. Sites that fell within the 800-foot corridor for either of the corridors were listed according to their location and type of contamination.

Corridor 3. The search of ADEC and EPA records yielded no record sites within Corridor 3 from Port MacKenzie to the intersection with the existing railroad alignment north of Willow.

Corridor 7. A total of 12 contaminated sites or sources of contamination were identified within Corridor 7, all of which are on the exiting road system. Of the 12 sites, 8 are in the Big Lake Area, one in Wasilla, and 3 in the general Houston Area (Table 8-1). These sites include contaminated wells, fuel storage tanks, maintenance facilities, or commercial facilities. None of these sites pose a constraint to the development of this corridor as a new access road to Port MacKenzie.

Table 8-1
List of Contaminated sites within Corridor 7

Community	Location of Site	Type of Facility/Source of Contamination
Big Lake Big Lake Wasilla Big Lake Big Lake Big Lake Big Lake Big Lake Houston Houston Houston Big Lake	5.5 Mile Big Lake Road Big Lake Road Mile 5.5 S. Big Lake Road Mile 4.2 Big Lake Road Big Lake Road Big Lake Road Makati Road Mile 3.5 Big Lake Road Big Lake Rd Big Lake Rd Big Lake Rd Big Lake Rd	Hardware stores Motor vehicle rental facilities Government vehicle maintenance facilities Tanks, diesel (above ground) Tanks, heating oil, nonresidential (aboveground) Water supply wells Tanks, heating oil, nonresidential (aboveground) Tanks, heating oil, nonresidential (underground) Water supply wells Motor/motor vehicle supplies stores Lumber processing and preservation Pit toilets (vaulted) nonresidential (one or more)

Source: Alaska Department of Enviromental Conservation, 2003

9.0 PUBLIC PROCESS SUMMARY

A Public Involvement Plan (PIP) was developed to ensure that the public and state and federal agencies were informed about the study. The PIP served as a guide for gathering relevant information from stakeholders to be used in project development. The critical milestones where public input was gathered include:

Critical Milestone	Approximate Schedule
⇒ Issues Identification	Spring 2002
⇒ State and Federal Agency Coordination	Spring 2002
⇒ Office Study	Summer/Fall 2002
⇒ Field Reconnaissance	Summer 2002
⇒ Route Alternatives Development & Evaluation	Fall 2002
⇒ Alternatives Presentation	Winter 2002
⇒ Route Recommendation	Winter/Early Spring 2003
⇒ Route Recommendation Presentation	Spring 2003

9.1 Mailing List

A study mailing list of individuals and groups with an interest in the study area was developed (Appendix J). A comprehensive list of property owners was obtained from the MSB. In addition, the mailing list includes businesses, local government departments, and state and federal resource agencies. To date, the list has approximately 10,000 names on it.

9.2 Study Flyers

At the beginning of the study, a postcard mailer was distributed to all parties on the mailing list providing information regarding the status and schedule of the study, and inviting the public to a public meeting on May 15, 2002 in Houston.

For the second workshop, a two-sided, 8.5 x 11-inch flyer was mailed to an expanded mailing list containing names toward the Willow area. The flyer summarized issues identified at the May 15, 2002, meeting and invited the public to a route analysis workshop on November 20, 2002, in Houston.

A third flyer was prepared for the April 2, 2003 open house and was mailed to all names on the mailing list. This flyer described the proposed route and information on the rationale behind the selection.

9.3 Public Meetings

Three public meetings were held at Houston High School during the course of the study.

Meeting #1: Issues Identification Meeting

Study objectives, a review of past studies, and the schedule were presented followed by a facilitated discussion. Comments are organized in regard to the following issues: route, recreation, and land use. A full record of the results of the meeting are found in the Public Involvement Report, Appendix I.

Meeting #2: Alternatives Presentation Workshop

Route options were presented at a workshop where the public could review the proposed route options and supporting technical information. Information from the commodities study, soils constraints analysis, baseline environmental data on wetlands, fish and wildlife habitat and archeological sites, traffic volume estimates, and land status were available for review. A ranking sheet was distributed to the participants. Eighty-four participants turned in the ranking sheet. The following table displays their first choice for roadway and railroad corridor. It also describes the most important development criteria. Participants ranked the proposed roadway corridors from 1-4 with 1 being the highest. They ranked the railroad corridors from 1-3 with 1 being the highest. Participants rated the development criteria from 1-5 with 1 being the most important criteria.

ROADWAY	RATED AS FIRST CHOICE	RAILROAD	RATED AS FIRST CHOICE
Corridor 4	16	**Corridor 3**	**66**
Corridor 5	8	Corridor 4	9
Corridor 7	21	Corridor 5	6
Corridor 10	**30**		
Add a Roadway Corridor 3	6	No Rail/No project	1

PROJECT CRITERIA FOR ROADWAY	RATED #1 in importance	PROJECT CRITERIA FOR RAILROAD	RATED #1 in importance
Construction Cost	14	Construction Cost	9
Wetlands Impact	12	Wetlands Impact	12
Private Property Impact	**41**	**Private Property Impact**	**51**
Public Property Impact	4	Public Property Impact	5
Access to undeveloped area	9	Access to undeveloped area	9
Reduced commute time	16	Reduced commute time	7
Build Road and Rail together			3

<u>Meeting #3: Recommended Route Presentation Open House</u>

An open house was held to present the recommended route option. Participants were invited to examine the information gathered to date on the route options and to review the rationale behind the selection. Exhibits included information on land ownership, environmental impacts, trail crossings, typical cross section for roadway and railroad, construction cost estimates, bridge crossings, and traffic analysis.

9.4 Agency Pre-application Meeting

An agency pre-application meeting was held on May 13, 2002 at the offices of URS Consulting in Anchorage. The purpose of the meeting was to introduce the study team, go over the study objectives and hold a roundtable discussion among local, state, and federal resource agencies regarding route location constraints, environmental baseline conditions, and information needs for future project permitting.

9.5 Media Contacts

Newspaper announcements and Public Service Announcements (PSA) were published in advance of each of the three public meetings. For the newspaper, display advertisements were designed and published at least one week prior to the meeting in the Anchorage Daily News and the Frontiersman. PSAs inviting the public to the meetings were sent to the following radio stations: KMBQ (Houston), KNIK, KSKA, KASH/KENI and KNBA.

9.6 Additional Outreach and Communications

Several presentations were made during the course of the study to the following groups:

- ✓ Matanuska-Susitna Borough Port Commission
- ✓ Knik-Goose Bay Community Council
- ✓ Matanuska-Susitna Borough Transportation Advisory Board

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APPENDIX A

Plans for Railroad – Corridor 3

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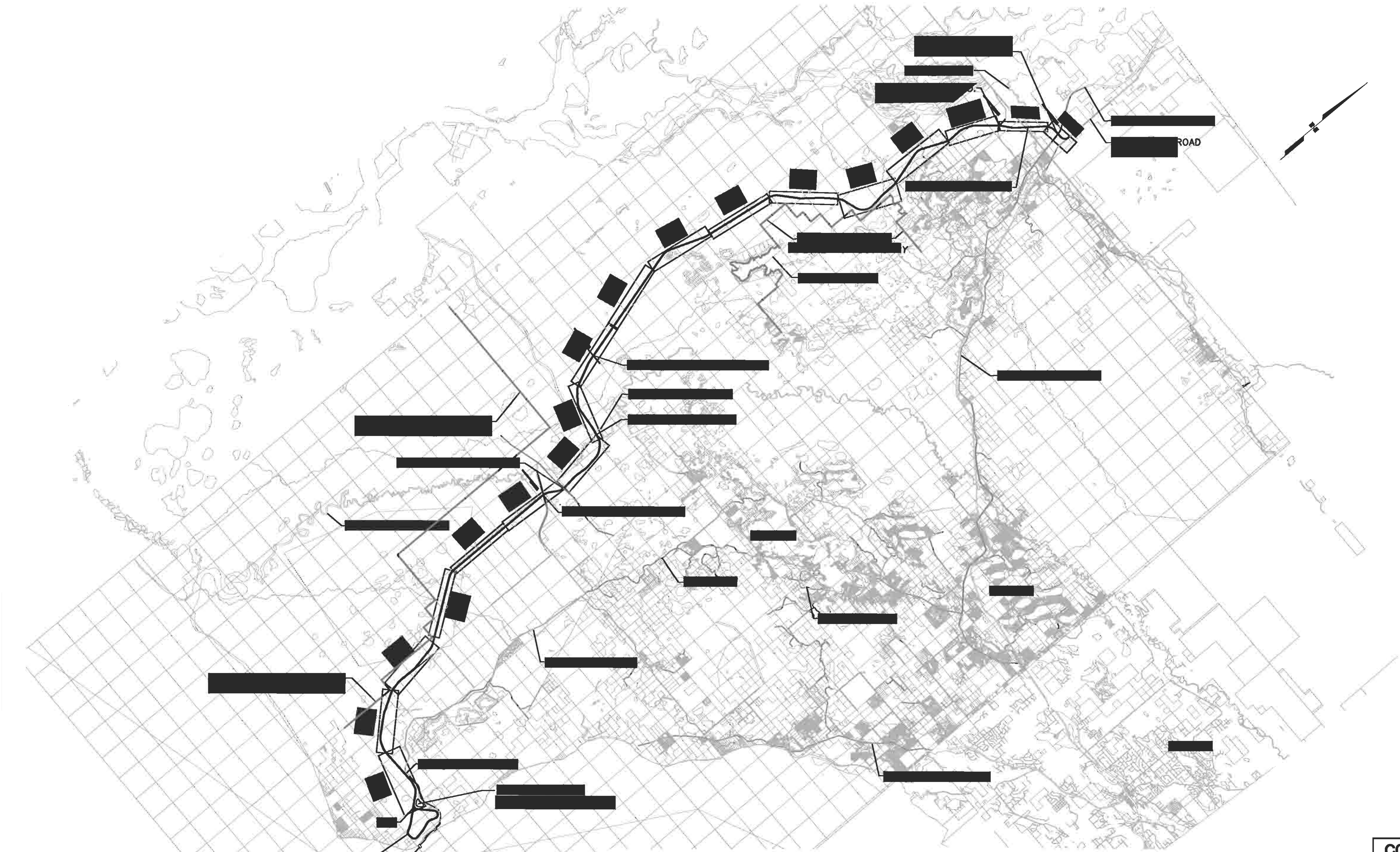

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TNH
ENGINEERING/SURVEYING & LANDSCAPE ARCHITECTURE
Tryck Nyman Hayes, Inc.

MAT-SU RAIL CORRIDOR STUDY

RAIL CORRIDOR 3
KEY MAP

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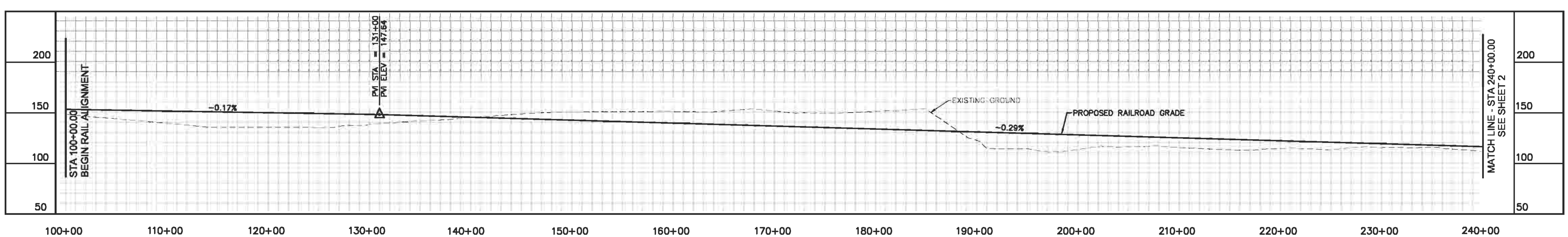

*NOTE: DRAWING SCALES REFERENCED ARE FOR HALF SIZE SHEETS

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Tryck Nyman Hayes, Inc.

MAT-SU
RAIL CORRIDOR STUDY
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SHEET 1 OF 11
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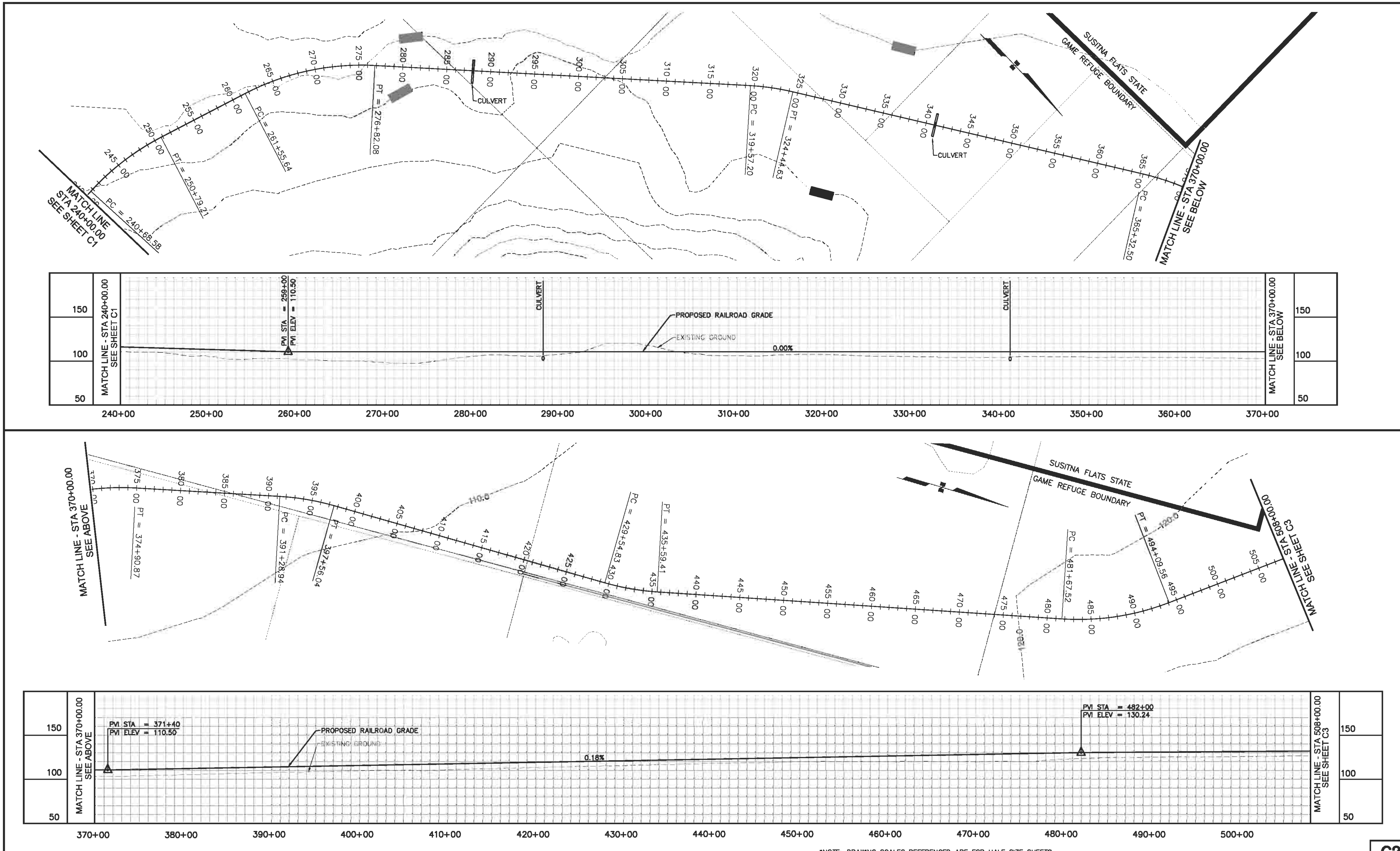

*NOTE: DRAWING SCALES REFERENCED ARE FOR HALF SIZE SHEETS

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ENGINEERING/SURVEYING & LANDSCAPE ARCHITECTURE
Tryck Nyman Hayes, Inc.

MAT-SU
RAIL CORRIDOR STUDY PLAN & PROFILE
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SHEET 2 of 11

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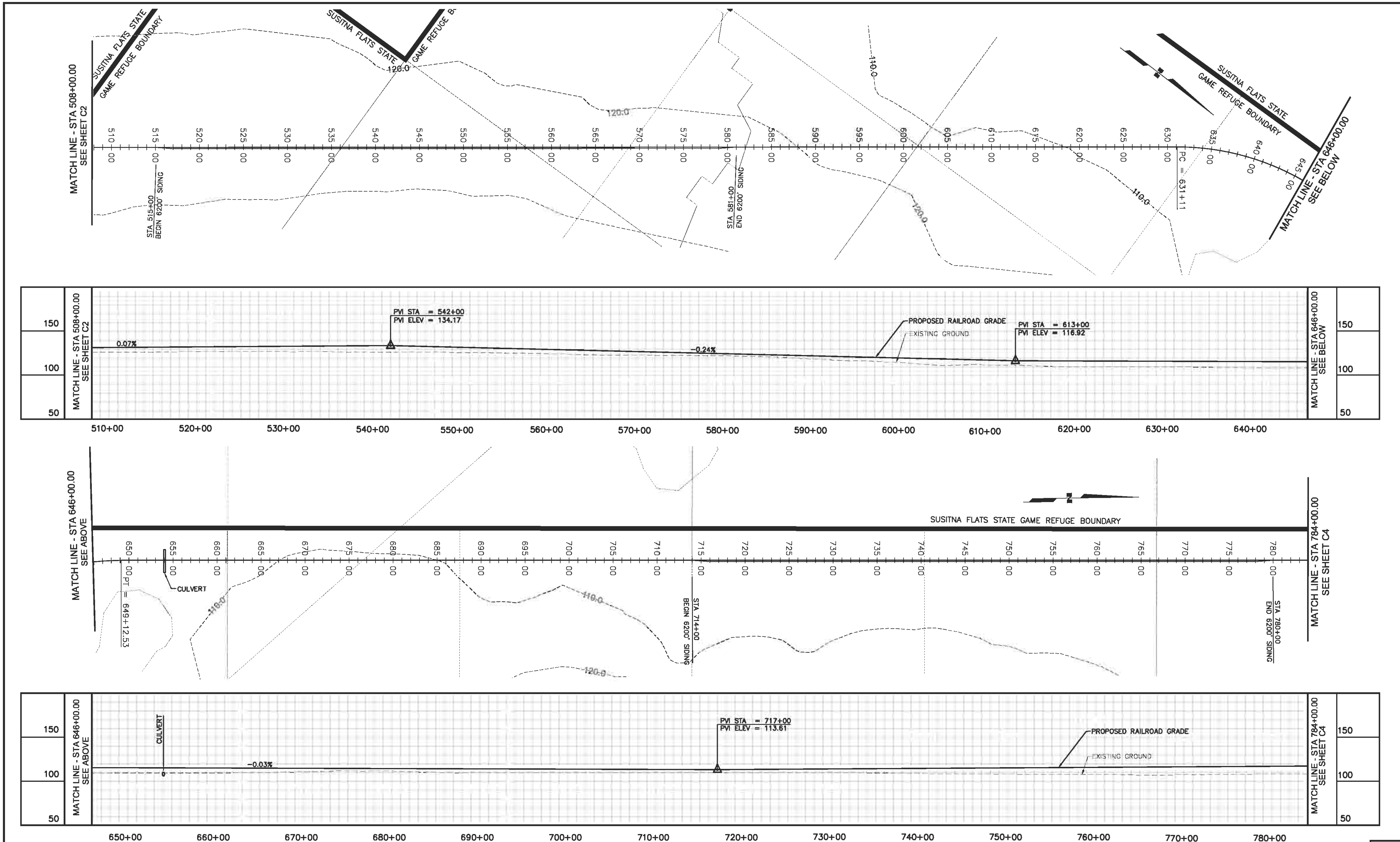

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*NOTE: DRAWING SCALES REFERENCED ARE FOR HALF SIZE SHEETS

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ENGINEERING/SURVEYING & LANDSCAPE ARCHITECTURE
Tryck Nyman Hayes, Inc.

MAT-SU
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SHEET 3 of 11

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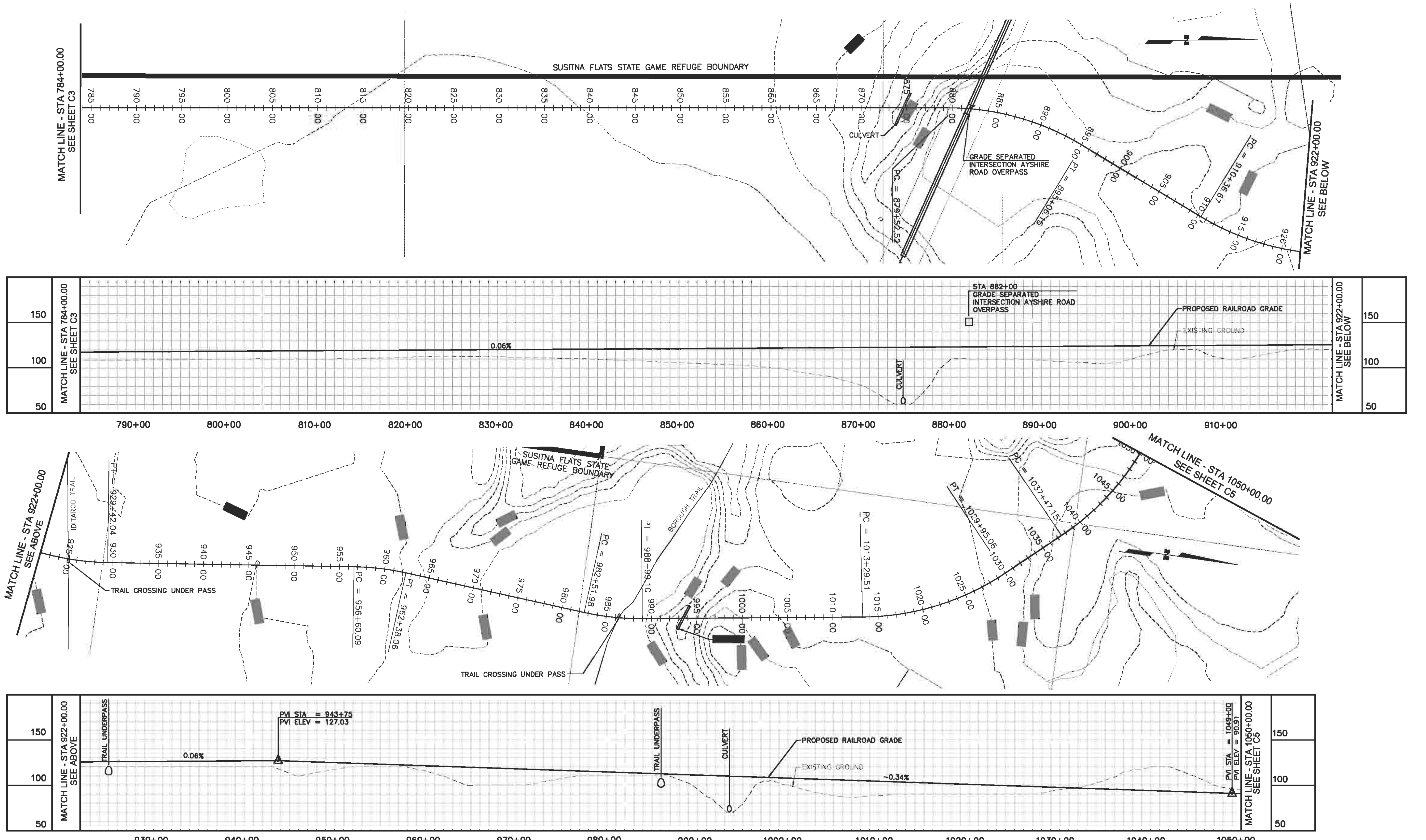

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*NOTE: DRAWING SCALES REFERENCED ARE FOR HALF SIZE SHEETS

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VER.	1"=100'	JOB NO.	01228.000

TNH
ENGINEERING/SURVEYING & LANDSCAPE ARCHITECTURE
Tryck Nyman Hayes, Inc.

MAT-SU

RAIL CORRIDOR STUDY
PLAN & PROFILE
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SHEET 4 OF 11

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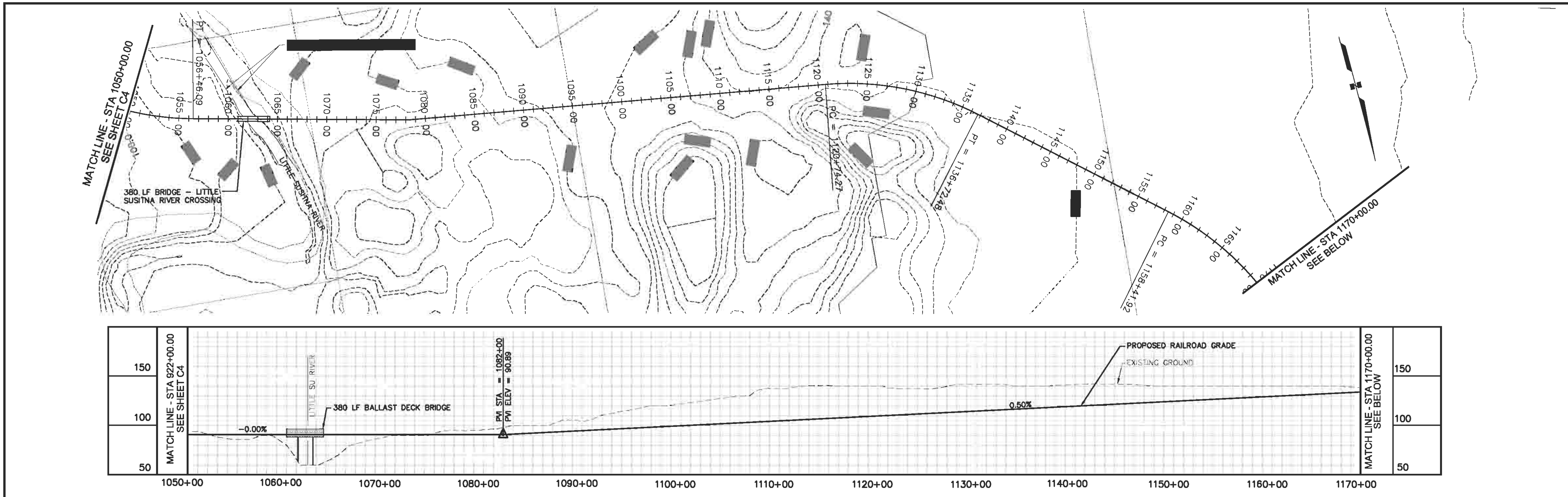

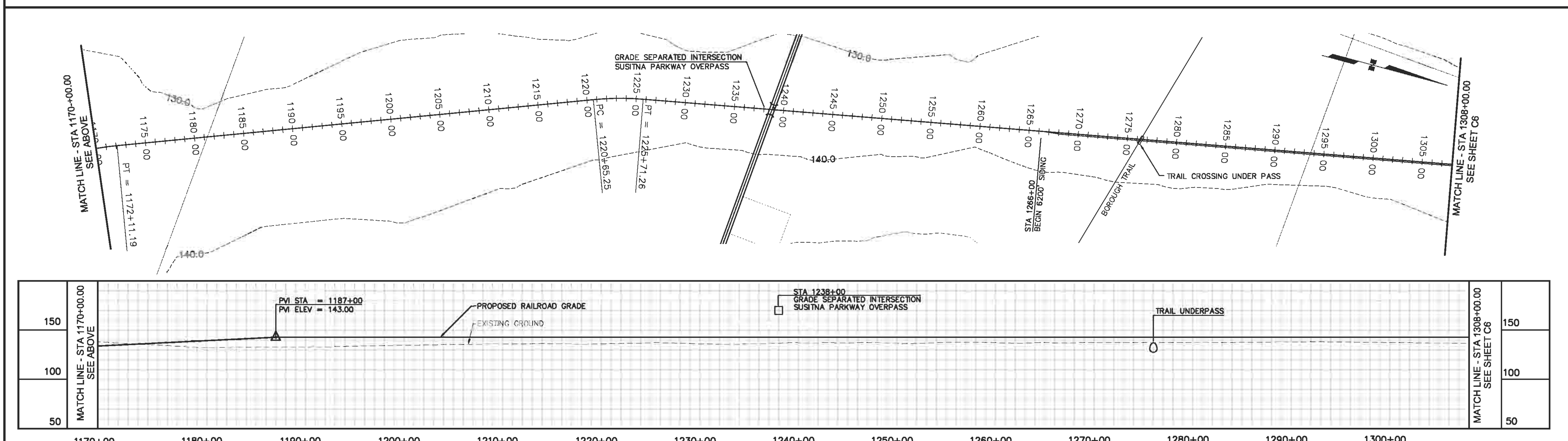

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AS-BUILT	–
SCALE HOR.	1"=1000'
SCALE VER.	1"=100'

DESIGNED	MKS
DRAWN	JDG
CHECKED	MKS
DATE	04/02/03
GRID	–
JOB NO.	01228.000

ENGINEERING/SURVEYING & LANDSCAPE ARCHITECTURE
Tryck Nyman Hayes, Inc.

MAT–SU
RAIL CORRIDOR STUDY PLAN & PROFILE
STA 1050+00.00 TO STA 1308+00.00

SHEET 5 OF 11

FILE NO. 01228.000

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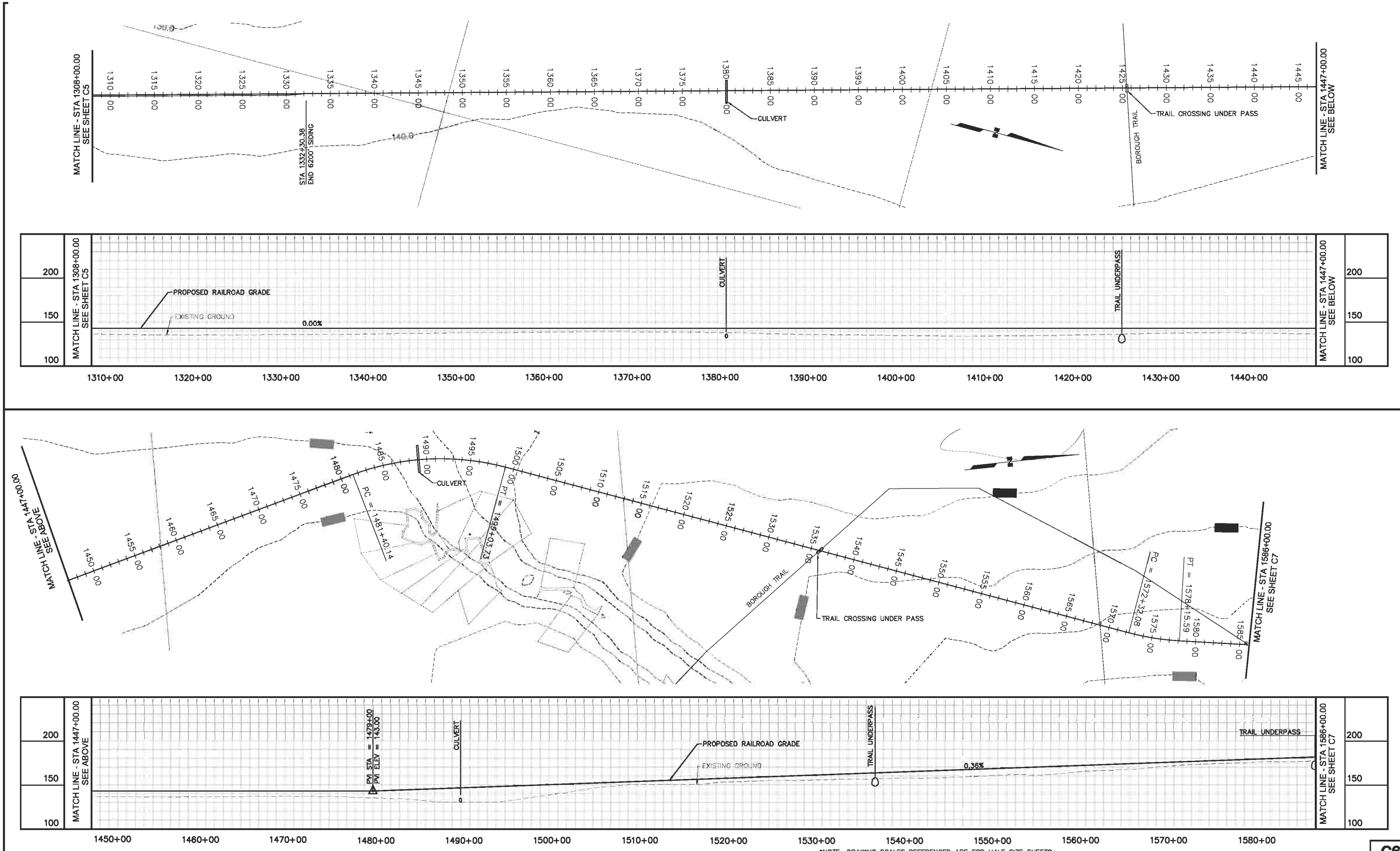

*NOTE: DRAWING SCALES REFERENCED ARE FOR HALF SIZE SHEETS

C6

REV.	DATE	BY	REVISION

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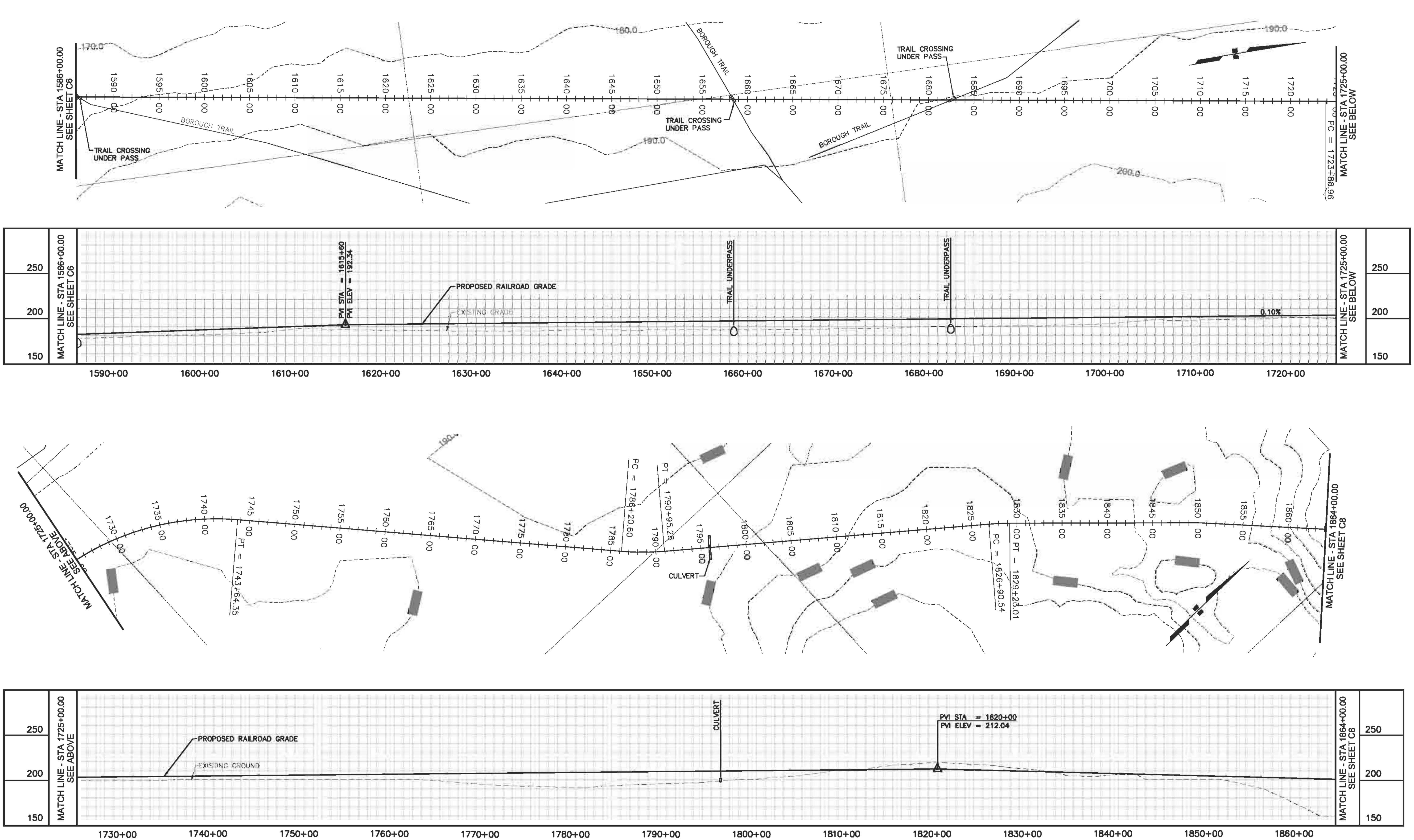
VER.	1"=100'	JOB NO.	01228.000

ENGINEERING/SURVEYING & LANDSCAPE ARCHITECTURE
Tryck Nyman Hayes, Inc.

MAT–SU
RAIL CORRIDOR STUDY
PLAN & PROFILE
STA 1308+00.00 TO STA 1586+00.00

SHEET 6 of 11
FILE NO. 01228.000



*NOTE: DRAWING SCALES REFERENCED ARE FOR HALF SIZE SHEETS

C7

REV.	DATE	BY	REVISION

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SCALE	HOR. 1"=1000' VER. 1"=100'

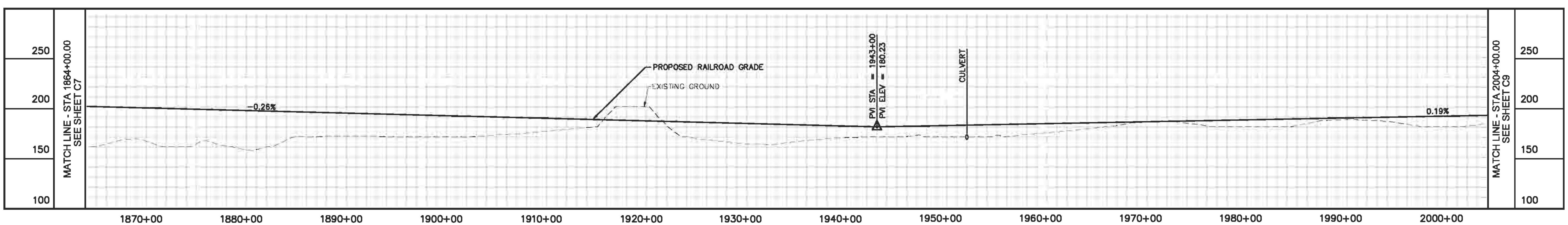
DESIGNED	MKS
DRAWN	MKS/JDG
CHECKED	MKS
DATE	04/02/03
GRID	–
JOB NO.	01228.000

ENGINEERING/SURVEYING & LANDSCAPE ARCHITECTURE
Tryck Nyman Hayes, Inc.

MAT-SU
RAIL CORRIDOR STUDY
PLAN & PROFILE
STA 1586+00.00 TO STA 1864+00.00

SHEET 7 OF 11

FILE NO. 01228.000



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REV.	DATE	BY	REVISION

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AS-BUILT	–	CHECKED	MKS
SCALE		DATE	04/02/03
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VER.	1"=100'	JOB NO.	01228.000

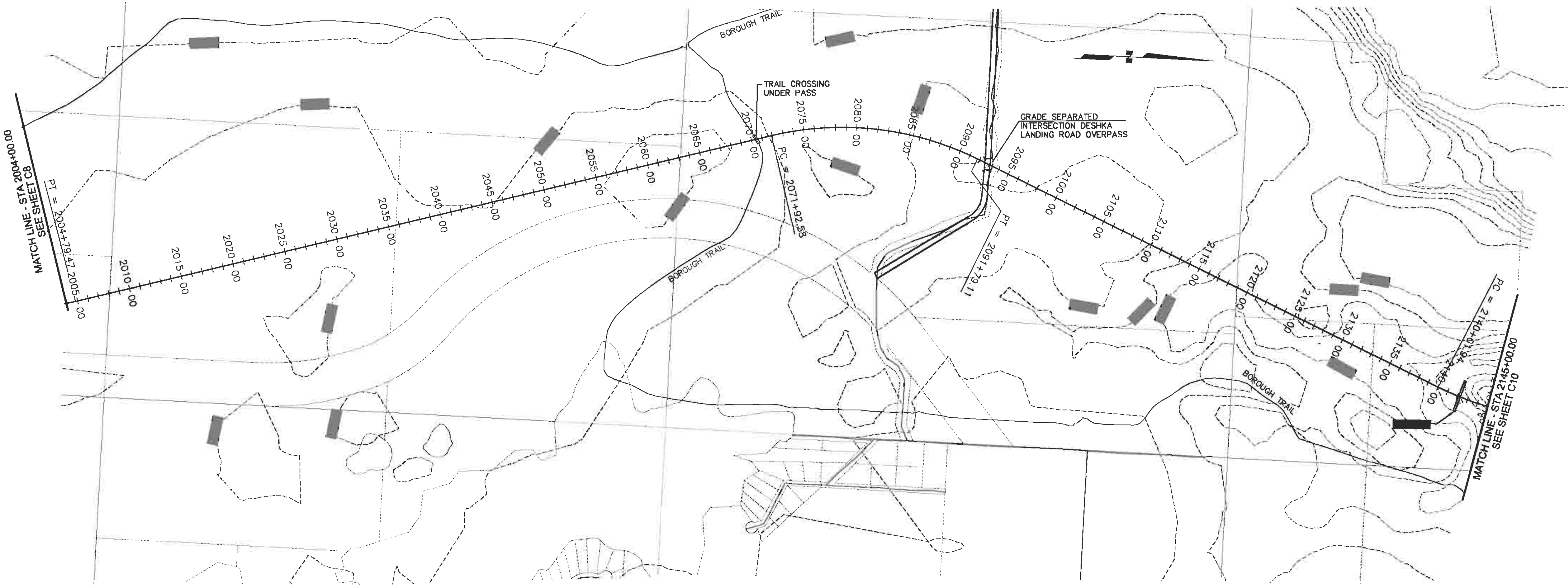
ENGINEERING/SURVEYING & LANDSCAPE ARCHITECTURE
Tryck Nyman Hayes, Inc.

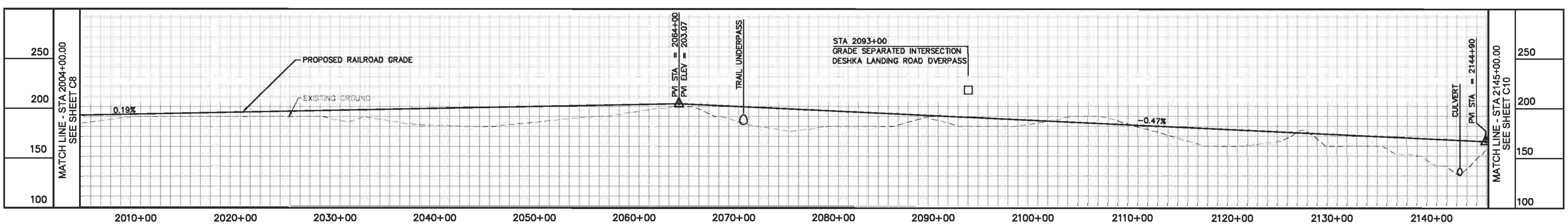
MAT-SU
RAIL CORRIDOR STUDY PLAN & PROFILE
STA 1864+00.00 TO STA 2004+00.00

C8

SHEET 8 OF 11

FILE NO. 01228.000





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REV.	DATE	BY	REVISION

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SCALE VER.	1"=100'

DESIGNED	MKS
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CHECKED	MKS
DATE	04/02/03
GRID	–
JOB NO.	01228.000

ENGINEERING/SURVEYING & LANDSCAPE ARCHITECTURE
Tryck Nyman Hayes, Inc.

MAT-SU
RAIL CORRIDOR STUDY
PLAN & PROFILE
STA 2004+00.00 TO STA 2145+00.00

C9

SHEET 9 OF 11

FILE NO. 01228.000

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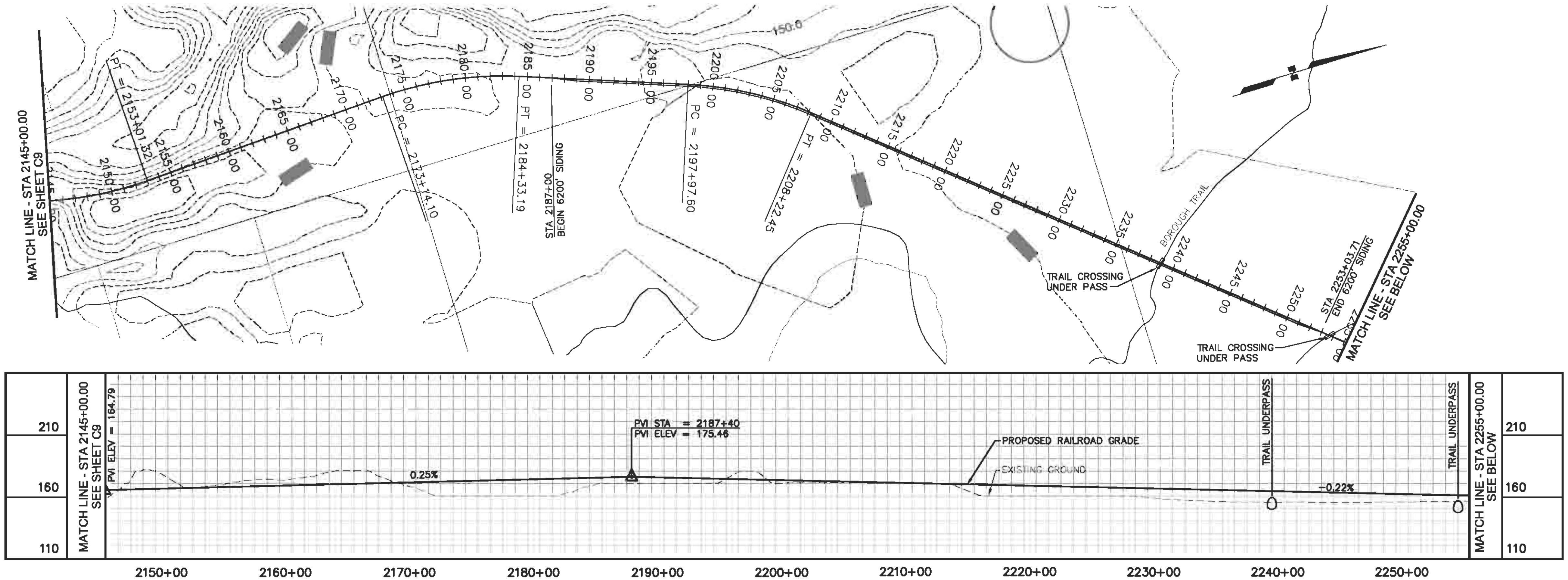

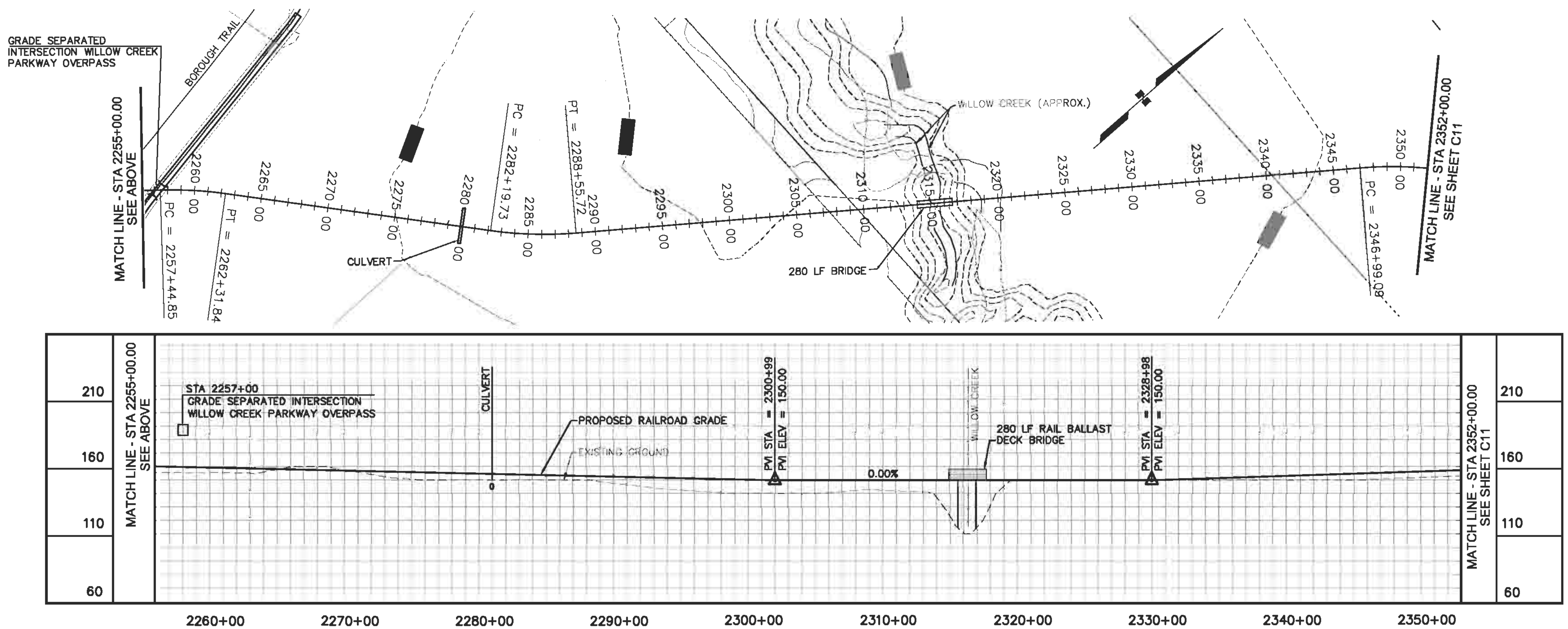

*NOTE: DRAWING SCALES REFERENCED ARE FOR HALF SIZE SHEETS

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		GRID	–
		JOB NO.	01228.000

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MAT-SU

RAIL CORRIDOR STUDY
PLAN & PROFILE

STA 2145+00.00 TO STA 2352+00.00

SHEET 10 OF 11

FILE NO. 01228.000

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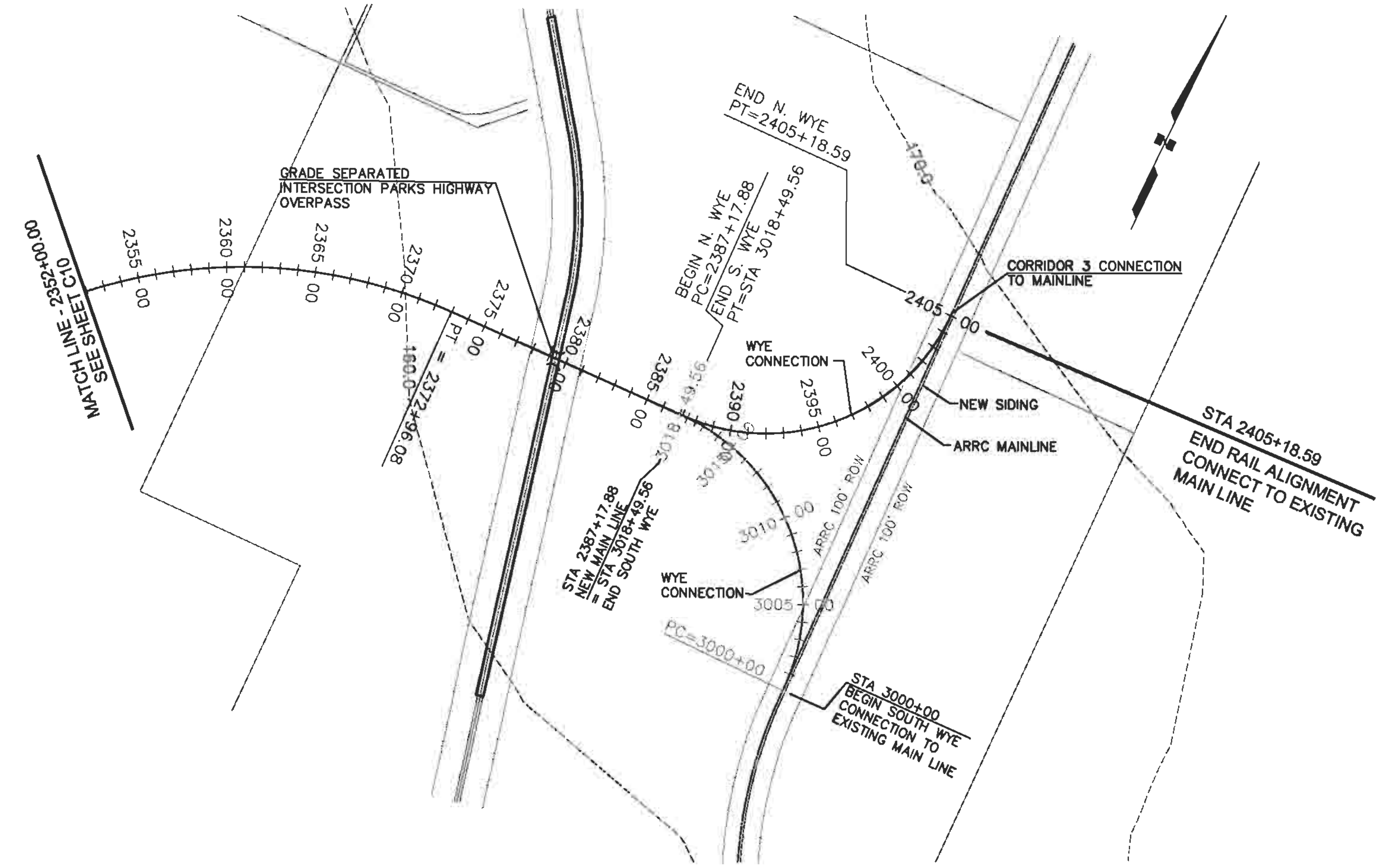

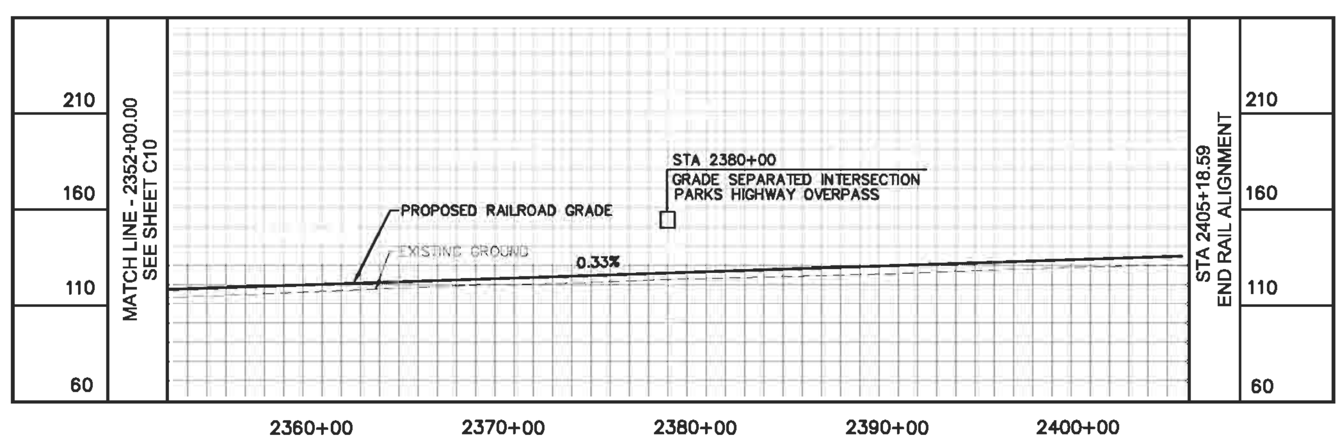

*NOTE: DRAWING SCALES REFERENCED ARE FOR HALF SIZE SHEETS

REV.	DATE	BY	REVISION

FIELD BOOKS			
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STAKING	–	DRAWN	JDG
AS-BUILT	–	CHECKED	MKS
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		GRID	–
		JOB NO.	01228.000

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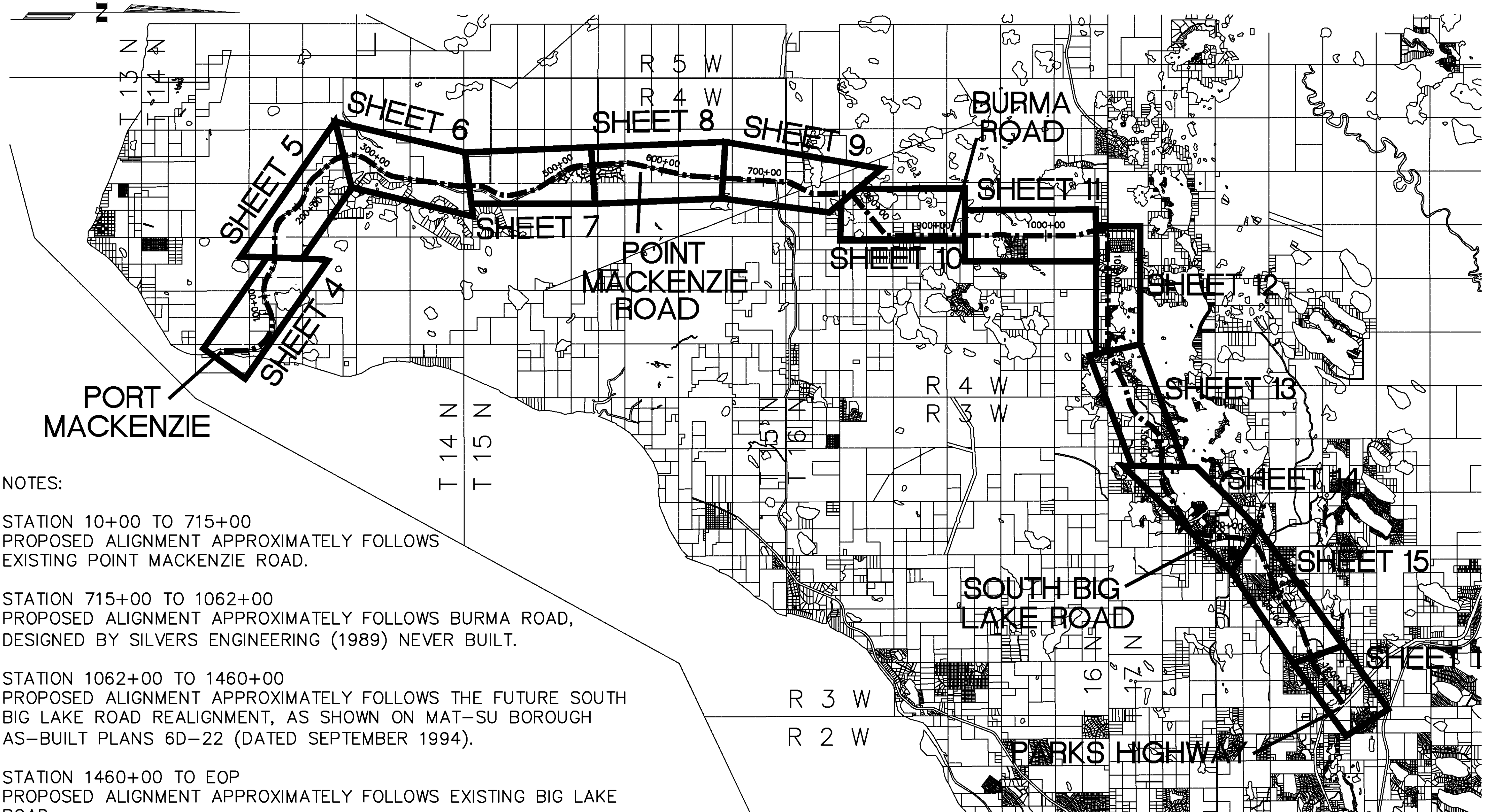
MAT–SU
RAIL CORRIDOR STUDY
PLAN & PROFILE
STA 2352+00.00 TO STA 2405+18.59

C11
SHEET 11 OF 11
FILE NO. 01228.000

APPENDIX B

Plans for Roadway – Corridor 7



NOTES:

STATION 10+00 TO 715+00
PROPOSED ALIGNMENT APPROXIMATELY FOLLOWS EXISTING POINT MACKENZIE ROAD.

STATION 715+00 TO 1062+00
PROPOSED ALIGNMENT APPROXIMATELY FOLLOWS BURMA ROAD, DESIGNED BY SILVERS ENGINEERING (1989) NEVER BUILT.

STATION 1062+00 TO 1460+00
PROPOSED ALIGNMENT APPROXIMATELY FOLLOWS THE FUTURE SOUTH BIG LAKE ROAD REALIGNMENT, AS SHOWN ON MAT-SU BOROUGH AS-BUILT PLANS 6D-22 (DATED SEPTEMBER 1994).

STATION 1460+00 TO EOP
PROPOSED ALIGNMENT APPROXIMATELY FOLLOWS EXISTING BIG LAKE ROAD.

DESIGN BY: ROE	DATE: 3-7-03
DRAWN BY: CJS	JOB NO.:
CHECKED BY: VLR	REV.:
FIELD BOOK:	FILE:
11 X 17 SCALE: HORZ.:1"=10000'	SHEET: 3 OF 17

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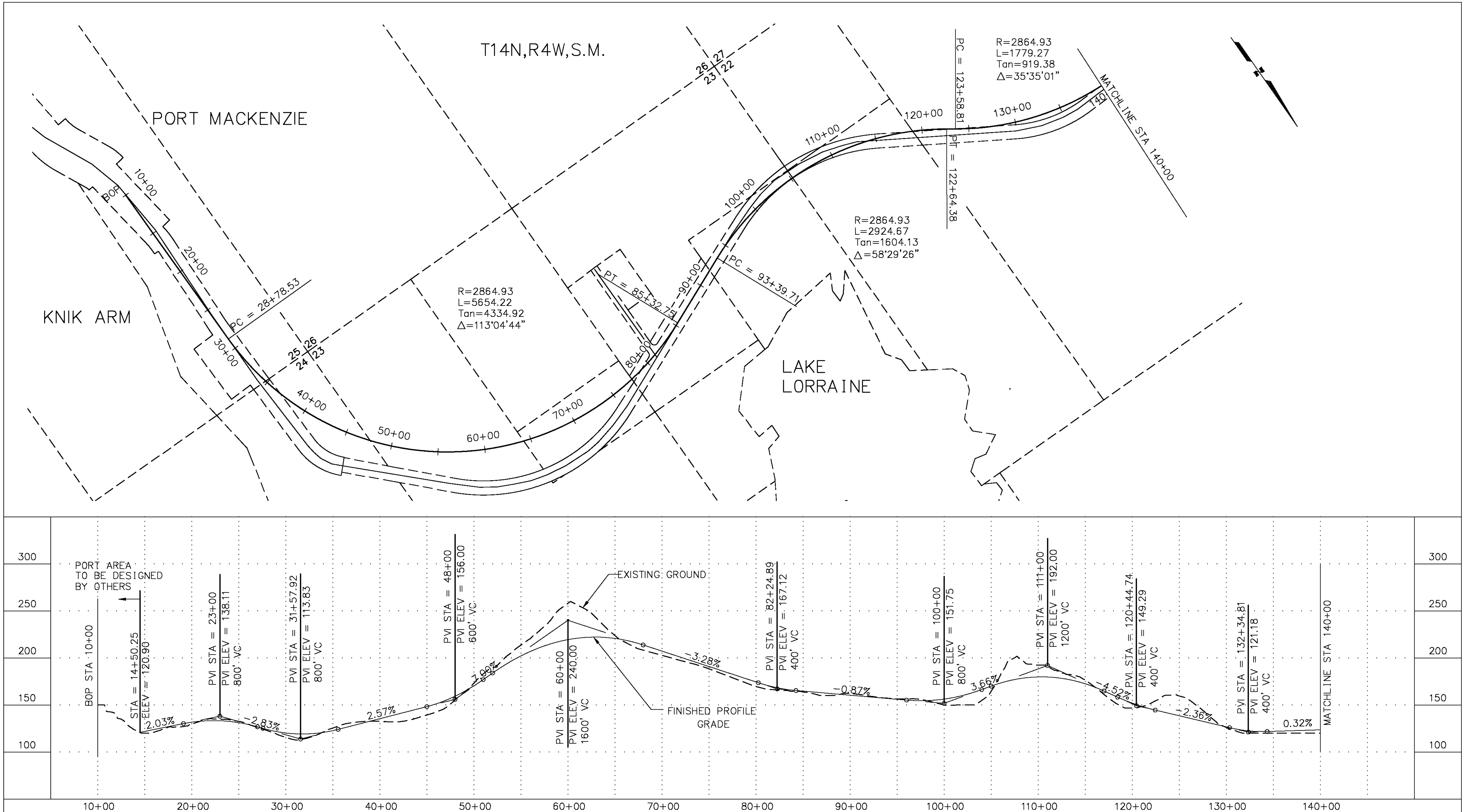
MAT-SU RAIL CORRIDOR STUDY

2-LANE HIGHWAY CORRIDOR INDEX SHEET



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MAT-SU RAIL CORRIDOR STUDY

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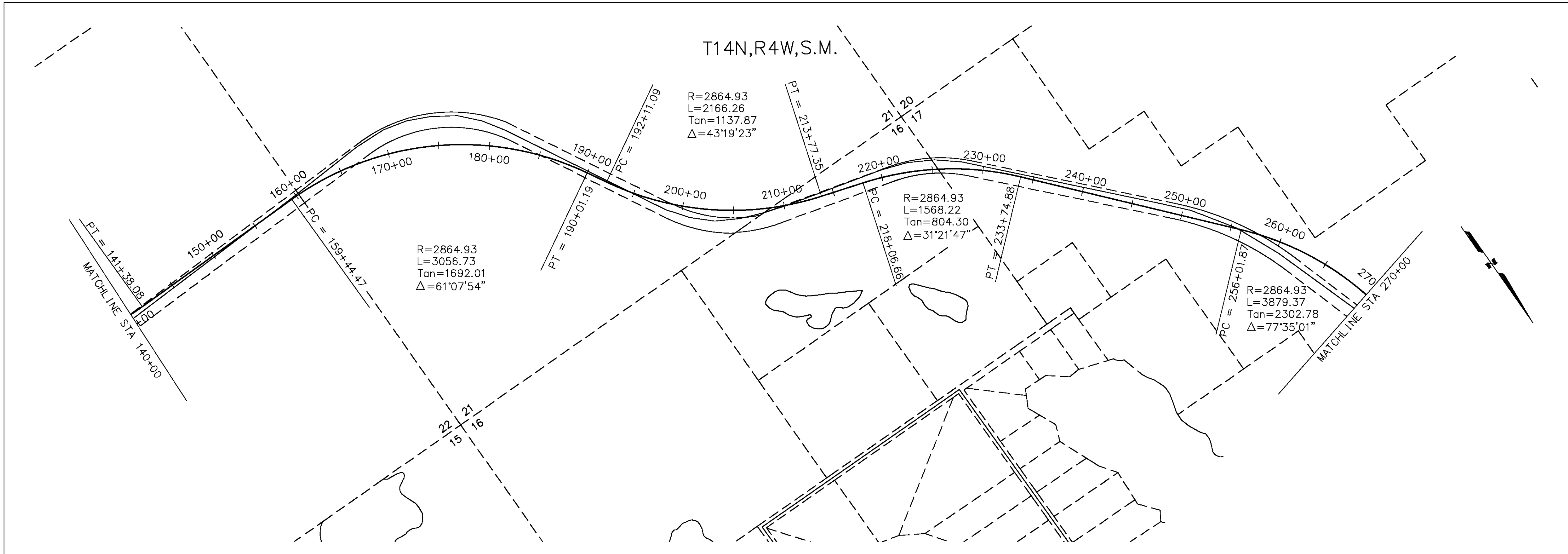

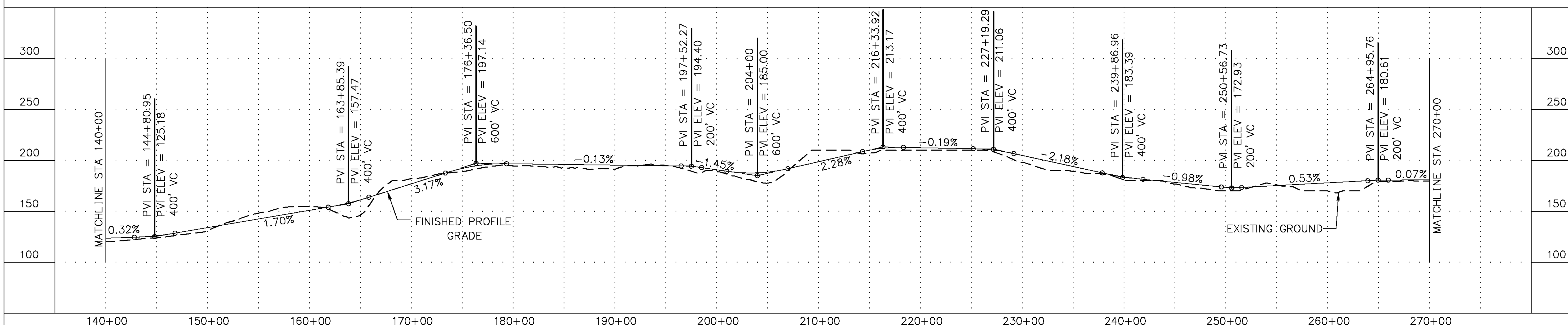

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11 X 17 SCALE: HORZ.:1"=1000' VERT.:1"=100'	SHEET: 5 OF 17

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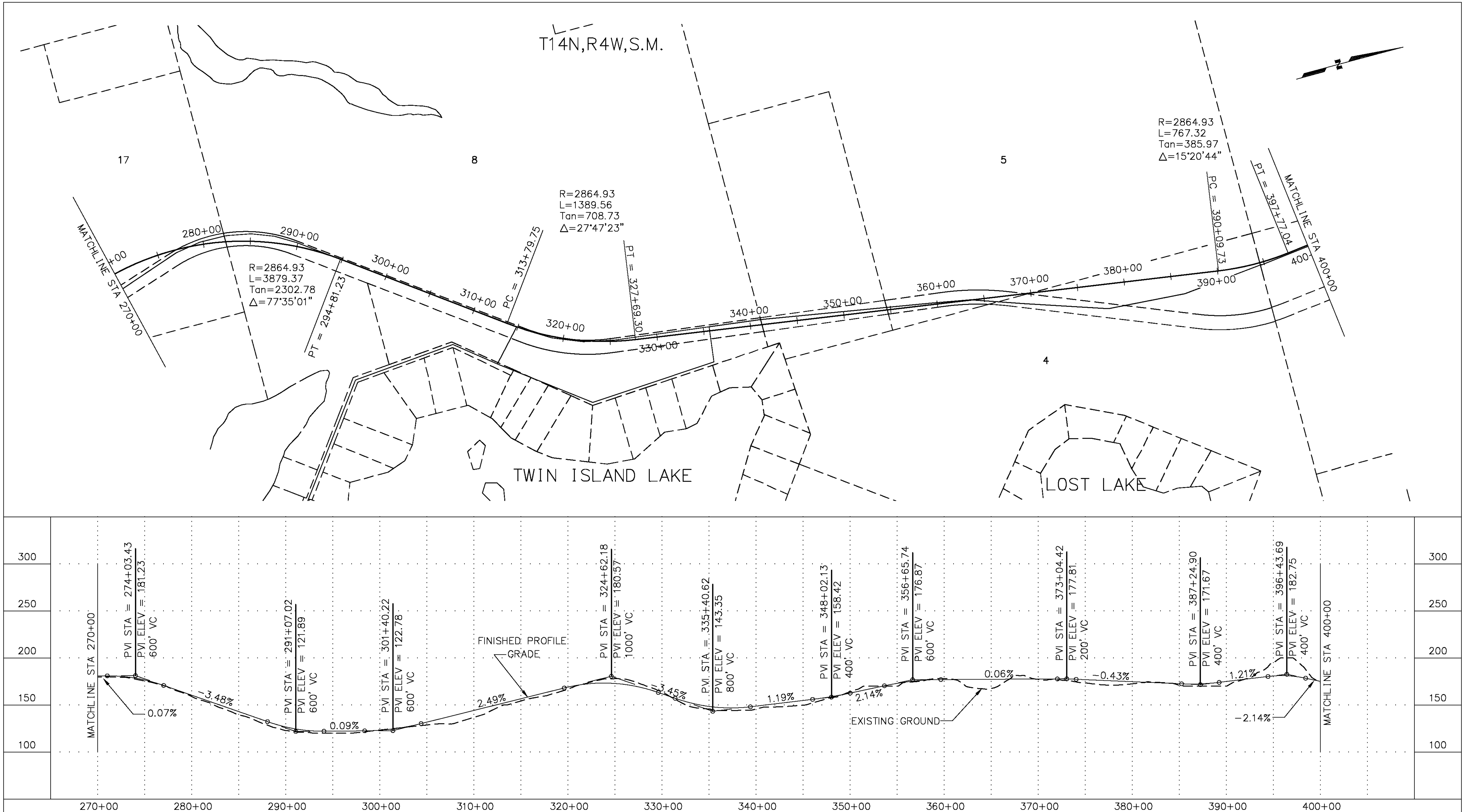
MAT-SU RAIL CORRIDOR STUDY

2-LANE HIGHWAY CORRIDOR PLAN AND PROFILE STA 140+00 TO 270+00



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MAT-SU RAIL CORRIDOR STUDY

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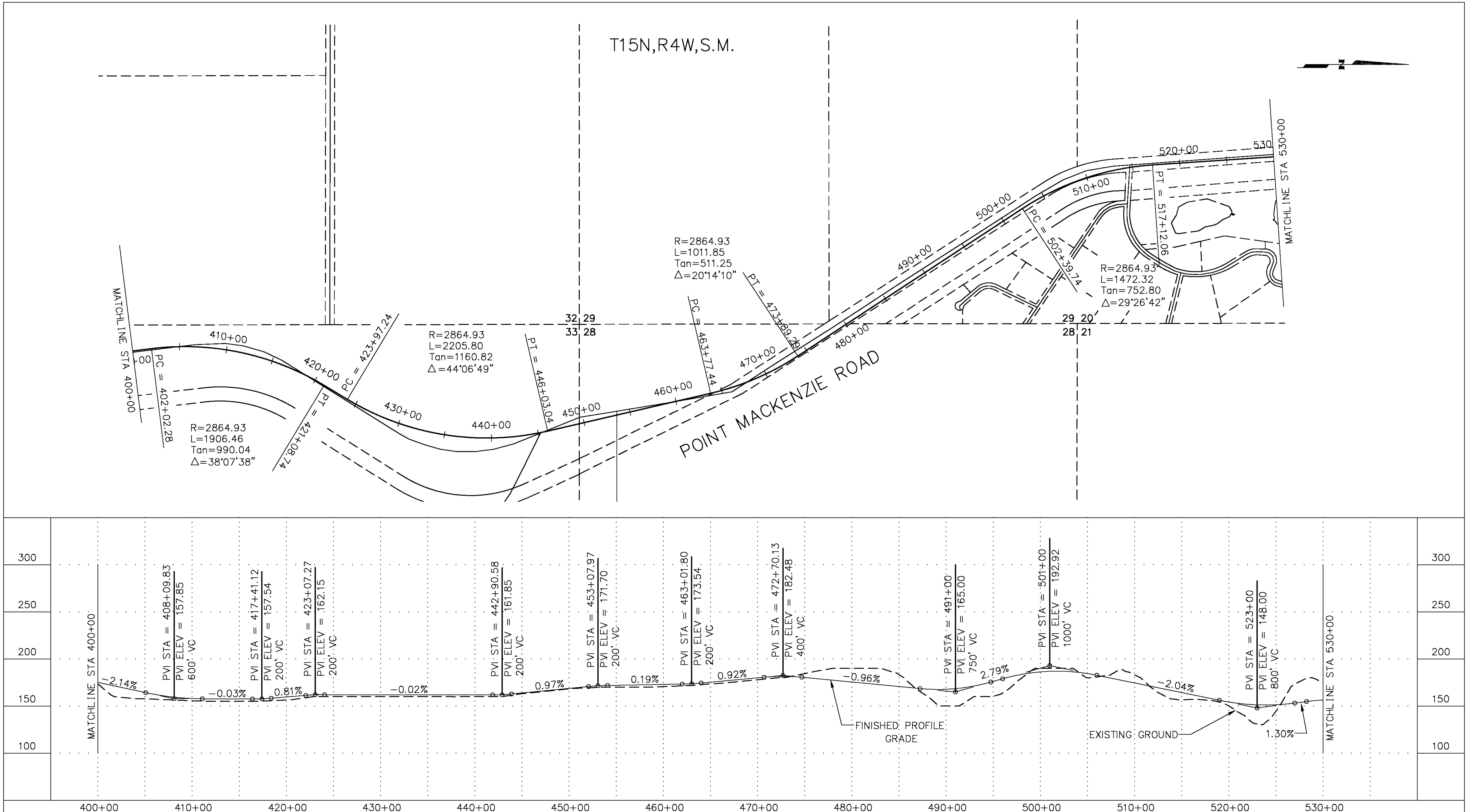

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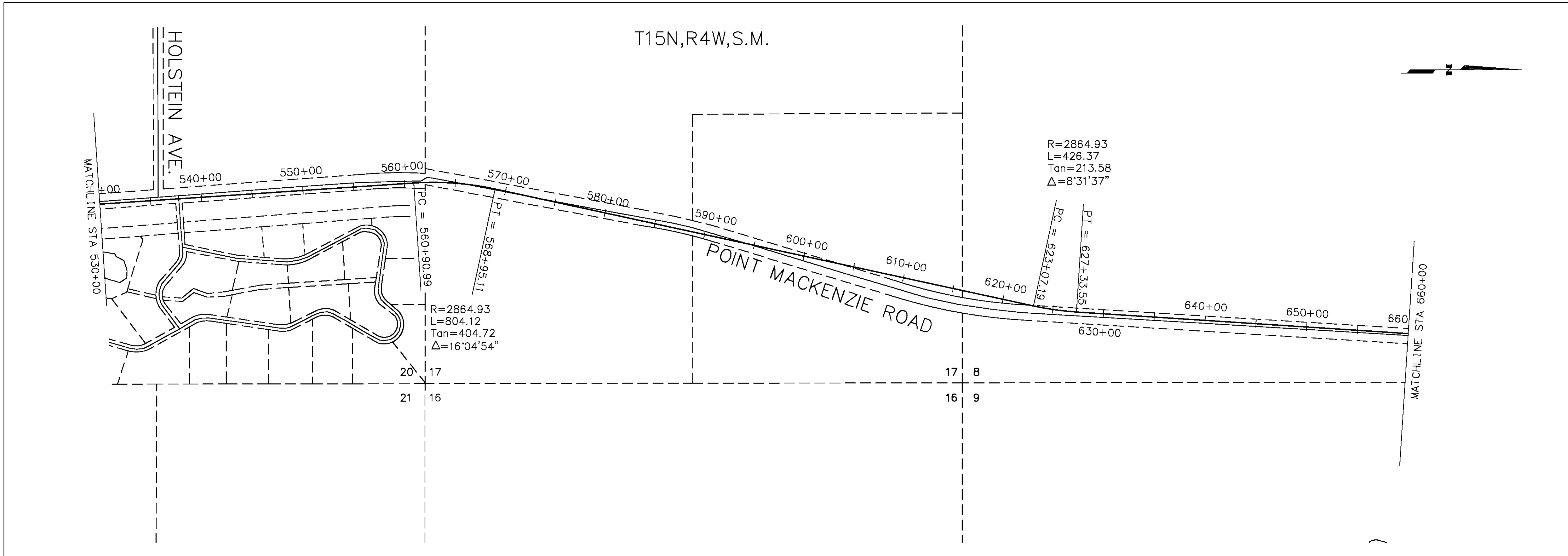
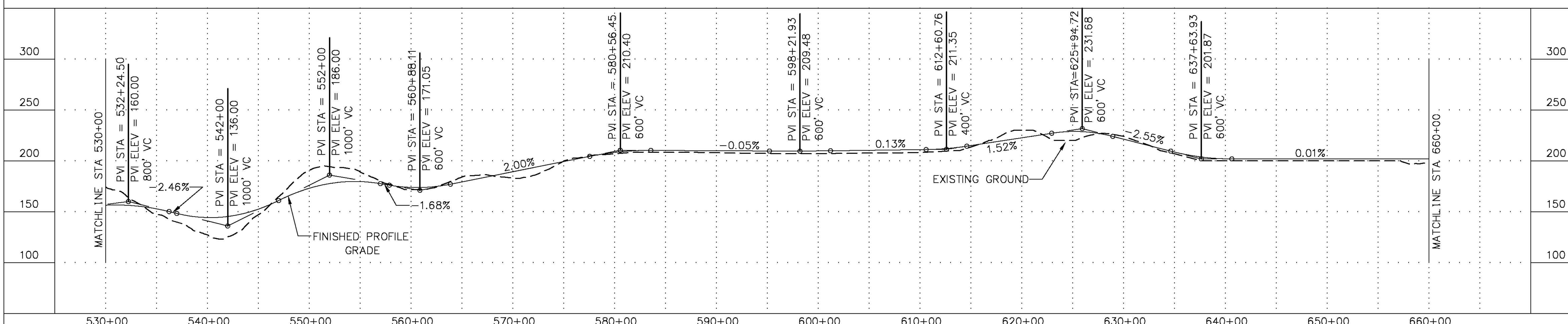
MAT-SU RAIL CORRIDOR STUDY

2-LANE HIGHWAY CORRIDOR
PLAN AND PROFILE
STA 400+00 TO 530+00





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MAT-SU RAIL CORRIDOR STUDY

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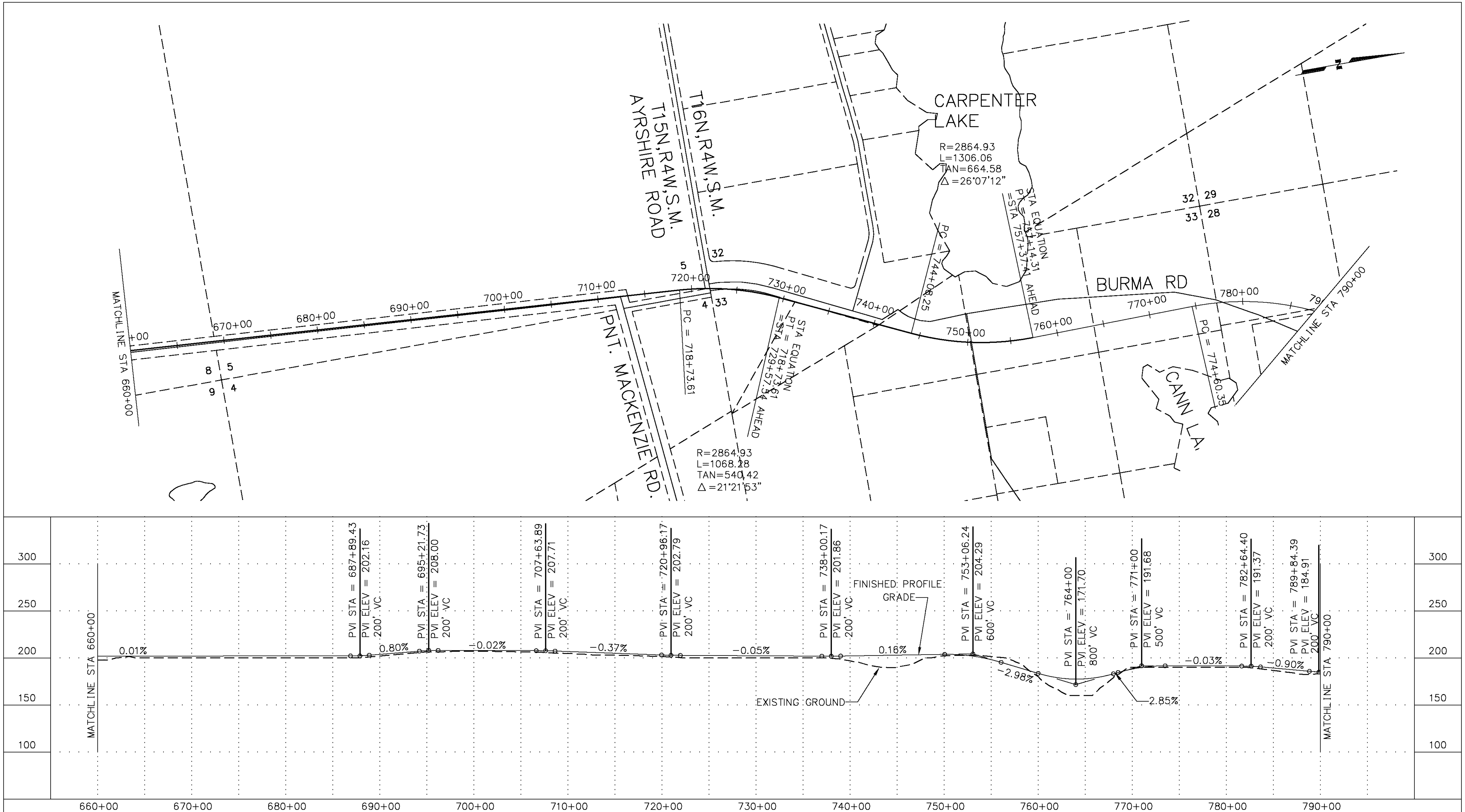

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MAT-SU RAIL CORRIDOR STUDY

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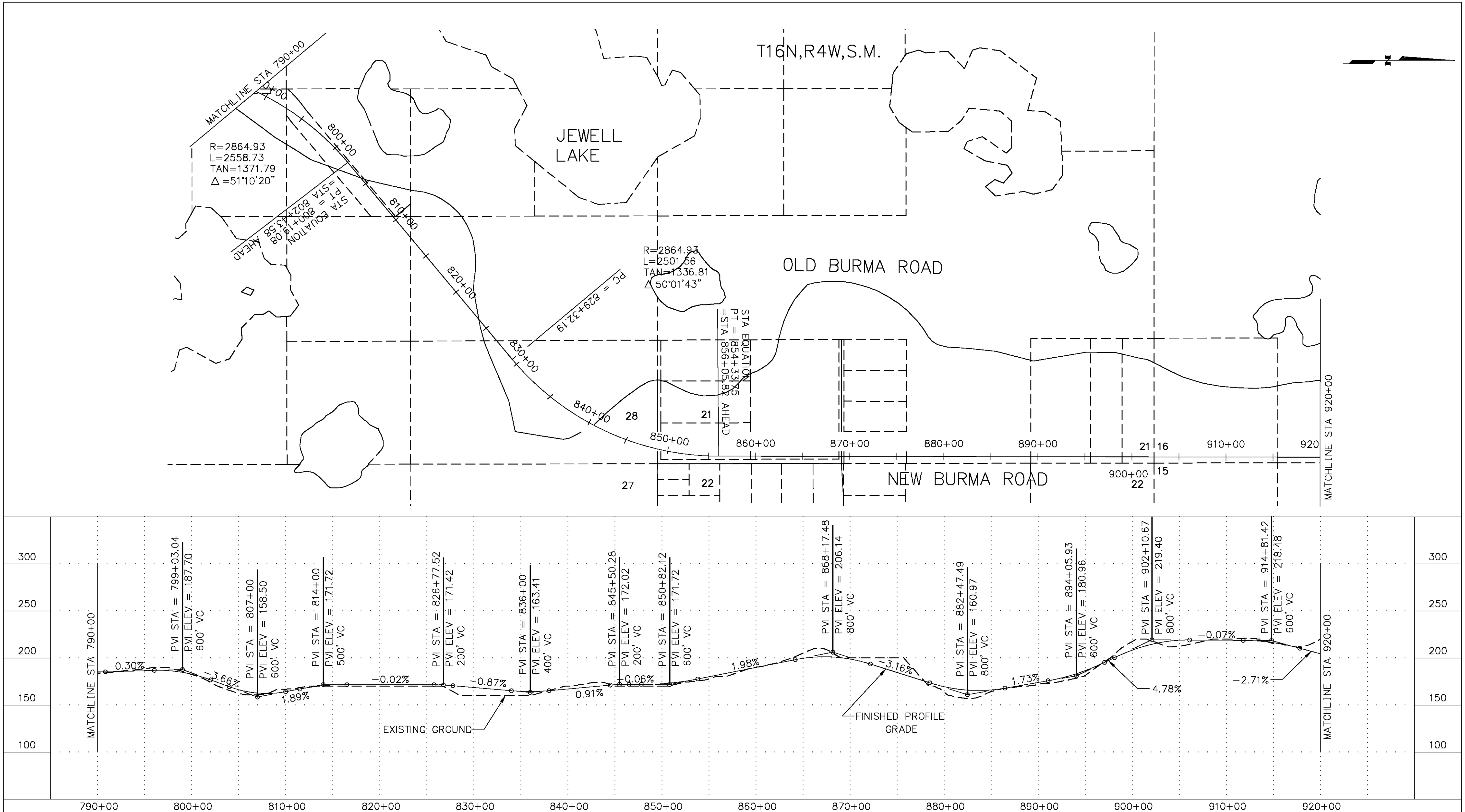

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SHEET: 10 OF 16

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MAT-SU RAIL CORRIDOR STUDY

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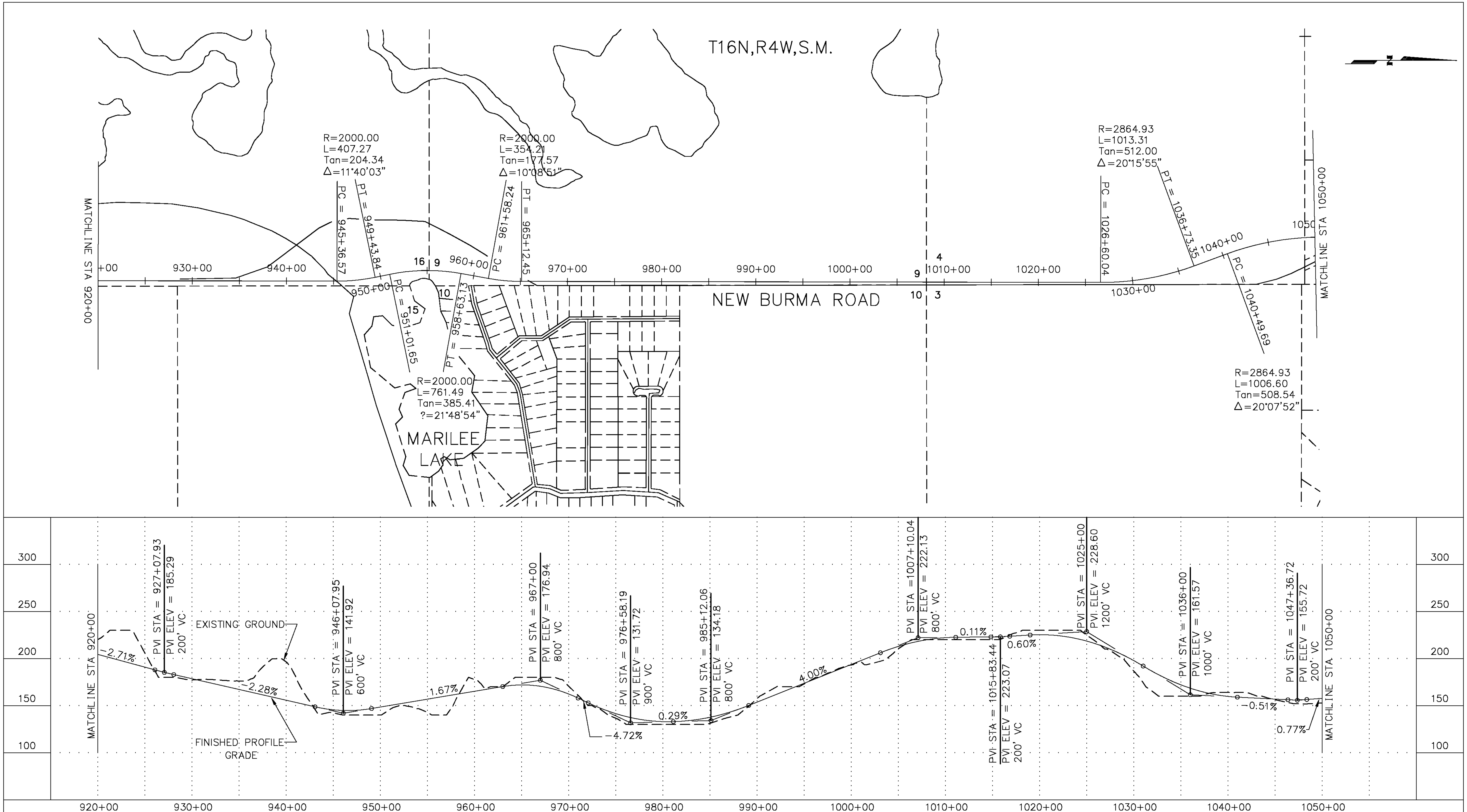

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MAT-SU RAIL CORRIDOR STUDY

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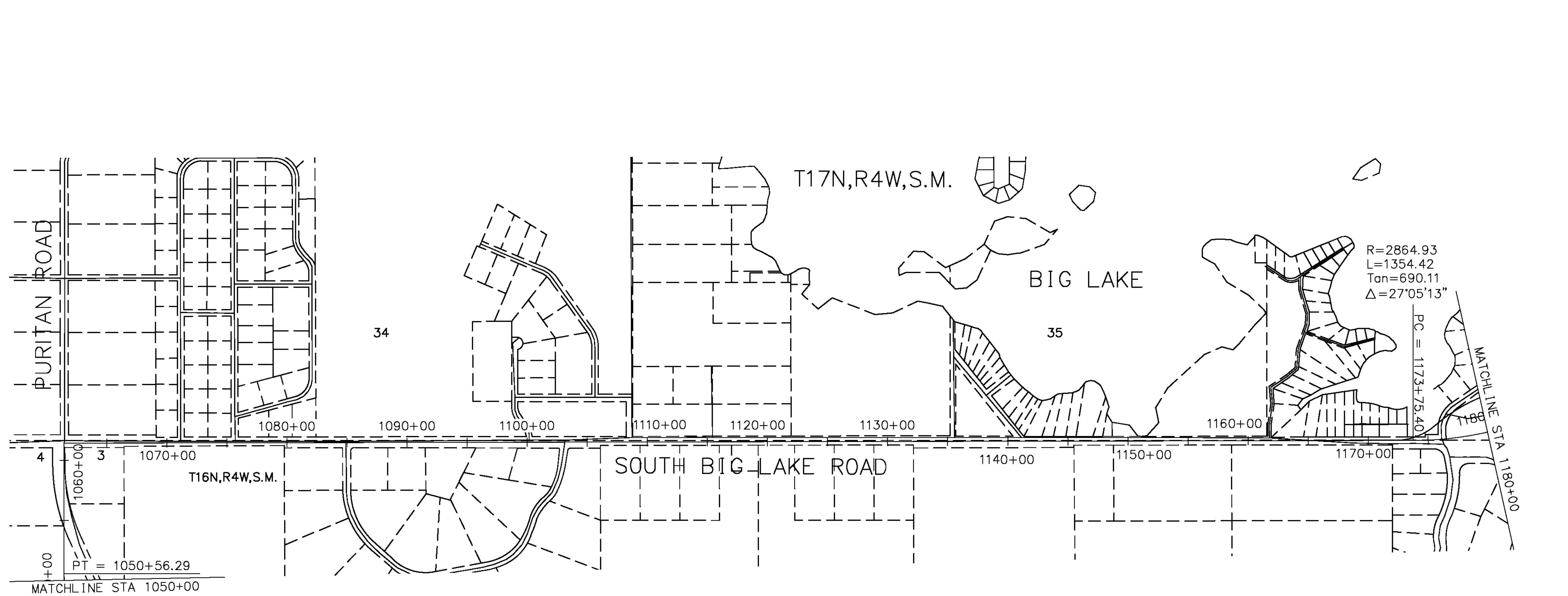

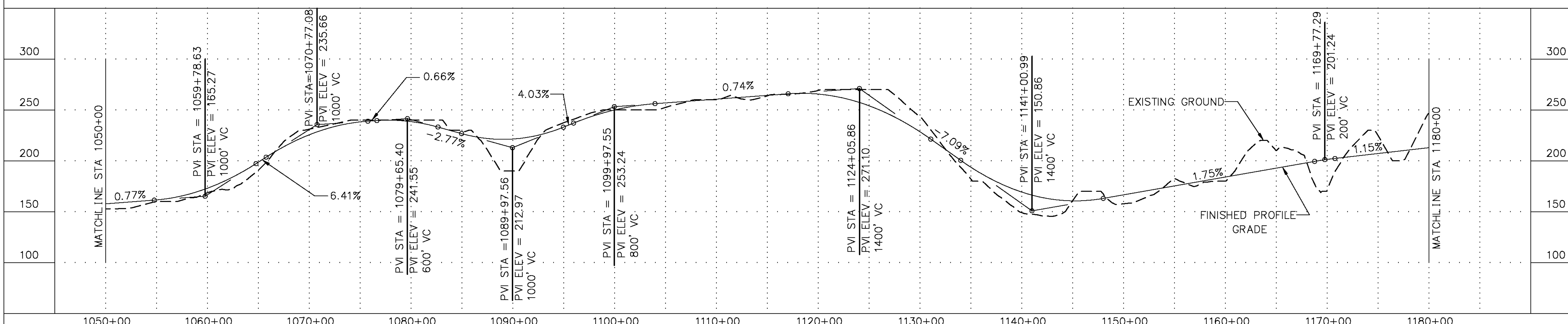

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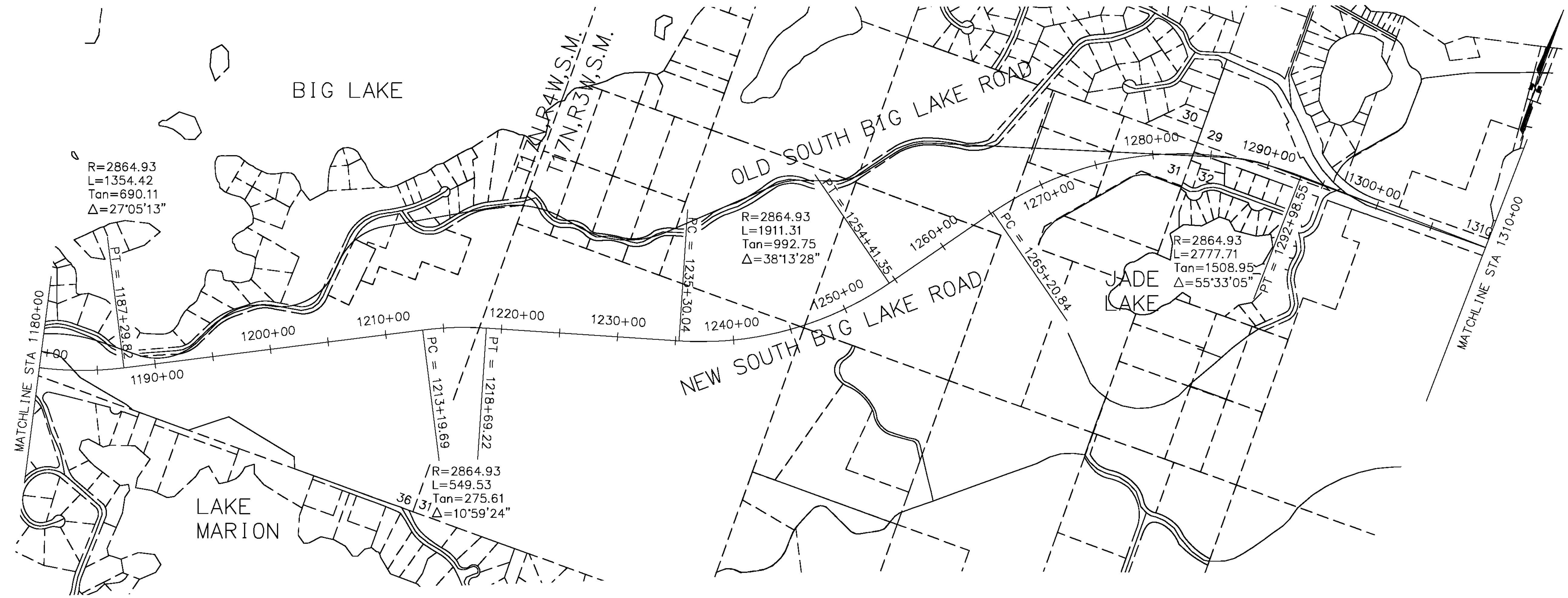
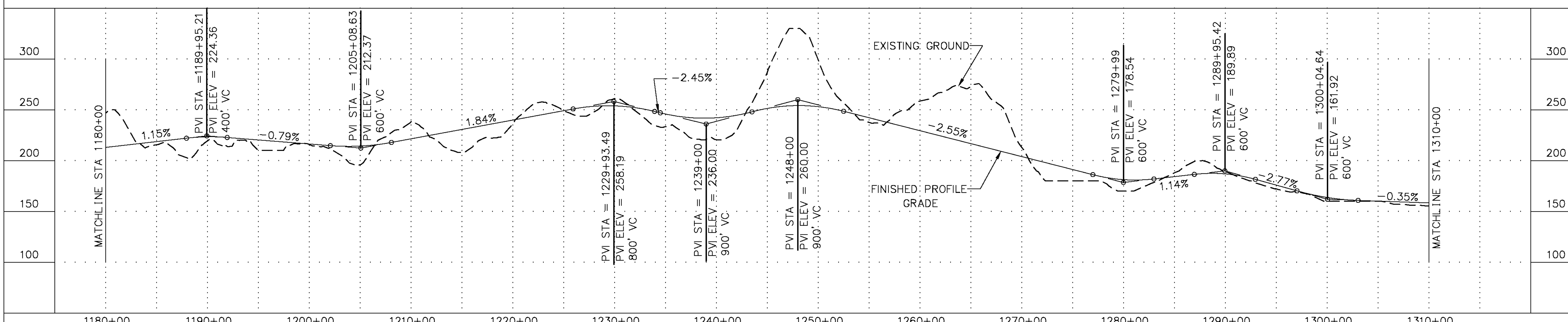
MAT-SU RAIL CORRIDOR STUDY

2-LANE HIGHWAY CORRIDOR
PLAN AND PROFILE
STA 1050+00 TO 1180+00





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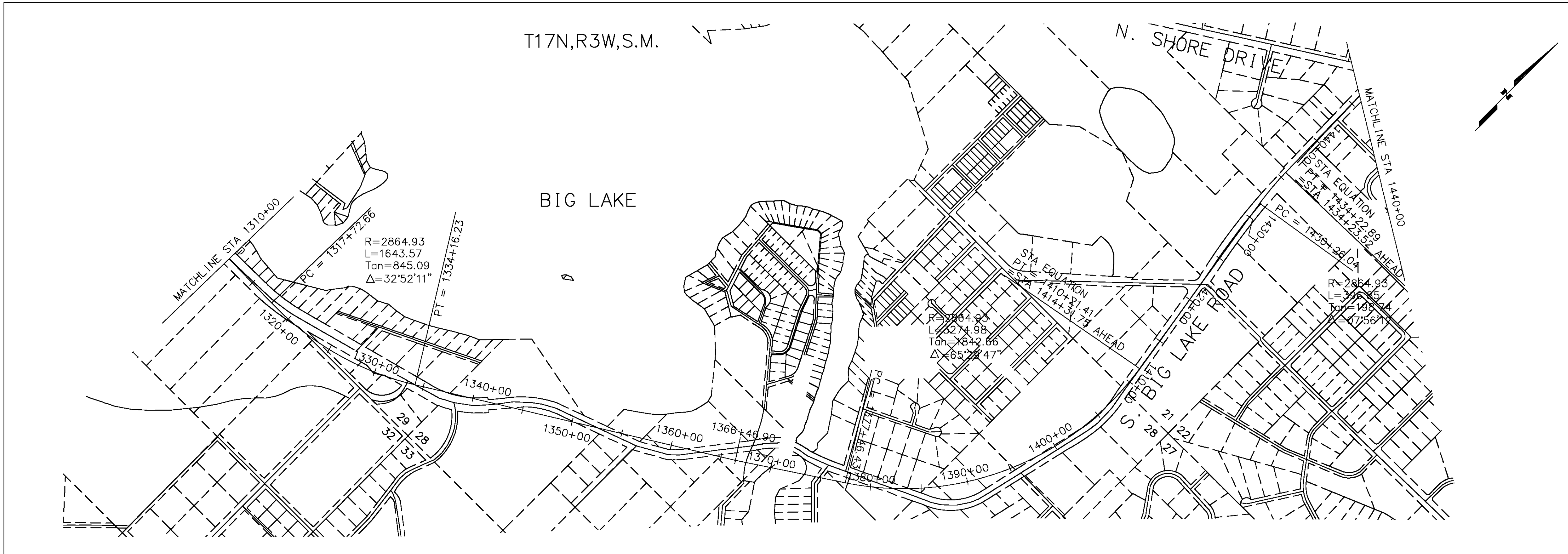
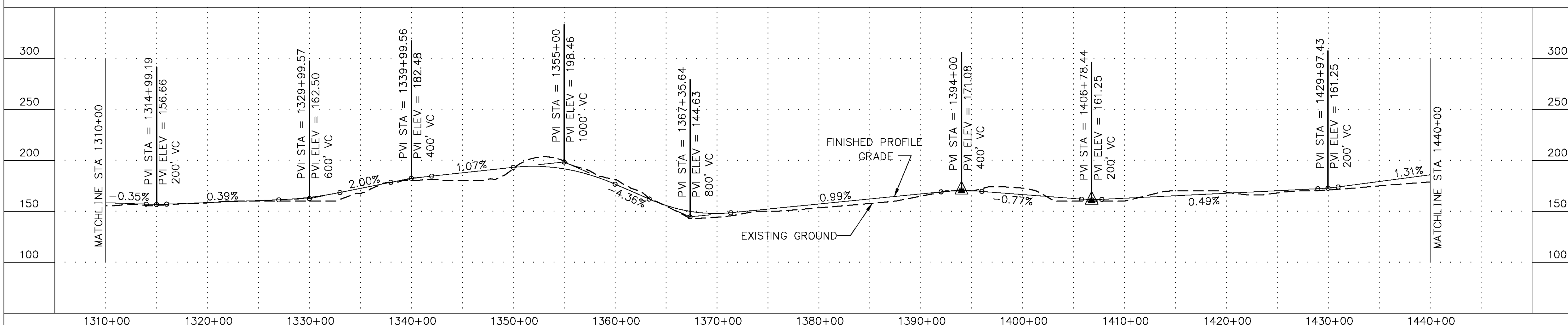
MAT-SU RAIL CORRIDOR STUDY

2-LANE HIGHWAY CORRIDOR
PLAN AND PROFILE
STA 1180+00 TO 1310+00





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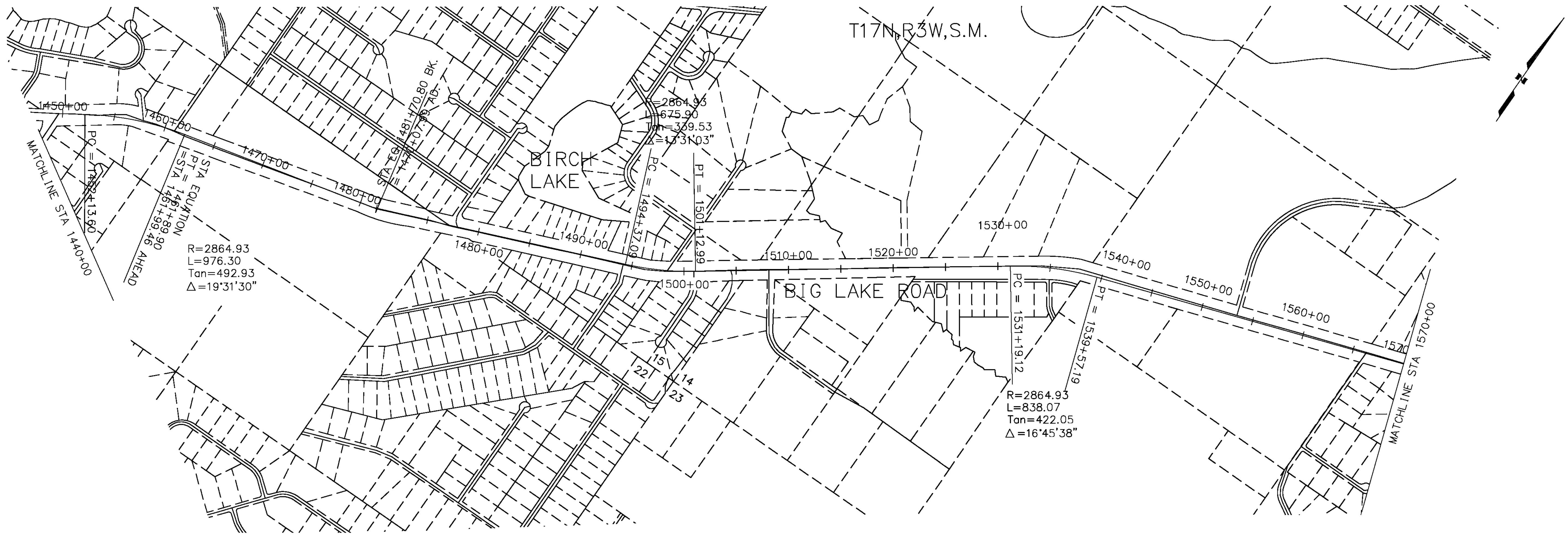
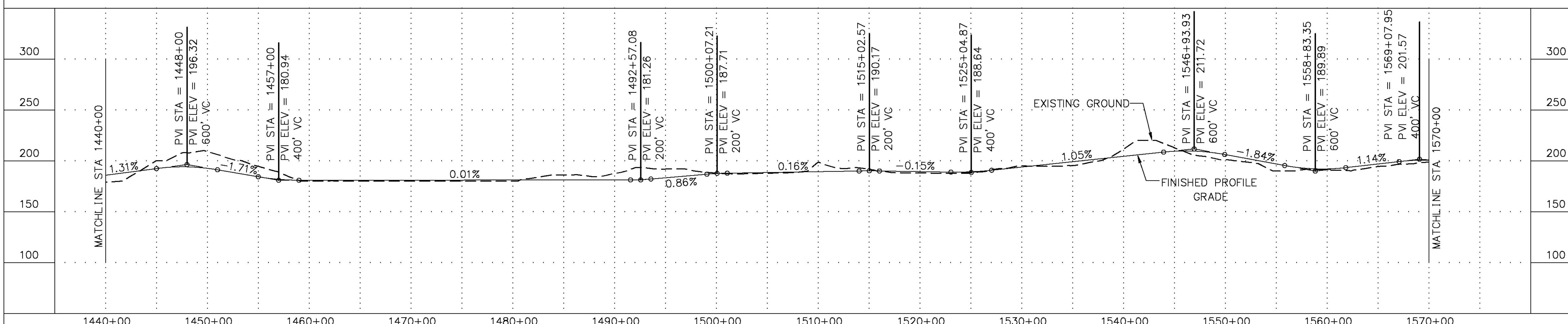
MAT-SU RAIL CORRIDOR STUDY

2-LANE HIGHWAY CORRIDOR PLAN AND PROFILE STA 1310+00 TO 1440+00





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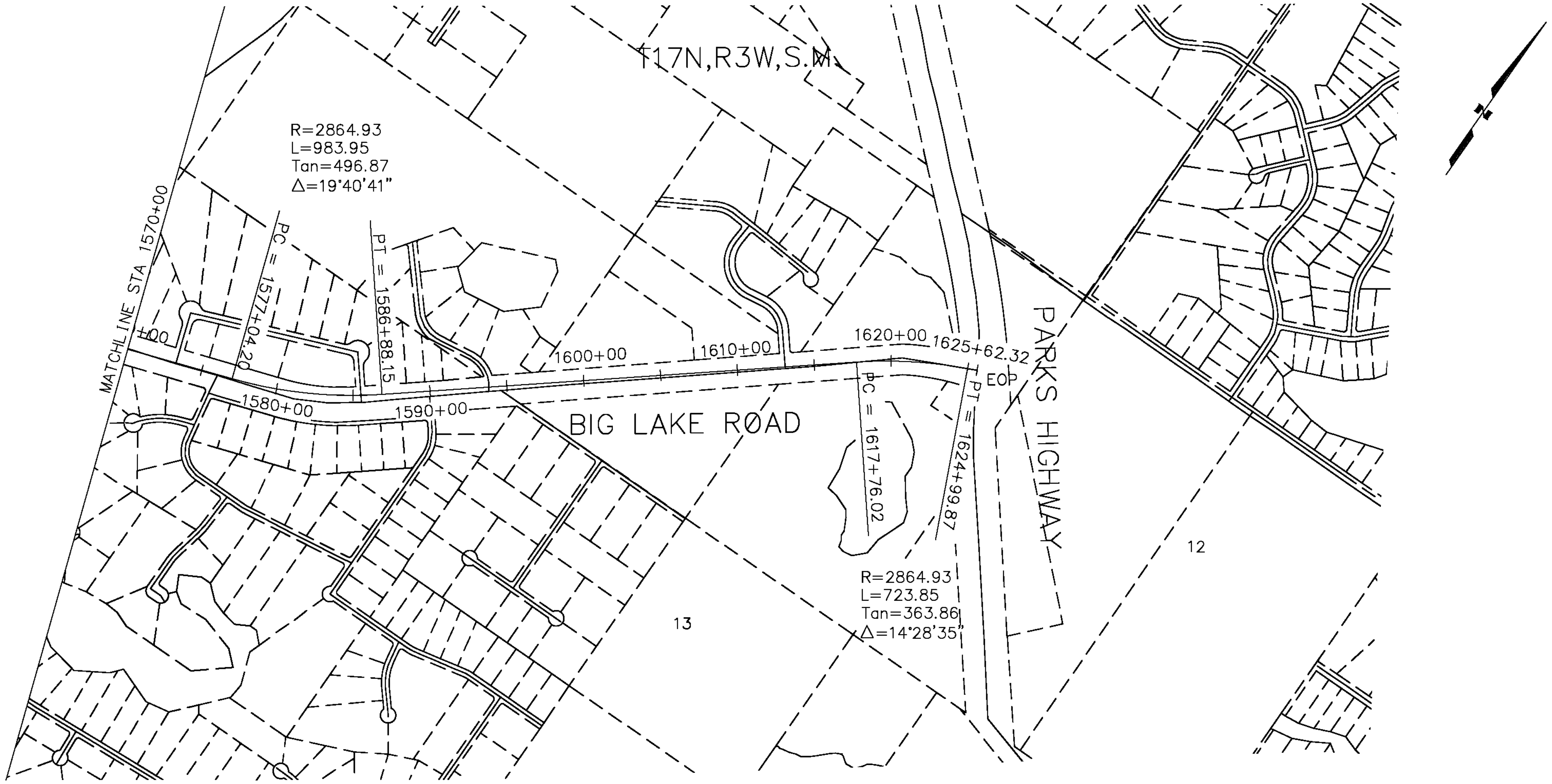
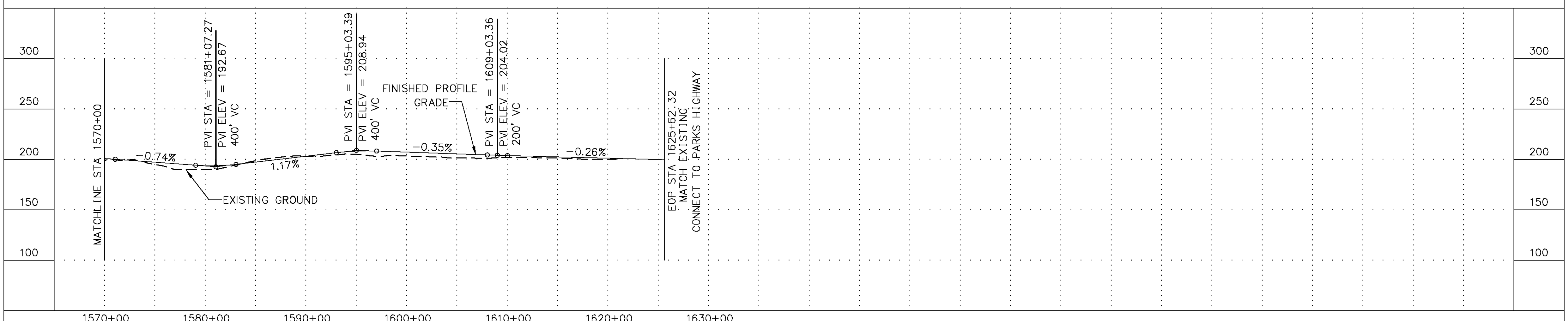
VEI Consultants
1345 RUDAKOF CIRCLE SUITE 201
ANCHORAGE, ALASKA 99508

TNH
ENGINEERING/SURVEYING
& LANDSCAPE ARCHITECTURE
Tryck Nyman Hayes, Inc.
911 W. 8TH AVENUE, SUITE 300
ANCHORAGE, AK 99501-3497
TEL: (907) 279-0543 • FAX: (907) 276-7679

MAT-SU RAIL CORRIDOR STUDY

2-LANE HIGHWAY CORRIDOR
PLAN AND PROFILE
STA 1440+00 TO 1570+00





DESIGN BY: ROE	DATE: 3-7-03
DRAWN BY: CJS	JOB NO.:
CHECKED BY: VLR	REV.:
FIELD BOOK:	FILE:
11 X 17 SCALE: HORZ.:1"=1000' VERT.:1"=100'	SHEET: 16 OF 17

VEI Consultants
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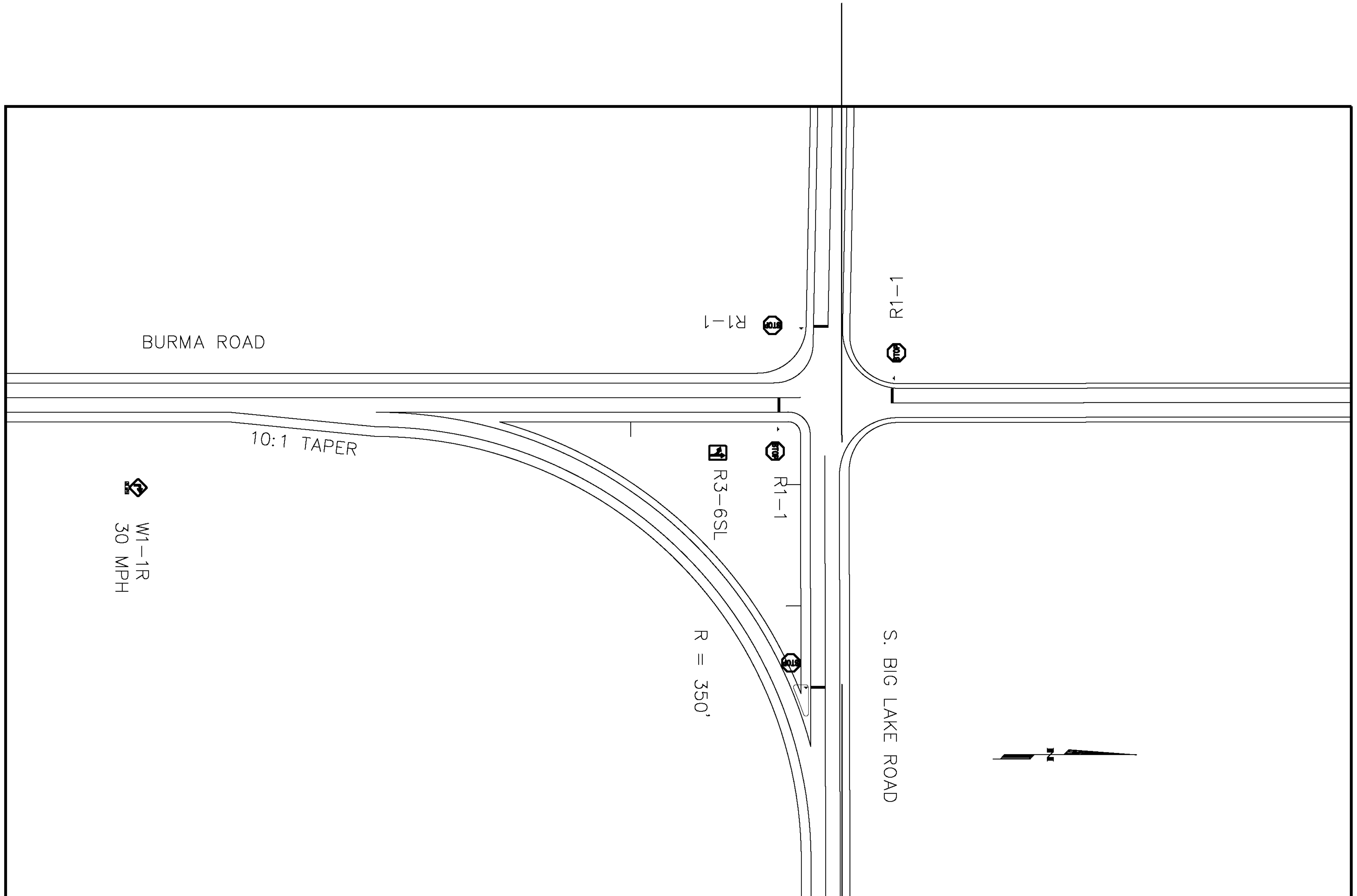
MAT-SU RAIL CORRIDOR STUDY

2-LANE HIGHWAY CORRIDOR PLAN AND PROFILE STA 1570+00 TO EOP



PROPOSED BURMA ROAD/SOUTH BIG LAKE ROAD INTERSECTION

DESIGN BY: ROE	DATE: 3-10-03
DRAWN BY: CJS	JOB NO.:
CHECKED BY: VLR	REV.:
FIELD BOOK:	FILE:
11 X 17 SCALE: HORZ.:1"=100' VERT.:1"=100'	SHEET: 17 OF 17

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MAT-SU RAIL CORRIDOR STUDY

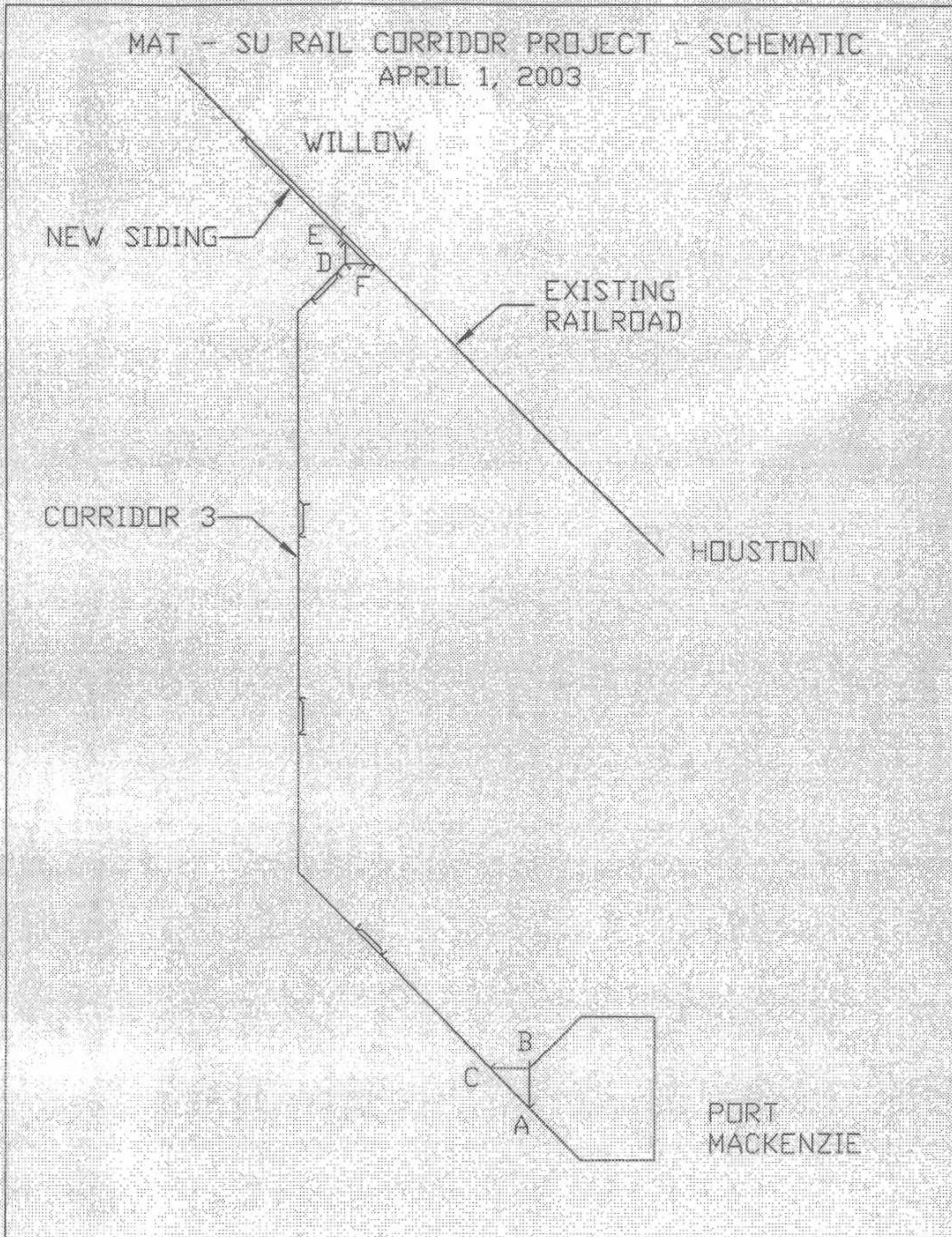
BURMA ROAD/SO BIG LAKE ROAD INTERSECTION

APPENDIX C

Construction Cost Estimates

Railway Corridor No. 3

ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	AMOUNT
201(3A)	CLEARING AND GRUBBING	ACRE	650	$5,000.00	$3,250,000
203(3)	UNCLASSIFIED EXCAVATION	CUBIC YARD	2,189,600	$6.00	$13,137,600
603(17-24)	24 INCH PIPE	LINEAR FOOT	3500	$40.00	$140,000
603(17-48)	48 INCH PIPE	LINEAR FOOT	2750	$70.00	$192,500
615(1)	STANDARD SIGN	SQUARE FOOT	200	$60.00	$12,000
618(1)	SEEDING	ACRE	82	$2,500.00	$205,000
618(3)	WATER FOR SEEDING	M. GAL	3600	$20.00	$72,000
620(1)	TOPSOIL	SQUARE YARD	396000	$3.00	$1,188,000
630(1)	GEOTEXTILE, SEPARATION	SQUARE YARD	1220000	$1.00	$1,220,000
640(1)	MOBILIZATION AND DEMOBILIZATION	LUMP SUM	ALL REQD		$4,000,000
641(1)	EROSION AND POLLUTION CONTROL ADMINISTRATION	LUMP SUM	ALL REQD		$85,000
641(2)	EROSION AND POLLUTION CONTROL	CONT SUM	ALL REQD		$170,000
641(4)	SILT FENCE	LINEAR FOOT	50000	$5.00	$250,000
642(1)	CONSTRUCTION SURVEYING	LUMP SUM	ALL REQD		$500,000
642(12)	FINAL TRAVERSE	LUMP SUM	ALL REQD		$50,000
643(3)	PERMANENT CONSTRUCTION SIGNS	LUMP SUM	ALL REQD		$20,000
643(15)	FLAGGING	HOUR	1500	$50.00	$75,000
643(25)	TRAFFIC CONTROL	LUMP SUM	ALL REQD		$500,000
644(1)	FIELD OFFICE	LUMP SUM	ALL REQD		$100,000
644(2)	FIELD LABORATORY	LUMP SUM	ALL REQD		$125,000
XXX	RAILROAD BRIDGE CONSTRUCTION	LF	760	$4,500.00	$3,420,000
XXX	SEPARATED GRADE CROSSING (ROAD OVER RAIL)	EACH	5	$1,500,000.00	$7,500,000
XXX	TRACK WORK - PORT MACKENZIE TO WILLOW	LS	1	$72,445,750.00	$72,445,750
	Includes Sidings, Power Switches and Appurtenances				
XXX	"Y" TRACK CONNECTION TO MAINLINE AT WILLOW	LS	1	$3,990,000.00	$3,990,000
	Includes Power Switches, Signals and Appurtenances				
XXX	NEW SIDING AT WILLOW	LS	1	$3,524,000.00	$3,524,000
	Includes Power Switches, Signals and Appurtenances				
XXX	LOOP TRACK AND CONNECTIONS AT PORT MACKENZIE	LS	1	$14,338,000.00	$14,338,000
	Includes Sidings, Power Switches and Appurtenances				
	ESTIMATE OF CONSTRUCTION COST				$130,509,850
	PRELIMINARY ENGINEERING (10% of construction cost)				$13,050,985
	CONSTRUCTION ADMINISTRATION (12% of construction estimate)				$15,661,182
	SUBTOTAL ENGINEERING COSTS				$28,712,167
	RIGHT OF WAY ACQUISITION				$6,603,341
	ESTIMATED PROJECT TOTAL				$165,825,358
	ROUNDING OFF - USE				**$165,825,000**


MAT - SU RAIL CORRIDOR PROJECT - SCHEMATIC
APRIL 1, 2003
WILLOW
NEW SIDING
E
D
F
EXISTING RAILROAD
CORRIDOR 3
HOUSTON
B
C
A
PORT MACKENZIE

Pt Mac Corrodor No. 7

ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	AMOUNT
201(3A)	CLEARING AND GRUBBING	ACRE	180	$5,000.00	$900,000
202(2)	REMOVAL OF PAVEMENT	SQUARE YARD	66248	$2.50	$165,620
202(4)	REMOVAL OF CULVERT PIPE	LINEAR FOOT	1900	$10.00	$19,000
202(10)	SINGLE MAIL BOX INSTALLATION	EACH	50	$250.00	$12,500
202(11)	MULTIPLE MAIL BOX INSTALLATION	EACH	50	$350.00	$17,500
203(3)	UNCLASSIFIED EXCAVATION	CUBIC YARD	3610007	$6.00	$21,660,042
203(6A)	BORROW TYPE A	TON	1412099	$6.00	$8,472,594
306(1)	ATB	TON	112388	$30.00	$3,371,640
306(2)	ASPHALT CEMENT, GRADE PG 52-28	TON	6181	$150.00	$927,150
401(1)	ASPHALT CONCRETE, TYPE II ; CLASS B	TON	75075	$35.00	$2,627,625
401(2)	ASPHALT CEMENT, GRADE PG 58-28	TON	4129	$180.00	$743,220
401(5)	ANTI-STRIP ADDITIVE	CONT SUM	ALL REQD		$3,000
402(1)	STE-1 ASPHALT FOR TACK COAT	TON	133	$300.00	$39,900
603(17-18)	18 INCH PIPE	LINEAR FOOT	5400	$35.00	$425,250
603(17-24)	24 INCH PIPE	LINEAR FOOT	12150	$40.00	$216,000
603(17-48)	48 INCH PIPE	LINEAR FOOT	5400	$70.00	$157,500
615(1)	STANDARD SIGN	SQUARE FOOT	2250	$60.00	$135,000
615(8)	REMOVAL OF SIGNS	EACH	60	$34.00	$2,040
618(1)	SEEDING	ACRE	166	$2,500.00	$415,000
618(3)	WATER FOR SEEDING	M. GAL	7290	$20.00	$145,800
620(1)	TOPSOIL	SQUARE YARD	807300	$3.00	$2,421,900
639(1)	RESIDENCE DRIVEWAY	EACH	80	$600.00	$48,000
639(3)	PUBLIC APPROACH	EACH	25	$800.00	$20,000
640(1)	MOBILIZATION AND DEMOBILIZATION	LUMP SUM	ALL REQD		$3,600,000
641(1)	EROSION AND POLLUTION CONTROL ADMINISTRAT	LUMP SUM	ALL REQD		$76,500
641(2)	EROSION AND POLLUTION CONTROL	CONT SUM	ALL REQD		$153,000
641(4)	SILT FENCE	LINEAR FOOT	12600	$5.00	$63,000
642(1)	CONSTRUCTION SURVEYING	LUMP SUM	ALL REQD		$300,000
642(3)	THREE PERSON SURVEY PARTY	HOUR	1486	$200.00	$297,200
642(12)	FINAL TRAVERSE	LUMP SUM	ALL REQD		$30,000
643(1)	TRAFFIC MAINTENANCE	CALENDAR DAY	2970	$200.00	$594,000
643(15)	FLAGGING	HOUR	13500	$50.00	$675,000
643(25)	TRAFFIC CONTROL	LUMP SUM	ALL REQD		$450,000
644(1)	FIELD OFFICE	LUMP SUM	ALL REQD		$90,000
644(2)	FIELD LABORATORY	LUMP SUM	ALL REQD		$76,500
670(10)	METHYL METHACRYLATE PAVEMENT MARKINGS	LUMP SUM	ALL REQD		$900,000
	CONSTRUCTION ESTIMATE				$50,251,481
	PRELIMINARY ENGINEERING				$6,030,178
	CONSTRUCTION ADMINISTRATION				$7,537,722
	SUBTOTAL ENGINEERING COSTS				$13,567,900
	RIGHT OF WAY ACQUISITION				$5,400,000
	CABLE TV RELOCATION				$40,000
	MTA TELEPHONE RELOCATION				$455,000
	MEA ELEC RELOCATION				$460,000
	ENSTAR GAS LINE RELOCATION				$120,000
	SUBTOTAL UTILITIES & ROW				$6,475,000
	ESTIMATED PROJECT TOTAL				$70,294,381
	ROUNDING OFF - USE				**$70,294,000**

EXISTING-POINT MAC ROAD

ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	AMOUNT
201(3A)	CLEARING AND GRUBBING	ACRE	30	$5,000.00	$150,000
202(2)	REMOVAL OF PAVEMENT	SQUARE YARD	0	$2.50	$0
202(4)	REMOVAL OF CULVERT PIPE	LINEAR FOOT	1600	$10.00	$16,000
202(10)	SINGLE MAIL BOX INSTALLATION	EACH	5	$250.00	$1,250
202(11)	MULTIPLE MAIL BOX INSTALLATION	EACH	5	$350.00	$1,750
203(3)	UNCLASSIFIED EXCAVATION	CUBIC YARD	1058137	$6.00	$6,348,822
203(6A)	BORROW TYPE A	TON	684062	$6.00	$4,104,372
306(1)	ATB	TON	54444	$30.00	$1,633,320
306(2)	ASPHALT CEMENT, GRADE PG 52-28	TON	2994	$150.00	$449,100
401(1)	ASPHALT CONCRETE, TYPE II ; CLASS B	TON	36369	$35.00	$1,272,915
401(2)	ASPHALT CEMENT, GRADE PG 58-28	TON	2000	$180.00	$360,000
401(5)	ANTI-STRIP ADDITIVE	CONT SUM	ALL REQD		$1,000
402(1)	STE-1 ASPHALT FOR TACK COAT	TON	65	$300.00	$19,500
603(17-18)	18 INCH PIPE	LINEAR FOOT	2640	$35.00	$207,900
603(17-24)	24 INCH PIPE	LINEAR FOOT	5940	$40.00	$105,600
603(17-48)	48 INCH PIPE	LINEAR FOOT	2640	$70.00	$77,000
615(1)	STANDARD SIGN	SQUARE FOOT	1100	$60.00	$66,000
615(8)	REMOVAL OF SIGNS	EACH	40	$34.00	$1,360
618(1)	SEEDING	ACRE	81	$2,500.00	$202,500
618(3)	WATER FOR SEEDING	M. GAL	3564	$20.00	$71,280
620(1)	TOPSOIL	SQUARE YARD	394680	$3.00	$1,184,040
639(1)	RESIDENCE DRIVEWAY	EACH	20	$600.00	$12,000
639(3)	PUBLIC APPROACH	EACH	4	$800.00	$3,200
640(1)	MOBILIZATION AND DEMOBILIZATION	LUMP SUM	ALL REQD		$1,760,000
641(1)	EROSION AND POLLUTION CONTROL ADMINISTRAT	LUMP SUM	ALL REQD		$37,400
641(2)	EROSION AND POLLUTION CONTROL	CONT SUM	ALL REQD		$74,800
641(4)	SILT FENCE	LINEAR FOOT	6160	$5.00	$30,800
642(1)	CONSTRUCTION SURVEYING	LUMP SUM	ALL REQD		$100,000
642(3)	THREE PERSON SURVEY PARTY	HOUR	726	$200.00	$145,200
642(12)	FINAL TRAVERSE	LUMP SUM	ALL REQD		$10,000
643(1)	TRAFFIC MAINTENANCE	CALENDAR DAY	1452	$200.00	$290,400
643(15)	FLAGGING	HOUR	6600	$50.00	$330,000
643(25)	TRAFFIC CONTROL	LUMP SUM	ALL REQD		$220,000
644(1)	FIELD OFFICE	LUMP SUM	ALL REQD		$44,000
644(2)	FIELD LABORATORY	LUMP SUM	ALL REQD		$37,400
670(10)	METHYL METHACRYLATE PAVEMENT MARKINGS	LUMP SUM	ALL REQD		$440,000
	CONSTRUCTION ESTIMATE				$19,808,909
	PRELIMINARY ENGINEERING				$2,377,069
	CONSTRUCTION ADMINISTRATION				$2,971,336
	SUBTOTAL ENGINEERING COSTS				$5,348,405
	RIGHT OF WAY ACQUISITION				$200,000
	CABLE TV RELOCATION				$0
	MTA TELEPHONE RELOCATION				$5,000
	MEA ELEC RELOCATION				$10,000
	ENSTAR GAS LINE RELOCATION				$0
	SUBTOTAL UTILITIES & ROW				$215,000
	ESTIMATED PROJECT TOTAL				$25,372,314
	ROUNDING OFF - USE				**$25,372,000**

PROPOSED-BURMA ROAD

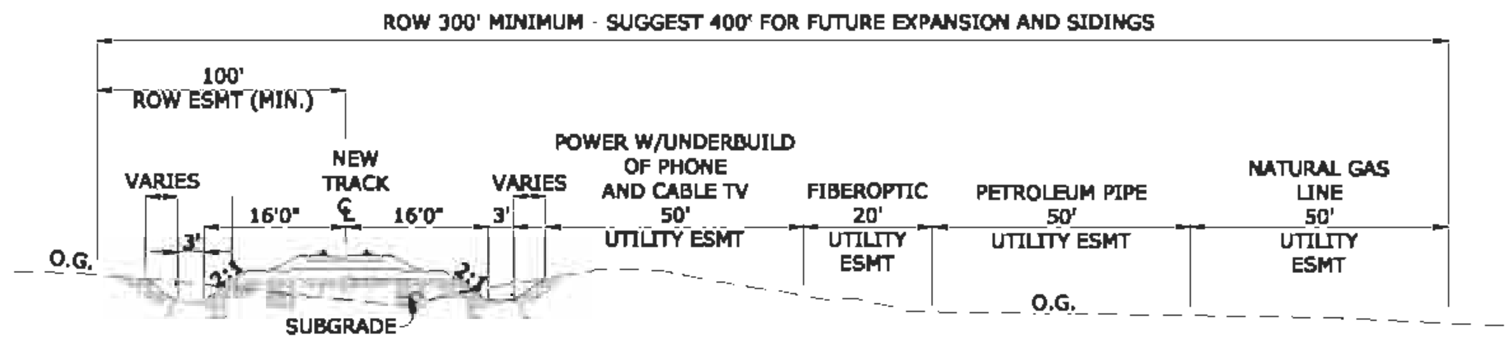
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	AMOUNT
201(3A)	CLEARING AND GRUBBING	ACRE	75	$5,000.00	$375,000
202(2)	REMOVAL OF PAVEMENT	SQUARE YARD	0	$2.50	$0
202(4)	REMOVAL OF CULVERT PIPE	LINEAR FOOT	100	$10.00	$1,000
202(10)	SINGLE MAIL BOX INSTALLATION	EACH	0	$250.00	$0
202(11)	MULTIPLE MAIL BOX INSTALLATION	EACH	0	$350.00	$0
203(3)	UNCLASSIFIED EXCAVATION	CUBIC YARD	752686	$6.00	$4,516,116
203(6A)	BORROW TYPE A	TON	342031	$6.00	$2,052,186
306(1)	ATB	TON	27222	$30.00	$816,660
306(2)	ASPHALT CEMENT, GRADE PG 52-28	TON	1497	$150.00	$224,550
401(1)	ASPHALT CONCRETE, TYPE II ; CLASS B	TON	18184	$35.00	$636,440
401(2)	ASPHALT CEMENT, GRADE PG 58-28	TON	1000	$180.00	$180,000
401(5)	ANTI-STRIP ADDITIVE	CONT SUM	ALL REQD		$1,000
402(1)	STE-1 ASPHALT FOR TACK COAT	TON	31	$300.00	$9,300
603(17-18)	18 INCH PIPE	LINEAR FOOT	1260	$35.00	$99,225
603(17-24)	24 INCH PIPE	LINEAR FOOT	2835	$40.00	$50,400
603(17-48)	48 INCH PIPE	LINEAR FOOT	1260	$70.00	$36,750
615(1)	STANDARD SIGN	SQUARE FOOT	525	$60.00	$31,500
615(8)	REMOVAL OF SIGNS	EACH	10	$34.00	$340
618(1)	SEEDING	ACRE	39	$2,500.00	$97,500
618(3)	WATER FOR SEEDING	M. GAL	1701	$20.00	$34,020
620(1)	TOPSOIL	SQUARE YARD	188370	$3.00	$565,110
639(1)	RESIDENCE DRIVEWAY	EACH	20	$600.00	$12,000
639(3)	PUBLIC APPROACH	EACH	6	$800.00	$4,800
640(1)	MOBILIZATION AND DEMOBILIZATION	LUMP SUM	ALL REQD		$840,000
641(1)	EROSION AND POLLUTION CONTROL ADMINISTRAT	LUMP SUM	ALL REQD		$17,850
641(2)	EROSION AND POLLUTION CONTROL	CONT SUM	ALL REQD		$35,700
641(4)	SILT FENCE	LINEAR FOOT	2940	$5.00	$14,700
642(1)	CONSTRUCTION SURVEYING	LUMP SUM	ALL REQD		$100,000
642(3)	THREE PERSON SURVEY PARTY	HOUR	347	$200.00	$69,400
642(12)	FINAL TRAVERSE	LUMP SUM	ALL REQD		$10,000
643(1)	TRAFFIC MAINTENANCE	CALENDAR DAY	693	$200.00	$138,600
643(15)	FLAGGING	HOUR	3150	$50.00	$157,500
643(25)	TRAFFIC CONTROL	LUMP SUM	ALL REQD		$105,000
644(1)	FIELD OFFICE	LUMP SUM	ALL REQD		$21,000
644(2)	FIELD LABORATORY	LUMP SUM	ALL REQD		$17,850
670(10)	METHYL METHACRYLATE PAVEMENT MARKINGS	LUMP SUM	ALL REQD		$210,000
	CONSTRUCTION ESTIMATE				$11,481,497
	PRELIMINARY ENGINEERING				$1,377,780
	CONSTRUCTION ADMINISTRATION				$1,722,225
	SUBTOTAL ENGINEERING COSTS				$3,100,004
	RIGHT OF WAY ACQUISITION				$1,800,000
	CABLE TV RELOCATION				$20,000
	MTA TELEPHONE RELOCATION				$200,000
	MEA ELEC RELOCATION				$200,000
	ENSTAR GAS LINE RELOCATION				$20,000
	SUBTOTAL UTILITIES & ROW				$2,240,000
	ESTIMATED PROJECT TOTAL				$16,821,501
	ROUNDING OFF - USE				**$16,822,000**

PROPOSED-SOUTH BIG LAKE ROAD

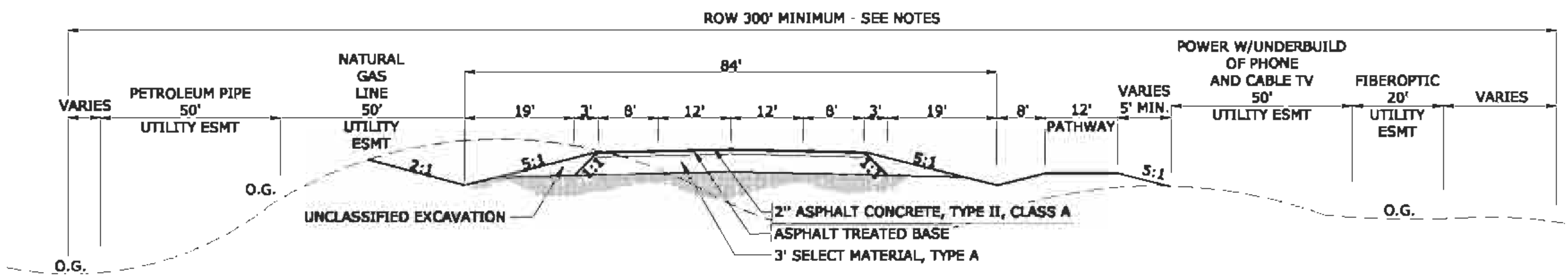
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	AMOUNT
201(3A)	CLEARING AND GRUBBING	ACRE	75	$5,000.00	$375,000
202(2)	REMOVAL OF PAVEMENT	SQUARE YARD	66248	$2.50	$165,620
202(4)	REMOVAL OF CULVERT PIPE	LINEAR FOOT	200	$10.00	$2,000
202(10)	SINGLE MAIL BOX INSTALLATION	EACH	45	$250.00	$11,250
202(11)	MULTIPLE MAIL BOX INSTALLATION	EACH	45	$350.00	$15,750
203(3)	UNCLASSIFIED EXCAVATION	CUBIC YARD	1799184	$6.00	$10,795,104
203(6A)	BORROW TYPE A	TON	386006	$6.00	$2,316,036
306(1)	ATB	TON	30722	$30.00	$921,660
306(2)	ASPHALT CEMENT, GRADE PG 52-28	TON	1690	$150.00	$253,500
401(1)	ASPHALT CONCRETE, TYPE II ; CLASS B	TON	20522	$35.00	$718,270
401(2)	ASPHALT CEMENT, GRADE PG 58-28	TON	1129	$180.00	$203,220
401(5)	ANTI-STRIP ADDITIVE	CONT SUM	ALL REQD		$1,000
402(1)	STE-1 ASPHALT FOR TACK COAT	TON	37	$300.00	$11,100
603(17-18)	18 INCH PIPE	LINEAR FOOT	1500	$35.00	$118,125
603(17-24)	24 INCH PIPE	LINEAR FOOT	3375	$40.00	$60,000
603(17-48)	48 INCH PIPE	LINEAR FOOT	1500	$70.00	$43,750
615(1)	STANDARD SIGN	SQUARE FOOT	625	$60.00	$37,500
615(8)	REMOVAL OF SIGNS	EACH	10	$34.00	$340
618(1)	SEEDING	ACRE	46	$2,500.00	$115,000
618(3)	WATER FOR SEEDING	M. GAL	2025	$20.00	$40,500
620(1)	TOPSOIL	SQUARE YARD	224250	$3.00	$672,750
639(1)	RESIDENCE DRIVEWAY	EACH	40	$600.00	$24,000
639(3)	PUBLIC APPROACH	EACH	15	$800.00	$12,000
640(1)	MOBILIZATION AND DEMOBILIZATION	LUMP SUM	ALL REQD		$1,000,000
641(1)	EROSION AND POLLUTION CONTROL ADMINISTRAT	LUMP SUM	ALL REQD		$21,250
641(2)	EROSION AND POLLUTION CONTROL	CONT SUM	ALL REQD		$42,500
641(4)	SILT FENCE	LINEAR FOOT	3500	$5.00	$17,500
642(1)	CONSTRUCTION SURVEYING	LUMP SUM	ALL REQD		$100,000
642(3)	THREE PERSON SURVEY PARTY	HOUR	413	$200.00	$82,600
642(12)	FINAL TRAVERSE	LUMP SUM	ALL REQD		$10,000
643(1)	TRAFFIC MAINTENANCE	CALENDAR DAY	825	$200.00	$165,000
643(15)	FLAGGING	HOUR	3750	$50.00	$187,500
643(25)	TRAFFIC CONTROL	LUMP SUM	ALL REQD		$125,000
644(1)	FIELD OFFICE	LUMP SUM	ALL REQD		$25,000
644(2)	FIELD LABORATORY	LUMP SUM	ALL REQD		$21,250
670(10)	METHYL METHACRYLATE PAVEMENT MARKINGS	LUMP SUM	ALL REQD		$250,000
	CONSTRUCTION ESTIMATE				$18,961,075
	PRELIMINARY ENGINEERING				$2,275,329
	CONSTRUCTION ADMINISTRATION				$2,844,161
	SUBTOTAL ENGINEERING COSTS				$5,119,490
	RIGHT OF WAY ACQUISITION				$3,400,000
	CABLE TV RELOCATION				$20,000
	MTA TELEPHONE RELOCATION				$250,000
	MEA ELEC RELOCATION				$250,000
	ENSTAR GAS LINE RELOCATION				$100,000
	SUBTOTAL UTILITIES & ROW				$4,020,000
	ESTIMATED PROJECT TOTAL				$28,100,565
	ROUNDING OFF - USE				**$28,100,000**

APPENDIX D

Typical Sections



TYPICAL SINGLE TRACK RAILWAY SECTION



NOTES

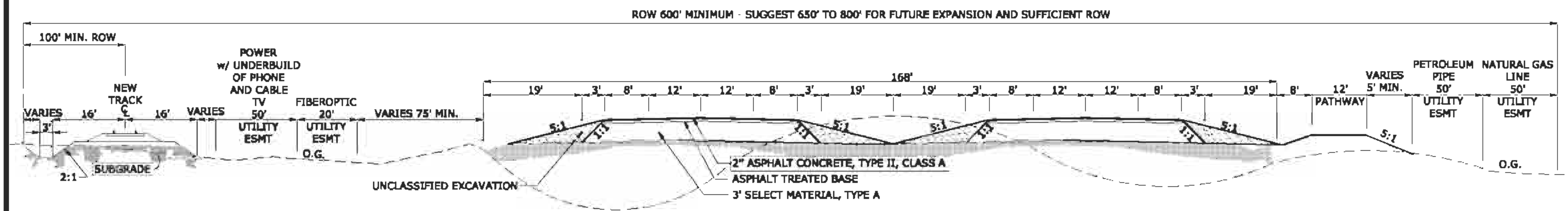
1. SUGGESTED MINIMUM RIGHT-OF-WAY IS 300 FEET; HOWEVER, 500 FEET IS PROPOSED FOR FUTURE ROAD EXPANSION AND ADDITIONAL UTILITIES. PREVIOUS ROAD DESIGNS FOLLOWING A PORTION OF THE PROPOSED CORRIDOR 7 ROADWAY MAY OBSERVE DIFFERENT RIGHT-OF-WAY WIDTHS THAN THIS DESIGN. THE MATANUSKA-SUSITNA BOROUGH MAY ADOPT A SINGLE WIDTH RIGHT-OF-WAY OR A VARIED WIDTH RIGHT-OF-WAY THROUGHOUT CORRIDOR 7 DEPENDING ON CONSTRAINTS.

2-LANE
TYPICAL ROADWAY SECTION

INITIAL CONSTRUCTION

FIGURE A

ENGINEERS/PLANNERS/SURVEYORS & LANDSCAPE ARCHITECTS
BRYCE HYMAN HAYES, INC.



4-LANE

TYPICAL ROADWAY SECTION W/SINGLE TRACK RAILWAY SECTION

ULTIMATE BUILD OUT IF KNIK ARM CROSSING IS CONSTRUCTED

FIGURE B

M:\01228.000\CIVIL\RAILROAD DESIGN\TYPICAL-SEC.dwg

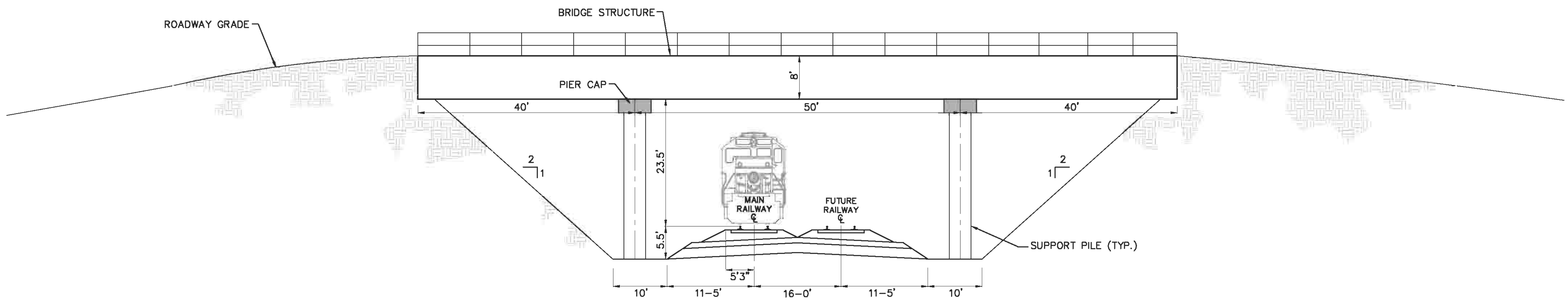


FIGURE 8

REV.	DATE	BY	REVISION

FIELD BOOKS			
DESIGN	–	DESIGNED	MKS
STAKING	–	DRAWN	JDG
AS-BUILT	–	CHECKED	MKS
SCALE HOR. VER.	NTS	DATE	03/31/03
		GRID	–
		JOB NO.	01228.000

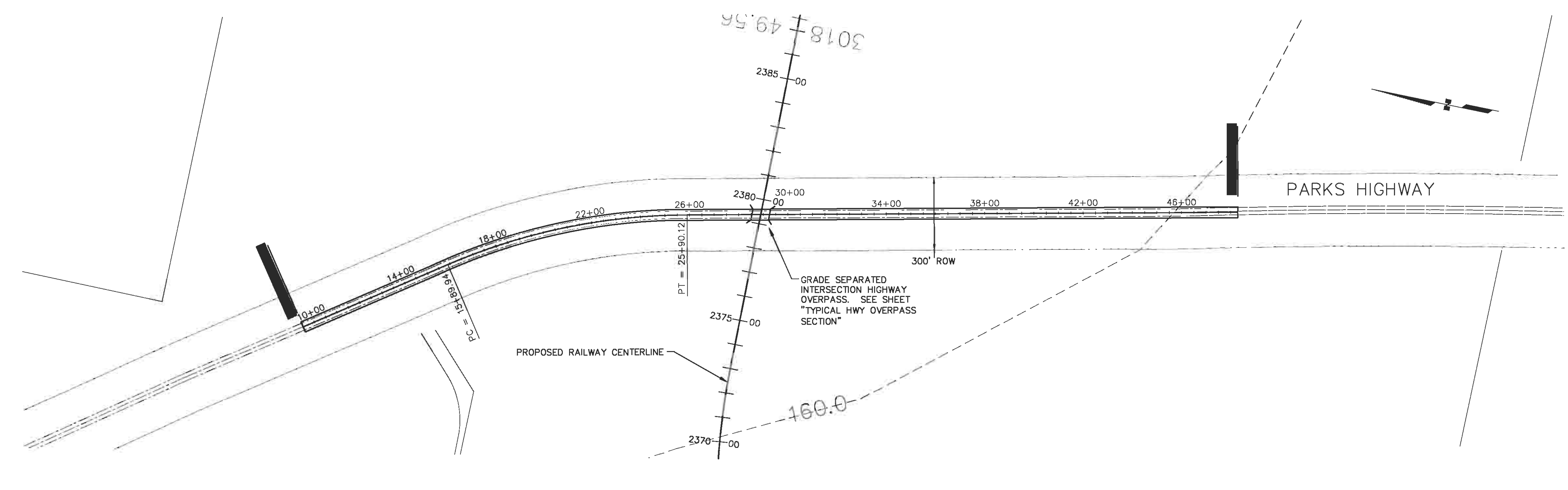
ENGINEERING/SURVEYING & LANDSCAPE ARCHITECTURE
Tryck Nyman Hayes, Inc.

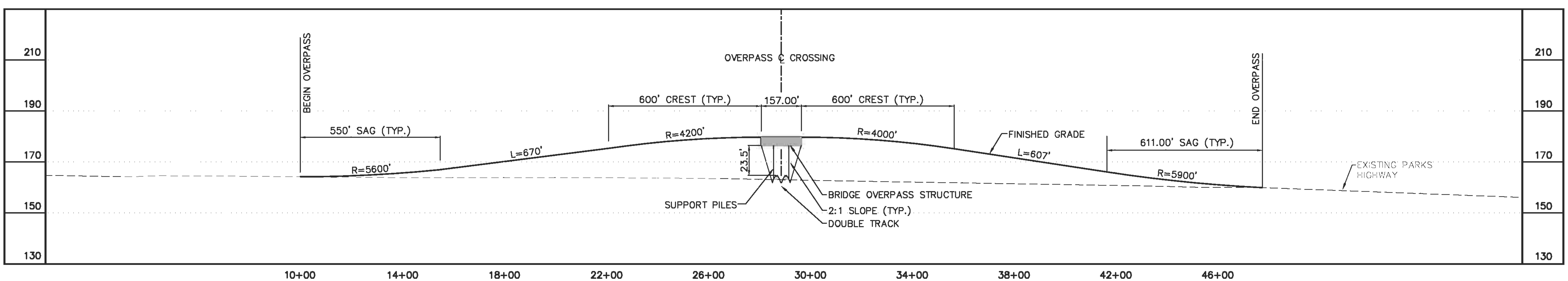
MAT-SU RAIL CORRIDOR STUDY

TYPICAL OVERPASS SECTION

SHEET
/ OF /

FILE NO.
01228.000





*NOTE: DRAWING SCALES REFERENCED ARE FOR HALF SIZE SHEETS

FIGURE 8

REV.	DATE	BY	REVISION

FIELD BOOKS	
DESIGN	–
STAKING	–
AS-BUILT	–
SCALE HOR.	1"=400'
SCALE VER.	1"=40'

DESIGNED	MKS
DRAWN	JDG/BED
CHECKED	MKS
DATE	03/31/03
GRID	–
JOB NO.	01228.000

ENGINEERING/SURVEYING & LANDSCAPE ARCHITECTURE
Tryck Nyman Hayes, Inc.

MAT-SU RAIL CORRIDOR STUDY

TYPICAL ROAD OVERPASS PLAN & PROFILE

SHEET / OF /

FILE NO. 01228.000

APPENDIX E

Commodities Study

RAIL CORRIDOR COMMODITY FLOWS

Prepared for

Tryck, Nyman Hayes Inc.

September 2002

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Abbreviations

AMC	Alaska Manufacturing Contractors LLC
BC	British Columbia
BDT	bone dry ton
BDU	Bone dry ton
BLM	Bureau of Land Management
EIA	Energy Information Administration
FAO	United Nations Food and Agricultural Organization
KEPCO	Korea Electric Power Company
KEWESPO	Korea East West Power Company
LNG	liquefied natural gas
LO-LO	lift-on and lift-off
mcf	thousand cubic feet
mmbtu	million British Thermal Units
mmcf	million cubic feet
MPC	Maximum Practical Throughput
mta	metric tons per annum
MSB	Matanuska-Susitna Borough
NPR-A	National Petroleum Reserve-Alaska
POA	Port of Anchorage
RO-RO	roll-on, roll-off
SAP	Susitna Area Plan
SPC	Sustainable Practical Capacity
tcf	trillion cubic feet
TEU	twenty-foot equivalent units
TOTE	Totem Ocean Trailer Express
VZM	Vickerman, Zachary, Miller
UCM	Usibelli Coal Mine, Inc.

Executive Summary

This economic study provides descriptions and market analyses of the types and quantities of goods that could pass through Port MacKenzie. The purpose of the study is to assess the volume of goods and materials that might move across the port if a rail link were available connecting the port with the Alaska Railroad main line near Willow or Houston. Potential exports and imports are considered. Exports are defined as goods originating in Alaska that could be shipped through the Port to other locations within and outside the state. Examples include such commodities as petroleum and chemical products, containerized cargo, wood chips, coal, sand and gravel aggregates, oil field modules, manufactured homes, selected minerals, and natural gas. Imports are goods arriving at the Port from elsewhere in the state, nation, or world. Containerized cargo, petroleum products, and logs are the items considered as possible imports. Low, base, and high case scenarios are considered.

For the economy of Alaska and that of the Matanuska-Susitna Borough (MSB), the low, base, and high case forecasts for the state and region published by Scott Goldsmith of the Institute of Social and Economic Research (ISER) (2001), are used to guide the commodity assessments. The study team also made some additional assumptions, specific to the area. These additional assumptions for each scenario are listed below.

Low

- Paved road to Port MacKenzie by 2003. Rail link is established at end of study period.
- Electricity and gas available at Port MacKenzie.
- Port of Anchorage (POA) expands to handle anticipated cargo, cruise ship traffic through 2020.
- No direct transportation link across Knik Arm between Anchorage and Point MacKenzie.

Base

- Paved road to Port MacKenzie by 2003. Rail corridor established and operations commence about 2015.
- Electricity and gas available at Port MacKenzie.
- POA has limited expansion of cargo handling capabilities and reaches limit of cargo capacity before 2020.
- Ferry service links the Port MacKenzie and POA.

- There is no Knik Arm bridge, hence no change in rail or highway access between the MSB and Anchorage.
- A fuel pipeline from Port MacKenzie to the POA is constructed late in the study period.

High

- Paved road access to Port MacKenzie by 2003. Rail service commences about 2010.
- Electricity and gas available at Port MacKenzie.
- POA has limited expansion of cargo handling capabilities and reaches limit of cargo capacity before 2020.
- Bridge links Point MacKenzie and Anchorage about 2015.
- Both rail and highway access to the MSB via Knik Arm bridge.
- Spur from natural gas pipeline to the Lower 48 states serves Port MacKenzie.
- Air cargo handling operations at Anchorage International Airport shift to new airport at Point MacKenzie.

In evaluating the forecasts, the reader should view the base case scenario as representative of the future, in the opinion of the study team, given current conditions and prospects. The low and high case scenarios are considered the limits of what could happen absent any major, unforeseeable developments. These unforeseeable developments could dramatically affect all three scenarios. Numerical forecasts for each commodity and scenario for 2020 are provided in each section. These estimates are consolidated in Table 1. The historical data on production of some commodities in Alaska is very limited (oil field modules for example) or nonexistent (many minerals). Thus, the numerical estimates may be subject to significant margins of error.

In general, under the base and high case scenarios, the prospects for some economic development and significant cargo handling seem likely for Port MacKenzie by 2020. A guiding assumption for the base and high case analyses is that Port MacKenzie will develop as a complement to, rather than a competitor of, the POA. Should the low case scenario develop, there will probably be little development beyond what already exists on Point MacKenzie. However, conclusions about specific commodities and goods vary. In some cases, a base case scenario is sufficient to envision substantial flows of certain commodities, petroleum products for example. In other instances, it appears that Port MacKenzie is unlikely to handle more than a small quantity of some commodities even under the high case scenario—minerals for example. A summary of the specific findings for each commodity group follows.

Table 1. Commodity Flow Summary for Various Development Scenarios: Port MacKenzie, 2020

Commodity	Base	Low	High
Petroleum and Chemicals (thousands of short tons)	870	50	2608
Cargo Containers	0	0	0
Wood Products (thousands of bone dry tons)	0	0	300
Coal	0	0	0
Sand and Gravel (thousands of short tons)	0	0	40
Oil Field Modules	0	0	3
Manufactured Homes	98	45	147
Selected Minerals	0	0	0
Natural Gas (millions of barrels)	0	0	12

Petroleum and Chemical Products

It appears unlikely that Port MacKenzie would handle significant quantities of crude oil regardless of the growth scenario. Petroleum production in the state has been declining steadily since 1988. If future increases occur (assumed in the base and high growth cases), it is most likely that such gains will be from North Slope fields. The current pipeline infrastructure is sufficient to transport substantial production gains over current levels, so it is likely that crude oil would continue to be exported from Valdez. Potential production from other geologic provinces is likely to be exported through the existing pipeline or other ports. Only a significant find in the north Cook Inlet area might lead to petroleum exports from Port MacKenzie.

The prospects for handling and storage of petroleum products other than crude oil at Port MacKenzie are greater. Safety concerns and limited space for expansion restrict the ability of the POA to significantly expand storage facilities. In a low case scenario, only a small quantity of fuel, that destined to be used in the Point MacKenzie area, is likely to be stored at Port MacKenzie. The limitation in the low case is the absence of low-cost transportation for petroleum products between Port MacKenzie and Anchorage.

A fuel pipeline across the Cook Inlet is assumed for the base case scenario, but occurs late in the study period. Such a pipeline would permit rapid and low-cost transport of fuels from Port MacKenzie to the major consumers in Anchorage. Similarly, under the high case, a fuel pipeline connected to the Knik Arm crossing would allow fuels to be quickly transported to the POA as needed. Furthermore, the high case scenario includes a new airport near Point MacKenzie and the shifting of air cargo operations to the new airport. Readily available fuel would be a necessary consideration for an airport. At the earliest, any new airport is envisioned for late in the study period.

Chemicals are more difficult to evaluate. Chemical cargo handled at the POA has generally been low and highly variable. However, Alaskan exports to Mexico, 57 percent of which were fertilizers (included under chemicals), increased sharply in 2001. Most of this increase appears to reflect significant export levels by Agrium Inc. through the port at Nikiski. The low levels of chemicals historically handled by the POA suggest little possibility for significant chemical cargo from Port MacKenzie under any of the scenarios. However, this conclusion could change if a natural gas pipeline with a spur to Port MacKenzie fosters a petrochemical industry in the area.

Containerized Cargo and Vehicles

In the low, base, and high cases, Port MacKenzie is not anticipated to handle more than a small amount of containerized cargo for the study period. Container cargo bound for Alaska from Tacoma will continue to be shipped via Totem Ocean Trailer Express (TOTE) and CSX Lines to the POA. Containers for the MSB area and Fairbanks will be delivered via railroad and trucks, with an increase in the number of containers shipped to Fairbanks in the 2.5 percent per year range. In the high case, containers bound for the MSB area will be delivered to the POA and hauled via ferry or trucks across the Knik arm bridge to end users.

Under the high case scenario, with high rates of economic and population growth, a third domestic marine carrier may be interested in serving Southcentral Alaska near the end of the study period. Constraints on land availability at the POA may make Port MacKenzie an attractive alternative for consideration as a container terminal. The Knik Arm bridge would enable a third carrier to deliver containers to the major market in Anchorage at costs comparable to those of carriers calling at the POA. The expected timing for construction of the Knik Arm bridge, and the growth in the population base necessary to support three carriers, will likely result in all of the required factors not being in place until the end of the study period or later.

Wood Products

Wood chips will remain a potential, not actual, resource in the Susitna valley for the low case scenario. Japanese exchange rates with other currencies, especially the US and Australian dollar, will affect wood chip exports in general and hardwood chips from the Pacific Northwest. Australia will continue to be a strong competitor. No significant development is anticipated under the low case.

Entrepreneurs will monitor world chip markets and develop business plans under the base case scenario. Test shipments to interested end-product users are likely. No significant development is likely.

In the high case scenario, the construction of a deeper-water dock extension at Port MacKenzie will permit large volume vessels to dock at Port MacKenzie. Rail access and a high-speed conveyor system, capable of delivering 1,000 tons per hour to the vessel, will allow firms to access and deliver wood chips to the Port from elsewhere along the railbelt. Asia markets will respond positively to this market presence and to the six-day shipping advantage that Alaska has over the Pacific Northwest and British Columbia. At a capacity of 15,000 Bone Dry Units (BDUs) per vessel load, ten cargoes will be shipped initially, expanding to near 30,000 BDUs at full capacity later in the study period. As exchange rates improve for Japanese buyers, both hardwood and softwood chips are processed and loaded at Port MacKenzie.

Coal

In either the low or base case scenario, there appears to be little prospect for coal shipments from Port MacKenzie. World coal prices have been falling in recent years as new supplies, particularly from Indonesia, have come onto the market. The sole Alaskan producer of coal has recently lost its only foreign contract, and a new contract will keep a considerable portion of its production in Interior Alaska. The loss of the foreign contract suggests that there will be substantial excess capacity in port coal-handling facilities in Seward unless another export contract is secured or spot market sales from Alaska increase sharply.

Even in a high case scenario for the state or region, the prospects for coal exports from Port MacKenzie appear limited. Again, the available capacity at Port Seward suggests that most coal exports that might occur from the state will be handled in Seward. The prospects for significant growth in coal exports, thus reaching a coal-handling capacity limit in Seward, or enabling a new facility at Port MacKenzie to be amortized, do not appear good in an era of globally declining coal prices. The only caveat to this conclusion is that sustained political instability in one of the major exporting countries might disrupt coal supplies, increase prices, and stimulate exports from Alaska. Such instability does not appear likely at present.

Previous studies have indicated that the rail transportation and other cost savings going to Port MacKenzie instead of Seward are not adequate to cover amortization of a new loading facility (Ogden Beeman & Associates, 1993). This finding would have to be reevaluated as the Seward facility nears the end of its physical life, when another new or refurbished facility would be required, or if further improvements in the Alaska Railroad's track between Healy and Port MacKenzie result in reducing the travel time so that only one crew is required to move a coal train between Healy and Port MacKenzie.

Sand, Gravel, and Rock

One company currently operates a sand and gravel extraction operation at Knik, and in both the low and base cases, those operations will continue to grow as Anchorage's economy grows. Competition with other established operations will inhibit, but not preclude, development of sand and gravel sites near Port MacKenzie. One or more very large development projects may provide the opportunity to develop an extraction operation, but under the low and base case, the operation would produce only in years of high demand.

In the high development case, infrastructure developed in the Port MacKenzie service area may facilitate development of sand and gravel operations. However, the Anchorage economy will continue to grow at a steady pace, and significant increases in the amount of sand and gravel required in the MSB will occur. A Knik Arm bridge envisioned under the high case would result in truck haul from Point MacKenzie becoming much more cost-effective, and cost reduction would reduce the amount of aggregate moving by barge across Knik Arm to Anchorage. However, larger production volumes could make the Point MacKenzie operation more competitive in other areas of Southcentral Alaska.

Oil Field Modules

Companies building oil field modules in Alaska have a competitive advantage in producing in the Alaskan market. That advantage arises from the proximity of these firms to oil producing areas in the State. As long as these companies remain competitive in the Alaskan market, the extent of module production in Alaska will depend on oil production levels in the State.

If the necessary infrastructure is in place, modules could probably be produced at Port MacKenzie; but the prospects seem limited with sporadic levels of activity, except in the high case scenario. In a high case scenario, which would include the opening of the Arctic National Wildlife Refuge to oil production, module production might be a significant industry.

Manufactured Homes

Alaska Manufacturing Contractors (AMC) will construct and transport 40 to 50 homes, about the same (or slightly less) production as 2001 in the low case. At ten homes per barge, four to five barge-loads per year will be shipped from Port MacKenzie.

In the base case, AMC’s increasing market acceptance and greater manufacturing efficiency will boost sales to near double 2001 sales, or 98 homes. Ten barge loads will cross Port MacKenzie docks for outbound delivery. In the high case, AMC will increase sales to nearly three times 2001 production, or 147 homes. Fifteen barge-loads will cross Port MacKenzie on outbound deliveries.

Selected Minerals

Southcentral and Interior Alaska contain significant deposits of minerals and precious metals, although the lack of roads and rail access to these deposits will constrain extraction. Under the base case, the facilities at Port MacKenzie are not expected to be used for mineral shipments. In the low development case, no significant mineral extraction activity will occur that will be shipped through Port MacKenzie.

In the high development case, commercial mineral extraction will occur for selected minerals where deposits can be accessed by roads. The State of Alaska or the Alaska Railroad Corporation, with federal assistance, is assumed to construct these roads to provide better access to locations in Southcentral and Interior Alaska.

With proper infrastructure in place, Port MacKenzie could be used for shipping minerals extracted in the region. The construction of a railroad extension or road to McGrath would allow such access to mineral resources in the Interior.[1] However, such a rail link or road to Interior Alaska is not foreseen within the planning period.

Natural Gas

Natural gas is projected to be the fastest growing primary source of world energy because of its technical, economical, and environmental advantages (International Energy Outlook 2002 Forecast). The Energy Information Administration (EIA) forecasts a strong demand growth for liquefied natural gas (LNG) in Asian markets. Previous studies have evaluated Port MacKenzie in addition to other potential LNG export sites, and other locations have been identified as the preferred sites. These previous findings suggest that LNG exports from Port MacKenzie are not likely. However, if a natural gas pipeline to the Lower 48 states or to a preferred LNG export site is built, and a spur is built to the Cook Inlet area, Point MacKenzie could become a site for petrochemical production and subsequent exports.

[1] The discussions about a rail link to McGrath occurred when the railroad was federally-owned.

1 Introduction

The Matanuska-Susitna Borough (MSB) seeks to develop further the facilities at Port MacKenzie. Such development could complement the capabilities of the POA and increase the economic base of the Borough. Further development of Port MacKenzie is contingent in part on the rail and highway access to the Port, and the appropriate level of access depends on the potential for long-term development in the area.

This study examines the most likely commodity flows that could be handled by Port MacKenzie. Nine groupings of commodities are considered:

1. Petroleum and chemical products
2. Containerized cargo and vehicles
3. Wood products
4. Coal
5. Sand, gravel, and rock
6. Oil field modules
7. Manufactured homes
8. Selected minerals

A commodity was selected for inclusion if it was the focus of past studies, or if there are presently significant flows of the commodity through ports in Southcentral Alaska. Each commodity section includes a discussion of current conditions in Alaska, national, and world markets. In order to provide additional guidance for policymakers, low, base, and high case scenarios are presented for each of the commodities. For the economy of Alaska and that of the MSB, the low, base, and high case forecasts prepared by Scott Goldsmith of the Institute for Social and Economic Research (ISER) (2001) are used to guide the analyses. The study team also made additional assumptions regarding the development scenarios. These additional assumptions are listed below.

Low

- Paved road to Port MacKenzie by 2003. Rail link is established at end of study period.
- Electricity and gas available at Port MacKenzie.
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Base

- Paved road to Port MacKenzie by 2003. Rail corridor established and operations commence about 2015.
- Electricity and gas available at Port MacKenzie.
- POA has limited expansion of cargo handling capabilities and reaches limit of cargo capacity before 2020.
- Ferry service links the Port MacKenzie and POA.
- There is no Knik Arm bridge hence no change in rail or highway access between the MSB and Anchorage.
- A fuel pipeline from Port MacKenzie to the POA is constructed late in the study period.

High

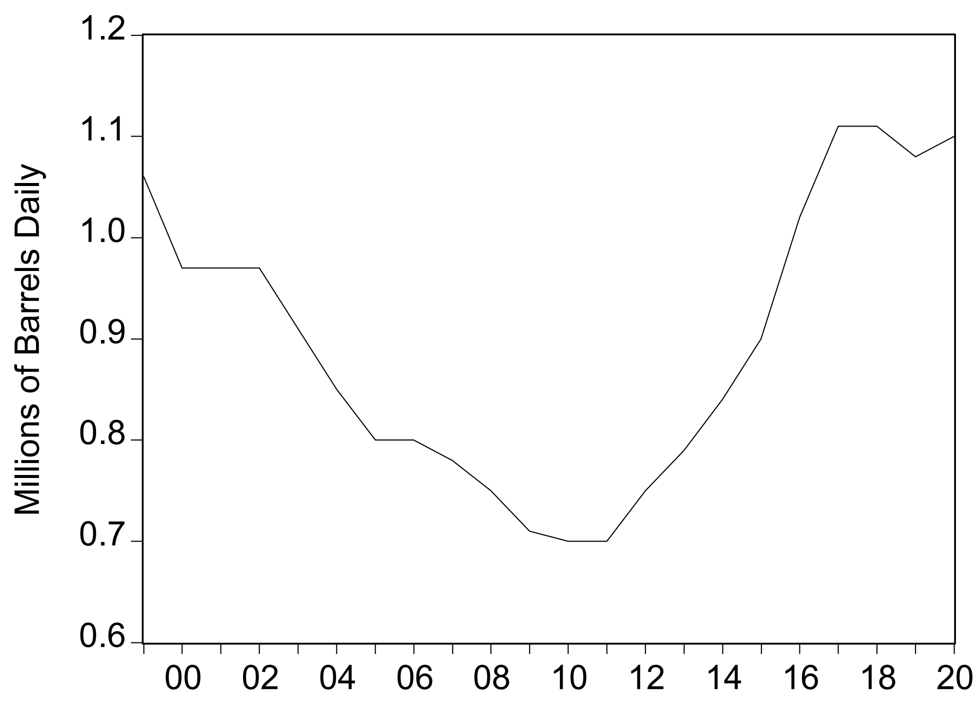
- Paved road access to Port MacKenzie by 2003. Rail service commences about 2010.
- Electricity and gas available at Port MacKenzie.
- POA has limited expansion of cargo handling capabilities and reaches limit of cargo capacity before 2020.
- Bridge links Point MacKenzie and Anchorage about 2015.
- Both rail and highway access to the MSB via Knik Arm bridge.
- Spur from natural gas pipeline to the Lower 48 states serves Port MacKenzie.
- Air cargo handling operations at Anchorage International Airport shift to new airport at Point MacKenzie.

2 Petroleum and Chemical Products

2.1 Alaska Crude Oil Production

Alaskan crude oil production peaked at more than 2 million barrels per day in 1988. Since that time, production has gradually declined. Crude oil production is expected to decline further, to 0.7 million barrels per day in 2010, according to the Energy Information Administration (EIA) (see Figure 1). The projected decline in production from the State's largest producing field, Prudhoe Bay, is anticipated to be somewhat offset by output increases from National Petroleum Reserve–Alaska (NPR-A), beginning in 2010. The likely delay in significant production from NPR-A is expected to occur because of the time required to explore and develop the oil field and to construct the associated infrastructure. After 2010, total Alaskan crude oil production is projected to grow somewhat to 1.1 million barrels per day by 2020, 14 percent higher than the 2000 level.

Figure 1. Alaska Oil Production and Reference Case Forecast, 1999-2020

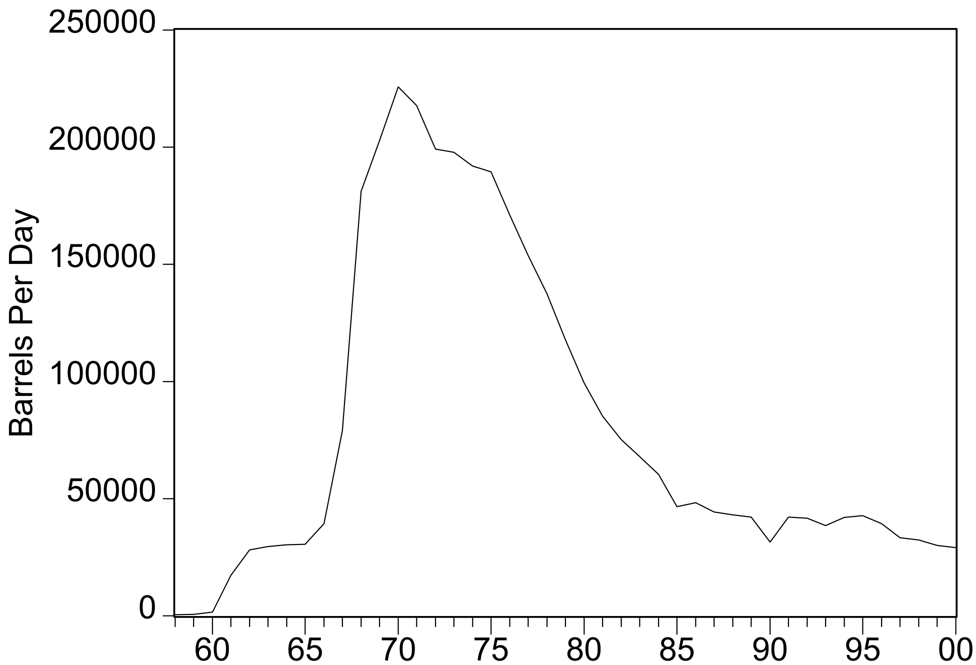


Source: Energy Information Administration, US Department of Energy

Production in the Cook Inlet is only a small part of total state oil output. Production reached a peak in 1970 with output of nearly 226,000 barrels per day. Just under

29,000 barrels per day were produced in 2000, the most recent year for which data are available (Figure 2).

Figure 2. Cook Inlet Oil Production, 1958-2000



Source: Tax Division, Alaska Department of Revenue

Most crude oil from Alaska is produced on the North Slope, transported south through the trans-Alaska pipeline, and exported from the Port of Valdez. Since most future production is anticipated to be from the North Slope and well below the peak of past production, the existing pipeline infrastructure will meet future needs, and the Port of Valdez will continue to be the primary exporting port for Alaskan oil. It is possible that commercially significant quantities of oil could be produced from other parts of the state. Exploration licenses have been issued or are expected to be issued shortly for the Copper River Basin, the Nenana Basin, and Delta Junction. Any production from these areas, given the locations, would probably be distributed by the oil pipeline to refineries within the State or to Valdez for export. Barring any large new discoveries in the north Cook Inlet area, it is unlikely that Port MacKenzie would handle significant quantities of crude oil.

2.2 Petroleum and Chemical Products

As shown in Table 2, the POA currently handles a significant quantity of petroleum products, which are typically stored on-site in the Port's tank farm or in tanks owned by private industry. For at least three reasons, these products appear to represent an opportunity for Port MacKenzie.

- Storage of flammable products and vapors from these products close to a residential area, the Government Hill section of Anchorage, raise safety concerns.
- Land currently occupied by the tank farms may have higher value in an alternative use as commercial or residential property.
- Without fill operations, there is limited room for expansion of the petroleum product storage facilities at the POA.

Table 2. Imports and Exports of Petroleum and Chemical Products Port of Anchorage, 1996-2000 (thousands of short tons)

Commodity	1996	1997	1998	1999	2000
Total Petroleum and Petroleum Products	1255	1393	1375	1290	1070
Crude Petroleum	-	-	15	215	78
Gasoline	568	589	376	235	583
Kerosene	207	310	357	278	129
Distillate Fuel Oil	145	177	169	103	124
Residual Fuel Oil	12	13	11	88	34
Lube Oil & Greases	13	15	14	12	14
Naphtha & Solvents	309	247	218	178	104
Asphalt, Tar & Pitch	-	-	1	1	-
Liquid Natural Gas	-	41	212	180	4
Total Chemicals and Related Products	93	40	97	353	54

Source: US Army Corps of Engineers. *Waterborne Commerce of the United States*, various years.

Base and high case scenarios for activity at the POA suggest that growth in the handling of petroleum products is anticipated. As can be seen in Table 3, the high case scenario suggests that the expected level of petroleum products cargo in 2020 will be almost 2.5 times the 2000 level (see Table 2 above).

Table 3. Low, Medium and High Case Scenarios for Petroleum Products Port of Anchorage, 2005, 2010, 2020 (thousands of short tons)

Scenario	2005	2010	2020
Low	977	977	977
Medium	1120	1489	1742
High	1334	2157	2608

Source: Transystems Corporation, Appendix C of *Regional Port of Anchorage Master Plan-Final Report*, September 1999

The POA cites as one goal "replacing an aging under-capacity petroleum valve yard needed to service Southcentral Alaska fuel distributions."[2] Thus, under a low growth scenario for the region's economy, there may be some possibility for the development of fuel storage facilities at Port MacKenzie. However, the potential is limited since many of the petroleum products currently stored at the POA are used at Ted Stevens International Airport and Elmendorf Air Force Base, and serve the population of Anchorage. With the major consumers located in Anchorage, only fuel to be distributed in the MSB or, perhaps, other areas north of Anchorage is likely to be stored in a Port MacKenzie tank farm. It is also possible that a Port MacKenzie tank farm could store such products during those periods when facilities at the POA are temporarily at capacity. Thus, for 2020, perhaps 5 percent of the low forecast for the POA, or approximately 50 thousand tons, might be stored annually at Port MacKenzie. The lack of infrastructure for cheaply transporting fuel between Port MacKenzie and the POA would limit the development of storage facilities at Port MacKenzie under a low case scenario.

The prospects for a tank farm on Port MacKenzie appear somewhat more promising under the base growth scenario. Capacity constraints and safety concerns may limit the fuel-handling capabilities of the POA. As with the low case, petroleum products to be distributed to areas in Northern Alaska and overflow from the POA facilities could be stored at a Port MacKenzie tank farm. In addition, a pipeline could be built across Cook Inlet to the tank farm at the POA, allowing additional storage at Port MacKenzie and low-cost transportation to major users in Anchorage. Additional study would be needed to determine the economic feasibility of such a pipeline, making it likely to be provided only late in the study period, if at all. Construction of a pipeline and the assumed limits on POA expansion imply substantially more fuel storage in the base case at Port MacKenzie by 2020. In the base scenario, about 870 thousand tons, approximately half the quantities projected in the Port of Anchorage Master Plan's medium scenario, could be stored at Port MacKenzie by 2020.

As mentioned earlier, there are safety concerns about the proximity of fuel storage tanks to residential areas in Anchorage. Furthermore, land currently occupied by fuel storage tanks at the POA may have a higher value in alternative uses. Thus, the high case growth scenario envisioned in this document implies a potentially significant role for Port MacKenzie in handling fuel and other petroleum products shipped into the area. Under that scenario, two other factors are important. First, Anchorage is constrained from developing additional tank storage facilities at or near the POA.

[2] See http://www.ci.anchorage.ak.us/port/index.cfm, accessed May 22, 2002.

Second, it is assumed that a bridge crossing the Knik Arm is constructed. If such a bridge were in place, a fuel pipeline could be attached to the bridge (or transit the Inlet) and used for transporting fuel from storage facilities at Port MacKenzie to the major consumers in Anchorage. Under this scenario, all fuel-handling capabilities currently forecast for the POA high case in 2020, 2,608,000 tons, could potentially be shifted to Port MacKenzie. Given long lead times for planning, appropriation of funds, and construction, this scenario appears possible only towards the end of the planning period.

It is much more difficult to assess the importance of chemicals. Except for 1999, chemicals have represented a relatively small portion of the cargo handled by the POA. In 1999, an exceptionally large quantity of chemicals passed through the POA. Of the 353,000 short tons, 292,000 were exported to other countries in 1999.[3] Just 54,000 short tons of chemicals were handled by the POA the following year. In 2001, Alaska exports to Mexico increased to $82 million from $37 million the previous year and fertilizers accounted for 57 percent of this total.[4] However, most fertilizer exports from Alaska to Mexico are made by Agrium Inc. through the port at Nikiski rather than Anchorage. Thus, it appears that the large quantity of fertilizer exports reported for the POA in1999 may have been an anomaly or a reporting error.

Because recent history suggests that chemicals generally account for a small share of cargo at the POA, there appears to be little potential for chemical cargo handling at Port MacKenzie. However, this conclusion should be re-evaluated if a natural gas pipeline from the North Slope to the Cook Inlet area fosters development of a petrochemical industry.

[3] US Army Corps of Engineers, *Waterborne Commerce of the United States, Calendar Year 1999*, p. 128. Available at http://www.iwr.usace.army.mil/ndc/wcuspac99.pdf. Accessed May 22, 2002

[4] Alaska Division of International Trade and Market Development, Alaska Department of Community and Economic Development. See http://www.dced.state.ak.us/trade/research/. Accessed May 16, 2002.

3 Containerized Cargo and Vehicles

Containerized cargo shipments are a practical and efficient way to transport goods to and from Alaska. This report section presents the estimated volume of containerized cargo shipped to Alaska, along with estimates of containers brought to the POA. The high case assumes a bridge or ferry system will move cargo between Anchorage and Point MacKenzie, while the current situation (shipping containers via Anchorage) is projected for the low and base cases to the year 2020.

3.1 Background

Containerized cargo is shipped in containers that are based on twenty-foot equivalent units (TEU). A 40-foot van, for example, is two TEU. Containerized cargo worldwide is expressed as multiples of TEU. Container shippers also carry vehicles, such as trucks and automobiles, converted to a TEU basis. Automobiles, for example, are converted at a rate of four cars equaling one TEU.

The POA is the primary container receiving port for containerized cargo bound for Southcentral and Interior Alaska. It began operations in 1961 and has expanded to a five-berth terminal, encompassing a 129-acre industrial park (http://www.muni.org/port/index.cfm, accessed May 16, 2002). It is mainly a receiving port, with inbound cargo tonnage generally more than twice the amount of outbound cargo levels.

Table 4 displays containerized cargo received at the POA from 1992 to 2001, from the POA web site.

Table 4. Annual Tonnage, Port of Anchorage, 1992 to 2001, by Category and TEUs.

In Short Tons	1992	1993	1994	1995	1996
Containers/vans/flats	1,374,285	1,424,894	1,445,769	1,476,263	1,474,496
Bulk petroleum	873,232	1,091,479	1,142,066	1,433,726	1,527,904
Other	124,286	107,087	128,027	117,494	85,869
Total	2,371,803	2,623,460	2,715,862	3,027,483	3,088,269
Total TEU (containers, etc.),	262,722	320,518	333,138	345,864	353,258

In Short Tons	1997	1998	1999	2000	2001
Containers/vans/flats	1,505,583	1,567,891	1,598,392	1,604,513	1,640,390
Bulk petroleum	1,713,730	1,279,746	948,603	1,069,031	1,203,471
Other	96,578	100,005	100,428	119,726	130,469
Total	3,315,891	2,947,642	2,647,423	2,793,270	2,974,330

Total TEU (containers, etc.)	368,531	359,000	408,995	432,296	360,614

Source: Adapted from POA Web site and BST Associates input to *Port of Anchorage Container Access Study. 1999.*

Discussions with the container carriers calling at the POA indicate that the number of tons per TEU was unusually low in 1999 and 2000 and the number of TEU's shown in 2001 is closer to the long term ratio of tons per container. The decline in number of TEU's between 2000 and 2001 does not represent a substantial drop in business.

Containerized cargo, including vans and flats, averaged 53.4 percent of total tonnage while bulk petroleum was 42.7 percent. All other cargo was 3.9 percent.

Annual growth rates were 1.8 percent for containerized cargo and 3.3 percent for bulk petroleum. Other cargo grew at a rate of 0.5 percent. Overall, cargo tonnage for the period 1992 to 2002 grew at an annual rate of 2.3 percent.

3.2 Container Shipping

Virtually all containerized cargo bound for Alaska originates at Tacoma, Washington. There are two major shipping firms using Tacoma's outbound container berths: Totem Ocean Trailer Express (TOTE) and CSX Lines, formerly Sea-land Shipping.

TOTE vessels carry 820 TEUs, while CSX Lines vessels can carry 1,500 TEUs. The larger transpacific vessels, by way of comparison, carry 5,000 TEUs.

Sea-Land began its Alaska service in 1964 and CSX currently makes port calls in Anchorage, Kodiak and Dutch Harbor. It has 16 ships serving Alaska, Hawaii/Guam, and Puerto Rico, with 27,000 containers (http://www.csx.com/aboutus/issues/transaction/alaska.shtml, accessed on May 16, 2002). Its container ships are based on a lift-on and lift-off (LO-LO) design.

TOTE began service from Tacoma to Anchorage (only) in September 1975, and now has three vessels with roll-on, roll-off (RO-RO) capability. The company has ordered two more vessels, with one to be delivered in late 2002, and the second in 2003. This will give the company five vessels. The president of TOTE's Alaska operations indicated one or more of the vessels would be redeployed to "…warm water…" service, if market expectations were not met (Alaska Journal of Commerce, April 29, 2001). These newer vessels are designed to meet demand for 53-foot containers, a container size similar to those currently hauled by trucks on the Alaska Highway.

Table 5 illustrates container shipments from Tacoma to Alaska.

Table 5. Port of Tacoma, Total and Alaska Container Shipments, 1995 to 2002 (est).

	1995	1996	1997	1998	1999	2000	2001	Estimated 2002
TEU								
International	677,000	661,000	740,000	721,000	828,000	932,000	827,356	822,450
Alaska	415,000	412,000	419,000	435,000	443,000	444,000	454,665	466,000
Total	1,093,995	1,074,996	1,160,997	1,157,998	1,272,999	1,378,000	1,284,022	1,290,452
Percentage								
International	61.9%	61.5%	63.7%	62.3%	65.0%	67.6%	64.4%	63.7%
Alaska	37.9%	38.3%	36.1%	37.6%	34.8%	32.2%	35.4%	36.1%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Port of Tacoma (http://www.portoftacoma.com, accessed May 16, 2002)

Alaska bound container cargo measures just over a third of the total number of containers that leave Tacoma. The difference between northbound containers and the number received at Anchorage reflects CSX Lines ports of call in Dutch Harbor and Kodiak.

3.3 Port of Anchorage (POA)

All the containerized cargo for Central and Southcentral Alaska (about 80 percent of Alaska's population) is handled at the POA, according to the *Master Plan, Final Report, September 30, 1999* submitted by Vickerman, Zachary, Miller (VZM) in association with Tryck, Nyman, and Hayes; Northern Economics, Inc.; Leeper, Cambridge, and Campbell, The Boutet Company; and Ogden Beeman Associates. The plan is referred to as the POA Master Plan.

The POA handled 1.5 million short tons of cargo in 1998 or 359,000 TEUs, a figure of 74 percent of the port's current maximum capacity of 485,170 TEUs. There are two general levels of containerized cargo activity, according to the POA Master Plan.

The 485,170 TEU is a Maximum Practical Throughput (MPC), as defined by VZM. This means "…. *It is an estimated throughput volume at the high end of a realistic operating scenario…operations at MPC may be uneconomical or unsafe…."* A figure less than MPC is often used, as the Sustainable Practical Capacity (SPC). It ranges from 75 to 85 percent of the MPC. The POA is at its SPC now.

The POA completed a projection of its containerized cargo shipments through the year 2020 and it plans to expand its capacity. Table 2-3 illustrates containerized cargo levels for the period 1988 (actual) through 2020 (estimated). The percentage distribution by cargo destination is also shown; the term northbound refers to containers destined for both the MSB and Fairbanks.

Table 2-3. Containerized Cargo, Port of Anchorage, in TEU from 1988 to 2020 (Master Plan, 1999).

	Dist %	1988	1996	1998	2000	2005	2010	2020
Anchorage	80.9	162,501	286,277	290,431	349,727	363,241	420,680	555,783
Fairbanks	11.9	23,903	42,110	42,721	51,443	53,431	61,880	81,753
Kenai	6.3	12,655	22,293	22,617	27,235	28,287	32,760	43,281
MSB	0.9	1,808	3,185	3,231	3,891	4,041	4,680	6,183
Total TEU		200,866	353,865	359,000	432,296	449,000	520,000	687,000
Northbound	12.8	25,711	45,295	45,952	55,334	57,472	66,560	87,936

Source: BST Associates, Port of Anchorage Container Access Study, 1999.

Northbound TEU figures in Table 2-3 are the sum of the number of containers bound for Fairbanks and the MSB. Not all are moved directly to their destination. Approximately half are moved by transload facilities. Further estimates suggest direct moves for Fairbanks account for two-thirds of all shipments, while direct loads represent less than 12 percent of the MSB shipments.

Growth scenarios for containerized cargo are primarily based on population growth. The medium rate for the Master Plan is a compound annual growth rate of 2.5 percent.

As cargo services increase, capacity is added in the form of a container terminal module. These are essentially self-sufficient units with approximately 1200 feet of berthing space, crane rails, and approximately 1450 x 1450 ft. of load and unload pad space, with cranes, administration, employee parking and fencing/gates etc. The storage area for each terminal module is 32 acres, enough for 1400 TEU.

Conceptual budget estimates for four new container terminals range from $13,000,000 to $56,000,000 depending on design assumptions, amount of new construction, especially concrete wharf and trestles, and the amount of rock work needed for dikes and rip-rap.

3.4 Port MacKenzie

Analysis of Table 2-3 indicates MSB container cargo averages approximately 70 containers per week, in the year 2000, growing to an estimated 119 containers per week in 2020. Current TOTE vessels can haul 820 TEUs per load, the smallest container vessel capacity.

These container numbers are aggregates. Actual containers delivered include freezer vans, dry containers, keep-from-freezing units, and refrigerator vans. This variety of MSB container shipments suggests an equally wide variety of services would be needed at Port MacKenzie to fuel the necessary units, keep them from excessive heat or cold, and provide back-haul and staging for the empty vans. In addition, there is a seasonality built into the container demand that reflects greater tourist and visitor presence during the May to September season. None of these variables is accounted for in the gross aggregate container demand. All serve to constrain the immediate and near-term potential of Port MacKenzie as a container port.

The capital cost estimates for Anchorage terminal expansion ranges from $13 million to $56 million, further suggesting that an expected demand of 70 to 199 containers per week in the MSB would be economically inefficient.

Population in the MSB area is about 60,000 (59,322 in the 2000 census). By means of comparison, the POA started operations in 1961 when the estimated population of Anchorage was in excess of 80,000 (82,833 in the 1960 census). As the POA expands beyond the year 2020 and consumes available real estate, Port MacKenzie will become increasingly attractive as an additional container dock. However, current project scope is limited to the year 2020 and there will be enough expansion space at the POA for this time frame. As such, no significant numbers of container shipments are projected to cross Port MacKenzie dock during the study period for either the low or base cases. There is a good possibility of limited barge shipments of containers or flats with, for example, turned log cabin kits from the Valley Sawmill site about eight miles from Port MacKenzie. These are considered incidental, but a ferry system could enhance the viability of the sawmill or other manufacturers at Port MacKenzie.

The high case assumes either a ferry system will be operating between Port MacKenzie and the POA, or a bridge will be built. At this level of development, it is more efficient for containers to be ferried to Port MacKenzie or driven across the bridge from Anchorage. A bridge connection across Knik Arm would make Port MacKenzie more attractive for a potential third marine carrier.

Again, Port MacKenzie will become increasingly attractive as a container dock as the POA reaches the limits of available real estate. This will occur beyond the year 2020.

4 Wood Products

MSB forests are a primary natural resource suitable for economic development. This section discusses the Borough's forestland base, forest products that can be manufactured from Susitna Valley forests, the current state of the industry, and forecasts for likely development.

4.1 Section Summary

Forests in the Susitna Valley were reviewed as part of the 1985 Susitna Area Plan (SAP). At this overview level, an estimated 360,000 acres of commercial forestlands were within six miles of a road; another 100,000 acres had potential for personal use (cabin logs, back-country buildings). The plan proposed 464,000 acres for legislative designation with forestry as one of the primary uses (SAP, 1985).

The Borough's forestland base, 84,691 acres, supports a primarily birch forest. The Borough has significant stands of timber near existing transportation corridors within a 100-mile radius extended from Port MacKenzie. Birch trees on this land are smaller and, as a result, have less potential quality forest-wide than birch forests in the Midwest states with warmer climates. Lumber from similar sized logs, however, can compete with products from other regions. Specialty products such as turned log home kits are viable, but the major product for any significant development from the Borough's forests will be birch wood chips.

Japan is the major importer of wood chips, consuming approximately 77 percent of the world's supply. The west coast of North America has historically supplied most wood chips to Japan, but in recent years, Australia has emerged as the number one supplier. Exchange rates are one contributing factor as buyers find more value in other currencies than the US dollar.

Alaska supplies about five percent of the west coast, US, wood chip volume, and all shipments for the past ten years have been softwoods (spruce and hemlock), not hardwoods such as birch.

At fixed costs of $5 million, contribution margins of $20 per bone dry ton (BDT) would require about 250,000 BDTs to breakeven. The $20 unit estimate is based on hardwood selling values of $95 to $105 per BDT and production costs of $75 to $85 per BDT. More detailed, project-level cost estimates could reduce this margin depending on loading costs, long-shoring or stevedoring costs, or other costs related to actual chips on board a vessel.

Both the base case and low case development scenarios project no major changes in the current situation. The high development scenario is based on an active wood chip production of 200,000 BDTs on an annual basis.

4.2 Matanuska-Susitna Borough Forest Land Base

The MSB land entitlement was estimated (in 1989) as 350,000 to 400,000 acres (Resource Management Associates, 1989) with 160,250–forested acres. Fourteen Forest Management Units were proposed as a timber base, consisting of 111,456 gross acres. Total forest acreage on the 14 units was 84,691 acres (76 percent of gross acres).

These forested acres were considered similar to other forestlands in the area, including the State of Alaska Department of Natural Resources land base, the University of Alaska's lands, and private lands belonging to regional and village native corporations.

The Timber Supply Report, from the 1989 project states:

> As found throughout the Susitna Basin, birch is by far the predominant forest type on MSB proposed Forest Management Unit lands. The type is best described as a mixed bich [sic] type, typically influenced by an invading White spruce understory. Mature and over mature birch comprise the dominant overstory postion [sic] in the typical mixed-birch stand, stocked with occasional White spruce dominant associates. Of the 84,691 acres of forest land, the birch type occupies approximately 76,406 acres or 90 percent of forest land.

Total cubic volume on these units was projected as 75,621,000 cubic feet, all species, with 51,490,000 cubic feet of hardwoods (68 percent of the total volume).

Birch volume is the primary volume in the Susitna Valley and it has been discussed in area-wide extensive surveys (inventories) since the 1920s, as presented in the following sections.

Other overview volume estimates are noted in the Susitna Area Plan, prepared in 1985 by several cooperating agencies. This 17 year old report provides estimated acres with references to more specific volume estimates. Lands included in this study included all government and private lands within the river-basin boundaries.

Birch Tree and Log Quality

Birch trees in the Susitna Valley are smaller and have less overall lumber quality than birch trees in the warmer climates of Minnesota and Michigan (US Forest Service, 1967). This same Forest Service report, the first published extensive inventory of the Susitna Valley, noted:

> Alaska's paper birch, in particular that of the Susitna Valley, has been the object of numerous studies and cruises. Starting with a 1920 reconnaissance and continuing through cruises and recommendations by the Bureau of Land Management (BLM), the reports have been of small, low-quality, defective trees…chiefly usable as pulp with [a] small amount suitable for veneer and furniture stock. Our inventory data confirm this.

Those logs that are suited for lumber, and are large enough, can compete well with other birch wood supplies, based on tests in 1987, as discussed in the following section.

Birch Lumber Recovery

Two test birch log shipments in April 1987 indicated larger, higher-quality logs were suitable for lumber manufacturing (Kerr and Associates, 1987). Logs from Trapper Creek and Point MacKenzie were shipped, via container, to mills in Washington, at

Sedro Woolley and Arlington. Lumber was sawn, planed, dried and graded. Results indicated higher-grade birch logs from the entire Susitna Valley could meet market requirements. The project report noted, consistent with earlier reports, that

> The key to hardwood development in the Susitna Valley is low quality product utilization. A market, such as an export chip market or biomass power market, should be evaluated to identify specific constraints (e.g. transportation, delivered cost, etc.) Once the lower quality material has a stable market, the higher quality logs will provide further added value.

Birch volumes on MSB forests are estimated in the following sections.

Timber Cruise Results

More intensive field sampling (termed a timber cruise, usually statistically based) in the Susitna Valley is consistent with US Forest Service and other less intensive inventories. A 1985 timber cruise report prepared for the MSB (Kerr and Associates, 1985) on the Chijuk Creek timber block found 1,104 cubic feet per acre, net basis, all species.

That volume consisted of 663 cubic feet per acre of birch sawlogs and 196 cubic feet per acre of birch pulp (chip) logs, for a total birch volume of 859 cubic feet per acre or 78 percent of total volume. Spruce comprised 13 percent of total volume and cottonwood was 9 percent.

These cruise data are generally indicative of the area. Birch is the primary species in the Susitna valley.

4.3 Forest Products: Logs, Lumber, Turned Log Kits

Although birch is the predominant species and the one most likely to drive major commodity flows, there are small specialty markets for logs, lumber, and other forest products.

Logs

Logs have been imported to the Port MacKenzie area from Afognak Island. A barge load of spruce logs was landed at the Port for The Valley Sawmill. The mill was testing new sources of wood supply and Afognak logs were a possibility. This type of shipment could expand in the future if logging operations at Afognak resume.

Export of logs outbound across the Port MacKenzie dock is less likely. The export market for birch logs is limited, though both Washington mills contacted in the 1987 study expressed interest either in a birch log or birch green lumber program. Birch logs from the Chijuk Creek area were harvested and shipped to Shelton Washington via

Alaska railroad gondola cars in early 2002. It is too early to determine if this test operation will expand.

Log suppliers for the 1987 study, from Trapper Creek and Point MacKenzie, were unable to generate a profit at the prices offered for birch log and green lumber delivered to Washington. However, a large and efficient operation might be able to add value through greater cost reductions per unit volume, making these shipments feasible.

Birch logs from the MSB's Chijuk Creek forest were exported in February 2002 via the Alaska Railroad. Gondola cars are loaded at a siding near Talkeetna and shipped via hydro-train to Shelton, Washington. These higher-grade logs are being used for lumber and, possibly, for green birch veneer.

Lumber

Lumber from The Valley Sawmill at Point MacKenzie will likely be shipped across the dock at Port MacKenzie to Anchorage. Actual shipments will be based on real cost advantages for barge transport, if this service begins, when compared to truck haul through Wasilla. If no cost advantage exists, finished lumber will be trucked to the mill's Anchorage retail location.

Barged volumes will be low, less than 10,000 board feet per month, until there is increased market acceptance of local kiln-dried, planed, and graded lumber. A ferry with capability of carrying flat-bed trucks could provide several shipments per month, at 5,000 to 16,000 board feet per load, assuming current kiln projects are completed in late 2002 or early 2003.

These volumes, at an annual estimated volume of 120,000 board feet, are incidental volumes when compared to the projected 100,000,000+ board feet consumed annually in the railbelt (Reid, Collins Alaska, 1982). However, they do represent a potential market share for local products.

Turned Log Kits

The Valley Sawmill is currently turning beetle-killed spruce logs on a large lathe at Point MacKenzie. House logs from this process are sold as kits, either directly (small outbuildings), or on a wholesale basis (through Superior Log Homes).

This high value-added operation is generating greater market acceptance with actual homes now built from Afognak Island to Fairbanks. Superior Log Homes provides contractors and homebuyers with plans and construction advice.

Kits are assembled at Point MacKenzie on pallets and lifted onto large truck flats. These can be transported by highway system and have been barged to Afognak.

United Lumber, in Anchorage, sold log cabin kits to Japan, using intermediaries. Though it is no longer in operation, United Lumber's units gained strong market acceptance due to high quality and the uniqueness of Alaska. Kits were termed the "Kenai", "Kodiak", and other well-known cities. These, too, are possibilities.

4.4 Forest Products: Wood Chips

As noted in prior sections, birch trees in the MSB account for an estimated 70 to 80 percent of total timber supply. Of this birch volume, about 80 percent is suitable only for low-quality commodity uses, such as wood chips, firewood, and lower grade lumber such as crating. The remaining 20 percent is suitable for log export, lumber manufacture, and veneer production. Hardwood chip export remains the key to developing forestlands in the Susitna valley.

Exporting wood chips, if economically feasible, will permit higher value-added manufacture of lumber and other products. Three major market levels (world, North America, and Alaska) for wood chips are discussed in the following sections.

World Demand and Supply

World wood chip imports and exports are tracked by the United Nations Food and Agricultural Organization (FAO). Annual reports are submitted to the UN by member countries as unit shipments, in metric tons (2,205 pounds) and nominal US dollars. Internal production and consumption of wood chips are not reported directly to the UN, though other products, such as lumber, are counted and submitted as production volume. As a by-product, in most cases, wood chips are considered a less-valued product than, for example, lumber.

Total wood chip demand is unknown due to reporting problems related to internal consumption by major industrial countries. However, since import demand for wood chips represents a major part of total demand for these countries, import data are used as a measure of total demand.

Japan is the most significant importer, followed at a distance by all other countries as shown in Table 6. Demand is centered in two areas. Asia (Korea, Japan, China) accounted for 77.7 percent of total demand in 2000. Europe (Norway, Sweden, Finland, Belgium, Italy and Austria) accounted for 12.4 percent of total demand in the same year. Table 7 depicts the value, in US dollars, of that same import volume.

Table 6. Wood Chip Imports, Top 20 Countries, Year 2000, in Metric Tons and Percent of Total Imports.

Country	2000	Percent
Japan	26,200,000	70.1
China	1,699,838	4.5
Italy	1,419,000	3.8
Canada	1,223,000	3.3
Korea, Republic of	1,162,000	3.1
Sweden	988,000	2.6
Finland	849,000	2.3
Austria	505,000	1.4
Norway	446,000	1.2
Belgium	397,000	1.1
France	353,000	0.9
United States of America	299,000	0.8
Denmark	275,000	0.7
Germany	269,000	0.7
Luxembourg	242,000	0.6
Switzerland	221,000	0.6
Portugal	172,100	0.5
Spain	120,000	0.3
Slovenia	101,848	0.3
Netherlands	93,353	0.2
Total Metric Tons:	37,035,139	99.1

Source: FAOSTAT, 2001.

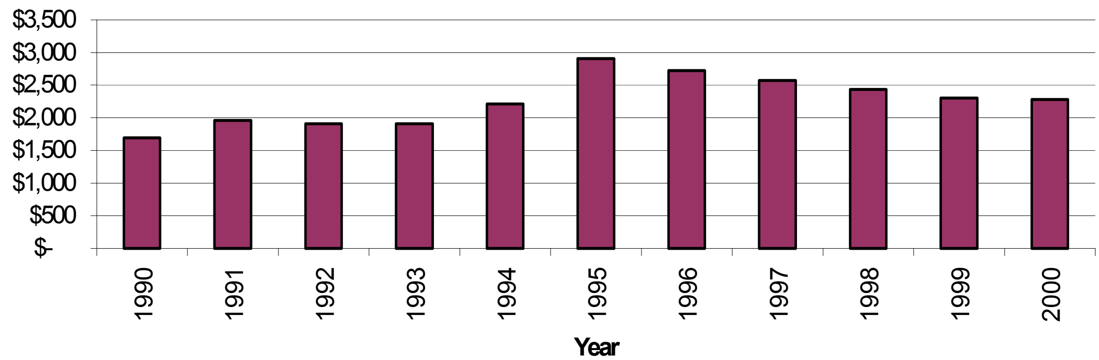
Table 7. Wood Chip Imports, Top 20 Countries, Year 2000, in US Dollars and Percent of Total Imports

Country	2000	Percent
Japan	$1,898,256,000	83.2
Korea, Republic of	$ 90,495,000	4.0
China	$ 72,771,000	3.2
Sweden	$ 47,404,000	2.1
Finland	$ 27,912,000	1.2
Italy	$ 20,818,000	0.9
United States of America	$ 18,221,000	0.8
Norway	$ 15,448,000	0.7
Austria	$ 12,943,000	0.6
France	$ 12,029,000	0.5
Belgium	$ 8,519,000	0.4
Canada	$ 7,870,000	0.3
Portugal	$ 5,917,000	0.3
Spain	$ 5,207,000	0.2
Switzerland	$ 4,594,000	0.2
Denmark	$ 4,578,000	0.2
Netherlands	$ 4,254,000	0.2
Germany	$ 3,661,000	0.2
United Kingdom	$ 3,401,000	0.1
Luxembourg	$ 3,242,000	0.1
Total:	$2,267,540,000	99.4

Source: FAOSTAT, 2001.

As Table 7 indicates, the top 20 countries imported wood chips valued at approximately $2,268,000,000 in the year 2000. The trend in world wood chip imports for the period 1990 to 2000 is shown in Figure 3. Demand peaked at $2,906,000,000, US, in 1995, with a gradual decline to $2,280,000,000 in 2000. The Japanese economic slow-down played a major part in this contraction.

Figure 3. World Chip Imports, 1990 to 2000, in US$, Millions.



Source: FAOSTAT, 2001.

Wood chip suppliers are more numerous than importers. Table 8 illustrates the top 20 wood chip suppliers in the year 2000.

Table 8. Top 20 Wood Chip Suppliers, in Metric Tons and Percent of Total Supply, Year 2000.

Country	2000	Percent
Australia	8,741,000	28.1
United States of America	5,166,000	16.6
South Africa	2,923,500	9.4
China	2,401,304	7.7
Chile	2,400,000	7.7
Germany	1,630,000	5.2
Canada	1,161,489	3.7
Brazil	664,000	2.1
Thailand	614,000	2.0
Russian Federation	600,000	1.9
Latvia	584,170	1.9
France	571,000	1.8
Estonia	437,896	1.4
Viet Nam	434,000	1.4
Malaysia	376,000	1.2
Austria	357,000	1.1
New Zealand	248,000	0.8
Sweden	230,000	0.7
Total Metric Tons	29,539,359	95.0

The main wood chip exporters are located in seven world regions: Europe (Germany), Russia, Asia (China and Thailand), South Africa, Australia, South America and North America. Table 9 lists each exporter, in order of its percentage of the export market. Although Australia was the number one exporter in 2000 in terms of tonnage, the US maintained a slight lead in value, perhaps due to wood species composition.

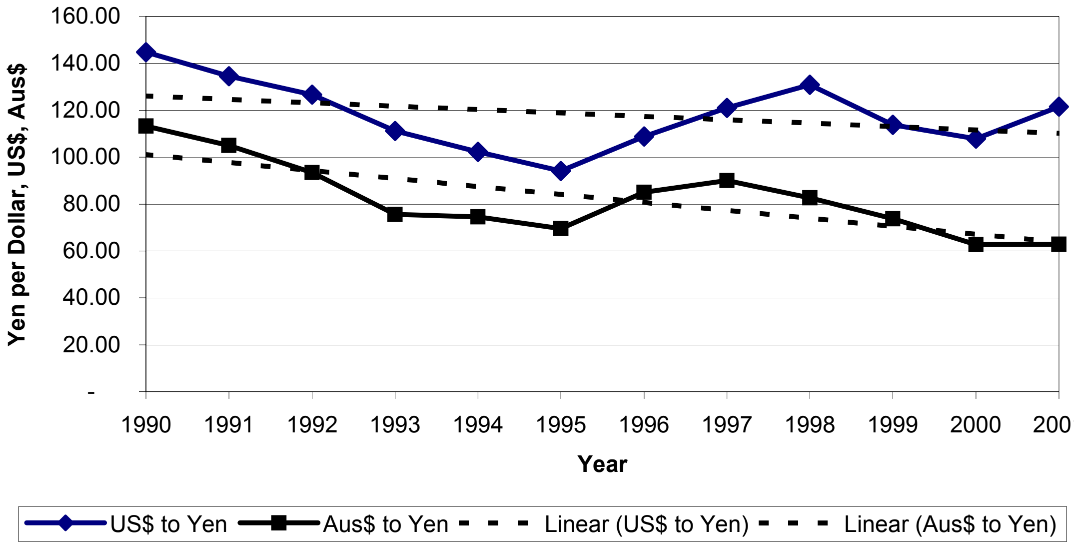
Table 9. Top Twenty Wood Chip Exporters, 2000, in US$.

Country	Percent of Total Wood Chip Export Value	Export Value
United States of America	26.2	$ 397,499,000
Australia	25.2	$ 380,900,000
South Africa	9.0	$ 136,194,000
Chile	8.8	$ 133,021,000
China	7.6	$ 115,134,000
Canada	4.2	$ 63,882,000
Germany	2.2	$ 33,864,000
Thailand	1.9	$ 28,751,000
Viet Nam	1.9	$ 28,649,000
Brazil	1.8	$ 27,671,000
New Zealand	1.5	$ 22,842,000
Russian Federation	1.2	$ 18,600,000
France	0.9	$ 13,832,000
Estonia	0.8	$ 11,761,000
Malaysia	0.7	$ 11,099,000
Latvia	0.7	$ 10,767,000
Austria	0.7	$ 10,250,000
Sweden	0.6	$ 9,414,000
Fiji Islands	0.5	$ 8,137,000
Argentina	0.5	$ 7,714,000
Total, Top 20	97.1	$1,469,981,000

Source: FAOSTAT, 2001.

As the single largest importer of wood chips, Japan's exchange rate with all other currencies drives much of its chip buying. Figure 4 illustrates the exchange rate between the Yen and both the US and Australian dollar between 1990 and 2001.

Figure 4. US, Australian Exchange Rate, 1990 to 2001



Source: http://fxinvestor.oanda.com/convert/fxhistory, May, 2002.

Figure 4 illustrates two main points. First, exchange rates are cyclical and this affects the relative competitiveness of wood chip suppliers relative to Japanese buyers. Second, over the time shown, the Australian dollar became less expensive for Japanese buyers when compared to the US dollar. Although the two currencies generally move together, the gap between them widened from just over 31 Yen in 1990 to 59 Yen in 2001.

This is partly why the US dropped from the number one supplier of wood chips to Japan in 1990 to number two in 2000. Other contributing factors include major environmental restrictions on public wood supply in the US, Australia's ability to quickly mobilize for export expansion, and new suppliers from plantation forests in South America.

Any wood chip supplier from the Susitna Valley will need to compete in this world arena.

North American Demand and Supply

Internal demand within the US and Canada is met first, followed by cross-border trade between the two countries. These volumes and values are not presented, only wood chip export data. Not all wood chips are exported, however, due to meeting internal demands first. Again, in this market, exports are a measure of supply.

The US and Canada sell wood chips to Japan and to other Asian countries, such as Korea and China. US wood chip export data are collected by the US Department of Commerce and reported on government Internet sites as well as published in secondary reports, such as those distributed by the US Forest Service. Canadian data are collected by Statistics Canada.

There are four US west coast customs districts with wood chip shipping facilities. The Alaska Customs District includes the entire state; wood chips are currently shipped from Homer and Southeast Alaska.

The Seattle District is the next (southerly) reporting district, followed by the Columbia River District (Portland) and the San Francisco Customs District.

Almost all Canadian export wood chips from the west coast of North America are shipped from British Columbia (BC).

Table 10 is a summary of US Wood Chip Exports for the period 1990 to 2000 (US Department of Commerce, as reported by the US Forest Service). Data are for all species. Table 11 illustrates the same data in percentage of total shipment, all species, by district.

Table 10. Volume of Wood Chip Exports, US West Coast, North America, 1990 to 2000, in Bone Dry Tons (2,000 lbs).

Year	All Chips	Alaska	Seattle	Columbia River	San Francisco
1990	3,266,504	28,283	744,397	2,081,199	412,625
1991	3,387,324	101,397	681,161	2,141,958	462,808
1992	2,722,883	15,509	583,141	1,766,502	357,731
1993	2,520,647	56,289	588,564	1,544,904	330,890
1994	2,778,229	73,503	755,872	1,563,772	385,082
1995	2,341,015	146,277	542,694	1,329,590	322,454
1996	2,335,097	199,862	589,989	1,230,966	314,280
1997	2,336,187	105,653	611,888	1,247,092	371,554
1998	2,313,763	145,837	835,594	1,076,786	255,546
1999	2,194,809	131,699	753,147	1,024,223	285,740
2000	1,870,178	178,461	461,874	992,062	237,781

Source: US Forest Service. 2000.

Table 11. Percent of All Wood Chip Exports, by West Coast US Customs District, 1990 to 2000

Year	Alaska	Seattle	Columbia River	San Francisco

1990	0.9	22.8	63.7	12.6
1991	3.0	20.1	63.2	13.7
1992	0.6	21.4	64.9	13.1
1993	2.2	23.3	61.3	13.1
1994	2.6	27.2	56.3	13.9
1995	6.2	23.2	56.8	13.8
1996	8.6	25.3	52.7	13.5
1997	4.5	26.2	53.4	15.9
1998	6.3	36.1	46.5	11.0
1999	6.0	34.3	46.7	13.0
2000	9.5	24.7	53.0	12.7
Average	4.6	25.9	56.2	13.3

Source: US Forest Service. 2000.

Alaska is a small volume supplier relative to the west coast producers in Washington, Oregon, and California.

Data are collected at time of export by species, generalized as softwood (spruce, hemlock, fir, etc.) and hardwood (birch, cottonwood, alder, etc.). Table 12 illustrates the average percentage of hardwoods, as a portion of the total exports by each customs district.

Table 12. Hardwood Wood Chip Percentage of Total Wood Chip Exports, by West Coast US Customs District, 1990 to 2000.

Year	Alaska	Seattle	Columbia River	San Francisco
1990	0.0	46.0	37.0	17.0
1991	0.0	36.6	53.2	10.2
1992	0.0	41.0	51.7	7.4
1993	0.0	52.7	34.7	12.7
1994	0.0	38.5	43.6	18.0
1995	0.0	32.6	47.9	19.5
1996	0.0	46.9	32.8	20.3
1997	0.2	39.7	31.1	29.1
1998	2.8	53.8	26.0	17.4
1999	0.0	44.5	30.7	24.8
2000	0.0	40.5	36.7	22.8
Average	0.3	43.0	38.7	18.1

Source: US Forest Service. 2000.

The data indicate that hardwood chips were exported from Alaska in 1997 and 1998. For this report, Northern Economics, Inc. contacted members of the forest products industry in Southeast Alaska and Southcentral Alaska about these shipments. No one could verify any actual hardwood shipments or suggest who might have sent a test shipment, for example. It is possible that these reported shipments are actually a coding error.

Seattle, Portland and San Francisco customs districts had average hardwood species composition of 43, 39, and 18 percent respectively. Alder chips are the largest single species exported, with others, such as eucalyptus, found farther south. Hardwoods chips are significant components of US west coast export chip trade, except for Alaska.

Table 13 shows BC wood chip export value in US dollars and as a percentage of total Canadian export value, for the period 1992 to 2001.

Table 13. British Columbia Wood Chip Export Value (US $) and Percentage of Total Canadian Wood Chip Export Value.

Year	Total Canadian Woodchip Exports Value, US$	British Columbia Woodchip Exports Value, US$	Percentage of Total Canadian Export Value
1992	$116,998,063	$95,778,324	81.9
1993	$114,744,750	$84,307,777	73.5
1994	$108,079,678	$67,060,285	62.0
1995	$111,451,314	$75,227,018	67.5
1996	$118,618,603	$78,369,944	66.1
1997	$122,599,451	$80,452,225	65.6
1998	$ 97,516,265	$58,207,701	59.7
1999	$ 91,803,829	$49,423,145	53.8
2000	$124,609,058	$61,990,452	49.7
2001	$141,269,216	$61,450,399	43.5

Source: Statistics Canada

This table illustrates the steadily declining role of BC wood chips within Canada, from a high of 82 percent in 1992 to the current 44 percent. Other provincial wood suppliers are supplying world markets (including cross border US trades) from both east and west coast Canadian shipping ports, while BC production is declining.

Again, any wood chip supplier from the Susitna Valley will be competing with producers from both British Columbia and the states of Washington, Oregon, and California. Further, they will be competing against cheaper currencies such as the Australian and Canadian dollars (relative to the current US dollar value).

Alaska Demand and Supply

Alaska had two major pulp mills; both are now closed. The Sitka mill closed in 1993 and the Ketchikan Pulp Company mill ceased operations in 1997. Wood chip operations in Southeast Alaska were closely tied to the mills until their closure. Chip production from the current three sources is now exported.

Wood chips from the Kenai Peninsula were exported from Homer starting in the early 1990s, with reduced volumes as the company, Circle DE Pacific, went into bankruptcy. The current operator is shipping both wood chips and utility grade logs (for chipping) from the export dock at Homer.

Table 14 illustrates total Alaska wood chip export volume for the period 1990 to 2000.

Table 14. Alaska Export Wood Chip Volume and Value, in Dollars per Bone Dry Ton (2000 lbs) 1990 to 2000

Year	All Chips Volume	All Chips Value	Softwood Volume	Softwood Value	Hardwood Volume	Hardwood Value
1990	28,283	$ 75.38	28,283	$ 75.38	-	$ -
1991	101,397	$ 78.01	101,397	$ 78.01	-	$ -
1992	15,509	$ 21.73	15,509	$ 21.73	-	$ -
1993	56,289	$ 110.13	56,289	$ 110.13	-	$ -
1994	73,503	$ 108.43	73,503	$ 108.43	-	$ -
1995	146,277	$ 137.38	146,277	$ 137.38	-	$ -
1996	199,862	$ 83.79	199,862	$ 83.79	-	$ -
1997	105,653	$ 72.10	104,547	$ 72.25	1,106	$ 57.92
1998	145,837	$ 73.80	126,181	$ 72.91	19,656	$ 79.51
1999	131,699	$ 41.75	131,699	$ 41.75	-	$ -
2000	178,461	$ 41.03	178,461	$ 41.03	-	$ -

Source: US Forest Service, 2000.

Hardwood chips reported in Table 14 cannot be verified. These data may be a recording error.

Wood Chip Production Costs

Discussions with industry representatives suggest birch wood chips could be landed at Port MacKenzie, "in the pile", for $88 per BDT. As operators gain experience, this cost could drop to around $71 per BDT, using the same cost assumptions.

Assumptions included stump-to-truck loads of 25 tons per single on-highway load. Hauling distances were projected at 100 miles or less. Green birch weights of 50 pounds per cubic foot (solid wood) were used for weight calculations. Logging and chipping costs were based on experienced data from Tyonek, operators on the Kenai Peninsula, and the Homer chipping operation.

Breakeven Analysis, Port MacKenzie Export Chip Dock

Breakeven analysis is a financial method for determining the unit volume where all costs are met, or the breakeven point. It is defined as fixed costs divided by contribution margin per unit. Contribution is the unit value left after variable costs per unit are subtracted from unit selling values.

Selling values for hardwood chips ranged from $95 to $105 per BDT, based on published west coast figures for 1999 and 2000. There have been no confirmed hardwood chip shipments from Alaska since the 1980s, so this number is an estimate for MSB selling values. Contribution margins have ranged from $7 to $33 per BDT. For this report, the average contribution of $20 per BDT was used.

Capital or fixed cost estimates for a chip loading facility at Port MacKenzie are beyond the scope of this project. However, the Homer chip loading facility was valued at $5 million (total), based on a news article (Anchorage Daily News, November 19, 1999)[5] about the bank foreclosure and sale of this asset. At the $5 million figure, breakeven is 250,000 BDTs, over the life of the project. This figure is derived by dividing $5,000,000 by $20 per BDT.

More detailed, project-level costing would provide information on loading costs: the costs to move chips from a pile, to conveyors, and from a spout into a chip barge, or ship hold. These estimated costs, at $5 per BDT, for example, would further reduce contribution margins and increase the quantity needed to reach break-even.

At average volumes per acre (20 to 25 BDTs), the Kenai operation, at 8000 or more loads per year, was harvesting beetle-killed spruce trees on approximately 8,000 to 9,000 acres per year[6].

This preliminary analysis suggests two major hurdles for any hardwood chip business at Port MacKenzie. First, the capital cost for a chip loading facility, whether conveyors or pneumatic, will be relatively large. Second, a large volume of chips will be needed to make the operation profitable and such volumes would require logging on a large number of acres of forested lands in the region.

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[5] The same news article indicated 8,000 truckloads of wood chips per year were delivered to the Homer facility (Kenai operations were based on chipping in the woods). This suggests the Homer facility was exporting close to 190,000 BDTs per year, when fully operational

[6] Birch volumes in the Susitna Valley, at an average of 900 cubic feet per acre, can range from 400 to 3,000 cubic feet per acre. This is similar in magnitude to spruce volumes on the Kenai. Spruce volumes on a large Ninilchik timber sale averaged 5,000 board feet per acre, Scribner log basis, on dense spruce stands. The range of spruce volumes is about 1000 to 11,000 board feet, Scribner log basis. In cubic foot terms, this is a range of approximately 300 to 4000 cubic feet.

4.5 MSB Forest Products Industry

The forest products industry within the MSB area has generally been small, fragmented, and tied to public timber supply. Historical and current operations are discussed in the following sections.

Historical

Manufacturing operations in the MSB area were characterized in 1989 (Resource Management Associates) as small with circular sawmills cutting rough, green lumber. By-products were used as firewood (slabs) and animal bedding (sawdust). Rough, green lumber was used for fencing, walkways, landscaping timbers, shoring, and for outbuildings. Total annual production was estimated at less than 1.5 million board feet, lumber tally.

Knik Hardwoods, based in Wasilla, manufactured birch lumber in the 1960s but ceased operations due to a variety of reported problems, including timber supply and limited market demand.

Hardwoods from Trapper Creek, especially cottonwood, were sawn and shipped via rail to Seward for chipping at the Louisiana Pacific (LP) mill in the 1970s. This mill also ceased operations; LP conducted an auction in the 1980s while the site reverted to the owner, the Alaska Railroad.

Hardwoods were processed at the Tyonek chipping mill during the period 1975 to 1982. Both cottonwood and birch trees were logged and processed at the mill, southwest of Point MacKenzie. Chips were loaded on ocean barges by a pneumatic blowing system, extending approximately 1,400 feet from shore. Beetle-killed white spruce was also logged and chipped at the mill. The parent company, Mitsui, indicated in 1982 that it had lost over $50 million on the project and declared a bankruptcy of its subsidiary, North American Development, Inc. Much of the infrastructure reverted to the village of Tyonek while other assets were sold at auction.

Hardwood logs were also chipped, as TimberChips™, in the Wasilla area during the 1980s for landscaping purposes, including both bulk and bagged products. The operation was sold to The Valley Sawmill and removed.

Current Manufacturing

The Valley Sawmill began operations near Wasilla in 1979. It is currently operating sawmills at two sites: Anchorage and Point MacKenzie. Primary products are rough, green spruce lumber, along with turned logs used for cabin kits. Spruce logs are the primary raw material, but the mill has tested markets for birch products over the past 23 years with minor success. The mill has also wholesaled bagged wood chips to greenhouses, landscaping firms, and hardware stores. It also chipped lumber residues for bulk sales to schools, landscapers, and contractors. Again, spruce was the primary raw material.

The Valley Sawmill is currently erecting two large buildings at Point MacKenzie for dry lumber storage and kiln operations. Project completion is scheduled for September 2002. When operational, the company will have an estimated annual 2,000,000 board foot capacity. The Point MacKenzie mill is situated about 10 miles from the Port MacKenzie dock.

The Poppert Brothers have operated a family kiln and value-added manufacturing firm at Wasilla for at least 20 years. Rough, green birch lumber has been purchased from other firms and is dried, planed and sold as mill run-lumber. Other firms, such as Alaska Wood Moulding (Anchorage) process this lumber into wood moulding, frames, cabinet facings, and trim.

4.6 Forecasts

Wood chip market forecasts for potential MSB operations are discussed in the following sections.

Base Case

The base case is the current case. This is a resource with strong potential in the Susitna Valley, but it has a number of constraints that limit its near-term feasibility (prior to the year 2015). Given current exchange rates, especially the Yen to US Dollar versus the Yen to Australian Dollar and others (Canada), it is unlikely that any major development stimulus will be felt. No additional infrastructure is expected.

No birch export chips are projected for the base case.

After the year 2015, however, projected completion of the rail extension will provide chip companies with access to wood resources beyond a 100-mile range and could provide the volumes necessary to cover the cost of the loading facility.

Low Case

The low development case is the base case with additional constraints: less developable timber, a stronger dollar, and no immediate economic recovery in Japan.

No birch export chips are projected for the low case.

Projected completion of the rail extension in 2020 or later could enhance the feasibility of a wood chip export facility with resource availability beyond a 100-mile radius from Port MacKenzie. The timing of the rail extension is anticipated to occur later than the study period.

High Case

The high development case includes construction of a rail spur from the existing Alaska rail line south to Point MacKenzie by the year 2010. Potential harvest from 2002 to 2010 would be closer to Port MacKenzie and wood fiber would be hauled by trucks.

In 2010, by opening up more remote timber supplies, including birch and spruce in Fairbanks, the volumes needed to amortize a dock and chip loading facility are attainable.

These volumes will be harvested outside of a 100 mile radius about Port MacKenzie; this is considered a distance at which rail haul becomes more efficient than truck and trailer combinations.

Extension of the existing dock to the -60 foot water depth will permit larger vessels to carry bulk commodities such as chips in more economical quantities.

Discussions with a company actively pursuing wood chip export from Point MacKenzie indicate an annual range of 200,000 to 300,000 Bone Dry Units (BDUs) (240,000 to 360,000 BDTs) is necessary for project success. At an average of 20 BDUs per acre, this annual harvest level will come from 10,000 to 15,000 harvested acres. Both hardwood and softwood species (spruce) will be chipped, loaded and shipped to Pacific Rim markets.

Japan's economy will recover and the Yen will grow stronger against the US Dollar, making Alaska's higher potential production costs less of an impediment.

Harvesting levels for this case will likely draw significant public attention. Depending on markets, forests will be harvested for both spruce and birch; concerns about forest regeneration and environmental protection will be raised.

Locally, Susitna Valley residents supported the forest products industry when questioned in 1989 (Resource Management Associates, Public Opinion Survey, July 1989). However, residents in Wasilla, Palmer, Big Lake, Talkeetna and Willow expressed support (79.2 percent) for small logging operations over larger national or international companies. They also were concerned about increased road access and long-term contracts, and wanted borough timber processed locally.

5 Coal

There has been a long history of coal exports from Alaska and, due to the substantial coal reserves in the state, the potential exists for significant exports in the future. Furthermore, coal has been the most important commodity handled by the Port of Seward, accounting for between 76 percent and 96 percent of the tonnage of all outbound cargo. In addition, coal transport has been a significant source of revenue to the Alaska Railroad.

In evaluating the potential for coal to be handled at Port MacKenzie, this section begins with a description of coal production and consumption in Alaska and deposits close to Port MacKenzie. Recent developments in the world coal market follow. The outlook for coal exports, including qualitative assessments of the low, base, and high scenarios concludes the section. To preview, the potential for coal exports from Port MacKenzie appears limited at present unless sustained political instability disrupts coal exports from Australia, Indonesia, or China, the major suppliers in the Asian market.

Alaska Coal

Alaska's demonstrated reserves of coal are estimated to exceed 6.0 trillion short tons according to the Energy Information Agency (EIA) of the US Department of Energy. Of this total, 4.7 trillion are in southern Alaska. Eighty-eight percent of the reserves are sub-bituminous coal. Total Alaska coal production was 1.5 million short tons in 2001. Coal consumption in the state was 694,000 short tons in 1999, the most recent year for which data are available. Coal production and consumption for Alaska are shown in Table 15.

Table 15. Alaska Coal Production and Consumption, 1994-2001 (thousands of short tons)

Year	Production	Consumption
1994	1,586	796
1995	1,484	815
1996	1,650	706
1997	1,396	740
1998	1,525	693
1999	1,305	694
2000	1,656	NA
2001	1,528	NA

Source: US Office of Surface Mining, US Department of Interior. NA-data are not available

According to the *Point MacKenzie Port Master Plan* prepared by the MSB Planning Department and John Isaacs and Associates, there are three significant coal deposits in the Southern Railbelt from which coal might be produced and exported via Port MacKenzie. These include:

- Nenana Basin deposit located near Healy, Alaska. In recent years, the Usibelli Coal Mine, Inc. (UCM) has mined coal at two locations, Gold Run Pass and the Poker Flats, in the Hoseanna Creek Valley east of Healy. A third mine, Two Bull Ridge, was recently opened by UCM in the same area.[7] Coal from the Healy-area sites has been transported by rail to Seward then exported under contract to the South Korean corporation, Hyundai Merchant Marine. The contract expired at the end of 2001 and has not been renewed. An Alaska Railroad spokesman has stated that 700,000 tons of coal were transported to Seward for shipment to Korea in 2001 (Alaska Journal of Commerce, April 2001). UCM also supplies coal to electric power plants in the Alaska Interior. A proposed rail spur from the Alaska Railroad's main line near Willow or Houston to Port MacKenzie would be needed to facilitate export of Healy-area coal through the port.
- That part of the Matanuska Basin located near Sutton, Alaska. This deposit, also referred to as the Wishbone Hill deposit, is not commercially exploited at present. Studies conducted in the last decade determined that the Wishbone Hill deposit was not commercially viable as a stand-alone mine. Usibelli Coal Mine, Inc. has interest in blending the higher thermal value Wishbone Hill deposit with coal extracted from the Healy-area mines. This concept has not yet proven to be commercially viable. Coal from Wishbone Hill could be trucked to Port MacKenzie.
- Beluga coal deposit near Tyonek, Alaska. This deposit is not commercially exploited at present and there are no overland transportation links between the Beluga deposits and Port MacKenzie. A coal slurry pipeline could transport coal from this site to Port MacKenzie. At current and projected market prices, the economic feasibility of such a pipeline is doubtful. The lack of other transportation infrastructure makes unlikely the development of this sub-bituminous deposit.

World Market

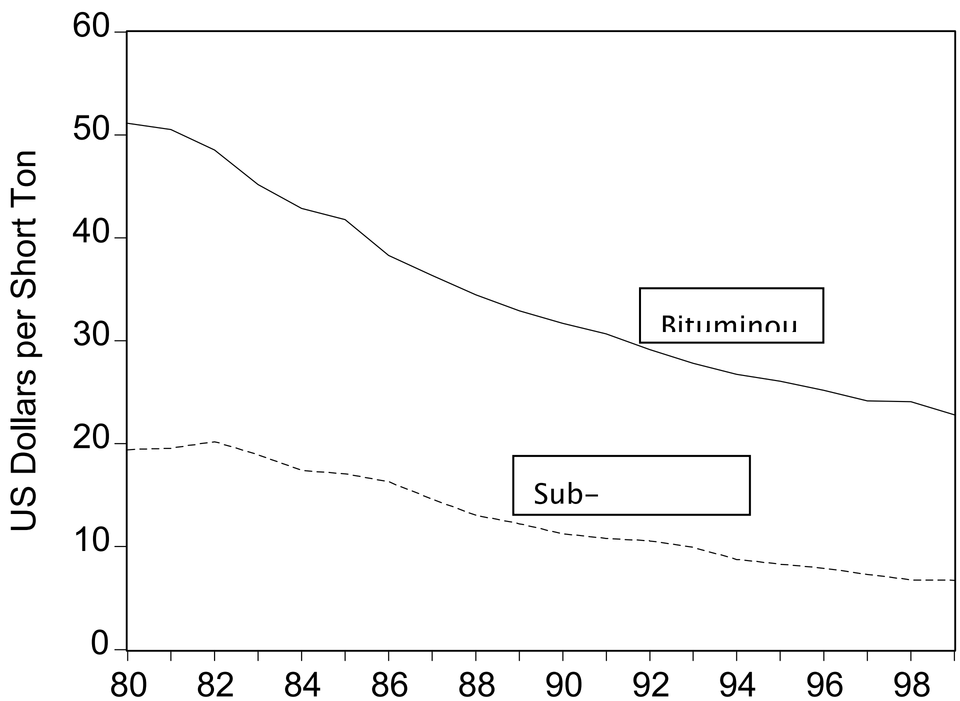
Although Alaska has substantial coal reserves and has a history of exporting coal, the state is a minor player in the world market. Asia is Alaska's primary export market. Australia, Indonesia, and China have been aggressive competitors in this market, accounting for nearly 87 percent of steam coal exports to Asia (*International Energy Outlook 2002*, p. 82). By contrast the United States accounted for just two percent of steam coal exports to Asia in 2002. Competitive pressures have driven down the real prices of bituminous and sub-bituminous coal at US mines since the early 1980s

[7] UCM has received a permit to open a fourth mine, Rosalie Mine, near its other operations. Production is scheduled to begin in Fall 2002 according to Ed Fogels, Manager of the Coal Regulatory Program of ADNR.

(Figure 5 and Table 16). Further, the Japanese benchmark price of Australian steam coal bound for Japan has been declining since 1990. Historically the benchmark price has been used as a reference with adjustments for thermal value in the pricing of steam coal sold under contract in Japan.

Early in 2002, UCM was notified that the low bid for the contract to supply coal to the Korea East West Power Company (KEWESPO) was made by Indonesia. Despite this, UCM continues to seek a contractual arrangement with KEWESPO.[8]

Figure 5. Real Prices for Bituminous and Sub-Bituminous Coals at US Mines, 1980-1999



Source: EIA, Annual Energy Review 2000

Table 16. U.S. Bituminous and Sub-bituminous Coal Prices and Japanese Benchmark Price Selected Years 1980-2001

Year	Bituminous[a]	Sub-bituminous[a]	Benchmark Price[b]
1980	$51.14	$19.42	na

[8] See Usibelli Coal Mine: Current News at http://www.usibelli.com/current.html Accessed May 16, 2002. Furthermore on April 8, 2002 the *Alaska Journal of Commerce* reported that revenues of the Alaska Railroad Corporation are expected to fall by almost $4 million annually if UCM does not provide the 750 thousand tons of coal that it had formerly supplied to Korea. Previously the coal had been transported by rail to Seward for export to South Korea. KEWESPO is one of the companies formed from the on-going breakup of the Korea Electric Power Company. The *Alaska Journal of Commerce* article is available at http://www.alaskajournal.com/040802/loc_railroad_lose.shtml and was accessed on May 16, 2002.

1985	$41.77	$17.06	na
1990	$31.71	$11.21	$40.85
1995	$26.06	$8.26	$40.30
1996	$25.17	$7.87	$40.30
1997	$24.17	$7.28	$37.65
1998	$24.09	$6.74	$34.50
1999	na	na	$29.95
2000	na	na	$28.75

Source: Energy Information Administration, US Department of Energy
[a] 1996 US dollars per metric ton
[b] US Dollars per metric ton. Benchmark price of Australian steam coal bound for Japan
Note: The US prices are free-on-board at the mine, thus excluding freight, shipping, and insurance.

Outlook[9]

The EIA expects Asian imports of steam coal to rise from 211.5 million short tons in 2000 to 349.4 million short tons in 2020, an increase of 65.2 percent. South Korea, Japan, and Taiwan are expected to account for much of the region's growth, according to the EIA. Changes in the Japanese electricity market have led utilities to focus more on fuel price and less on long-term supply, and the Korea Electric Power Company (KEPCO) is currently undergoing a breakup as part of the attempt to privatize some government enterprises. From its analysis of the Asian coal market, the EIA infers that spot market purchases are becoming more important at the expense of long-term contracts.

The EIA expects Australia, China, and Indonesia to continue their dominance of the Asian steam coal export market at least until 2020. Chinese exports are expected to grow most sharply, accounting for 36.8 percent of steam coal exports to Asia in 2010 and 35.7 percent in 2020. EIA forecasts suggest that most of this growth will be at the expense of Australian producers whose share of the Asian market is expected to decline to 32.3 percent of the market total by 2020. US and Indonesian shares, 2.1 percent and 24 percent of the expected total, are predicted to remain relatively constant. However, with overall steam coal exports expected to rise by 65 percent by 2020 (above 2000 levels), constant market shares reflect greater export quantities. US exports to Asia are anticipated to increase from 4.6 million short tons in 2001 to 7.5 million short tons in 2020. If Alaska's share of US coal exports to Asia remains constant (about 16 percent), then Alaskan exports could increase to 1.2 million short tons in 2020. Although the EIA forecasts a constant market share for the US in the Asian market, later in the study it concludes that "less competitive suppliers, such as the United States, will find it difficult to increase or maintain coal export sales to the

[9] Most of the information in this section is from the Energy Information Administration, US Department of Energy. *International Energy Outlook 2002* pp. 82-83.

region." It should be noted that suppliers with domestic markets that enable the supplier to cover full costs (variable costs plus all of their fixed costs) with domestic sales may be able to market export coal at prices that only cover their variable costs, with hopefully some contribution to fixed costs. This pricing concept was used by Usibelli Coal Company to market their coal to Korea.

Despite the growth in the Asian coal market, the EIA price forecasts for coal from US regions indicate a generally declining real price overall for bituminous coal (Figure 6). The real price of sub-bituminous coal produced in the US is expected to decline until 2010 or so, then stabilize while sub-bituminous from Washington and Alaska is predicted to fluctuate between $26.00 and $27.70 per short ton until 2010, when the price is expected to stabilize at about $27.11 (Figure 7 and Figure 8). The differences between sub-bituminous coal prices in Washington and Alaska, and elsewhere in the country, are attributable to worker productivity variations. Coal seam depth and thickness and other geological factors explain these productivity differences (Mellish, May 22, 2002). Labor productivity measured by short tons per miner hour in Alaska and Washington is less than half the US average for surface mines.[10]

Falling or constant prices suggest limited economic incentive presently exists for a significant expansion of Alaskan coal exports to Asia. Ogden Beeman & Associates' report, *South Central Alaska Coal Transportation Study* prepared in 1993 in association with Northern Economics, evaluated the cost of shipping coal from several existing and potential ports in Southcentral Alaska, including mining costs, rail transport, marine shipping, and other costs. The study concluded that, "Major expansion of Railbelt coal mines is unlikely until prices increase sufficiently to cover operating costs and permit capital amortization." (p. 21-22). Nothing has occurred in the nine years since that report to alter that conclusion. Given the 20-year history of declining real prices for coal sales, it is unlikely that new mines at Wishbone Hill or Beluga would be developed until the availability of infrastructure or some other factor results in lower mining costs for these deposits. The study also indicated that the potential savings in rail transport with a Cook Inlet port would not provide a competitive advantage for Anchorage or Port MacKenzie if amortization of a coal loading facility was required.

Until the recent loss of the contract to supply coal to the Korean market, coal from the Usibelli mine had been transported by rail to Port Seward for shipment to Asia. If such shipments resume, a rail link to Port MacKenzie and the availability of a coal handling facility there would lower the charge for transporting coal by rail by an estimated $3

[10] If hourly wages and benefits in Alaska surface mines are similar to those in other US surface mines, then the productivity differences suggest that coal production costs are relatively higher in Alaska.

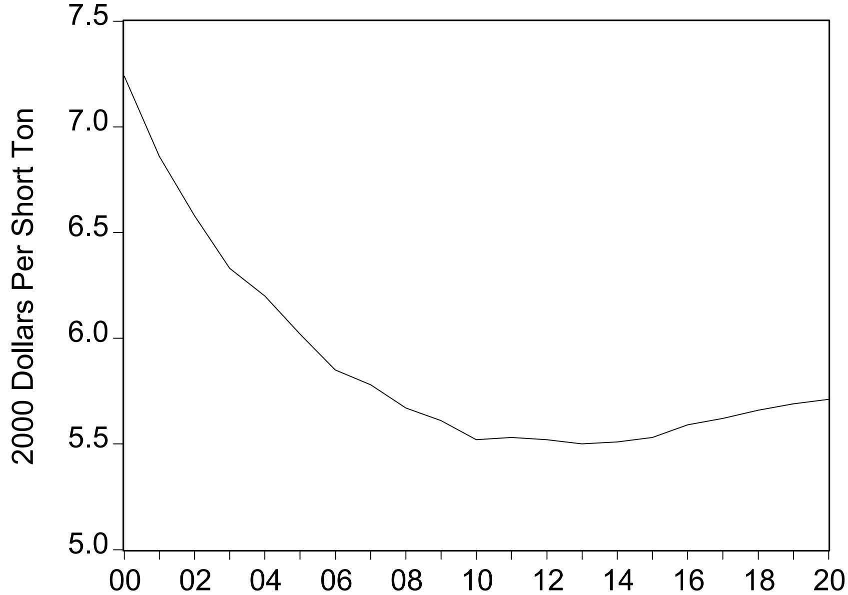
per ton.[11] However, unless substantial exports of coal occur, the per ton cost of amortizing a new coal handling facility at Port MacKenzie is likely to be high. Given the market dominance of lower cost foreign producers, and the expectation of declining or at best stable future prices, the $3 per ton transport reduction appears insufficient to make Alaska coal substantially more competitive in the world market.

Figure 6. Bituminous Coal Price and Forecast, All US Regions, 2000-2020

Source: Energy Information Administration, US Department of Energy

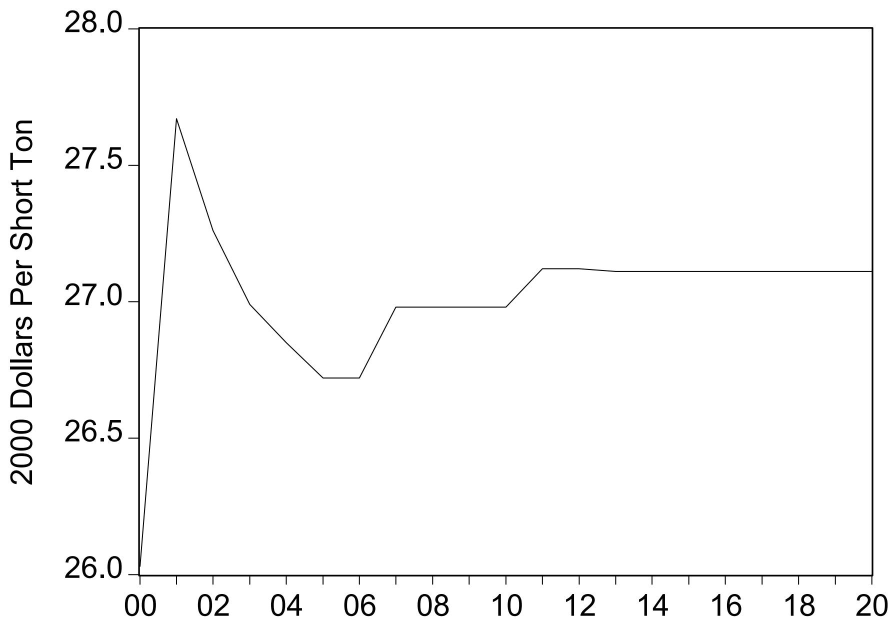
[11] The $3 per ton reduction relative to the tariff for transporting coal to Seward is based on comments from individuals knowledgeable regarding such costs. However, attempts to confirm this estimate with representatives of the Alaska Railroad were unsuccessful.

Figure 7. Sub-bituminous Coal Price and Forecast, All US Regions, 2000-2020



Source: Energy Information Administration, US Department of Energy

Figure 8. Sub-bituminous Coal Price and Forecast, Washington and Alaska, 2000-2020



Source: Energy Information Administration, US Department of Energy

Under either a low or base case scenario, there are several reasons that investment in coal-loading facilities at Port MacKenzie may not be adequate by itself to act as the catalyst for coal exports in the foreseeable future.

- Declining world prices and projected prices for coal suggest that there may be limited incentive to produce coal for export in Alaska.
- US producers tend to be less competitive in Asian markets than producers in other countries according to the EIA. Thus, domestic producers are likely to lose market share to foreign firms. Furthermore, Alaska (and Washington) surface mines are less productive with higher mine production costs than the average US surface mine, suggesting that mines in Alaska are even less competitive.[12]
- Failure to secure a contract with KEWESPO (or some other utility) would mean that the coal-handling facilities in Seward and railcars used to transport coal would be idle. With capacity at Seward likely to be at very low utilization in the absence of a contract with a South Korean utility, there would be sufficient capacity for handling spot market sales or a contract with another customer. Anticipated spot market or contract sales in excess of previous volumes would be required before additional coal handling facilities were needed in the state. The operator of the coal loading facility at Seward could be expected to offer very competitive loading rates to capture a potential coal export movement in order to make use of the sunken capital in the facility.

In the high case scenario, some coal exports from Alaska might occur if significant, lasting, political turmoil in one of the large suppliers to the Asian market interrupted coal supplies from a large exporter in the Asian market. Such instability might allow inroads for Alaskan coal. Even in the presence of such instability, there is sufficient capacity at the Port of Seward to handle at least twice the volume of coal that was previously exported from Alaska.

The coal handling facilities in Seward are expected to be obsolete and nearing the end of their physical life in ten to fifteen years, towards the end of the forecast horizon for this study. If the potential for Alaskan coal exports appears more promising in the future, then the possibility of a coal export facility at Port MacKenzie to replace the one at Seward could be reexamined.

If the Seward coal loading facility remains inactive for a period of time, it might be dismantled with the site used for other purposes. In this situation, Port Mackenzie would be a primary site for a future coal loading facility in Southcentral Alaska.

[12] The American Embassy in Jakarta has estimated that coal costs $13-$14 per metric ton to produce in Indonesia. See *Coal Report, Indonesia 2000*, October 2000, p. 4.

However, the absence of a coal loading facility will also make it more difficult to market Alaska coal to Pacific Rim markets.

6 Sand, gravel and rock

Alaska is rich in sand and gravel resources due to its historical glaciation in most areas of the state, except for the Yukon and Kuskokwim basins. Sand and gravel, along with other aggregates, are used primarily in the construction industry, and, due to their high densities, aggregate imports and exports are severely limited by transportation costs. Quarry sites are generally located close to markets and end-users as a means of controlling transportation costs.

Several quarry sites of varying sizes are located in the MSB, and Port MacKenzie may serve as a point of transportation for local aggregates bound elsewhere in Alaska. The Point MacKenzie area currently does not have significant sand and gravel extraction operations, and only one company operates on an ongoing basis.

Summit Alaska, Inc., sent 300,000 tons of sand and gravel to Anchorage from Knik in 1995, with plans to increase the quantity to 500,000 tons per year by 2000 (TranSystems Corporation, 1999). Recent data are not available, but operations have continued. Summit Alaska is the only company hauling gravel by barge from the west side of Knik Arm to Anchorage. Summit Alaska managers have noted that local times and water depths have apparently differed from published tide tables for the west side of Cook Inlet. Typically, there is only one tide each day that allows barge access, and on some days the water never reaches sufficient height (Poland, June 25, 2002).

The MSB Port Director has indicated that as much as 50 million tons of gravel could be mined from sites within 1.5 miles of the Port MacKenzie dock. Sampling tests were conducted in June 2002 to determine the quality and quantity of these gravel deposits. It is estimated that production could yield 2 million tons annually for 25 years.

The average annual price for industrial sand and gravel remained below $20 (in constant 1998 dollars) per metric ton for much of the 1990s. Figure 9 shows historical sand and gravel prices.

In the future, aggregate production is expected to grow at a steady rate both in volume and in dollar value. Prices are expected to rise in metropolitan areas as aggregates are brought in from distant sources and as local opposition to gravel mining moves quarries into rural areas (USGS, 2000).

Under all development scenarios, the shipping of aggregates outside of Southcentral Alaska is anticipated to be minimal. Conversations with representatives of various barge companies suggest that shipments to Western Alaska would be prohibited by the high transportation costs.

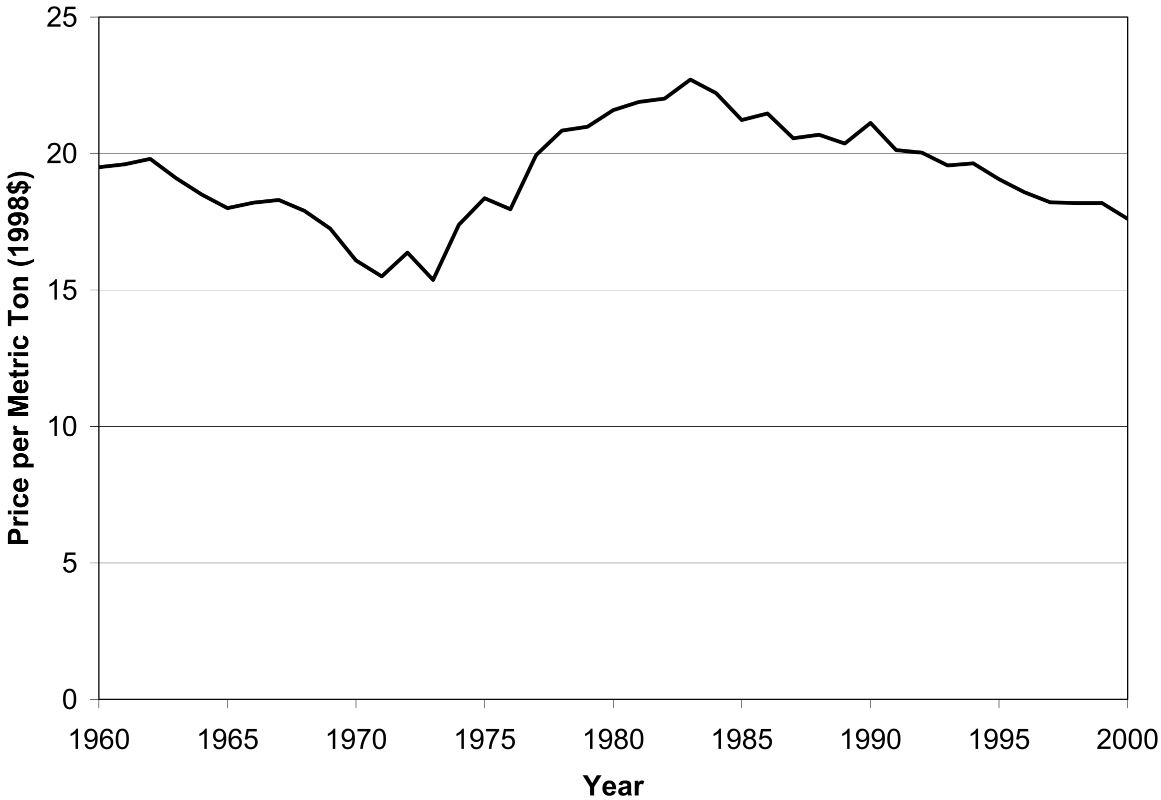
A price quote for a full barge shipment suggested that the cost per ton to barge aggregates from the Anchorage area to Bethel would range from $25 to $46 per ton.[13] Once transportation, extraction, hauling, and loading are considered, the overall cost could be higher than current prices in Western Alaska. Materials prices in the Bethel area are currently $40 per ton for crushed rock, $35-40 per cubic yard of pit-run gravel, and $4 per cubic yard for sand [14] (Knik Construction, June 20, 2002 and September 10, 2002). The price for sand is considerably lower than for other aggregates, because it is loaded directly from a local Bethel pit (with 15-20 percent of 200 grain size), whereas the aggregates are barged in from Kalskag and Platinum, and the crushed rock from elsewhere in Western Alaska. It is possible that existing suppliers in Western Alaska are using monopolistic-like pricing practices, setting prices just below the delivered price from other regions in order to keep other competitors out of their primary markets.

At existing prices, shipment of gravel from Port MacKenzie to the Bethel area, or other areas in Western Alaska with similar access to construction aggregates, would not be supported without special arrangements. If an arrangement were made with a freight company to provide back-haul from Bethel to Port MacKenzie, then the cost of transporting gravel may be reduced. However, very little freight is shipped from the Bethel area, and opportunities for back-haul may be difficult to find. The cost of unloading at the one unloading facility on the river, potentially storing the gravel in Bethel, and rehandling if the product must be transferred to shallower draft barges, could also be issues for new suppliers. Therefore, shipments of aggregates by barge from Port MacKenzie are assumed to be for large projects in the Southcentral region of Alaska.

[13] Cost estimates vary with each barge company. Anderson Tug and Barge Company quoted $94,275 for a 3,500-ton load, or $26.94 per ton. (Anderson Tug and Barge Company, June 21, 2002) The Lynden Company quoted $46 per ton, with a 16-day travel time from Anchorage to Bethel, including one day each for loading and unloading. (Lynden Company, June 24, 2002) A quote by Northland Services was significantly higher, since it was assuming a much smaller shipment; the quote was $4,550 for 40,000 pounds of bagged gravel, or in excess of $200 per ton. (Northland Services, June 21, 2002)

[14] A cubic yard of construction aggregates is approximately equal to 1.5 tons.

Figure 9. Historical Industrial Sand and Gravel Prices



Source: U.S. Geological Survey, 2000.
Note: Prices adjusted to 1998 dollars using the Producer Price Index for Industrial Sand and Gravel.

In the base case, the number of households in the Anchorage area is expected to experience annual growth of 1 percent until 2010, and 1.7 percent for 2011 to 2025 (ISER, 2001). At this rate of growth, Anchorage will require nearly 700,000 tons annually within the next 20 years. In the low case, the annual needs will barely reach 600,000 tons within the next 20 years.

Several reasons have been cited suggesting why significant volumes of aggregates may not be shipped from Port MacKenzie within the study period. However, there are opposing viewpoints on the issue, and aggregate extraction may be feasible despite those concerns.

- If Anchorage doesn't expand beyond its existing boundaries, the market for aggregates will diminish significantly within 10 years. However, development in the Port MacKenzie area will require a substantial amount of aggregate for residential and commercial needs, as well as for roads. It is highly likely that development throughout the Anchorage and MSB areas will help to maintain the market for aggregates in the region.

- The cost of developing the infrastructure for large-scale aggregate production and transportation at Port MacKenzie, and handling facilities at the POA, would be substantial. No designated stockpiling areas exist at the POA for unloading sand and gravel, although an increase in aggregate transportation through the Port might justify development of such an area.
- Development at Point MacKenzie would face fierce competition from existing operations that have already paid for most, if not all, of their original capital investments.
- The existing Palmer operations will last for another 25 to 35 years. The Port MacKenzie gravel deposits may last for 25 years, if the total quantity is 50 million tons and 2 millions tons are extracted annually. No information is available about the life of Summit's operations in Knik. However, it should be noted that, if additional pits open, increased competition might result in lower production from each pit and extend the life of all three pits.
- An Anchorage-based company has recently studied the possibility of gravel extraction at a Port MacKenzie site and has concluded that the project is not economically feasible. However, a public facility would not face the same financial constraints as would a private operation, so that the project may have a positive net benefit if completed with public funding. The existing operation at Knik also suggests that gravel extracted from the west side of Knik Arm can be competitive in the Anchorage market.

The competitive position of existing firms and the uncertainty surrounding the viability of a gravel extraction operation at Point MacKenzie suggests that no significant, sustained production of aggregates from Point MacKenzie would occur in the low and base cases. However, it should be noted that one of the expansion alternatives under consideration by the POA could involve the barge shipment of substantial quantities of sand and gravel from Point MacKenzie for use as fill for the POA construction project. Such a project could result in high quantities of aggregates passing through Port MacKenzie, but only for the duration of the fill operation. Afterwards, production levels would be expected to drop substantially in the low and base cases. Other large construction projects could result in sporadic production from the Point MacKenzie area in the low and base cases.

In the high case, demand for aggregates will experience a high growth rate as new households are constructed in Anchorage and the MSB. Within the next 20 years, the amount needed annually will exceed 800,000 tons. It is anticipated that a Knik Arm bridge would result in truck haul from Point MacKenzie becoming much more cost-effective (Poland, June 25, 2002). This cost reduction would reduce the amount of aggregate moving by barge across Knik Arm to Anchorage.

Under the high case, it is expected that no more than 40,000 tons, or 5 percent of the quantity demanded in Anchorage, will typically utilize the Port MacKenzie dock facilities each year. This quantity would be shipped by barge to larger construction projects close to the water and near Port MacKenzie. The shipment of larger quantities of sand and gravel through the Port to locations outside of Southcentral Alaska will be limited by competition from lower cost sources. Other large construction projects could result in sporadic production levels that are much greater than the anticipated average annual production from the Point MacKenzie area. For example, a significant quantity of gravel will be required to develop an air cargo airport at Point MacKenzie under the high case, although this will utilize trucks to transport sand and gravel.

7 Oil Field Modules

Oil field modules are production facilities that are prefabricated then transported to the production site. Formerly, such modules used on Alaska's North Slope have been built and shipped from ports along the Gulf of Mexico and the Pacific Northwest. The logistics and costs of transporting such equipment, sometimes weighing thousands of tons, from the Gulf to the North Slope have been significant. In recent years, some modules destined for the North Slope have been constructed in Anchorage and Nikiski as Alaskan firms have used their proximity to Alaskan oil fields to underbid firms located elsewhere.

According to the *Alaska Journal of Commerce,* Veco, one of the companies that produces oil field modules in Alaska, has expressed interest in a Port MacKenzie production site (St. George, 2001). Veco currently produces modules at the POA. Continued module production in Alaska will depend on two factors: the ability of firms to build the modules at competitive prices, and the level of oil production in the state.

Alaskan firms have a cost advantage in module construction for oil production in the state because the cost of transporting the modules to oil fields from Anchorage or another in-state site is substantially lower than the transportation cost from elsewhere in the United States or from Asia. Anecdotal evidence suggests that this advantage is an important one for all but the largest modules. It appears that the pool of skilled workers in Alaska is large enough to construct all but the very biggest modules in a timely fashion.

Module production in Alaska will depend on the level and nature of oil production in the state. Although the EIA reference case projection suggests that overall production will decline until 2010 then rise gradually (see Figure 1 in Section 2), there will probably be some demand for small and medium-sized modules, despite short-term production declines, as smaller oil fields are more fully exploited.[15] This would bode well for firms constructing modules in Alaska. A low case scenario may occur if the State's oil production continues to decline past 2010. Under the low scenario, oil field module production would probably be limited. Under a high case scenario that could arise if areas like the Arctic National Wildlife Refuge are opened for exploration, and production levels in other fields exceed expectations, there could be a substantial amount of oil field module fabrication.

Under the low and base case scenarios, it is anticipated that Veco will continue to produce modules at its Anchorage location. Under the high case scenario (specifically,

[15] The EIA predicts that increased production from the National Petroleum Reserve-Alaska will offset declines at other fields beginning in 2010.

the limited expansion of facilities at the POA) with significant increases in oil production at the North Slope and other fields, Veco or another company involved in module construction are assumed to expand operations to a Point MacKenzie site resulting in, perhaps, three modules per year being shipped from Port MacKenzie.[16] Module production at Point MacKenzie would require a relatively large labor force resulting in substantially increased traffic to the area.

[16] Any decision on the expansion of module production to Point MacKenzie and the number of modules produced will depend on many factors in addition to those cited above. Corporate preferences for the location of production facilities and success in securing module construction contracts are but two of the considerations.

8 Manufactured Homes

Alaska Manufacturing Contractors LLC (AMC) is the sole occupant of the Port MacKenzie business park. AMC built its factory at Port MacKenzie in 2000 and began manufacturing operations within 60 days. AMC expects to grow as its rural homes gain more awareness and market acceptance. AMC's history and its current business plans are presented here as an example of a successful operation at the Port.

8.1 History

AMC was developed to provide quality homes for bush Alaska. Port MacKenzie was selected for its proximity to tidewater and the ability to move factory-built homes onto barges for final transport to Western and Northern Alaska. Discussions with company representatives indicate barge access is a primary concern. The homes are too wide for rail shipment and too tall for highway underpasses on the Glenn and Parks Highways.

The factory was erected in 2000; it began producing homes that same year. The manufacturing process is similar to automotive assembly lines. Each home starts with pre-tensioned concrete beams that are 28 ft. wide and 46 ft. long. These foundation beams are placed on metal tracks, joined, and the foundation is moved to the first of twelve assembly stations. At the end of the line, each home receives another (final) inspection and then it is towed to inventory holding areas until a barge load is completed (Alaska Journal of Commerce web site, posted on October 1, 2001).

Two types of barges have been used. One barge, shipped to Nome, contained 20 homes, stacked one on top of another in rows of twos. The more typical barge-load consists of ten homes, stacked two to a set, with a large crane used to load and unload each home. A special tractor and towing assembly is sent with the barge; these are used for final home placement (Alaska Manufacturing Contractors Web site, http://www.akmanufacturing.com, May 2002).

There are four standard home plans, from two to four bedrooms, with custom floor plans available. There are standard and custom finishing options, including an attached shop area suitable for working on snow machines or all-terrain vehicles.

AMC is now wholly owned by the Alutiiq LLC, a subsidiary of the Afognak Island Native Corporation.

8.2 Current Manufacturing Capacity

In 2001, 49 homes were shipped to villages at St. Michael, Mountain Village, Shaktoolik, Nome and Emmonak. Average home construction time was approximately 3.5 days for a potential maximum throughput of 1 home every 2 days, or 125 homes at 250 working days per year.

Assuming an 80 percent maximum availability (for factory maintenance and repair), there are 200 days available or 100 homes per year at capacity.

Current staffing is 16 to 22 employees on the factory floor. One unique feature of the company's plan is hiring village residents to fly to the factory and assist in home construction. This provides skills for the plant, as well as competent maintenance staff in the village. Additionally, the company hires its assembly staff on a four-week basis, followed by two weeks off. This allows workers the opportunity to participate in traditional village life and then return to the factory, if desired.

8.3 Projected Growth

Market demand for rural Alaska homes was projected at 15,017 homes in 2000 by the Alaska Housing Finance Corporation. Many of these are replacement homes for units that have deteriorated in Alaska's harsh rural conditions.

Selling prices range from $140,000 to $160,000 per home. At an average of $150,000, the 49 homes shipped in 2001 represent gross sales of $7.4 million.

Low case.

Alaska Manufacturing Contractors will construct and transport 40 to 50 homes, about the same (or slightly less) production as 2001. At ten homes per barge, four to five barge-loads per year will be shipped from Port MacKenzie.

Base case.

AMC's increasing market acceptance and greater manufacturing efficiency will boost sales to near double 2001 sales over the next two years, or 98 homes. Ten barge loads will cross Port MacKenzie docks for outbound delivery.

High case.

AMC will be able to expand and increase sales to nearly three times 2001 production, or 147 homes. Fifteen barge-loads will cross Port MacKenzie on outbound deliveries.

Adding manufacturing plants at Point MacKenzie is possible. Additional land is available and the tidewater docking capability is attractive for shippers and those receiving the homes.

9 Selected Minerals

Numerous deposits of important and valuable minerals are found in Southcentral Alaska. A minerals inventory prepared by the United States Army Corps of Engineers revealed hundreds of gold, lead, and copper deposits within several hundred miles of the Port MacKenzie service area. (PN&D, 1998) Several other minerals, including antimony and tungsten, are represented in the area, with fewer known deposits. A discussion of peat resources is also included. This section discusses the mineral resources that are found in the area, and offers outlooks for commercial mining operations that might use facilities at Port MacKenzie for water transportation.

Under the low and base case scenarios, no additional mining activity is expected to take place. World prices for the selected minerals are expected to remain at current levels or decline slightly with inflation. International political events may influence prices of some minerals, and imbalances in world supply and demand will cause changes in price over time. Due to low world prices for many minerals, an assumption is made that no capital investments will be made to develop infrastructure for mining of known deposits. Unless minerals can be sold for higher prices, the cost of capital investments will not be recovered over the useful life of the equipment. For many mineral deposits, the lack of roads to the known deposits poses an additional constraint.

In the high case scenario, it is assumed that some new mining operations will take place to extract known mineral deposits located within several hundred miles of the Port MacKenzie service area. It is assumed that world prices for most minerals will increase, which will allow for a faster recovery of the capital costs associated with establishing a new mining operation. The state is expected to construct new roads that will allow better access to several of the known mineral deposits. Under the high case scenario, any new mining operations would have the option of shipping ores or concentrates, depending on the type of mineral and expected size of the deposit. The shipment of ores will result in heavier shipments of lower value, whereas concentrates will be lighter in weight, but higher in value.

In addition to servicing mineral deposits in the MSB, Port MacKenzie would likely provide access to water transportation for mineral extraction occurring in Interior Alaska. Under the high case, minerals coming from that area would likely use Port MacKenzie facilities. Otherwise, mineral shipments from Port MacKenzie will be limited to sites currently accessible by roads and the proposed rail corridor link.

9.1 Antimony

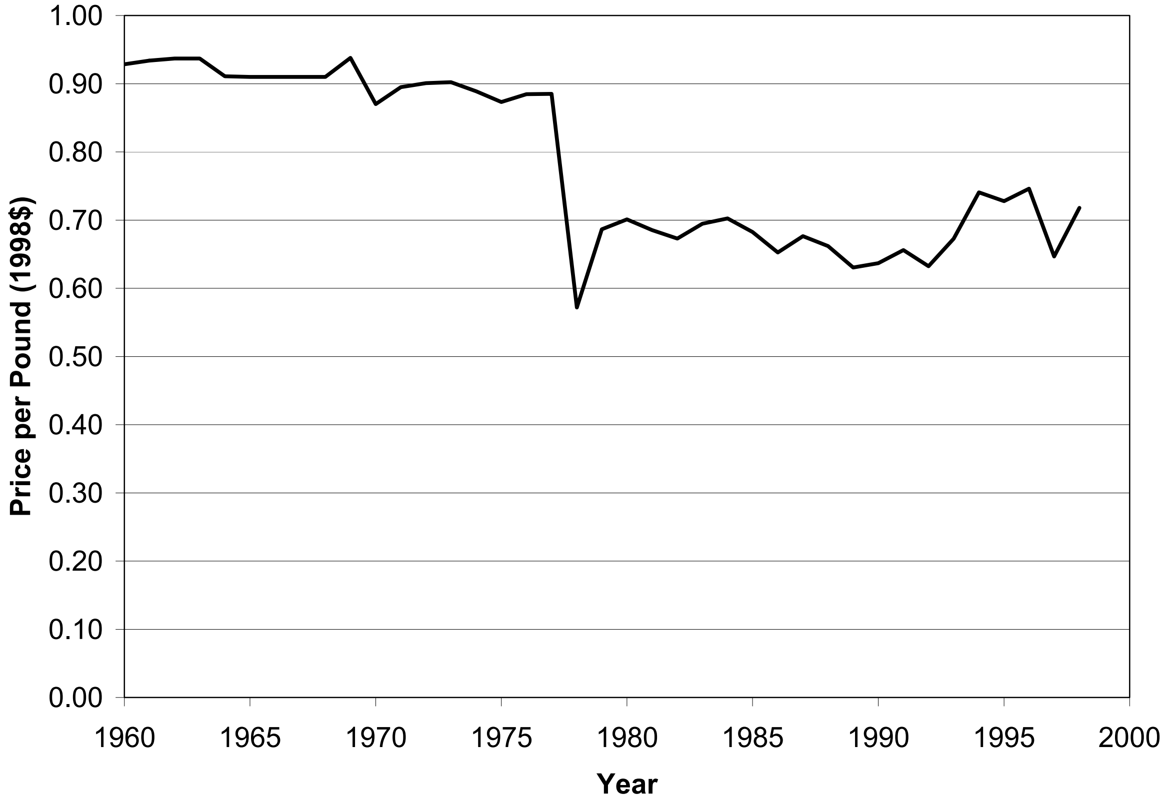
Antimony is used primarily in flame-retardants. Other users of the metal include the transportation, chemical, ceramics, and glass industries. China accounts for most of the world's mine production, with Australia, Bolivia, Russia, South Africa, and Tajikistan accounting for most of the remainder. United States production for 1999 was 450 metric tons, approximately 0.4 percent of the world production of 108,000 metric tons. (USGS, 2000) Twenty-five deposits of antimony have been identified in the potential service area of Port MacKenzie, with the closest site 198 miles away by air. (PN&D, 1998)

The annual average price of antimony has fluctuated significantly over the past 40 years, with major fluctuations driven by imbalances of worldwide supply and demand. Historical antimony prices are shown in Figure 10. (USGS, 2002) Supply constraints in China have produced the most significant fluctuations in the metal's price due to the country's importance in worldwide supply. The outlook for antimony is that U.S. consumption should remain strong in the near future due to the metal's role in flame-retardants. New mining operations have opened in China, but low prices have prevented those mines from coming fully on-line. (USGS, 2000)

Under low and base case scenarios, it is assumed that no antimony mining activity will occur. Most new worldwide demand will be met by operations in China, which is the primary source for U.S. imports.

Under a high case development scenario, some mining may occur in the Port MacKenzie service area. No data are available about the quantity of antimony that can be recovered, although most would be used for domestic purposes or for exporting to Canada or Mexico. If any exports are made to the Far East, the total quantity exported is likely to be small.

Figure 10. Historical Antimony Prices



Source: U.S. Geological Survey, 2000.
Note: Prices adjusted using Producer Price Index for Antimony

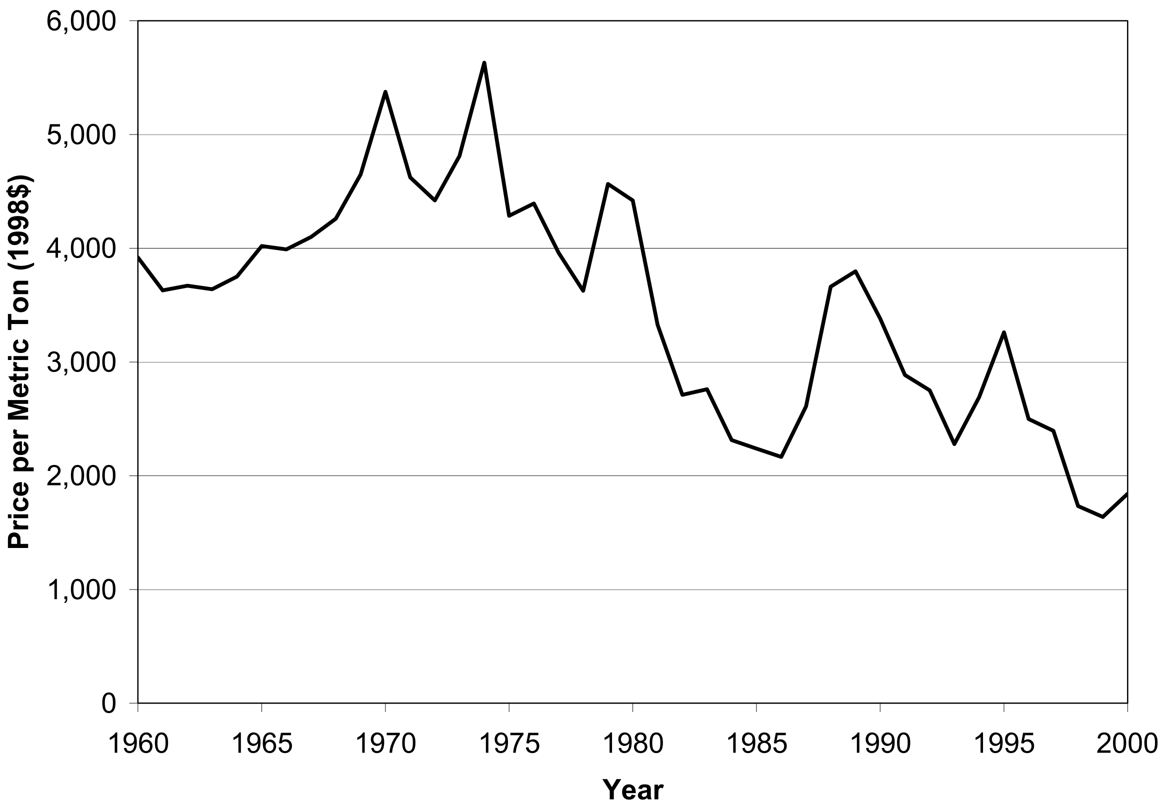
9.2 Copper

Copper is used in a variety of products, including wire and several alloys. Numerous countries produce copper, although the two largest producers are Chile and the United States. Chile produced 35 percent of the world production in 2000, and the United States produced 11 percent. (USGS, 2000) Thirty-seven sources of copper have been identified near the Port MacKenzie service area, with the closest site located 29 miles away by air. (PN&D, 1998) The Kennicott mine used to extract copper, but that mine no longer operates. At present, the only significant copper mining activity is taking place at Caribou Dome near the Denali Highway. (TranSystems Corporation, 1999)

The annual average price of copper has exhibited a steady downward trend in 1992 dollars, as shown in Figure 11. (USGS, 2002) Worldwide events have caused shocks to the metal's price nearly every year over the past 40 years, with the highest prices experienced in the mid-1970s due to the removal of price controls. The outlook for copper is of declining worldwide prices, with regular fluctuations due to economic events that affect both supply and demand. (USGS, 2000)

United States production of copper has declined in recent years, and low copper prices should prohibit any new operations from opening in the Port MacKenzie service area. In the low and base case scenarios, there will not be any mining activity related to copper. In the high case scenario, some mining activity may take place, with the ore being consumed in the United States, China, or Canada. The U.S. exports a significant amount of copper to Mexico each year, although mines in Arizona and the Southwest United States could offer copper at a lower cost than any new developments in Alaska.

Figure 11. Historical Copper Prices



Source: U.S. Geological Survey, 2000.
Note: Prices adjusted using Producer Price Index for Copper

9.3 Gold

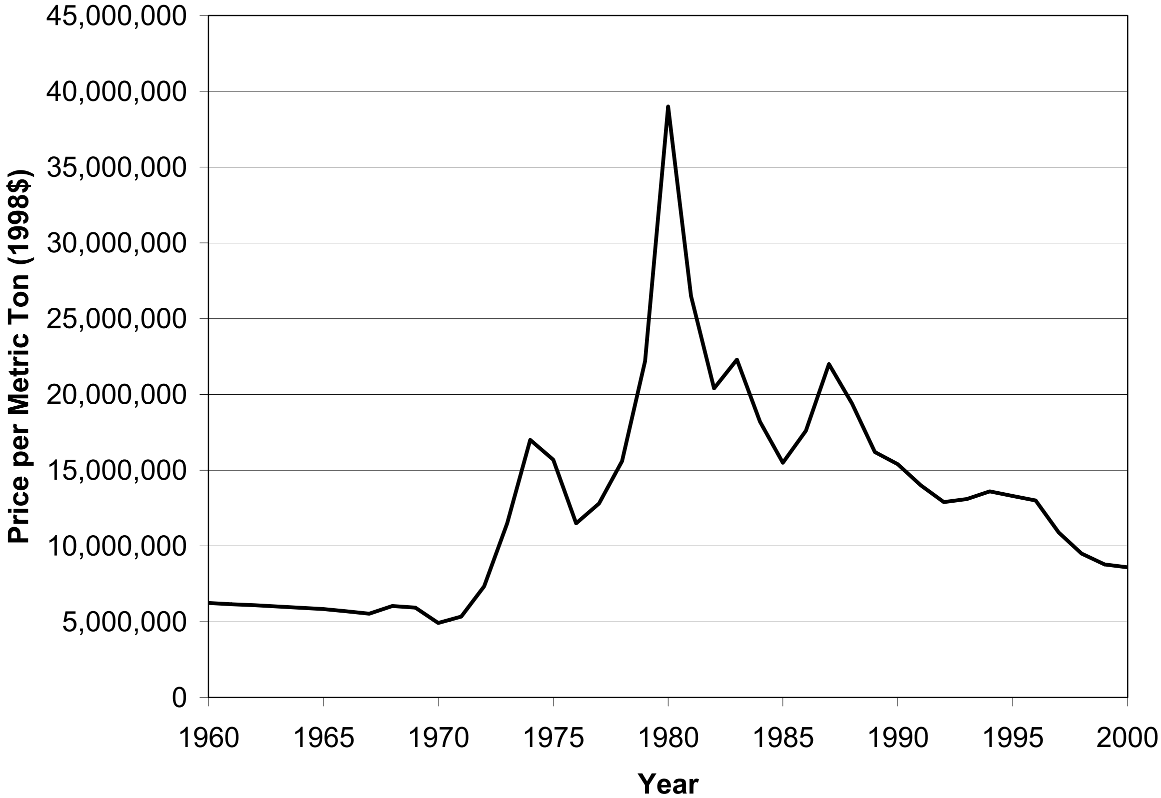
Gold is a precious metal that is used primarily for jewelry and art, although it is also used as a low-resistance electrical conductor. Gold is also used as a monetary investment. The United States is the second largest producer of gold in the world, behind South Africa, which contributes about one-quarter of the world's production. (USGS, 2000) Over 230 deposits of gold are located near the Port MacKenzie service area, with the closest location only three miles away by air. (PN&D, 1998) Gold has been mined in Alaska since early gold discoveries in the 1800s. Several large mines are active and two others are being developed.

The average annual price of gold is up slightly from the prices in the late 1960s, as shown in Figure 12. The increase in price since the 1960s and 1970s is attributed to the removal of official gold prices established by the United States government and other countries. Gold prices peaked on January 21, 1980 at $850 per ounce, and have experienced a steady decline since then. (USGS, 2002) The outlook for gold suggests that prices will remain low and capital spending will decline. In addition to the disincentive created by gold's low price, investors have lost interest in gold companies due to their poor returns. (USGS, 2000)

The close proximity of gold deposits to the Port MacKenzie service area suggests that mining may take place if gold prices increase in the future. Under a low case scenario, no extraction is expected to take place. Under the base case scenario, some extraction will take place, although most of it will be at individual claims, and will not directly impact the Port. However, individuals accessing deposits may create demand for infrastructure improvements in the Port MacKenzie service area.

Under a high case scenario, large-scale mines will be developed to extract gold ore deposits located near the Port. Some ore might be exported to Canada, but most of it will be shipped to other locations in Alaska. Only if deposits in Southcentral Alaska are determined to be large will it be possible to develop processing capacity in Southcentral Alaska.

Figure 12. Historical Gold Prices



Source: U.S. Geological Survey, 2000. Note: Prices adjusted using Producer Price Index for Gold

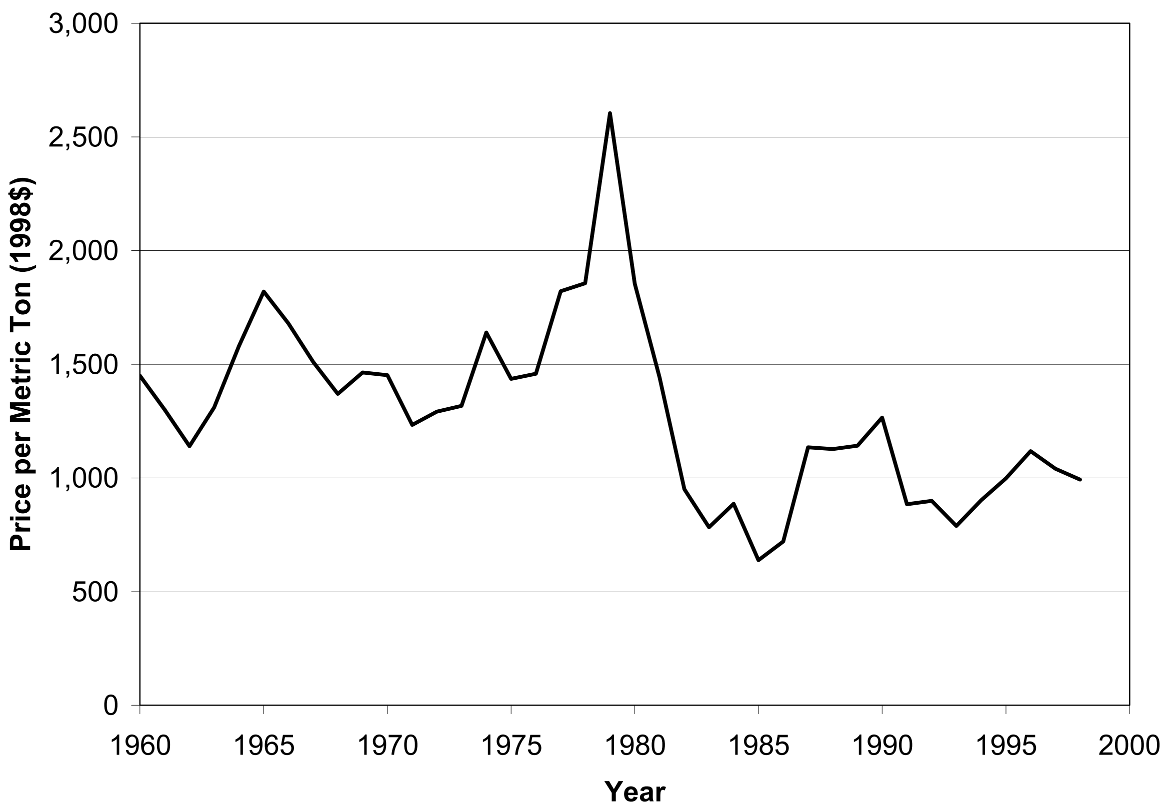
9.4 Lead

Lead is a metal that has been in use for over 5,000 years, and is used in a variety of products, ranging from batteries to ammunition to construction materials and solders. In the United States, Alaska and Missouri account for 91 percent of production, and the largest domestic lead producer is the Red Dog Mine in Northwest Alaska. On a global scale, the United States held a 15 percent share of world production, behind Australia and China, with 23 percent and 18 percent shares, respectively. (USGS, 2000) Eleven deposits of lead have been identified near the Port MacKenzie service area, with the closest location 23 miles away by air. (PN&D, 1998)

The average annual price for lead has declined over the last 40 years, although the price has exhibited volatility, as seen in Figure 13. Before the Vietnam war, lead averaged about 55 cents per pound, and a post-Vietnam War boom sent the price over $1.00 per pound. Since the early 1980s, the average price has fallen below 40 cents per pound. (USGS, 2002) The outlook for lead includes a steady growth in demand for industrial batteries throughout the world. The demand for lead batteries will grow as the demand grows for wireless telecommunications networks and uninterruptible power supplies. (USGS, 2000)

Alaska is a significant producer of lead in the United States, and deposits near the Port MacKenzie service area may contain significant quantities of the metal. Growing demand for lead-based products will help to maintain the price of lead, and mining near the Port MacKenzie service area might be feasible if sufficient quantities are available and easily accessible. In the low case scenario, no additional development of Southcentral Alaska lead deposits is expected. Under the base case scenario, development may begin in the next 20 years, as worldwide and U.S. demand grows. Under the high case scenario, commercial extraction of lead from Southcentral Alaska is expected to begin, with significant exports made from Port MacKenzie to Japan, Mexico, Canada, and Belgium. The primary source of competition for Southcentral Alaska production will come from the existing production at the Red Dog Mine in Northwest Alaska.

Figure 13. Historical Lead Prices



Source: U.S. Geological Survey, 2000. Note: Prices adjusted using Producer Price Index for Lead

9.5 Molybdenum

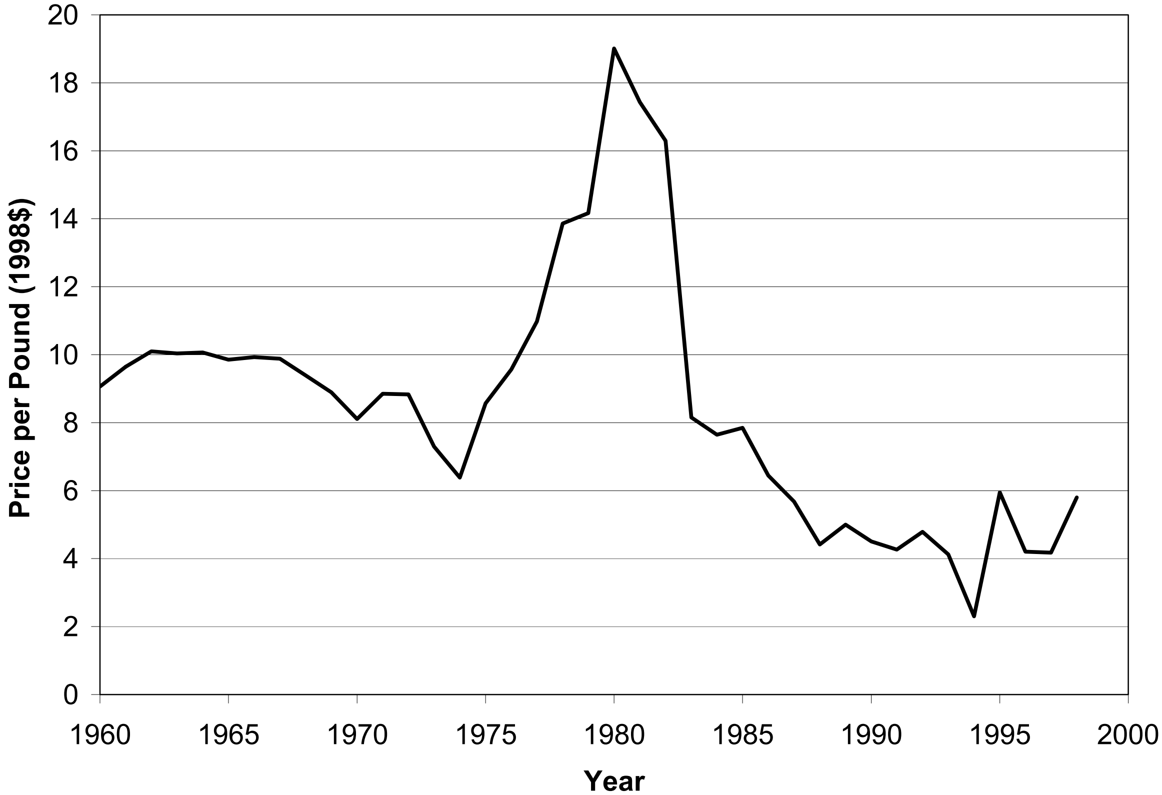
Molybdenum is a metallic element used primarily as an alloying agent to produce steel, cast iron, and superalloys. Molybdenum has allowed the development of alloys that withstand high stress, wide temperature ranges, and highly corrosive environments. The United States produced 32 percent of the world molybdenum production in 2000, with Chile and China the second and third largest producers. (USGS, 2000) Three sites for molybdenum have been identified near the Port MacKenzie service area, with the closest location 95 miles away by air. (PN&D, 1998)

The average annual price for molybdenum has declined over the last 40 years, as seen in Figure 14. The price peaked and dropped in the late 1970s and early 1980s in real dollars, but has exhibited a steady decline in other years. (USGS, 2002) The outlook for molybdenum appears stable in terms of supply and demand. The abundant resources and adequate production capacity in the world's producers should allow producers to meet any demand over the next several years. Healthy economic conditions will ensure strong growth in the production of stainless steel and other alloys that use molybdenum. (USGS, 2000)

In the base and low case scenarios, no additional mining activity will take place at molybdenum sites in Southcentral Alaska. A surplus in worldwide capacity will prohibit significant capital spending, which will deter any large-scale mining operations from beginning in the Port MacKenzie service area. Unless demand for molybdenum forces prices to increase significantly, no new operations are likely to take place.

In a high case scenario, increased worldwide demand for molybdenum may warrant some mining in the Port MacKenzie service area, provided that road access has been developed by the State of Alaska.

Figure 14. Historical Molybdenum Prices



Source: U.S. Geological Survey, 2000.
Note: Prices adjusted using Producer Price Index for Primary Nonferrous Metals except Precious

9.6 Tungsten

Tungsten is a metal that is used for a wide variety of applications, ranging from commercial to industrial to military uses. China and Russia are the largest producers of tungsten in the world. (USGS, 2000) Thirteen deposits of tungsten have been identified near the Port MacKenzie service area, with the closest site 42 miles away by air. (PN&D, 1998)

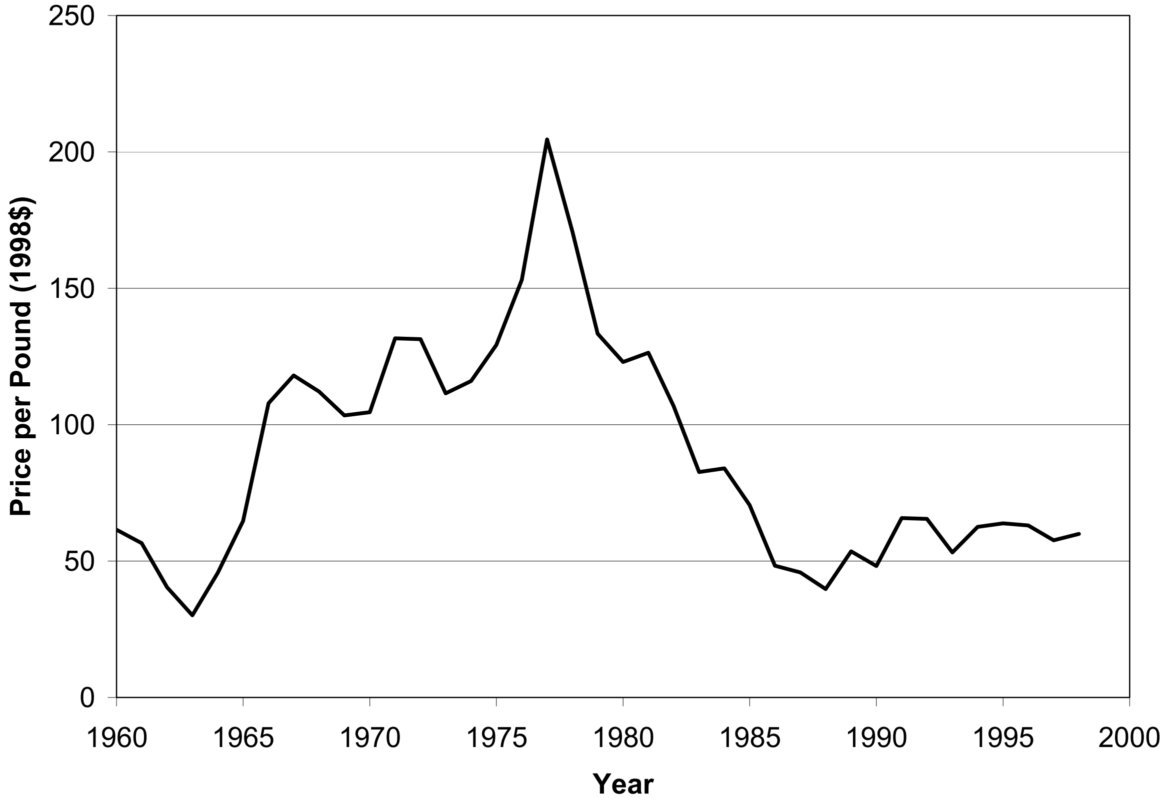
The average annual price of tungsten has remained relatively stable over the last 15 years, although between 1963 and 1986, the price rose to nearly seven times recent prices and then fell back to the $50 to $60 per pound range, where prices have remained in recent years. Historical tungsten prices are shown in Figure 15. (USGS, 2002) The outlook for the metal depends on economic conditions, which tend to drive tungsten demand. The future of cemented carbides[17], which are the largest end-use sector, will depend on automotive and aircraft production, construction, mining, oil and gas drilling, and semiconductor and other manufacturing. Tungsten has also been used to replace lead in many applications. (USGS, 2000)

Most of the import and export trade for tungsten in the United States is with European countries. The largest source of tungsten imports is China, with several European countries following closely in quantity. However, very few exports from the U.S. are made to other regions of the world. For this reason, any production located near the Port MacKenzie service area would be consumed within the United States, with limited export potential for Canada and Mexico.

Under the low and base case scenarios, mining of tungsten would not be feasible. Under a high development scenario, limited mining operations may take place. Most of this production would be consumed within the United States, and the Port MacKenzie dock might have some role in transporting tungsten ore to the continental U.S.

[17] Cemented carbide materials are metal carbides that have been mixed with an organic binding material and fired in a furnace. The resulting material has a high resistance to wear and stress. Cemented carbides are used for machinery parts where durable materials are required.

Figure 15. Historical Tungsten Prices



Source: U.S. Geological Survey, 2000.
Note: Prices adjusted using Producer Price Index for Primary Nonferrous Metals except Precious

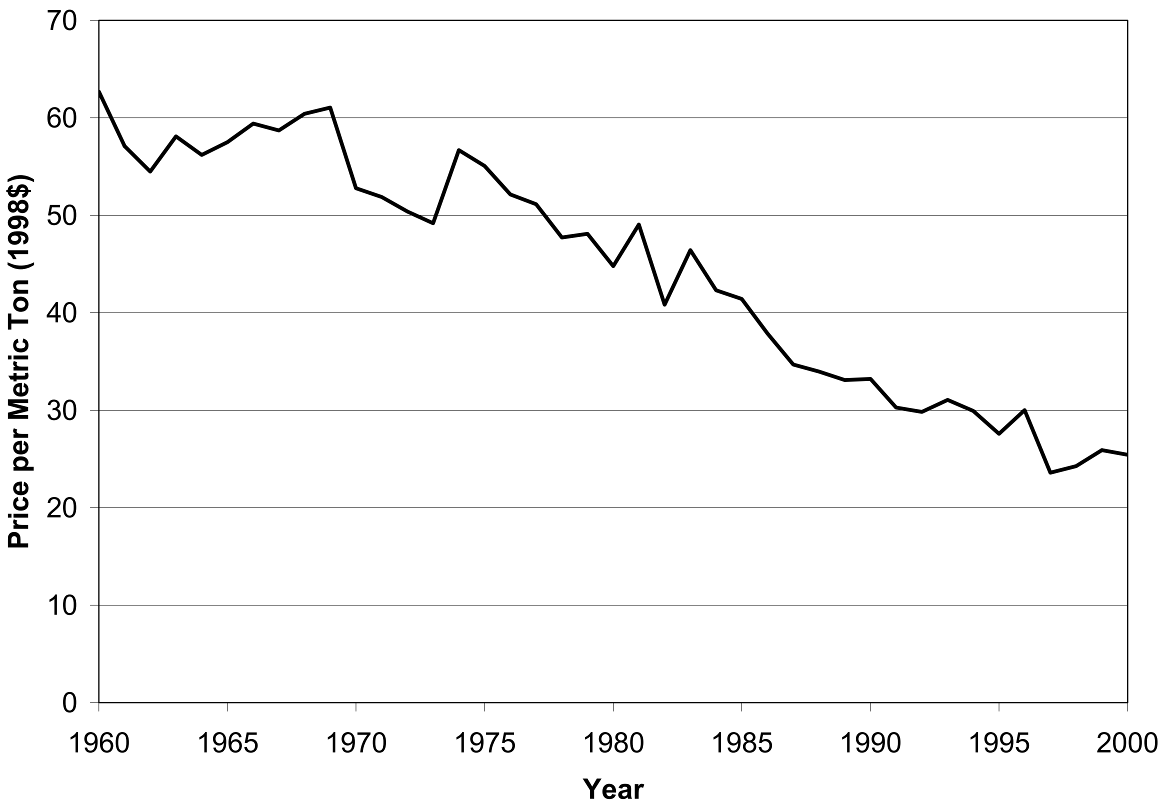
9.7 Peat

Peat is a renewable, natural, organic material of botanical origin and of commercial significance. It is formed in shallow wetland areas of the northern hemisphere, where large deposits have formed from the gradual decomposition of plant matter. Peat has widespread use as a plant-growth medium in a variety of horticultural and agricultural applications, and it is used in commercial and industrial applications. Several companies produce it in Alaska, although Finland and Ireland lead world production. (USGS, 2000) One site has been identified near the Port MacKenzie service area. The site is located 5 miles away by air. (PN&D, 1998)

The average annual price for peat has ranged from $23 to $27 per metric ton from 1997 to 2001, as shown in Figure 16. (USGS, 2002) The outlook for peat is bright because of the growing demand for plants, flowers, ornamental trees, natural turf, and outdoor recreational activities. Domestic peat production will be influenced by a number of variables, including wetlands environmental regulations, the ability to permit new bogs, competition from recycled yard wastes and other natural organic materials, and competition from other countries. (USGS, 2000)

Very little peat is exported, and about half of the U.S. consumption comes from imports. Nearly all of the U.S.'s imported peat comes from Canada. Although the MSB contains large areas of land that may be suitable for peat production, most production would be limited to use within Alaska due to transportation costs and low demand for U.S. exports of peat. Under low and base case scenarios, no peat extraction operations are expected to utilize the dock. Some production may begin in the next twenty years under the base scenario, but consumption will be limited to local uses. Under a high development scenario, active production of peat will begin in the Port MacKenzie service area, but use of the Port MacKenzie dock will be limited to shipments to other locations in Alaska or the United States.

Figure 16. Historical Peat Prices



Source: U.S. Geological Survey, 2000.
Note: Prices adjusted using Producer Price Index for Peat

9.8 Forecasts

Mineral outlooks for potential mining activity in the MSB are discussed in the following sections.

Base Case

The base case is the current case. Several deposits of minerals and precious metals have been identified and documented in proximity to the Port MacKenzie service area. However, the lack of road access to many of these sites will prohibit any commercial development. Since no additional infrastructure is expected, no mineral exports are expected to occur from the Port MacKenzie service area.

Low Case

The low development case faces the same outlook as the base case. No additional mineral extraction activity is expected to occur in the potential service area of Port MacKenzie.

High Case

The only mineral examined that might be economically feasible for mining in the Point MacKenzie region is gold, due to its high value. However, it is unlikely that a potential gold mine would utilize port facilities. Most gold produced in Alaska is processed on site, and transported by air from the mine because of the high value by weight. The Fort Knox mine near Fairbanks is the largest gold mine in Alaska, and its production is only about 1,000 ounces of pure gold each day, or about 60 pounds per day. The second largest is Greens Creek, near Juneau, with an annual production of less than one quarter that of Fort Knox. Therefore, it is extremely unlikely that a gold mine in the MSB would utilize port facilities.

10 Natural Gas

The prospects for capitalizing on the economic benefits of emerging natural gas markets, particularly for liquefied natural gas (LNG) exports to the Asia Pacific region are contingent on the development of gas fields in the North Slope and infrastructure to support the industry. Conventional known natural gas reserves in the Cook Inlet region currently support most of the natural gas-based energy needs in Southcentral Alaska, as well as the ammonia-urea and LNG plants located in Nikiski. These known gas reserves are projected to be adequate to meet residential, commercial, and industrial demand for natural gas for the next ten years (Northern Economics, 2001). There have been several significant natural gas discoveries in the recent past, and it is anticipated that there will be more natural gas reserves in the Cook Inlet region. Nonetheless, without the development of the North Slope gas fields and the pipeline that will transport natural gas from the North Slope to more accessible distribution/processing hubs, it is highly unlikely that LNG can be developed and exported to the Asian markets through Port Mackenzie.

The following sections discuss market potentials of LNG and the infrastructure development that will be required for the Borough to support LNG export operations.

Global Market Trends

Natural gas is projected to be the fastest growing primary source of world energy because of its technical, economical, and environmental advantages (International Energy Outlook 2002 Forecast). LNG as an energy import option is significant in that it reduces certain countries' dependency on oil and coal imports and also helps achieve environmental goals. Recent developments in LNG exporting countries (i.e. Indonesia) have opened up opportunities for other non-Asian world suppliers to capture existing and emerging markets in Asia. If adequate infrastructure were developed, the North Slope natural gas could provide a reliable and long-term LNG supply alternative to the Asian markets.

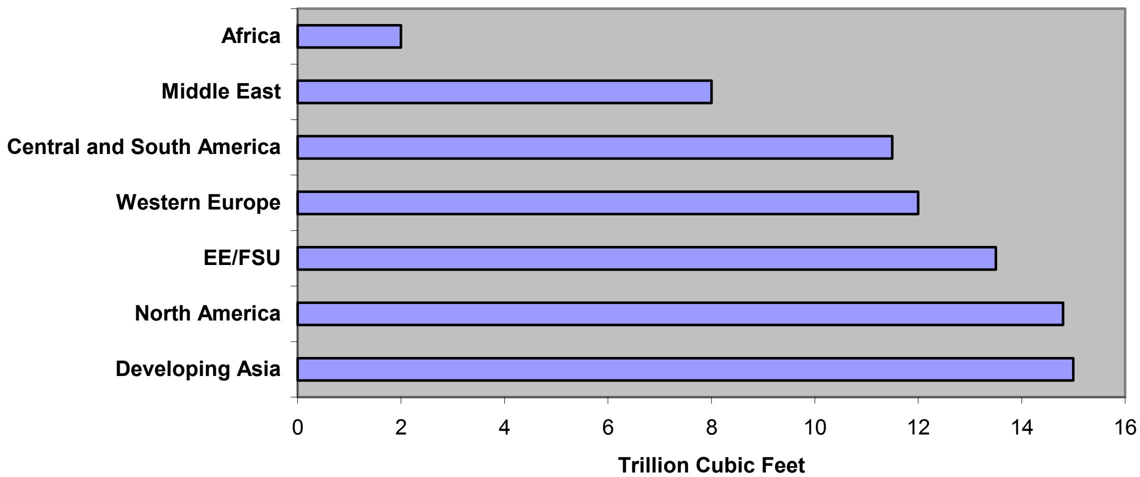
World trade in LNG has grown at an average rate of 6.7 percent since 1990, including a 12.4 percent rise between 1995 and 1996 (EIA, 2002). The EIA also forecasts a strong demand growth for LNG in Asian markets where pipeline gas supplies are for the most part not economic, infeasible due to location, or not available. Australian LNG sources estimate that world LNG trade could increase from about 82 million tons (112 billion cubic feet) to 112-161 million tons (153 to 221 billion cubic feet) by 2010, and could be higher depending on the growth markets (i.e. China, India, Korea, and Taiwan) (www.alaskabackbone.com). The potential major LNG markets for Alaska are Japan, Korea and Taiwan. These three countries combined import about 75 percent of the world's LNG. According to EIA, South Korea is the second largest importer of LNG. The state-owned monopoly importer of natural gas, Kogas, is planning to expand its two LNG receiving facilities and construct another. China and India, the two most populous countries, are likewise expected to have a substantial impact on gas demand. The EIA expects China's natural gas consumption to triple by 2010 as a result of increased domestic production and imports (by pipeline and LNG) (Country Analysis Briefs, EIA, 2002). Plans for gas imports to India reflect expectations of rising consumption. In the *International Energy Outlook 2000* reference case, gas use in India is projected to grow at an average annual rate of nearly eight percent per year from 1997 to 2020. Although India is considered too far from Alaska to be considered as a viable market, it will absorb potential LNG production from Southeast Asia and Australia.

The competition for these future markets could also be stiff with gas producing countries already taking action to meet the increased demand for LNG. Global gas reserves have more than doubled over the past 20 years, outpacing the 62 percent growth in oil reserves over the same period. The Oil and Gas Journal estimated proven world gas reserves at 5,146 trillion cubic feet (tcf) (as of January 1, 2000). The six countries that export a significant volume of LNG—Qatar, Abu Dabi, Malaysia, Indonesia, Brunei, and Australia—have reserves of gas totaling 640 tcf. Gas supplies in northwestern Australia alone have been estimated at 100 tcf. In Alaska, recent exploration activities have resulted in several significant natural gas discoveries (i.e. those by Forest Oil Corporation, Marathon, etc).

In response to the greater demand for LNG, four natural gas liquefaction plants came on stream in 1999 and 2000 in Trinidad and Tobago (Atlantic LNG), Nigeria (Bonny), Qatar (Rasgas), and Oman (www.alaskabackbone.com). There are also a number of LNG projects in Alaska that are being explored to potentially supply a portion of the LNG markets in Asia (i.e. Alaska North Slope LNG Project and Yukon Pacific Corporation).

Nonetheless, the demand for LNG is strong despite the growing number of LNG suppliers, as recent market opportunities emerged that were nonexistent five years ago. The entry of India and China into the LNG market in Asia are expected to place pressure on gas suppliers to develop new LNG projects.

Figure 17. Increases in Natural Gas Consumption by Region, 1999-2020



Source: Energy Information Administration, 2002.

The United States primarily exports LNG to Japan and Mexico.

Table 17 provides the volume and average price of LNG from 1996 to 2001. The volume of exports to Japan has remained fairly constant, while exports to Mexico have increased over the past five years. LNG is currently being exported from the Phillips–Marathon LNG facility in Kenai. This plant supplies about 1.3 million barrels—equivalent to 14,404 tons or 20 million cubic feet (mmcf)—of LNG to Japan each month; this is equivalent to over 2 percent of Japan's LNG imports.

Table 17. U.S. LNG Exports, by Country, 1996-2002

	Japan		Mexico		Total	
Year	Volume (mmcf[a])	Ave Price ($ per mcf[b])	Volume (mmcf[a])	Ave Price ($ per mcf[b])	Volume (mmcf[a])	Ave Price ($ per mcf[b])
1996	67,648	3.65	0	-	67,648	3.65
1997	62,187	3.83	0	-	62,187	3.83
1998	65,951	2.91	33	5.69	65,984	4.3
1999	63,607	3.08	275	6.95	63,882	5.015
2000	65,610	4.31	418	5.82	66,028	5.065
2001	65,753	4.39	465	5.82	66,218	5.105

[a] mmcf = million cubic feet
[b] mcf = thousand cubic feet
Source: Natural gas Monthly, April 2002. Energy Information Administration

Table 18. World LNG Imports by Origin, 2000 (Billion Cubic Feet)

	ORIGIN

	United States	Trinidad & Tobago	Algeria	Libya	Nigeria	Qatar	UAE	Oman	Australia	Brunei	Indonesia	Malaysia	**Total Imports**
IMPORTERS													
North America	**0.42**	**98.95**	**46.95**	**-**	**12.65**	**46.06**	**2.73**	**10**	**5.95**	**-**	**2.76**	**-**	**226.46**
United States	-	98.95	46.95	-	12.65	46.06	2.73	10	5.95	-	2.76	-	226.04
Mexico[1]	0.42	-	-	-	-	-	-	-	-	-	-	-	0.42
Central/South America	**-**	**12.33**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**12.33**
Puerto Rico	-	12.33	-	-	-	-	-	-	-	-	-	-	12.33
Western Europe	**-**	**29.45**	**904**	**27.37**	**148.89**	**28.46**	**4.84**	**7.06**	**-**	**-**	**-**	**-**	**1150.07**
Belgium	-	-	162.6	-	-	-	-	-	-	-	-	-	162.63
France	-	-	365.1	-	8.83	2.83	-	-	-	-	-	-	376.78
Greece	-	-	17.9	-	-	-	-	-	-	-	-	-	17.9
Italy	-	-	99.31	-	77.76	1.41	-	-	-	-	-	-	178.48
Spain	-	29.45	139.7	27.37	59.47	4.17	4.84	7.06	-	-	-	-	272.03
Turkey	-	-	119.4	-	2.83	20.06	-	-	-	-	-	-	142.25
Asia/Oceania	**65.61**	**-**	**-**	**-**	**-**	**442.04**	**241.8**	**76.28**	**361.94**	**319.3**	**1297.29**	**739.97**	**3544.17**
Japan	65.61	-	-	-	-	291.35	230.61	2.83	359.47	282.4	886.09	538.66	2656.99
South Korea	-	-	-	-	-	150.69	11.19	73.46	2.47	36.87	282.41	112.3	669.4
Taiwan	-	-	-	-	-	-	-	-	-	-	128.78	89.01	217.79
Apparent Exports	**66.03**	**140.73**	**950.9**	**27.37**	**161.54**	**516.56**	**249.36**	**93.34**	**367.89**	**319.3**	**1300.05**	**739.97**	**4933.03**

[1] Imports to Mexico from the United States are delivered by truck.

Source: Energy Information Administration (www.eia.doe.gov)

Prospects for Alaska LNG and Infrastructure Requirements

Alaska could be in a position to capture a portion of the emerging markets in Asia with its significant natural gas reserves that are yet to be developed. The estimated remaining known recoverable reserves of natural gas in the Prudhoe Bay gas cap and Point Thomson unit amount to about 29 tcf (DNR, 2000). The proposed gas pipeline will initially rely on these remaining reserves, although it is anticipated that an estimated additional 100 tcf[18] of undiscovered natural gas resources are potentially available once the pipeline is in operation. An LNG facility at the MSB could augment the existing LNG operations in Kenai, which is operating at or near its maximum capacity but with room for expansion. With the availability of the North Slope gas, there will be adequate natural gas supply to support these ventures.

[18] Estimated conventional, recoverable natural gas resources: 1) 63.5 tcf in Northern AK (onshore) and 2) 32.1 tcf in Bueaufort Shelf (offshore). Sherwood and Craig, 2001

In order to develop an LNG export operation at the MSB, the following infrastructure should be put in place:

- A pipeline to the Lower 48 or Tidewater
- With a gas line to the Lower 48, an additional pipeline spur from Fairbanks to the vicinity of Port Mackenzie
- An LNG facility at the Borough
- A loading dock for LNG tankers

While there is already an existing LNG plant in Point MacKenzie, this facility is not capable of supporting export volumes. The current LNG plant is a small-scale facility that delivers LNG by truck to Fairbanks. Industry experts believe that an LNG project should start small enough to gain a toehold in the Asian marketplace and yet large enough to make economic sense.

Several proposals are being discussed to transport North Slope gas resources to the Lower 48 or Valdez. The proposed southern route gas pipeline generally will follow the Dalton and Alaska Highway corridors from Prudhoe Bay to the border with Canada. If a natural gas pipeline is built to Valdez or along the Alaska Highway, a spur line could be built from either pipeline to serve the MSB. Without these major export pipelines, the cost to build a line from the North Slope to serve the Railbelt area would be very expensive. A study estimates that North Slope gas could be transported through the Southcentral Alaska distribution system, by a spur line from Glenallen that transports 400 mmcf per day, with a transportation cost of $1.72 to $1.79 per thousand cubic feet (mcf). A 200 mmcf per day pipeline would have a transportation cost of about $2.29 per mcf (Metz, 2001). This transportation cost does not include value for produced gas.

Cost estimates for a LNG project located at Tidewater, including a gas conditioning plant, pipeline, compressor stations, LNG plant and marine terminal by pipeline capacity (throughput) is shown in Table 19. The Tidewater LNG project (13.8 metric tons per annum [mta]) has an estimated cost of service to Tokyo of $2.99/million British Thermal Units (mmbtu). This cost of service provides a wellhead price of $0.66/mmbtu at the North Slope.

Table 19. Estimated Capital Costs for the Tidewater LNG Project

Capacity	9.2 Mta	13.8 Mta	18.4 Mta
Estimated Cost (billion $)	7.3	8.8	10.43

Note: Mta = metric tons per annum
Source: "Standing Up for Alaska's Future" (www.alaskabackbone.com)

Estimating the volume of LNG for export to Asian markets that can potentially go through Port Mackenzie depends on four factors:

- Existing and potential natural gas reserves in Cook Inlet
- Throughput of the spur line that will serve Southcentral Alaska
- Capacity of the LNG plant that might be built in the MSB
- Industrial demand for natural gas at the existing facilities in Cook Inlet area

A study that looked at natural gas distribution in Southcentral Alaska projected a spur line that transports 400 mmcf per day of natural gas (Metz, 2001). Assuming a similar capacity and that half of the pipeline capacity is used to supplement Cook Inlet natural gas supplies for existing industrial demand, there are potentially 200 mmcf per day of natural gas that could be used for LNG production in the Borough. The LNG facility in Nikiski consumes 220 mmcf of natural gas per day and exports about 1.3 million barrels (20 mmcf) of LNG to Japan every month. Hence, assuming a similar LNG capacity in MSB, in the high case scenario about 12 million barrels of LNG could go through Port MacKenzie annually by 2020. However, LNG is only one potential industry that could use the natural gas; other possibilities include aluminum smelting and petrochemical feedstocks.

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northerneconomics inc.

Memorandum

To: Norm Gutcher, Tryck, Nyman, Hayes, Inc.

From: Cal Kerr

Date: 1/8/03

Re: Railbelt Commodities, Recent Changes, Jan Updates

This is in response to your email of December 10, regarding changes to the Railbelt Commodities forecasts. I also reviewed methodology with Micah Schoming (TNH) and Terry Nininger (NPI) and revised birch moisture content to 42% (original weight or wet basis) for a year-round figure.

Recent Information

You relayed the following wood chip export volumes, from information provided by Marc VanDongen, Port Director for the Matanuska-Susitna Borough (MSB):

NPI projects to ship 200,000 green tons in 2004, 300,000 green tons/yr. from 2005 through 2008, and 400,000 green tons/yr. from 2009 through 2023.

After reviewing our original forecasts, I confirmed our "high" case assumption of a deep-water dock. Further research, after a telephone call with Terry Nininger at NPI, indicated the State of Alaska, on August 14, 2002, passed a law (SCS CSHB 528(FIN)) that allows the State Department of Transportation and Public Facilities to reimburse municipalities for costs on certain types of debt. The Port of Anchorage limit is $15,000,000 and the MSB (deep water port and road upgrade) is $10,000,000.

I checked with our analysts and staff and could find no record of this state action. Had we known of this law, we would have moved the wood chip export forecasts into the "base" case. I checked our emails and MSB comments on this change but they were silent.

Table 1 indicates likely volumes and gross sales revenues at the volumes indicated. Birch wood chips weights are based on an original weight moisture content of 42% (down from 51%) and industry standard conversion factors.

Spruce wood chips are based on a 32% original weight moisture content that allows for some drying after attack by spruce bark beetles. These bugs are species specific and do not attack birch, so that weight relationship is likely to hold steady.

Selling values in dollars per bone-dry unit (BDU) are forecast for an average selling value in 2002 dollars.

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Table 1. Wood Chip Export Volumes, Port MacKenzie, with Estimated Gross Revenue.

Chips	*Low*	*Medium*	*High*
Green tons Total	200,000	300,000	400,000
Birch 60 %	120,000	180,000	240,000
Spruce 40%	80,000	120,000	160,000
OD Tons Birch	69,425	104,138	138,851
OD Tons Spruce	54,448	81,673	108,897
OD Tons	123,874	185,811	247,748
BDUs	103,228	154,842	206,457
BDUs/ship	11,600	11,600	11,600
Cargos	8.9	13.3	17.8
Assume:			
$/BDU	$105	$105	$105
Gross Rev	$10,838,970	$16,258,455	$21,677,939

Revising moisture content from 51% to 42% (to reflect a year-round average) has a significant impact on volumes and values, increasing volume by 0.8 cargos and $0.9 million in gross revenues.

Northern Economics Inc. Forecasts, Sand and Gravel

Installation of a conveyor system at Port MacKenzie, as proposed by NPI and documented in our report, would be multi-functional. Wood chips, coal and a mix of sand and gravel are all bulk commodities that could be loaded onto ships or barges, with proper care and cleaning between uses.

Marc VanDongen indicated, via an email received on December 20, that a study was completed on October 17, 2002 suggesting a minimum of 12 million tons of exportable aggregate along the south side of the Port MacKenzie road. Projections from Marc suggest a minimum export of 2 million tons per year, starting in 2004. He believes there could be up to 40 million tons in the area.

Our report, submitted in September, was more optimistic and used 2 million tons per year for 25 years. We also stated, *Under all development scenarios, the shipping of aggregates outside of Southcentral Alaska is anticipated to be minimal*.

Pat asked me to double check this statement by contacting potential users in Western and Southwestern Alaska, as indicated in one of your prior emails. This was an independent check of another staff member's prior research and analysis.

I contacted Calista, the regional native corporation for southwestern Alaska, along with the City of Bethel, Knik Construction, the Kuskokwim Corporation, and the Alaska Department of Transportation and Public Facilities. We discussed market demand (quantity and price) along with alternatives available to purchasers in the two regions (Western and Southwestern Alaska).

After this research, I believe our original statement is still accurate. There is no indication under any of the three scenarios that aggregate from Port MacKenzie would be competitive in western or southwestern Alaska. The price differential ranges from minus $20 per ton to minus $40, depending on barge capacity, destination, and especially unloading, stockpiling and re-loading costs for shipping to final end-users.

Cc: Pat Burden, President

APPENDIX F

Traffic Study

MAT-SU RAIL CORRIDOR STUDY
TRAFFIC REPORT

Prepared for:
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Prepared Under my Supervision:

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Norman K Gutcher, P.E., Alaska No. 4919

July 21, 2003
Project Number 01228.000

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TRAFFIC ANALYSIS REPORT

APPENDICES

5.0 TRAFFIC ESTIMATES

The traffic estimates complied for this report are directly derived from Northern Economics, Inc. (NEI) *Rail Corridor Commodity Study*, dated September 2002, the *Knik Arm Crossing Draft Environmental Impact Study* by ADOT&PF, dated August 1984 (KAC ADOT&PF 1984 study), assumptions on traffic movement and existing traffic counts. The economical land based modes of transportation viable for commodities and general public travel to and from the proposed Port MacKenzie development are by roadway and/or railroad. The origin for most commodities exported through the Port is expected to be from within the Mat-Su Borough (MSB) for the short-term condition. As development continues within the state of Alaska, specifically the interior and northern regions, additional commodities are expected to contribute to the exporting progression at Port MacKenzie. Many of the exports would be nationally and internationally bound. A portion of the exports would be bound intrastate.

The NEI study identified several possible bulk commodities with associated quantities that could be exported though the Port MacKenzie up to the study period of 2020. The commodity flow through the Port is presented in Table 1 from the executive summary of the NEI report. The commodities listed are petroleum and chemicals, cargo containers, wood products, coal, sand and gravel, oil field modules, manufactured homes, select material and natural gas. The NEI report identified these commodities as possible exports, however, market conditions will ultimately dictate which materials will move through the Port and in what quantities. The NEI report listed commodities and their associated quantities based on a low, high and base level of development. Imports identified by the NEI report are containerized cargo, petroleum products and logs. These imports were only considered and not realized as potential goods that would be transported into the MSB. No commodities were identified within the study period as import commodities, however, future market conditions will determine when commodities will begin to move through the Port.

Although the main thrust of this report is possible commodities transported by railroad to the Port, a portion of these commodities will most likely be transported by roadway due to the cost-effectiveness of a short haul and long construction time for the rail link to be completed. Commodities transported to the Port will initially be moved exclusively via truck using existing roadways or improved roadways. Port employees for the various export businesses and dock operations will travel to work by this new or improved roadway. Completion of the rail spur and the need to expand beyond the local area for resources, such as wood and gravel, will promote rail transport to the Port instead of truck haul. Commodities that would most likely be transported exclusively by rail are petroleum products from the North Pole refinery and potentially coal from the established Usibelli Mines and the Wishbone Hill Mine. In addition, future mining of select minerals from interior Alaska could also be transported by the rail to the Port. The following paragraphs will describe the assumed split between rail and roadway transport to the Port.

The existing roadway network will provide the main route of transport to the Port for the short-term future. Long-term roadway networks will be discussed in subsequent paragraphs and as part of the overall feasibility project for roadway and railway corridors.

The immediate impact to the existing roadways will be the increased traffic volume transporting goods and employees of Port businesses. As part of the Traffic Estimates task, we compiled the existing traffic volumes and the proposed increased use for these roadways to determine the total expected traffic flow. The traffic volume data assembled for the existing conditions was obtained from two sources. These two sources are identified as the Matanuska-Susitna Borough 1999 Traffic Report and the Annual Traffic Volume Report by the Alaska Department of Transportation and Public Facilities. Each source provided information on existing traffic volumes for several roadways in the region of the proposed corridors and areas related to the Port MacKenzie development. The traffic count for both sources is for two-way traffic (i.e. opposing traffic lanes).

The Matanuska-Susitna Borough 1999 traffic report provided a break down of weekend daily traffic, weekday daily traffic and average daily traffic volume. This analysis uses the average daily traffic volume to reflect the most probable flow of traffic on any given day. The Annual Traffic Volume Report (ATVR) provided the annual average daily traffic for 2001 and prior years along state highways. The ATVR offered data on State of Alaska roads, which the 1999 MSB report did not cover.

5.1 Rail Traffic Attractions/Generations

Prosperous rail service to Port MacKenzie is directly related to the development of natural resources within the state of Alaska, a fuel storage/depot and other light industrial businesses within this local area. Containerized cargo shipments may be a recognized import commodity in the future, however the NEI report indicates this will not be realistic to assume until post 2020. The NEI report also indicates the export of coal and select minerals will most likely not be a viable export within the study time frame. This however does not preclude the possibility of future development of these natural resources within the MSB or statewide beyond the study date 2020. Other commodities not listed within this NEI may also become a realized commodity post 2020 such as agriculture products and associated freight from the MSB or the Delta area. The ARRC could perform a long term planning study to anticipate future types and quantities of commodities that could be transported on the mainline between the MSB and northern Alaska. This type of planning study would validate new construction of rail spurs to transport commodities anticipated in the near future.

Natural resources the NEI study identifies with associated quantities are wood products, gravel products and petroleum products for the study period. These commodities will be used in this report to generate loads or trips by the railway.

Primary areas for gravel extraction and timber clearing will probably be outside a close proximity of the proposed rail corridor. This will force the development of roads, rail spurs or other infrastructure to transport these commodities to the mainline from remote locations. Based on existing information of gravel haul by train, the sand and gravel extraction operation should be located within a mile of the rail spur. This distance is reasonable to construct a conveyer belt system or an access road to transport the product from the extraction area to waiting rail cars.

Transport of wood products, either in raw form such as logs or in semi process form such as chips is somewhat variable. Loading stations along the rail could be connected to the dedicated harvest areas by logging roads. Trucks would haul the wood products via these roads for a considerable distance depending on capital costs to build such roads. A possible distance for these connecting roads, considering economical impacts is five to fifteen miles. This range of distances is based on our assumption for this study only.

The NEI report did not indicate a quantity of coal delivered to the Port under any level of development. Unless world markets change, the Port of MacKenzie is not expected to export any coal before 2020.

Port MacKenzie could realistically begin to handle wood and gravel products for export within one to three years. Other potential commodities that were listed above may be added beyond this time frame. Transportation of these products to the Port by railroad would not be viable within one to three years mainly due to the construction time required to build the railway and political hurdles to overcome for this substantial development. Therefore, the initial transportation of wood and gravel products would not be by train.

Once the railway spur and the loading stations are constructed, we assume a substantial shift from truck transport to train transport of commodities to the Port. The time frame for trains to begin operation along the spur is approximately 2012, which correlates with an early opening date of KAC. A later opening date may be more realistic given the construction and political issues to complete. When the rail spur opens, this study assumes, 75 percent of all wood products and 50 percent of all gravel products transported to the Port will be via railroad. These percentages are based on the probability that the truck haul operation would have depleted most of the gravel quarries and dedicated timber stands within the viable truck haul boundary.

The delivery and storage of the petroleum products to the Port of MacKenzie is particularly attractive due to the rail haul cost effectiveness, safety considerations to Anchorage area residence and the ability to supplement the Port of Anchorage. Cost savings would be primarily realized by a reduced transport time and reduced operational costs of railroad equipment and personnel. Safety concerns with the tank farm at the Port of Anchorage have been voiced as a potential hazard to nearby neighborhoods. The relocation of these tanks to a less populated area, such as Port MacKenzie, would reduce liability to residential areas and satisfy public concerns. The Port of MacKenzie would complement POA by effectively extending the existing facilities to an alternate location. Since land at the POA is readily in short supply, alternate places would need to be acquired to handle the future storage demands expected in Anchorage. The extension of facilities from POA to Port MacKenzie is intended to complement, not compete, with each other.

The best-case scenario would be the diverting of all Anchorage bound petroleum products to Port MacKenzie once construction of the rail spur and Port facilities are complete. Petroleum products would be transported exclusively via rail to the Port, similar to the existing operation to Anchorage. From Port MacKenzie, fuel could be transferred to POA by a pipeline installed below the water surface.

5.2 Vehicular Traffic Attractions/Generations

Traffic volume to the Port will develop from exporting natural resources and commuters traveling to work at Port businesses. In addition, vehicle trips will be increased by the proposed ferry transport system scheduled between the Port of MacKenzie and the Port of Anchorage. The increased traffic volume due to Port development and the ferry transport system is not expected to exceed capacity of the existing road system. When a bridge link (Knik Arm Crossing) between the Anchorage bowl and the Point Mackenzie is placed in service, substantial increases in traffic movements to the Mat-Su Borough may be expected. Upgrading the existing road system will most likely be required to accommodate this traffic volume. The upgraded road system may include an improved two-lane highway or possibly a four-lane divided highway.

In order to avoid a long haul situation and maintain a profitable cost benefit, areas dedicated for wood harvesting and gravel extraction should be within a 25-mile zone of the Port. This study assumes a distance of 25 miles or less is more efficient with a truck than utilizing train cars. The actual maximum distance traveled by trucks will be dictated by a cost benefit study and/or market conditions. If achievable, potential wood harvesting or gravel extraction areas outside this zone would best be transported by rail.

As stated earlier in this report, Point MacKenzie could begin to export wood and gravel products within one to three years. These commodities would be exclusively transported via trucks to the Port. Truck transportation would continue until the dedicated areas are exhausted or the rail spur begins to transport a large portion of these commodities. Based on the assumption that a portion of the dedicated timber stands are depleted by 2012 when the railway comes on line, we estimate 25 percent of all wood products will be transported by roadway. Another assumption is the roadway will only transport 50 percent of the proposed Port bound gravel based upon the new rail spur providing alternate transport.

Employees of the businesses at the Port or within the vicinity of the Port could use the existing roads for commuting purposes. The sand and gravel operation, along with the wood chip operation, will require several employees based at the Port (or vicinity) to unload and prep the products for sea transport. The number of employees for each operation is an assumption based on current employment practices.

The ferry transport system proposed between POA and Port MacKenzie is currently under design. Construction of the port facilities to handle the ferry system and the acquisition of a ferry ship is estimated to open to the public by 2005. The ferry system will transport several types of travelers throughout the early morning to mid evening hours. The main customers will most likely be commuters that live in Knik, Point MacKenzie, Big Lake, Houston or Wasilla and work in Anchorage. However, there will be other users throughout the day that will use the ferry system on a non-regular basis. Recreational users from Anchorage would also be consumers of this ferry system.

The bridge link construction will most likely not be complete until sometime post 2012. This date was obtained from ADOT&PF given optimum conditions for design and construction efforts. Opening of the bridge link will increase the traffic volume to the Point MacKenzie area and outlying areas. Initial vehicular traffic movement across the bridge was derived from estimating the proposed redirected Parks Highway traffic and delineating an area of potential users within the MSB. Several assumptions for both redirected traffic and potential users within south and west areas of the MSB, they are briefly listed below.

Assumptions for Redirected Traffic

- Average residential household generates 10-vehicle trips/day.
- Average commuter (Anchorage bound) traffic from residence is 3-vehicle trips/day.
- One additional vehicle trip/day from MSB to Anchorage for other reasons.
- A total of four vehicle trips per day from MSB to travel Anchorage.

Assumptions for KAC versus existing Glenn Highway users (originating from MSB)

- Bridge toll of $3 per car per one way
- Terminus of KAC and Glenn Highway is at the intersection of New Seward (a.k.a. Gambell/Ingra) and 5th avenue.
- Calculations are based on overall distance commuters travel not speed limits.
- Fuel cost is $1.57 a gallon and average efficiency of vehicle is 20 miles/gallon

Please see the attached calculations labeled 'Driver Decision of Routes' and 'Redirected Corridor Traffic Volume' for more information. Traffic movements beyond the initial startup date for the bridge link and the outlying areas are presented in the KAC ADOT&PF 1984 study for 10 and 20 years beyond the opening date.

5.3 Traffic Distribution

The traffic distributions related to the Port activities were divided into an initial scenario (Case I) and an expected level of development after several years of operation (Case II). This report assumes Case I would initiate within one to five years considering Port facilities development only. Case I also assumes vehicular traffic would use existing or upgraded roadways for traveling to the Port. Travel expected to flow to the Port during this initial start up is based on the development and export of wood products, gravel products and manufactured homes, and the use of the ferry transport system. Case II is the anticipated condition of both the road and railway corridors by 2020. The corridor route(s) for road and railway would be constructed and open to the public for use of transporting commodities and commuters to the Port by this time. If the bridge is open by 2020, traffic for the selected road corridor will also include redirected traffic from the Parks Highway and from the southeast area of the MSB to Anchorage. Additional information for Case I and Case II is provided in the 'Traffic Volumes' calculations located in the appendix.

5.3.1 Traffic Distribution – Rail

CASE I
Case I assumes no commodities would be transported to the Port via railroad. No train movements are expected at this time.

CASE II
The potential commodities traveling by rail into the Port of MacKenzie are calculated under the Case II scenario. Case II assumes 75 percent of wood products, 50 percent of gravel and sand material, and 100 percent of petroleum products would be transported by railroad to the Port. From the attached calculations, the total estimated loads for wood products are 187-car load per week. Since train makeup typically hold to about 80 cars per load for this type of product, Port bound loads would be approximately two full trainload per week.

The estimated load for the gravel products is 6 cars per month. Based on current given tonnages, a full trainload would take more than 13 months to accumulate. Gravel loads would most likely share credit of a trainload with another commodity bound for the Port, as opposed to stockpiling the necessary quantity and loading a full trainload.

The attached calculations estimate 96 fuel carloads per day. Trainloads containing fuel cars typically haul no more than 60 cars per load. Port bound fuel trains would be more than one and a half per day.

5.3.2 Traffic Distribution – Trucks

Under the high level of development scenario, Case I assumes all commodities would be transported to the Port via truck haul. Although the truck haul may not transport the high level of commodities within the one to five year timeframe (startup time), this will be assumed for a conservative approach to the potential maximum level. The truck haul transportation will remain in effect until the railroad is constructed and opened for travel. Case I estimates 159 vehicle trips per day to the Port. The specific commodities are listed below.

CASE I

Commodity	Trips/Day
Wood Products	66
Gravel Products	30
Manufactured Homes	36
Total	159

Under the same high level of development scenario, Case II assumes 25 percent of wood product and 50 percent of gravel products would be transported by truck. Case II estimates 136 vehicle trips per day to the Port or Port area. The itemization of these values is described in the table below.

CASE II

Commodity	Trips/Day
Wood Products	111
Gravel Products	11
Manufactured Homes	14
Total	136

These values are based in part on the assumptions listed on the attached calculation sheets.

5.3.3 Traffic Distribution – Other Vehicles

Additional traffic anticipated from Port development will be the employees of Port businesses and commuters using the ferry system. Case I estimates 1098 vehicle trips per day to the Port or within close proximity to the Port. The specific commodities are listed below.

CASE I

Commodity	Trips/Day
Wood Products	12
Gravel Products	8
Manufactured Homes	22
Ferry Transport	1056
Total	1098

Case II estimates 2211 vehicle trips per day to the Port or Port area.

CASE II

Commodity	Trips/Day
Wood Products	32
Gravel Products	12
Manufactured Homes	45
Ferry Transport	2108
Petroleum Products	14
Total	2211

The reader should understand that if the bridge link were constructed between the Point MacKenzie area and the Anchorage bowl, the ferry system would most likely become obsolete for travel. If the ferry system were eliminated in Case II, the vehicle trips per day would reduce to 102.

5.3.4 Impact of Knik Arm Crossing on traffic distribution

Traffic volume for roads within the proposed corridor areas were based on initial opening of KAC (assumed to be 2012) and the expected counts in 2020 (eight years after opening). Initial traffic volume and 2020 traffic volume likely on any one of the road corridors was determined by adding the baseline ADT, Port facilities ADT and redirected ADT. Traffic volume for the bridge and various roads in Port MacKenzie and Knik areas after 10 and 20 years of operation originated from the KAC ADOT&PF 1984 study.

Initial traffic volume was derived on a manual basis combining three sources of traffic counts. The traffic sources expected on the road corridors are; **baseline traffic**, proposed **redirected traffic** (Anchorage bound/departure) and proposed **Port bound traffic**.

The **baseline traffic** is the volume currently using these roads under present circumstances.

The proposed **redirected traffic** is the volume from the Parks Highway and the southwesterly areas of the MSB that would use KAC over the existing Parks/Glenn Highway to travel to Anchorage. An analysis was performed to estimate this redirected volume of traffic based on the traffic counts from the 2001 ATVR . This analysis assumes corridor 4, 5 or 7 would become the main route to/from Anchorage for all traffic north of the Big Lake cut off. Corridor 10 would most likely not be the main route to Anchorage for traffic on the Parks Highway. When developing traffic volume estimates for these corridors, assumptions were made on the division of trips with an Anchorage trip terminus. These assumptions are; 50 percent of ADT north of Willow is Anchorage bound/departure and the redirected volume originating from the Houston, Big Lake, Knik or Point MacKenzie area would consist of commuters and other users from residential dwellings. From national trends, a residential household makes 10 vehicle trips per day that would include commuters and other trips. This analysis assumes a total of four out of the 10 vehicle trips per day would cross KAC based on three commuter trips and one other trip. Therefore, approximately forty percent of the listed ADT for the Houston, Big Lake, Knik or the Point MacKenzie area would use KAC based on the mileage advantage over the existing route. Additional information is provided on the 'Initial Corridor Traffic Volumes' calculations in the appendix.

The proposed **Port bound traffic** is the volume expected to travel to the Port for exporting of goods and commuting employees of Port businesses.

The users of the road system will decide which route (KAC or existing route) to travel, based in part, by the total miles traveled and a nominal toll charged to use KAC. An analysis was performed to estimate the probable location of this division line where drivers would take either KAC or the existing route to downtown Anchorage. This calculation begins with the probable assumption that drivers would be inclined to take a shorter route if no additional cost to the driver is incurred beyond their own car use. However, a toll will most likely be charged (each way) for the KAC and would likely deter some users. To find a workable division line where drivers would consider taking the existing route over KAC, assumptions were made on the toll cost, cost of fuel and gas mileage for the average vehicle. Based on this information a division line was delineated on the attached exhibit where drivers would choose either KAC or the existing route to Anchorage. Additional information is provided on the 'Driver Decision of Routes' calculation page in the appendix.

The initial traffic volume for the corridors is identified on the attached exhibit labeled 'KAC – 2012 ADT' in the appendix. The traffic volume for the initial stage is directly dependent on which corridor is ultimately selected for design. For example, the Big Lake Corridor would attract the highest ADT due to central location and the highest number of redirected drivers. The existing route (KGB) would have the least ADT primarily due to a smaller number of redirected drivers.

The expected traffic for 2020 is identified on the exhibit labeled 'KAC – 2020 ADT' in the appendix. The exhibit depicts estimated ADT based on Port facilities development, redirected ADT and the proposed volume obtained from the KAC ADOT&PF 1984 study. The cumulative volume for the Mat-Su road system is directly dependent on which corridor is selected as the final route. Each corridor has separate volumes due to its location in the proximity to existing population base and tie-in location to the Parks Highway.

The ADOT&PF 1984 Knik Arm Crossing Study identifies volumes for the possible bridge links and various roads within the Mat-Su corridor area projected for 10 and 20 years after construction. As of today, the best time frame for the KAC to open would be 2012, but more realistically sometime beyond this date. For this analysis, we will assume KAC will open in 2012 in order to offer traffic volumes for 2020 to correlate with the rest of the calculations for Case II. In order to determine the ADT in 2020, the KAC ADOT&PF 1984 study volume and the initial redirected ADT required linear interpolation to find the ADT eight years from the opening year of the KAC. These calculations are presented in the appendix on the sheet identified as 'Expected 2020 ADT on Corridors – KAC Impact'.

APPENDIX A

EXPECTED TRAFFIC VOLUME

BASELINE COUNT

ROAD	TYPE	2001 AADT	2003 AADT*	2005 AADT*	2012 AADT*	2020 AADT*	SOURCE	NOTES
Knik Goose Bay	Min. Arterial	1,480	1,510	1,540	1,651	1,788	ATVR[1]	South of Settlers Bay
Knik Goose Bay	Min. Arterial	4,710	4,805	4,901	5,255	5,690	ATVR[1]	Settlers Bay to Vine
Knik Goose Bay	Min. Arterial	4,910	5,009	5,109	5,478	5,932	ATVR[1]	Vine to Fairview Loop
Knik Goose Bay	Min. Arterial	9,661	9,855	10,053	10,779	11,671	ATVR[1]	Fairview Loop to Parks Intersection
Big Lake	Min. Arterial	900	918	937	1,004	1,087	ATVR[1]	south of campground
Big Lake	Min. Arterial	2,135	2,178	2,222	2,382	2,579	ATVR[1]	campground to Hollywood
Big Lake	Min. Arterial	3,810	3,887	3,965	4,251	4,603	ATVR[1]	Hollywood to Parks Highway intersection
Burma	Min. Collector	176	180	183	196	213	ATVR[1]	south of Big Lake intersection
Point Mackenzie	Min Collector	690	704	718	770	834	MSB 1999 Traffic Report	at KGB/Point Mac intersection
Point Mackenzie	Min Collector	70	71	73	78	85	MSB 1999 Traffic Report	prior to Ayshire Road
Point Mackenzie	Min Collector	53	54	55	59	64	MSB 1999 Traffic Report	south of Holstein
Ayshire	Min Collector	483	493	503	539	584	MSB 1999 Traffic Report	at Point Mac and Ayshire intersection
West Lakes blvd	Min Collector	323	329	336	360	390	MSB 1999 Traffic Report	west of Beaver Lake road
Parks	Princ Arterial	15,850	16,169	16,494	17,684	19,148	ATVR[1]	west of Wasilla Fishhook
Parks	Princ Arterial	9,390	9,579	9,771	10,476	11,344	ATVR[1]	North of Pitman Road
Parks	Princ Arterial	5,573	5,685	5,799	6,218	6,733	ATVR[1]	North of Big Lake Road
Parks	Princ Arterial	3,490	3,560	3,632	3,894	4,216	ATVR[1]	North of Little Su bridge
Parks	Princ Arterial	2,664	2,718	2,772	2,972	3,218	ATVR[1]	North of Willow

[1] Annual Traffic Volume Report - Central Region - 2001
by Alaska Department of Transportation & Public Facilities

* Based on 1% growth per year

EXPECTED TRAFFIC VOLUME - CASE I*

INCLUDES BRIDGE CONNECTION AND PORT FACILITIES
EXCLUDES FERRY TRANSPORT

ROUTE	EXISTING ROAD	TYPE	REDIRECTED ADT	PROPOSED PORT ADT	2012 BASELINE ADT	TOTAL ADT	BASELINE SOURCE	NOTES
Big Lake Corridor	Point Mackenzie	Min. Arterial	5,682	531	59	6,272	MSB 1999 Traffic Report	Port to Twin Island Lakes area
	Point Mackenzie	Min. Arterial	4,000	350	78	4,428	MSB 1999 Traffic Report	Twin island lakes to 90 degree corner (s of Burma)
	Burma	Min. Arterial	3,300	300	196	3,796	MSB 1999 Traffic Report	90 degree corner end of Big Lake road
	Big Lake Rd	Min. Arterial	2,600	200	1,004	3,804	ATVR	south of campground
	Big Lake Rd	Min. Arterial	2,400	175	2,382	4,957	ATVR	campground to Hollywood
	Big Lake Rd	Min. Arterial	2,200	150	4,251	6,601	ATVR	Hollywood to Parks Highway intersection
Houston Corridor	Point Mackenzie	Min. Arterial	3,079	531	59	3,669	MSB 1999 Traffic Report	Port to Twin Island Lakes area
	Point Mackenzie	Min. Arterial	2,200	350	78	2,628	MSB 1999 Traffic Report	Twin island lakes to 90 degree corner (s of Burma)
	Houston Corridor	Min. Arterial	1,800	175	n/a	1,975	n/a	90 degree corner to Parks Hyw (Houston area)
Existing Roads	Point Mackenzie	Min. Arterial	654	531	59	1,244	MSB 1999 Traffic Report	Port to Twin Island Lakes area
	Point Mackenzie	Min. Arterial	600	350	78	1,028	MSB 1999 Traffic Report	Twin island lakes to 90 degree corner (s of Burma)
	Point Mackenzie	Min. Arterial	525	300	770	1,595	MSB 1999 Traffic Report	90 degree corner to KGB intersection
	Knik Goose Bay	Min. Arterial	400	225	1,651	2,276	ATVR	PT Mac intersection to Settlers Bay
	Knik Goose Bay	Min. Arterial	350	150	5,255	5,755	ATVR	Settlers Bay to Vine
	Knik Goose Bay	Min. Arterial	300	75	5,478	5,853	ATVR	Vine to Fairview Loop
	Knik Goose Bay	Min. Arterial	250	50	10,779	11,079	ATVR	Fairview Loop to Parks intersection

Assumptions

* Traffic volume assumes 2012 condition
Redirected ADT uses 2012 volume (derived from 2001 traffic counts)
2012 Baseline ADT is derived from the Annual Traffic Volume Report - Central Region - 2001 by Alaska Department of Transportation & Public Facilities and MSB 1999 Traffic report

EXPECTED TRAFFIC VOLUME - CASE I*

INCLUDES FERRY TRANSPORT AND PORT FACILITIES
EXCLUDES BRIDGE CONNECTION

ROUTE	EXISTING ROAD	TYPE	PROPOSED PORT ADT[2]	PROPOSED FERRY ADT[3]	2005 BASELINE ADT	TOTAL ADT	BASELINE SOURCE	NOTES
Big Lake Corridor	Point Mackenzie	Min. Arterial	531	1,056	55	1,642	MSB 1999 Traffic Report	Port to Twin Island Lakes area
	Point Mackenzie	Min. Arterial	350	950	73	1,373	MSB 1999 Traffic Report	Twin island lakes to 90 degree corner (s of Burma)
	Burma	Min. Arterial	300	800	183	1,283	MSB 1999 Traffic Report	90 degree corner end of Big Lake road
	Big Lake Rd	Min. Arterial	200	500	937	1,637	ATVR	south of campground
	Big Lake Rd	Min. Arterial	175	400	2,200	2,775	ATVR	campground to Hollywood
	Big Lake Rd	Min. Arterial	150	300	3,965	4,415	ATVR	Hollywood to Parks Highway intersection
Houston Corridor	Point Mackenzie	Min. Arterial	531	1,056	55	1,642	MSB 1999 Traffic Report	Port to Twin Island Lakes area
	Point Mackenzie	Min. Arterial	350	650	73	1,073	MSB 1999 Traffic Report	Twin island lakes to 90 degree corner (s of Burma)
	Houston Corridor	Min. Arterial	175	200	n/a	375	n/a	90 degree corner to Parks Hyw (Houston area)
Existing Roads	Point Mackenzie	Min. Arterial	531	1,056	55	1,642	MSB 1999 Traffic Report	Port to Twin Island Lakes area
	Point Mackenzie	Min. Arterial	350	950	73	1,373	MSB 1999 Traffic Report	Twin island lakes to 90 degree corner (s of Burma)
	Point Mackenzie	Min. Arterial	300	800	718	1,818	MSB 1999 Traffic Report	90 degree corner to KGB intersection
	Knik Goose Bay	Min. Arterial	225	600	1,540	2,365	ATVR	PT Mac intersection to Settlers Bay
	Knik Goose Bay	Min. Arterial	150	400	4,901	5,451	ATVR	Settlers Bay to Vine
	Knik Goose Bay	Min. Arterial	75	350	5,109	5,534	ATVR	Vine to Fairview Loop
	Knik Goose Bay	Min. Arterial	50	300	10,053	10,403	ATVR	Fairview Loop to Parks intersection

[2] See Case I - Commodities Calculations

[3] See Case I - Ferry Calculations

Assumptions

* Traffic volume assumes 2005 condition
Vehicle trips to port based in part by tonnages provided in NEI report (September 2002)
Ferry contributes an assumed value of 37.5 cars per hour for 14 hours
Port ADT is based on commodity flows and employees of port businesses
Ferry ADT is based on commuters and non-regular users
2003 Baseline ADT is derived from the Annual Traffic Volume Report - Central Region - 2001 by Alaska Department of Transportation & Public Facilities and MSB 1999 Traffic report

EXPECTED TRAFFIC VOLUME - CASE I*

INCLUDES FERRY TRANSPORT AND PORT FACILITIES
EXCLUDES BRIDGE CONNECTION

ROUTE	EXISTING ROAD	TYPE	PROPOSED PORT ADT[2]	PROPOSED FERRY ADT[3]	2005 BASELINE ADT	TOTAL ADT	BASELINE SOURCE	NOTES
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Existing Roads	Point Mackenzie	Min. Arterial	531	1,056	55	1,642	MSB 1999 Traffic Report	Port to Twin Island Lakes area
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	Point Mackenzie	Min. Arterial	300	800	718	1,818	MSB 1999 Traffic Report	90 degree corner to KGB intersection
	Knik Goose Bay	Min. Arterial	225	600	1,540	2,365	ATVR	PT Mac intersection to Settlers Bay
	Knik Goose Bay	Min. Arterial	150	400	4,901	5,451	ATVR	Settlers Bay to Vine
	Knik Goose Bay	Min. Arterial	75	350	5,109	5,534	ATVR	Vine to Fairview Loop
	Knik Goose Bay	Min. Arterial	50	300	10,053	10,403	ATVR	Fairview Loop to Parks intersection

[2] See Case I - Commodities Calculations

[3] See Case I - Ferry Calculations

Assumptions

* Traffic volume assumes 2005 condition
Vehicle trips to port based in part by tonnages provided in NEI report (September 2002)
Ferry contributes an assumed value of 37.5 cars per hour for 14 hours
Port ADT is based on commodity flows and employees of port businesses
Ferry ADT is based on commuters and non-regular users
2003 Baseline ADT is derived from the Annual Traffic Volume Report - Central Region - 2001 by Alaska Department of Transportation & Public Facilities and MSB 1999 Traffic report

EXPECTED TRAFFIC VOLUME - CASE I*

INCLUDES PORT FACILITIES
EXCLUDES BRIDGE CONNECTION AND FERRY SERVICES

ROUTE	EXISTING ROAD	TYPE	PROPOSED PORT ADT[2]	2003 BASELINE ADT	TOTAL ADT	BASELINE SOURCE	NOTES
Big Lake Corridor	Point Mackenzie	Min. Arterial	531	54	585	MSB 1999 Traffic Report	Port to Twin Island Lakes area
	Point Mackenzie	Min. Arterial	350	71	421	MSB 1999 Traffic Report	Twin island lakes to 90 degree corner (s of Burma)
	Burma	Min. Arterial	300	180	480	MSB 1999 Traffic Report	90 degree corner end of Big Lake road
	Big Lake Rd	Min. Arterial	200	918	1,118	ATVR	south of campground
	Big Lake Rd	Min. Arterial	175	2,200	2,375	ATVR	campground to Hollywood
	Big Lake Rd	Min. Arterial	150	3,887	4,037	ATVR	Hollywood to Parks Highway intersection
Houston Corridor	Point Mackenzie	Min. Arterial	531	54	585	MSB 1999 Traffic Report	Port to Twin Island Lakes area
	Point Mackenzie	Min. Arterial	350	71	421	MSB 1999 Traffic Report	Twin island lakes to 90 degree corner (s of Burma)
	Houston Corridor	Min. Arterial	175	n/a	175	n/a	90 degree corner to Parks Hyw (Houston area)
Existing Roads	Point Mackenzie	Min. Arterial	531	54	585	MSB 1999 Traffic Report	Port to Twin Island Lakes area
	Point Mackenzie	Min. Arterial	350	71	421	MSB 1999 Traffic Report	Twin island lakes to 90 degree corner (s of Burma)
	Point Mackenzie	Min. Arterial	300	704	1,004	MSB 1999 Traffic Report	90 degree corner to KGB intersection
	Knik Goose Bay	Min. Arterial	225	1,510	1,735	ATVR	PT Mac intersection to Settlers Bay
	Knik Goose Bay	Min. Arterial	150	4,805	4,955	ATVR	Settlers Bay to Vine
	Knik Goose Bay	Min. Arterial	75	5,009	5,084	ATVR	Vine to Fairview Loop
	Knik Goose Bay	Min. Arterial	50	9,855	9,905	ATVR	Fairview Loop to Parks intersection

[2] See Case I - Commodities Calculations

Assumptions

* Traffic volume assumes 2003 condition
Vehicle trips to port based in part by tonnages provided in NEI report (September 2002)
Port ADT is based on commodity flows and employees of port businesses
2003 Baseline ADT is derived from the Annual Traffic Volume Report - Central Region - 2001 by Alaska Department of Transportation & Public Facilities and MSB 1999 Traffic report

EXPECTED TRAFFIC VOLUME - CASE II*

INCLUDES BRIDGE CONNECTION AND PORT FACILITIES
EXCLUDES FERRY TRANSPORT

ROUTE	EXISTING ROAD	TYPE	PROPOSED ADT	PROPOSED PORT ADT	INITIAL REDIRECTED ADT	2020 BASELINE ADT	TOTAL ADT	BASELINE SOURCE	NOTES
Big Lake Corridor	Point Mackenzie	Min. Arterial	15,856	531	5,682	64	22,133	MSB 1999 Traffic Report	Port to Twin Island Lakes area
	Point Mackenzie	Min. Arterial	17,200	350	4,000	85	21,635	MSB 1999 Traffic Report	Twin island lakes to 90 degree corner (s of Burma)
	Burma	Min. Arterial	7,940	300	3,300	213	11,753	MSB 1999 Traffic Report	90 degree corner end of Big Lake road
	Big Lake Rd	Min. Arterial	6,200	200	2,600	1,087	10,087	ATVR	south of campground
	Big Lake Rd	Min. Arterial	4,500	175	2,400	2,579	9,654	ATVR	campground to Hollywood
	Big Lake Rd	Min. Arterial	2,920	150	2,200	4,603	9,873	ATVR	Hollywood to Parks Highway intersection
Houston Corridor	Point Mackenzie	Min. Arterial	15,336	531	3,079	64	19,010	MSB 1999 Traffic Report	Port to Twin Island Lakes area
	Point Mackenzie	Min. Arterial	16,840	350	2,200	85	19,475	MSB 1999 Traffic Report	Twin island lakes to 90 degree corner (s of Burma)
	Houston Corridor	Min. Arterial	2,440	175	1,800	n/a	4,415	n/a	90 degree corner to Parks Hyw (Houston area)
Existing Roads	Point Mackenzie	Min. Arterial	14,851	531	654	64	16,100	MSB 1999 Traffic Report	Port to Twin Island Lakes area
	Point Mackenzie	Min. Arterial	16,520	350	600	85	17,555	MSB 1999 Traffic Report	Twin island lakes to 90 degree corner (s of Burma)
	Point Mackenzie	Min. Arterial	1,225	300	525	834	2,884	MSB 1999 Traffic Report	90 degree corner to KGB intersection
	Knik Goose Bay	Min. Arterial	934	225	400	1,788	3,347	ATVR	PT Mac intersection to Settlers Bay
	Knik Goose Bay	Min. Arterial	656	150	350	5,690	6,846	ATVR	Settlers Bay to Vine
	Knik Goose Bay	Min. Arterial	500	75	300	5,932	6,807	ATVR	Vine to Fairview Loop
	Knik Goose Bay	Min. Arterial	370	50	250	11,671	12,341	ATVR	Fairview Loop to Parks intersection

Assumptions

* Traffic volume assumes 2020 condition
Proposed ADT derived from report - "Knik Arm Crossing - Draft Corridor Alternative Analysis"
dated August 31, 1984
Proposed ADT from KAC report uses the Downtown Mid-Range Corridor values & based on 20 years after bridge opening
2020 Baseline ADT is derived from the Annual Traffic Volume Report - Central Region - 2001 by Alaska Department of Transportation & Public Facilities
and MSB 1999 Traffic report

EXPECTED TRAFFIC VOLUME - CASE II*

INCLUDES FERRY TRANSPORT AND PORT FACILITIES
EXCLUDES BRIDGE CONNECTION

ROUTE	EXISTING ROAD	TYPE	PROPOSED PORT ADT[2]	PROPOSED FERRY ADT[3]	2020 BASELINE ADT	TOTAL ADT	BASELINE SOURCE	NOTES
Big Lake Corridor	Point Mackenzie	Min. Arterial	198	2,108	64	2,370	MSB 1999 Traffic Report	Port to Twin Island Lakes area
	Point Mackenzie	Min. Arterial	130	1,700	85	1,915	MSB 1999 Traffic Report	Twin island lakes to 90 degree corner (s of Burma)
	Burma	Min. Arterial	100	900	213	1,213	MSB 1999 Traffic Report	90 degree corner to end of Big Lake
	Big Lake Rd	Min. Arterial	75	600	1,087	1,762	ATVR	south of campground
	Big Lake Rd	Min. Arterial	60	500	2,579	3,139	ATVR	campground to Hollywood
	Big Lake Rd	Min. Arterial	50	400	4,603	5,053	ATVR	Hollywood to Parks Highway intersection
Houston Corridor	Point Mackenzie	Min. Arterial	198	2,108	64	2,370	MSB 1999 Traffic Report	Port to Twin Island Lakes area
	Point Mackenzie	Min. Arterial	130	1,700	85	1,915	MSB 1999 Traffic Report	Twin island lakes to 90 degree corner (s of Burma)
	Houston Corridor	Min. Arterial	50	400	n/a	450	n/a	90 degree corner to Parks Hyw (Houston area)
Existing Roads	Point Mackenzie	Min. Arterial	198	2,108	64	2,370	MSB 1999 Traffic Report	Port to Twin Island Lakes area
	Point Mackenzie	Min. Arterial	130	1,700	85	1,915	MSB 1999 Traffic Report	Twin island lakes to 90 degree corner (s of Burma)
	Point Mackenzie	Min. Arterial	100	1,350	834	2,284	MSB 1999 Traffic Report	90 degree corner to KGB intersection
	Knik Goose Bay	Min. Arterial	80	900	1,788	2,768	ATVR	PT Mac intersection to Settlers Bay
	Knik Goose Bay	Min. Arterial	60	600	5,690	6,350	ATVR	Settlers Bay to Vine
	Knik Goose Bay	Min. Arterial	50	400	5,932	6,382	ATVR	Vine to Fairview Loop
	Knik Goose Bay	Min. Arterial	40	200	11,671	11,911	ATVR	Fairview Loop to Parks intersection

[2] See Case II - Commodities Calculations

[3] See Case II - Ferry Calculations

Assumptions

* Traffic volume assumes 2020 condition
Vehicle trips to port based in part by tonnages provided in NEI report (September 2002)
Ferry contributes an assumed value of 75 cars per hour for 14 hours
Port ADT is based on commodity flows and employees of port businesses
Ferry ADT is based on commuters and non-regular users
2020 Baseline ADT is derived from the Annual Traffic Volume Report - Central Region - 2001 by Alaska Department of Transportation & Public Facilities and MSB 1999 Traffic report

EXPECTED TRAFFIC VOLUME - CASE II*

INCLUDES PORT FACILITIES
EXCLUDES BRIDGE CONNECTION AND FERRY SERVICES

ROUTE	EXISTING ROAD	TYPE	PROPOSED PORT ADT[2]	2020 BASELINE ADT	TOTAL ADT	BASELINE SOURCE	NOTES
Big Lake Corridor	Point Mackenzie	Min. Arterial	198	64	262	MSB 1999 Traffic Report	Port to Twin Island Lakes area
	Point Mackenzie	Min. Arterial	130	85	215	MSB 1999 Traffic Report	Twin island lakes to 90 degree corner (s of Burma)
	Burma	Min. Arterial	100	213	313	MSB 1999 Traffic Report	90 degree corner to Burma
	Big Lake Rd	Min. Arterial	75	1,087	1,162	ATVR	south of campground
	Big Lake Rd	Min. Arterial	60	2,579	2,639	ATVR	campground to Hollywood
	Big Lake Rd	Min. Arterial	50	4,603	4,653	ATVR	Hollywood to Parks Highway intersection
Houston Corridor	Point Mackenzie	Min. Arterial	198		198	MSB 1999 Traffic Report	Port to Twin Island Lakes area
	Point Mackenzie	Min. Arterial	130	64	194	MSB 1999 Traffic Report	Twin island lakes to 90 degree corner (s of Burma)
	Houston Corridor	Min. Arterial	50	85	50	n/a	90 degree corner to Parks Hyw (Houston area)
				n/a			
Existing Roads	Point Mackenzie	Min. Arterial	198		198	MSB 1999 Traffic Report	Port to Twin Island Lakes area
	Point Mackenzie	Min. Arterial	130	64	194	MSB 1999 Traffic Report	Twin island lakes to 90 degree corner (s of Burma)
	Point Mackenzie	Min. Arterial	100	85	185	MSB 1999 Traffic Report	90 degree corner to KGB intersection
	Knik Goose Bay	Min. Arterial	80	834	914	ATVR	PT Mac intersection to Settlers Bay
	Knik Goose Bay	Min. Arterial	60	1,788	1,848	ATVR	Settlers Bay to Vine
	Knik Goose Bay	Min. Arterial	50	5,690	5,740	ATVR	Vine to Fairview Loop
	Knik Goose Bay	Min. Arterial	40	5,932	5,972	ATVR	Fairview Loop to Parks intersection

[2] See Case I - Commodities Calculations

Assumptions

* Traffic volume assumes 2020 condition
Vehicle trips to port based in part by tonnages provided in NEI report (September 2002)
Port ADT is based on commodity flows and employees of port businesses
2020 Baseline ADT is derived from the Annual Traffic Volume Report - Central Region - 2001 by Alaska Department of Transportation & Public Facilities and MSB 1999 Traffic report

APPENDIX B

TRAFFIC VOLUME
BASED ON BULK COMMODITY FLOW
AND PORT COMMUTERS

SUMMARY SHEET

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CASE I

	TRAIN	VEHICLE		
		Trucks (per/day)	Commuters (per/day)	**TOTAL** (trips/day)
Wood Products	n/a	54	12	**66**
Gravel Products	n/a	22	8	**30**
Manufactured Homes	n/a	14	22	**36**
Ferry Transport	n/a	see note[1]	1056	**1056**
Petroleum Products	n/a	n/a	n/a	n/a
TOTAL (Trips/day)		**90**	**1098**	

CASE II

	TRAIN	VEHICLE		
	Cars (loads)	Trucks (per/day)	Commuters (per/day)	**TOTAL** (trips/day)
Wood Products	(per/week) 187	111	32	**143**
Gravel Products	(per/mo) 6	11	12	**23**
Manufactured Homes	n/a	14	45	**59**
Ferry Transport	n/a	see note[1]	2108	**2108**
Petroleum Products	(per/day) 96	n/a	14	
TOTAL (Trips/day)		**136**	**2211**	

Notes:

1 Calculations account for passenger cars. To account for any trucks, the commuter counts would have to be converted to truck counts

CASE I - Occurs within 1 to 5 years of 2003
CASE II - End of study timeline, year 2020

Prepared by Tryck Nyman Hayes, Inc.
for the Matanuska Susitna Borough

CASE I

WOOD PRODUCTS - TONNAGE

Given: 200,000 green tons/yr based on revised memo by NEI dated 12/30/02

ASSUMPTIONS:

1.) Wood is transported via chip trucks only
2.) Total weight is 40% softwood (spruce) and 60% hardwoods (birch)
4.) Work week is 5 days a week at 10 hour days
5.) Truckloads are 30 tons
6.) Trips per day are considered on a round trip basis
7.) Port employees for wood product operation range from 4 to 10

CALCULATIONS:

KEY	
/	divide
x	multiply

1.) Softwood-

trips per day

	value	units	factor	value	units		total	units
	80,000	tons/yr	/	12	month/year		6667	tons/mo
.=>	6667	tons/mo	/	4.33	weeks/mo		1540	tons/week
.=>	1540	tons/week	/	5	days/work week		308	tons/day
.=>	308	tons/day	/	30	tons/load		10	load/day
.=>	10	load/day	x	2	trips/load		**22**	**trips/day**

2.) Hardwood-

trips per day

	value	units	factor	value	units		total	units
	120,000	tons/yr	/	12	month/year		10000	tons/mo
.=>	10000	tons/mo	/	4.33	weeks/mo		2309	tons/week
.=>	2309	tons/week	/	5	days/work week		462	tons/day
.=>	462	tons/day	/	30	tons/load		15	load/day
.=>	15	load/day	x	2	trips/load		**32**	**trips/day**

3.) Commuter (employee) trips to Port

assume an average of 6 employees per day
trip factor is 2
Total trips per day **12**

4.) Total vehicle trips per day

Truck trips	54
Commuters (employees)	12
Total trips per day	**66**

CASE I

WOOD PRODUCTS - CUBIC YARDS

Given: 200,000 green tons/yr based on revised memo by NEI dated 12/30/02

ASSUMPTIONS:

1.) Wood is transported via chip trucks only - estimated volume is 170 CY per spuce wood load and 105 CY per birch load. (given a max of 30 tons per load)
2.) Total weight is 40% softwood (spruce) and 60% hardwoods (birch)
3.) Specific gravity (oven dried) is 0.55 - hardwood and 0.37 - softwood
4.) Specific gravity is (green weight) 0.88 - hardwood and 0.53 - softwood
5.) expansion factor from solid wood to chips is 2.6
6.) Work week is 5 days a week at 10 hour days
7.) Trips per day are considered on a round trip basis
8.) Port employees for wood product operation range from 4 to 10

CALCULATIONS:

KEY
/ divide
x multiply

1.) Softwood-

		value	units	factor	value	units		total	units
volumetric weight		0.53		x	62.4	lb/cuft		33.1	lb/cuft
		33.1	lb/cuft	/	2.6	(factor)		12.7	lb/cuft
	.=>	12.7	lb/cuft	x	27	cuft/cuyd		343.4	lb/cuyd
	.=>	343.4	lb/cuyd	/	2000	lb/ton		**0.17**	**ton/cuyd**
volume per year		80,000	tons/year	/	0.17	ton/cuyd		**465,875**	**cuyd/yr**
trips per day		465,875	cuyd/yr	/	12	month/year		38823	cuyd/mo
	.=>	38823	cuyd/mo	/	4.33	weeks/mo		8966	cuyd/week
	.=>	8966	cuyd/week	/	5	days/work week		1793	cuyds/day
	.=>	1793	cuyds/day	/	170	cuyd/trips		11	load/day
	.=>	11	load/day	x	2	trips/load		**22**	**trips/day**

2.) Hardwood-

		value	units	factor	value	units		total	units
volumetric weight		0.88		x	62.4	lb/cuft		54.9	lb/cuft
		54.9	lb/cuft	/	2.6	(factor)		21.1	lb/cuft
	.=>	21.1	lb/cuft	x	27	cuft/cuyd		570.2	lb/cuyd
	.=>	570.2	lb/cuyd	/	2000	lb/ton		**0.29**	**ton/cuyd**
volume per year		120,000	tons/year	/	0.29	ton/cuyd		**420,875**	**cuyd/yr**
trips per day		420,875	cuyd/yr	/	12	month/year		35073	cuyd/mo
	.=>	35073	cuyd/mo	/	4.33	weeks/mo		8100	cuyd/week
	.=>	8100	cuyd/week	/	5	days/work week		1620	cuyds/day
	.=>	1620	cuyds/day	/	105	cuyd/trips		15	load/day
	.=>	15	load/day	x	2	trips/load		**32**	**trips/day**

3.) Commuter (employee) trips to Port

assume an average of 6 employees per day
trip factor is 2
Total trips per day 12

4.) Total vehicle trips per day

Truck trips	54
Commuters (employees)	12
Total trips per day	**66**

CASE I

GRAVEL PRODUCTS

Given: 40,000 tons/year based on high level of development

ASSUMPTIONS:

1.) Gravel is transported via trucks only
2.) Conversion factor is 2 ton/per cuyard of gravel
3.) Work week is 5 days a week at 10 hour days
4.) Truckloads are 14 cubic yards
5.) Port employees for gravel products range from 2 to 5
6.) Trips per day are considered on a round trip basis

CALCULATIONS:

KEY	
/	divide
x	multiply

1.) Truck trips to Port

		value	units	factor	value	units		total	units
volumetric weight		40,000	ton/yr	/	2	tons/cuyd		20,000	cuyd/yr
trips per day		20,000	cuyd/yr	/	6	month/year		3333	cuyd/mo
	.=>	3333	cuyd/mo	/	4.33	weeks/mo		770	cuyd/week
	.=>	770	cuyd/week	/	5	days/work week		154	cuyds/day
	.=>	154	cuyds/day	/	14	cuyd/load		11	load/day
	.=>	11	load/day	x	2	trips/load		**22**	**trips/day**

2.) Commuter (employee) trips to Port

assume an average of 4 employees per day
trip factor is 2
Total trips per day 8

3.) Total vehicle trips per day

Truck trips	22
Commuters (employees)	8
Total trips per day	**30**

CASE I

MANUFACTURED HOMES

Given: Construction of 98 homes per year

ASSUMPTIONS:

1.) Work week is 6 days a week at 12 hour days
2.) Half of work force commutes beyond Point Mackenzie and half lives onsite or within 2 miles of Port
3.) 22 full-time employees - based on NEI report September 2002
4.) Supplies and materials for home manufacturing are transported via truck and/or car
5.) Trips per day are considered on a round trip basis

CALCULATIONS:

1.) Commuter (employee) trips to Port

total employees	22
factor of commuters (beyond port area)	0.5
round trip factor	2
Total commuter trips	**22**

2.) Supply trucks to Port

Assume 3 trucks a day	
Assume 4 cars a day	
round trip factor is 2	
Total supply trips	**14**

3.) Total vehicle trips per day

Commuters	22
Supply Vehicles	14
Total trips per day	**36**

CASE I

FERRY TRANSPORT

Given: Ferry capacity is 50 passenger cars or equivalent trucks

ASSUMPTIONS:

1.) Ferry would make 1.5 trips per hour between Port of Anchorage and Port MacKenzie
2.) Toll would be charged per each way of travel
3.) Work week is 7 days a week for 14 hours
4.) Port employees range from 2 to 5
5.) Ferry users would ride on a round trip basis
6.) Initial use would be at half capacity

CALCULATIONS:

1.) trips per day

	value	units	factor	value	units		total	units
	50	cars/load	x	0.5	reduction		25.0	cars/load
.=>	25.0	cars/load	x	1.5	load/hour		37.5	cars/hour
.=>	37.5	cars/hour	x	14	hours/day		525.00	cars/day
.=>	525.00	cars/day	x	2	roundtrip		**1050**	**trips/day**

2.) Commuter (employee) trips to Port

assume an average of 3 employees per day
trip factor is 2

Total trips per day 6

3.) Total vehicle trips per day

Truck trips	1050
Commuters (employees)	6
Total trips per day	**1056**

CASE II

WOOD PRODUCTS - TONNAGE

Given: 400,000 green tons/yr based on revised memo by NEI dated 12/30/02

ASSUMPTIONS:

1.) Wood is transported via chip trucks (25%) and railroad cars (75%)
2.) Total weight is 40% softwood (spruce) and 60% hardwoods (birch)
3.) Work week is 5 days a week at 10 hour days
4.) Train cars (Hoppers) carry 137 cubic yards max - corresponds to 23.5 tons/car (hardwood) or 39 tons/car (softwood)
5.) Truckloads are 30 tons
6.) Trips per day are considered on a round trip basis
7.) Port employees range from 4 to 10
8.) Max train length equals 80 cars

CALCULATIONS:

KEY	
/	divide
x	multiply

TRUCK TRANSPORTATION

Softwood weight = 40,000 tons
Hardwood weight = 60,000 tons
Total weight = 100,000 tons

1.) Softwood-

		value	units	factor	value	units		total	units
trips per day		40,000	tons/yr	/	12	month/year		3333	tons/mo
	.=>	3333	tons/mo	/	4.33	weeks/mo		770	tons/week
	.=>	770	tons/week	/	5	days/work week		154	tons/day
	.=>	154	tons/day	/	30	tons/load		5	load/day
	.=>	5	load/day	x	2	trips/load		**12**	**trips/day**

2.) Hardwood-

		value	units	factor	value	units		total	units
trips per day		60,000	tons/yr	/	12	month/year		5000	tons/mo
	.=>	5000	tons/mo	/	4.33	weeks/mo		1155	tons/week
	.=>	1155	tons/week	/	5	days/work week		231	tons/day
	.=>	231	tons/day	/	30	tons/load		8	load/day
	.=>	8	load/day	x	2	trips/load		**16**	**trips/day**

TRAIN TRANSPORTATION

Softwood weight = 120,000 tons
Hardwood weight = 180,000 tons
Total weight = 300,000 tons

1.) Softwood-

trips per day

	value	units	factor	value	units		total	units
	120,000	tons/yr	/	12	month/year		10000	tons/mo
.=>	10000	tons/mo	/	4.33	weeks/mo		2309	tons/week
.=>	2309	tons/week	/	5	days/work week		462	tons/day
.=>	462	tons/day	/	23.5	tons/car load		19.7	car load/day

2.) Hardwood-

trips per day

	value	units	factor	value	units		total	units
	180,000	tons/yr	/	12	month/year		15000	tons/mo
.=>	15000	tons/mo	/	4.33	weeks/mo		3464	tons/week
.=>	3464	tons/week	/	5	days/work week		693	tons/day
.=>	693	tons/day	/	39	tons/car load		18	car load/day

3.) Commuter (employee) trips to Port

assume an average of 6 employees per day
trip factor is 2

Total trips per day 12

4.) Total vehicle trips per day

Truck trips	20
Commuters (employees)	12
Total trips per day	**32**

5.) Total carloads per week

softwood	20
hardwood	18
Total carloads per day	37
Total carloads per week (37x5)	187
Total trains per week (187/80)	**2.3**

CASE II

WOOD PRODUCTS - CUBIC YARDS

Given: 400,000 green tons/yr based on revised memo by NEI dated 12/30/02

ASSUMPTIONS:

1.) Wood is transported via chip trucks - estimated volume is 170 CY per spuce wood load and 105 CY per birch load. (given a max of 30 tons per load)
2.) Wood is transported via railroad car (hopper)
3.) Total weight is 40% softwood (spruce) and 60% hardwoods (birch)
4.) Specific gravity (oven dried) is 0.55 - hardwood and 0.37 - softwood
5.) Specific gravity is (green weight) 0.88 - hardwood and 0.53 - softwood
6.) expansion factor from solid wood to chips is 2.6
7.) Work week is 5 days a week at 10 hour days
8.) Trips per day are considered on a round trip basis
9.) Port employees range from 4 to 10
10.) Train cars (Hoppers) are considered 137 cubic yards (11,000 cubic yards per trainload)
11.) 80 cars (Hoppers) per train.

CALCULATIONS:

KEY
/ divide
x multiply

1.) TRUCK TRANSPORTATION

Softwood weight = 40,000 tons
Hardwood weight = 60,000 tons
Total weight = 100,000 tons

Softwood-

		value	units	factor	value	units		total	units
volumetric weight		0.53		x	62.4	lb/cuft		33.1	lb/cuft
		33.1	lb/cuft	/	2.6	(factor)		12.7	lb/cuft
	.=>	12.7	lb/cuft	x	27	cuft/cuyd		343.4	lb/cuyd
	.=>	343.4	lb/cuyd	/	2000	lb/ton		**0.17**	**ton/cuyd**
volume per year		40,000	tons/year	/	0.17	ton/cuyd		**232,937**	**cuyd/yr**
trips per day		232,937	cuyd/yr	/	12	month/year		19411	cuyd/mo
	.=>	19411	cuyd/mo	/	4.33	weeks/mo		4483	cuyd/week
	.=>	4483	cuyd/week	/	5	days/work week		897	cuyds/day
	.=>	897	cuyds/day	/	170	cuyd/trips		5	load/day
	.=>	5	load/day	x	2	trips/load		**11**	**trips/day**

Hardwood-

		value	units	factor	value	units		total	units
volumetric weight		0.88		x	62.4	lb/cuft		55.0	lb/cuft
		55.0	lb/cuft	/	2.6	(factor)		21.2	lb/cuft
	.=>	21.2	lb/cuft	x	27	cuft/cuyd		571.1	lb/cuyd
	.=>	571.1	lb/cuyd	/	2000	lb/ton		**0.29**	**ton/cuyd**
volume per year		240,000	tons/year	/	0.29	ton/cuyd		**840,414**	**cuyd/yr**
trips per day		840,414	cuyd/yr	/	12	month/year		70034	cuyd/mo
	.=>	70034	cuyd/mo	/	4.33	weeks/mo		16174	cuyd/week

.=>	16174	cuyd/week	/	5	days/work week		3235	cuyds/day
.=>	3235	cuyds/day	/	105	cuyd/trips		31	load/day
.=>	31	load/day	x	2	trips/load		**62**	**trips/day**

2.) TRAIN TRANSPORTATION

Softwood weight = 120,000 tons
Hardwood weight = 180,000 tons
Total weight = 300,000 tons

Softwood-

	value	units	factor	value	units		total	units
volumetric weight	0.53		x	62.4	lb/cuft		33.1	lb/cuft
	33.1	lb/cuft	/	2.6	(factor)		12.7	lb/cuft
.=>	12.7	lb/cuft	x	27	cuft/cuyd		343.4	lb/cuyd
.=>	343.4	lb/cuyd	/	2000	lb/ton		**0.17**	**ton/cuyd**
volume per year	120,000	tons/year	/	0.17	ton/cuyd		**698,812**	**cuyd/yr**
trips per day	698,812	cuyd/yr	/	12	month/year		58234	cuyd/mo
.=>	58234	cuyd/mo	/	4.33	weeks/mo		13449	cuyd/week
.=>	13449	cuyd/week	/	5	days/work week		2690	cuyds/day
.=>	2690	cuyds/day	/	137	cuyd/trips		**20**	**car load/day**

Hardwood-

	value	units	factor	value	units		total	units
volumetric weight	0.88		x	62.4	lb/cuft		55.0	lb/cuft
	55.0	lb/cuft	/	2.6	(factor)		21.2	lb/cuft
.=>	21.2	lb/cuft	x	27	cuft/cuyd		571.1	lb/cuyd
.=>	571.1	lb/cuyd	/	2000	lb/ton		**0.29**	**ton/cuyd**
volume per year	180,000	tons/year	/	0.29	ton/cuyd		**630,310**	**cuyd/yr**
trips per day	630,310	cuyd/yr	/	12	month/year		52526	cuyd/mo
.=>	52526	cuyd/mo	/	4.33	weeks/mo		12131	cuyd/week
.=>	12131	cuyd/week	/	5	days/work week		2426	cuyds/day
.=>	2426	cuyds/day	/	137	cuyd/trips		**18**	**car load/day**

3.) Commuter (employee) trips to Port

assume an average of 6 employees per day
trip factor is 2
Total trips per day 12

4.) Total vehicle trips per day

Truck trips	72
Commuters (employees)	12
Total trips per day	**84**

5.) Total train loads per week

softwood	20
hardwood	18
Total loads per day	37
Total loads per week (37x5)	187
Total trains per week (187/80)	**2.3**

CASE II

GRAVEL PRODUCTS

Given: 40,000 tons/year based on high level of development

ASSUMPTIONS:

1.) Gravel products are transported 50% via trucks and 50% via train
2.) Conversion factor is 2 ton/per cuyard of gravel
3.) Work week is 5 days a week at 10 hour days for truck and 7 days a week for train
4.) Truckloads are 14 cubic yards
5.) Train car (Hoppers) are considered 137 cubic yards (11,000 cubic yards per trainload)
6.) Trips per day or per year are considered round trip
7.) Port employees for gravel products range from 2 to 4 for the Railroad and 2 to 4 for Trucking operation

CALCULATIONS:

KEY	
/	divide
x	multiply

TRUCK TRANSPORTATION

		value	units	factor	value	units		total	units
volumetric weight		20,000	ton/yr	/	2	tons/yd		10,000	cuyd/yr
trips per day		10,000	cuyd/yr	/	6	month/year		1667	cuyd/mo
	.=>	1667	cuyd/mo	/	4.33	weeks/mo		385	cuyd/week
	.=>	385	cuyd/week	/	5	days/work week		77	cuyds/day
	.=>	77	cuyds/day	/	14	cuyd/load		5.5	load/day
	.=>	5	load/day	x	2	trips/load		**11**	**trips/day**

TRAIN TRANSPORTATION

		value	units	factor	value	units		total	units
volumetric weight		20,000	ton/yr	/	2	tons/yd		10,000	cuyd/yr
trips per month		10,000	cuyd/yr	/	12	month/yr		833	cuyd/mo
	.=>	833	cuyd/mo	/	137	cuyd/car load		6	car load/mo

COMMUTER (EMPLOYEE) TRIPS

Train - assume average of 3	
Trucking - assume average of 3	
factor (round trip) 2	
Total trips per day	**12**

TOTAL VEHICLE TRIPS PER DAY

Truck trips	11
Commuters (employees)	12
Total trips per day	**23**

CASE II

MANUFACTURED HOMES

Given: Construction of 147 homes per year

ASSUMPTIONS:

1.) Work week is 6 days a week at 12 hour days
2.) Three-quarters of work force commutes beyond Port Mackenzie
3.) Up to 30 full-time employees
4.) Supplies and material for home manufacturing is transported via truck and/or car
5.) Trips per day are considered on a round trip basis

CALCULATIONS:

1.) Commuter (employee) trips to Port

total employees	30
factor of commuters	0.75
round trip factor	2
Total commuter trips	**45**

2.) Supply trucks to Port

Assume 3 trucks a day	
Assume 4 cars a day	
round trip factor is 2	
Total supply trips	**14**

3.) Total vehicle trips per day

Commuters	45
Supply Vehicles	14
Total trips per day	**59**

CASE II

FERRY TRANSPORT

Given: Ferry capacity is 50 passenger cars or equivalent trucks

ASSUMPTIONS:

1.) Ferry would make 1.5 trips per hour between Port of Anchorage and Port MacKenzie
2.) Ferry would operate 14 hours per day
3.) Toll would be charged per each way of travel
4.) Work week is 7 days a week for 14 hours
5.) Port employees range from 2 to 5
6.) Ferry users would ride on a round trip basis

CALCULATIONS:

1.) trips per day

	value	units	factor	value	units		total	units
	50	cars/load	x	1	reduction		50	cars/load
.=>	50	cars/load	x	1.5	load/hour		75	cars/hour
.=>	75	cars/hour	x	14	hours/day		1050	cars/day
.=>	1050	cars/day	x	2	roundtrip		**2100**	**trips/day**

2.) Commuter (employee) trips to Port

assume an average of 4 employees per day
trip factor is 2
Total trips per day 8

3.) Total vehicle trips per day

Truck trips	2100
Commuters (employees)	8
Total trips per day	**2108**

CASE II

PETROLEUM PRODUCTS

Given: 2,608,000 tons/year based on a high level of development

ASSUMPTIONS:

1.) Capacity of fuel cars is 22,000 gallons
2.) Work week is 7 days a week for 14 hours a day
3.) Port employees range from 5 to 10
4.) Specific gravity is 0.81 for petroleum products
5.)
6.)
7.)

CALCULATIONS:

KEY
/ divide
x multiply

TRAIN TRANSPORTATION

		value	units	factor	value	units		total	units
volumetric weight		0.81		x	62.4	lb/cuft		50.5	lb/cuft
	.=>	50.5	lb/cuft	x	0.1337	cuft/gal		6.8	lb/gal
weight per tankcar		6.8	lb/gal	x	22,000	gal/car		148,670	lb/car
	.=>	148,670	lb/car	/	2000	lb/ton		74.3	ton/car
cars per year		2,608,000	tons/year	/	74.3	ton/car		**35,084**	**cars/yr**
carloads per day		35,084	cars/yr	/	12	month/year		2924	cars/month
	.=>	2924	cars/month	/	4.33	weeks/mo		675	cars/week
	.=>	675	cars/week	/	7	days/work week		96	carloads/day

COMMUTER (EMPLOYEE) TRIPS

assume an average of 7 employees per day
trip factor is 2

Total trips per day 14

APPENDIX C

REDIRECTED CORRIDOR TRAFFIC VOLUME

I.) <u>PURPOSE:</u>

To determine initial redirected ADT on proposed Corridors routes

II.) <u>ASSUMPTIONS:</u>

1.) Average residential household generates 10 vehicle trips/day
2.) Average commuter from residence is 3 vehicle trips/day
3.) Remaining 7 vehicle trips/day are services, entertainment, medical, shopping, etc
4.) At least 1 additional vehicle trip/day travels to Anchorage for other reasons
5.) A total of 4 vehicle trips per day travel to Anchorage
6.) Opening year of KAC is 2012

III.) <u>2001 ADT</u>

A.) Proportion of Contributing traffic

Area	2001 ADT	Subtraction of contributing ADT	Percent of traffic Anchorage bound/depart	Anchorage bound/depart	Notes
Parks - North of Willow	2664	n/a	50	1332	
Parks - North of Houston	3490	1332	40	2195	
Parks - N of Big Lake Rd	5573	1332	40	3028	
Big Lake Road	3810		40	1524	Prior to Parks intersection
Knik Goose Bay Rd	1480		40	592	South of Settlers Bay Road

B.) Possible ADT for Corridor 4 & 5

Contributing Road	ADT
Parks - N of Houston	2195
KGB	592
total crossing KAC	**2787**

Possible ADT for Corridor 7

Contributing Road	ADT
Parks - N of Houston	3028
Big Lake Rd	1524
KGB	592
total crossing KAC	**5144**

Possible ADT for Corridor 10	
Contributing Road	ADT
KGB	592
total crossing KAC	**592**

III.) <u>INITIAL 2012 ADT</u>

A.) Proportion of Contributing traffic - Assume a 1% growth per year

Possible ADT for Corridor 4 & 5	
2001 ADT	2787
2003 ADT	2843
2012 ADT	3079

Possible ADT for Corridor 7	
2001 ADT	5144
2003 ADT	5247
2012 ADT	5682

Possible ADT for Corridor 10	
2001 ADT	592
2003 ADT	604
2012 ADT	654

APPENDIX D

DRIVER DECISION OF ROUTES

PROPOSED KNIK ARM CROSSING (KAC) VERSUS EXISTING GLENN HIGHWAY

I.) PURPOSE:

To determine location where drivers will travel KAC over existing Glenn Highway to downtown Anchorage

II.) ASSUMPTIONS:

1. Calculations based on distance traveled by commuter
2. Use given/proposed speed limits
3. Terminus for KAC and Glenn Highway is at New Seward intersection
4. $3 toll for KAC - one way
5. Average fuel efficiency is 20 miles/gallon
6. Fuel cost is $1.57/gallon

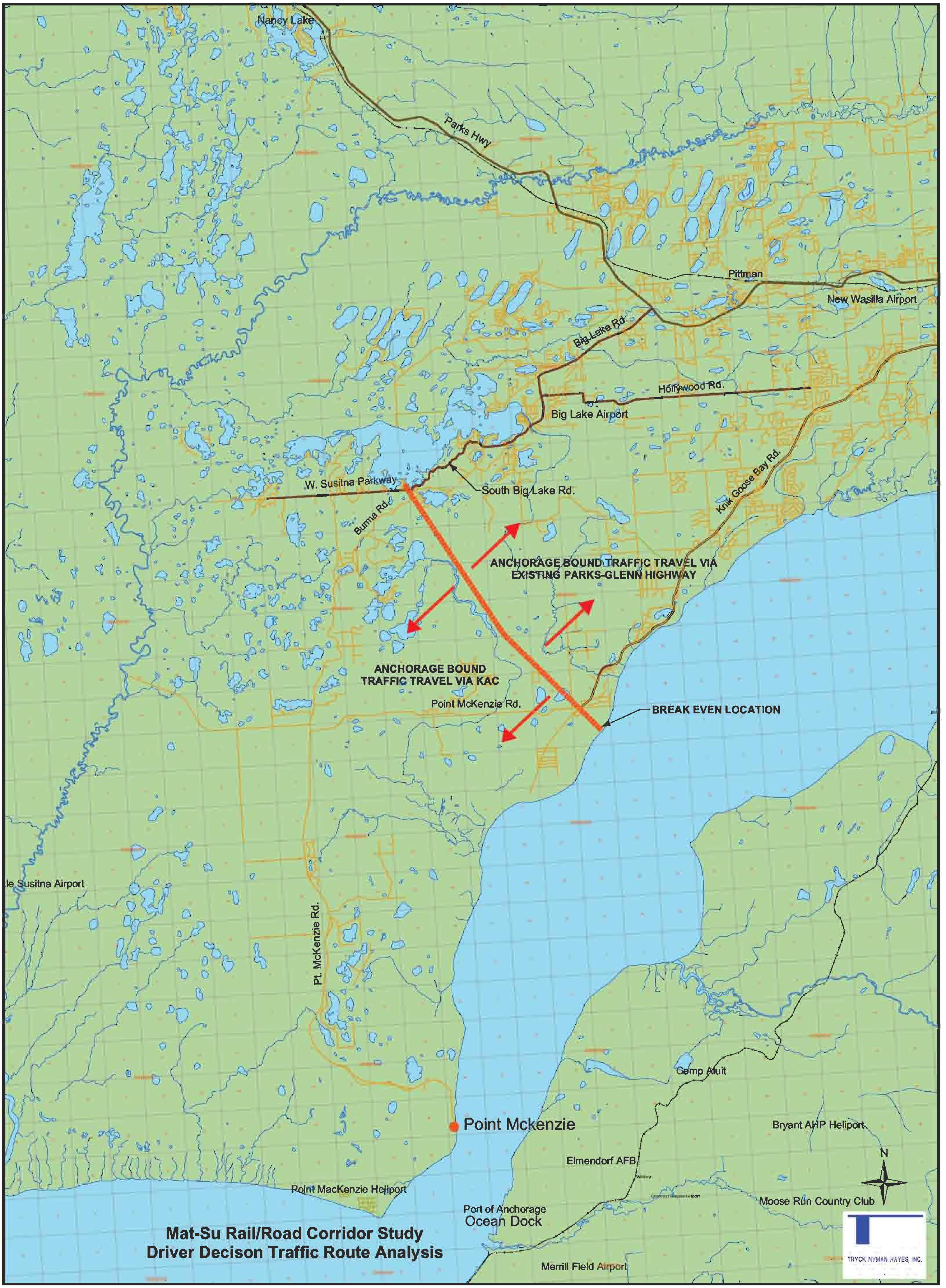
III.) DRIVER DECISION BASED ON TRAVELED MILES

If KAC toll is $3, the equal gas usage is:

Equivalent gallons used: ($3) / ($1.57/gal) = 1.9 gal
Average miles: (1.9 gal) x (20 miles/gal) = **38 miles**

IV.) ONE-WAY DISTANCES TO DOWNTOWN ANCHORAGE

Main Road	Start location	KAC		Existing Parks-Glenn Route	Difference between Routes	Break Even Location
		Miles	Corridor	Miles		
Parks	Willow (City of)	46	5	73	27	
Parks	Houston (City of)	32	5	59	27	
Parks	Houston (City of)	33	7	59	26	
Parks	Big Lake Cutoff Rd	29	7	54	25	
Parks	Pittman Rd.	32	7	50.5	18.5	
Parks	Wasilla (City of)	40	10	44	4	
KGB	Edlund St.	37.5	10	46.5	9	
KGB	Fairview Loop	36.5	10	47.5	11	
KGB	Vine Rd	34	10	50	16	
KGB	Knik Lake	27	10	57	30	
KGB	KGB/Pt. Mac.	24	10	61	37	**<<**
S. Big Lake	Hollywood Rd	25	7	58	33	
S. Big Lake	Burma Rd	22	7	61	39	**<<**


Nancy Lake
Parks Hwy
Pittman
New Wasilla Airport
Big Lake Rd.
Hollywood Rd.
Big Lake Airport
W. Susitna Parkway
South Big Lake Rd.
Burma Rd.
Knik Goose Bay Rd.
ANCHORAGE BOUND TRAFFIC TRAVEL VIA
EXISTING PARKS-GLENN HIGHWAY
ANCHORAGE BOUND
TRAFFIC TRAVEL VIA KAC
Point McKenzie Rd.
BREAK EVEN LOCATION
tle Susitna Airport
Pt. McKenzie Rd.
Camp Aluit
Point Mckenzie
Bryant AHP Heliport
Elmendorf AFB
N
Point MacKenzie Heliport
Moose Run Country Club
Port of Anchorage
Ocean Dock
Mat-Su Rail/Road Corridor Study
Driver Decison Traffic Route Analysis
TRYCK NYMAN HAYES, INC.
Merrill Field Airport

APPENDIX E

EXPECTED 2020 ADT ON CORRIDORS - KAC IMPACT

BASED ON KAC ADOT&PF 1984 KNIK ARM STUDY AND INITIAL TRAFFIC VOLUMES

Corridor	Route[4]	10 Year ADT[1]	Initial ADT[2]	2020 ADT[3]
Big Lake (Corridor 7)	23	18,400	5,682	15,856
	22	20,500	4,000	17,200
	21	9,100	3,300	7,940
	24	900	2,200	2,920
	Bridge	31,500		
Houston (Corridor 4 & Corridor 5)	23	18,400	3,079	15,336
	22	20,500	2,200	16,840
	21	9,100	2,200	7,720
	not listed	800	1,800	2,440
	bridge	31,500		
Existing Roads (Corridor 10)	23	18,400	654	14,851
	22	20,500	600	16,520
	35	1,400	525	1,225
	34	1,067	400	934
	33	733	350	656
	32	400	250	370
	bridge	31,500		

[1] Taken from the Knik Arm Crossing Study by ADOT&PF 1984

[2] Calculated values. See attached work sheet titled Redirected Corridor Traffic Volume. Assumes an opening date of 2012

[3] Interpolated values between 10-year ADT and Initial ADT

[4] See figure III-1 from the ADOT&PF 1984 Knik Arm Crossing Study

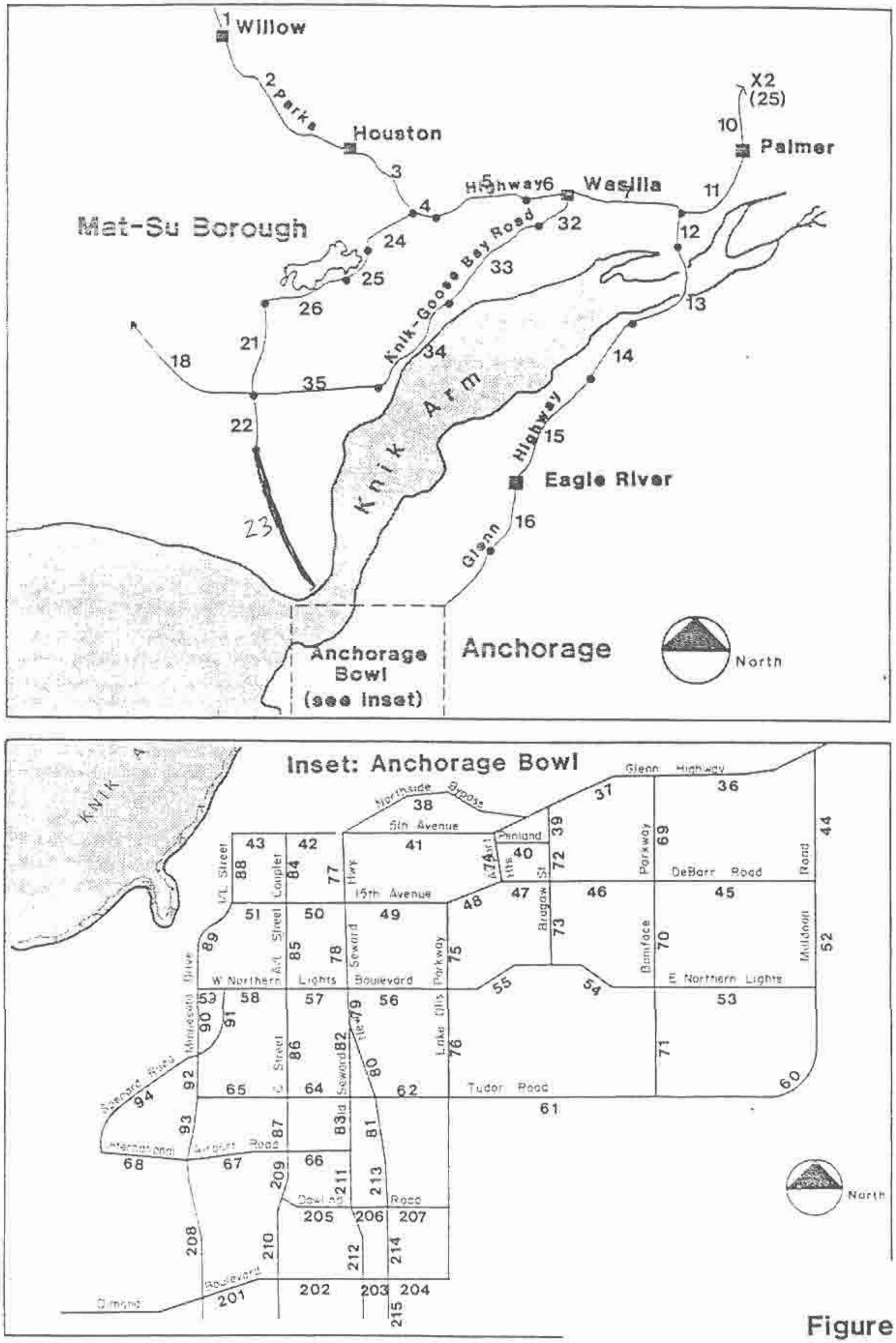
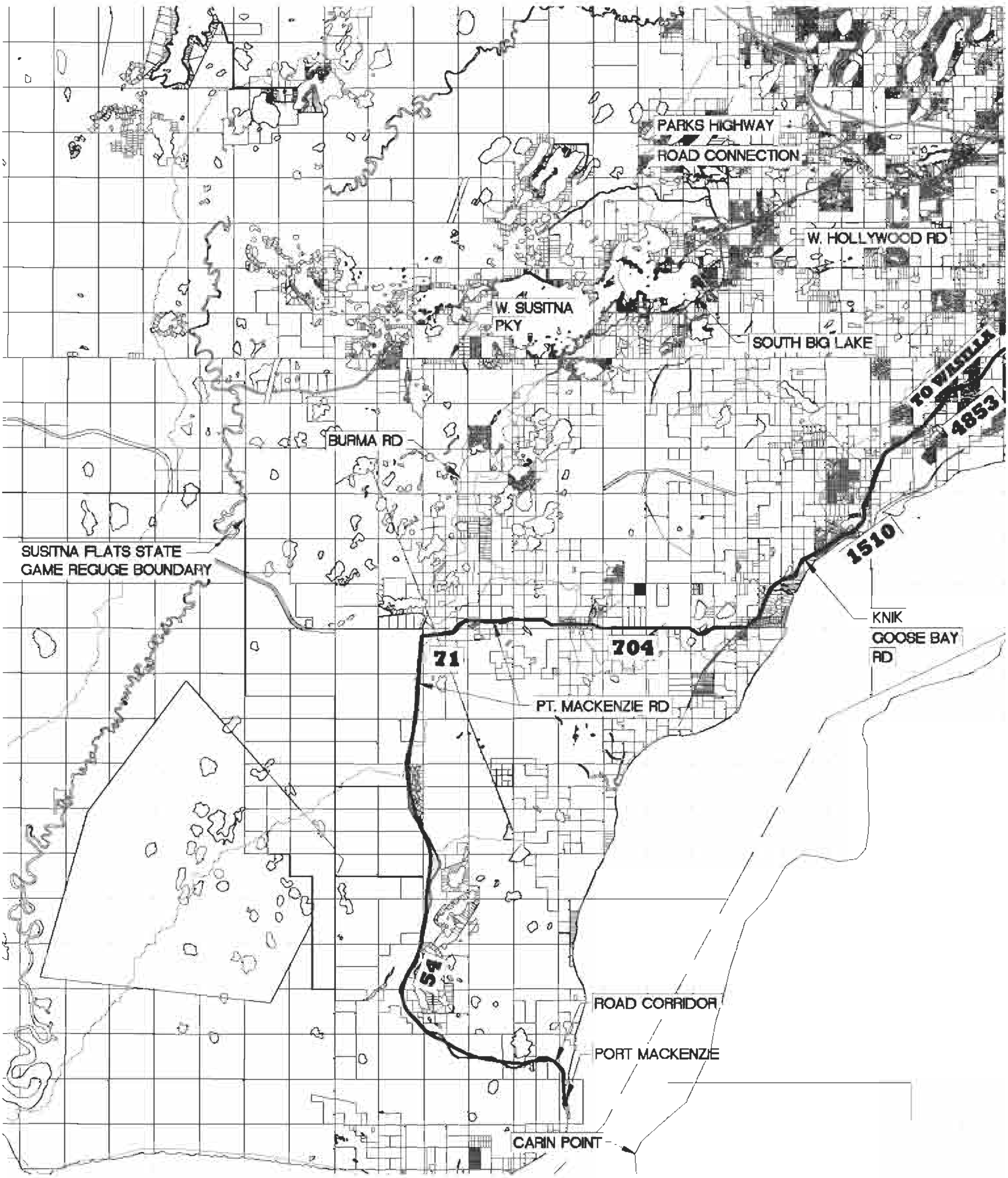


Figure III-1

Key Roadway Links

APPENDIX F



BASELINE ADT - 2020

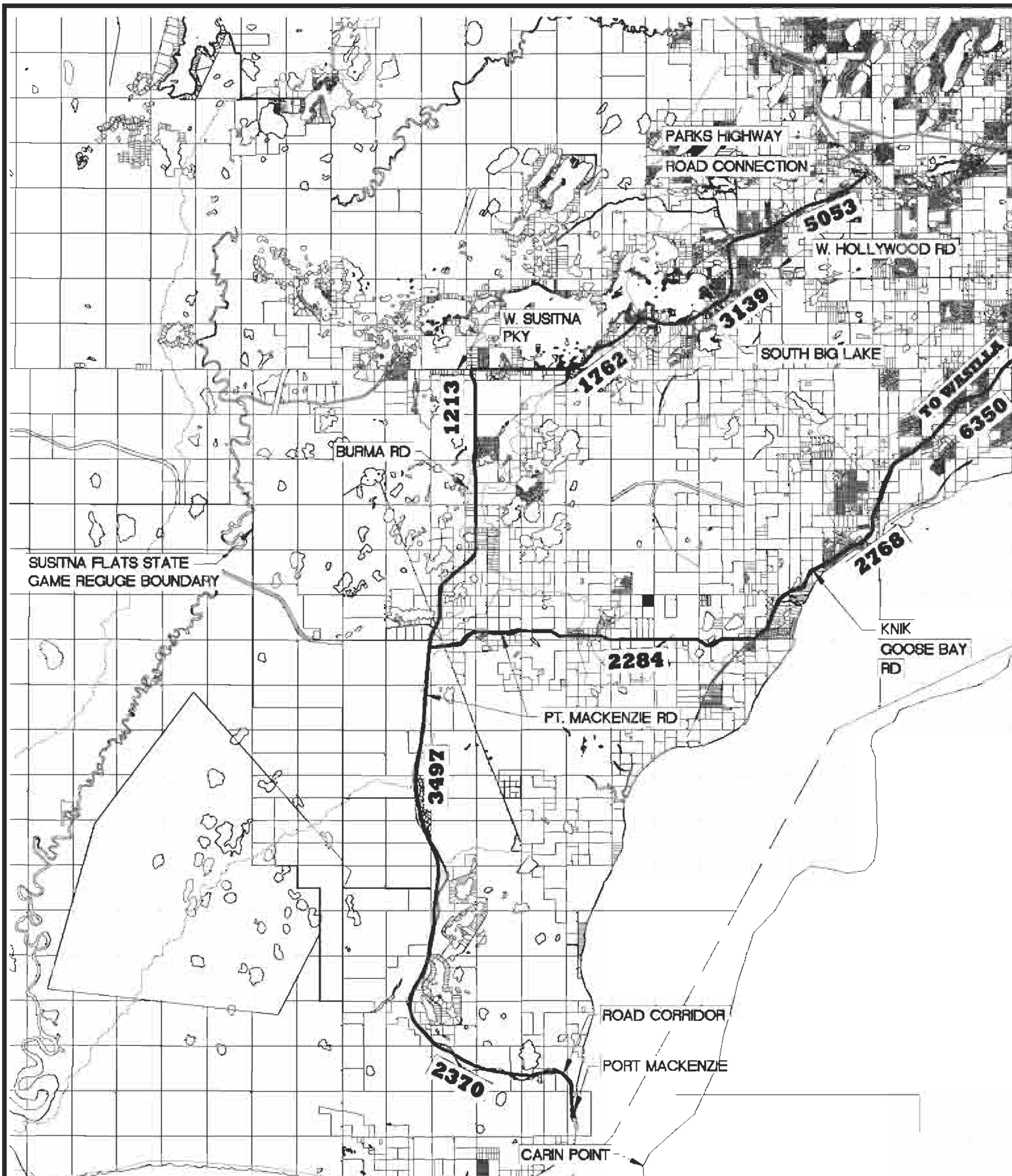
GRAPHIC SCALE
1 0 1/2 1 2
(IN MILES)
SCALE: 1"=8000'

LEGEND

PROPOSED CORRIDOR
EXISTING ROAD
1491 ADT (AVERAGE DAILY TRAFFIC)

NOTES

1. ADT BASE EXTRAPOLATED FROM 2001 ADT AND ASSUMES 1% GROWTH PER YEAR



PORT IMPROVEMENTS - 2020 ADT

GRAPHIC SCALE

1 0 1/2 1 2

(IN MILES)

SCALE: 1"=8000'

LEGEND

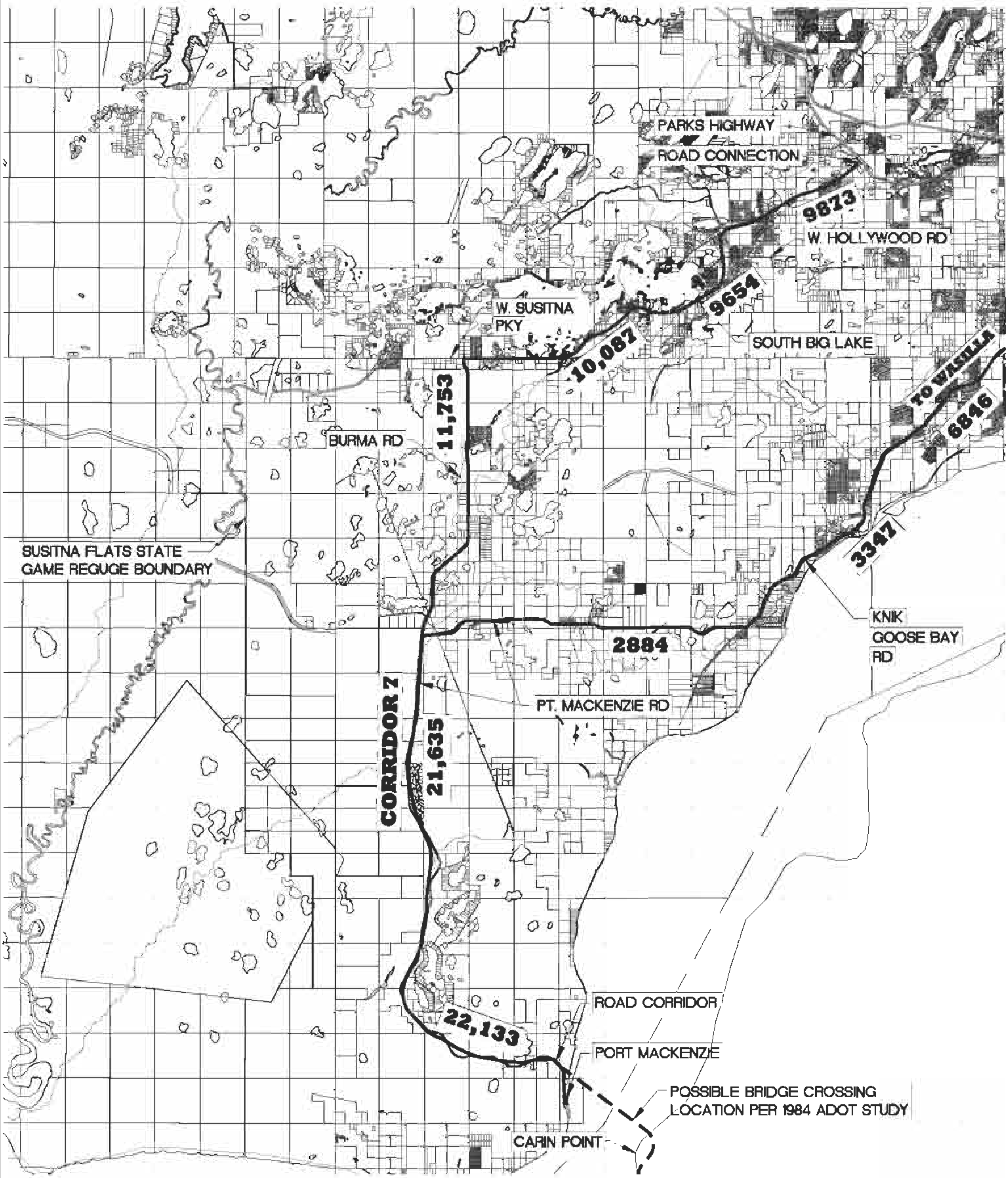
PROPOSED CORRIDOR

EXISTING ROAD

1491 ADT (AVERAGE DAILY TRAFFIC)

NOTES

1. ADT BASED ON FERRY TRANSPORT, PORT FACILITIES DEVELOPMENT AND BASELINE ADT



KAC - 2020 ADT

GRAPHIC SCALE

1 0 1/2 1 2

(IN MILES)

SCALE: 1"=8000'

LEGEND

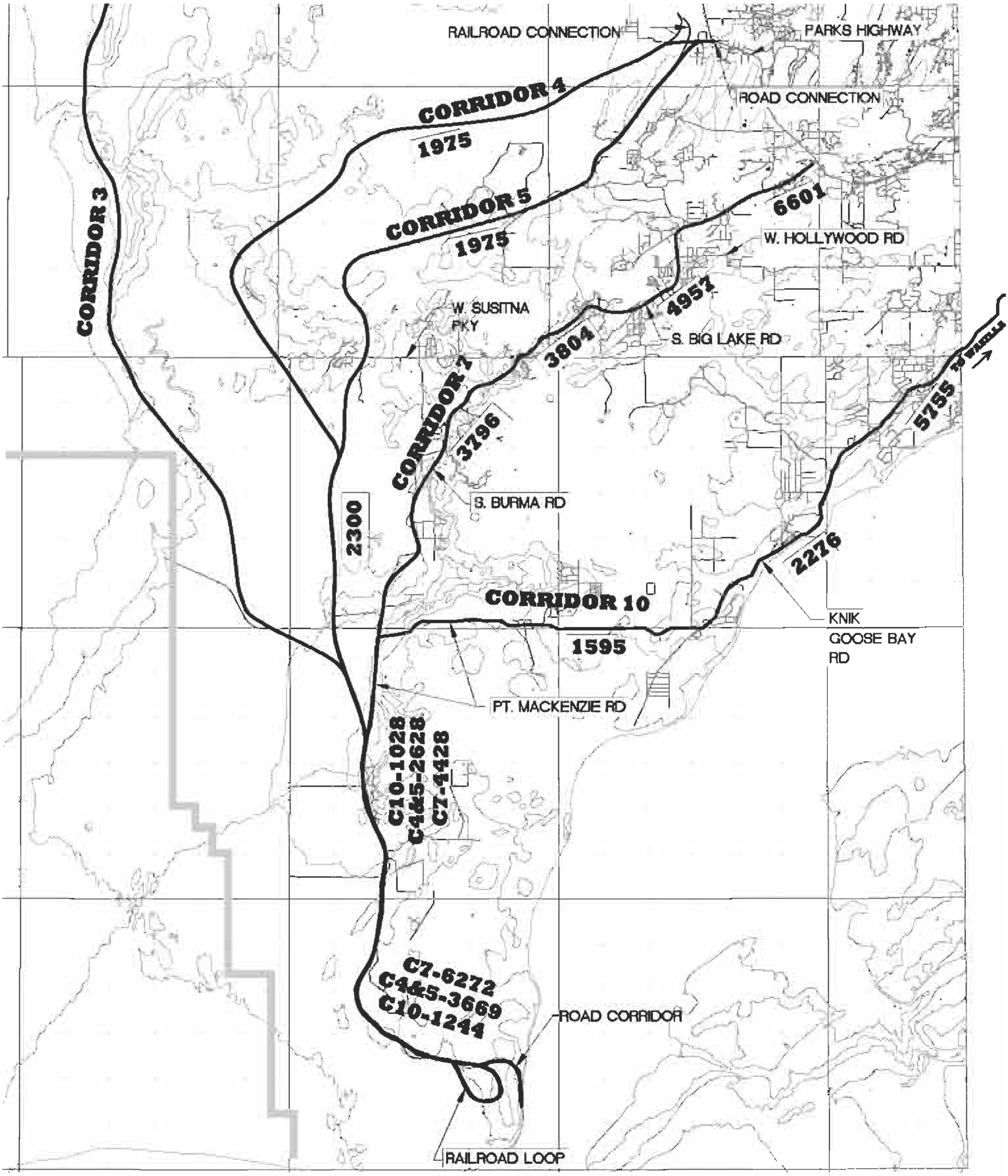
PROPOSED CORRIDOR

EXISTING ROAD

1491 ADT (AVERAGE DAILY TRAFFIC)

NOTES

1. ADT IS BASED ON ADOT EIS STUDY DATED AUGUST 31, 1984 PORT FACILITIES DEVELOPMENT, BASELINE ADT AND REDIRECTED ADT.



KAC - 2012 ADT

GRAPHIC SCALE
1 0 1/2 1 2
(IN MILES)
SCALE: 1"=8000'

LEGEND

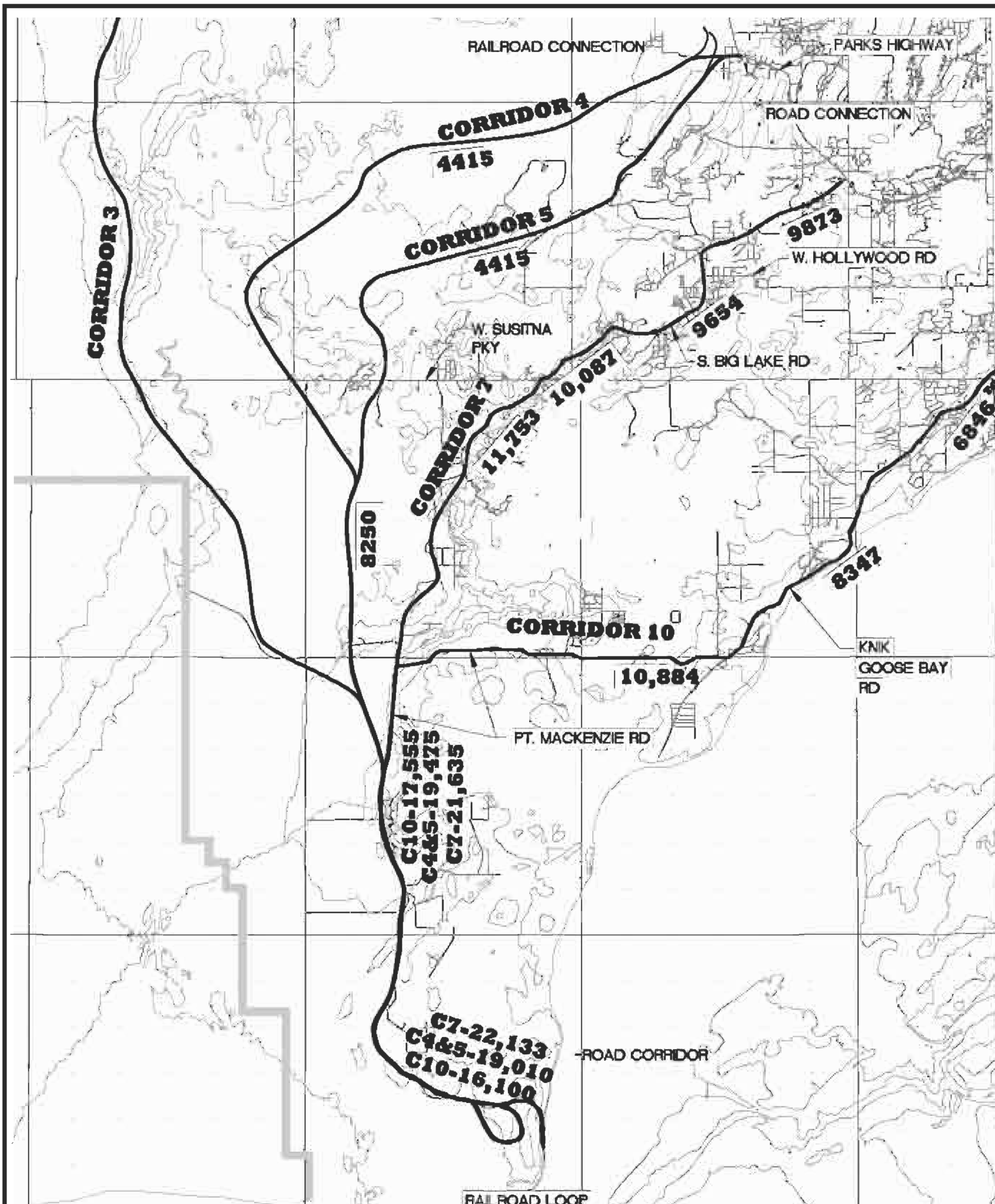
PROPOSED CORRIDOR
EXISTING ROAD
1491 ADT (AVERAGE DAILY TRAFFIC)

CORRIDOR KEY

CORRIDOR 3 - RAIL ONLY
CORRIDOR 4 - ROAD AND RAIL
CORRIDOR 5 - ROAD AND RAIL
CORRIDOR 7 - ROAD ONLY
CORRIDOR 10 - ROAD ONLY

NOTES

1. ADT IS BASED ON ADOT EIS STUDY DATED AUGUST 31, 1984
PORT FACILITIES DEVELOPMENT, BASELINE ADT AND REDIRECTED ADT.



KAC - 2020 ADT

GRAPHIC SCALE
1 0 1/2 1 2
(IN MILES)
SCALE: 1"=8000'

LEGEND

PROPOSED CORRIDOR
EXISTING ROAD
1491 ADY (AVERAGE DAILY TRAFFIC)

CORRIDOR KEY

CORRIDOR 3 - RAIL ONLY
CORRIDOR 4 - ROAD AND RAIL
CORRIDOR 5 - ROAD AND RAIL
CORRIDOR 7 - ROAD ONLY
CORRIDOR 10 - ROAD ONLY

NOTES

1. ADT IS UGUST 31, 1984
PORT FACILITIES DEVELOPMENT, BASELINE ADT AND REDIRECTED ADY.

ENGINEERS PLANNERS SURVEYORS & LANDSCAPE ARCHITECTS

APPENDIX G

Geotechnical Report

Reconnaissance Geotechnical Report
Mat-Su Rail Corridor
Mat-Su Valley, Alaska

JUNE 2003

Submitted To:
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Project Number: 32-1-01506

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RECONNAISSANCE GEOTECHNICAL REPORT
MAT-SU RAIL CORRIDOR
MAT-SU VALLEY, ALASKA

1.0 INTRODUCTION

This report presents the results of our filed reconnaissance and baseline geotechnical engineering studies along a new Alaska Railroad Corporation (ARRC) rail corridor extending from Port MacKenzie north to either Wasilla or Houston, Alaska. The purpose of this study was to compile existing subsurface information along the various proposed corridors, to verify the accuracy of this information by ground proofing in the field, and provide baseline geotechnical observations regarding the constructability of a new rail spur along these corridors. Existing information was attained from state, federal, and private agencies. Ground proofing was performed subsequently in several different stages and observations made during these exercises were considered in formulating our baseline analyses. Presented in this report are descriptions of the site and project, a list and summary of existing subsurface information in the project area, an explanation of our reconnaissance activities, an interpretation of subsurface conditions considering both existing and new data, and conclusions from our studies. The primary goal of this presentation is to determine the correlation of existing, mapped soil data with observed soil conditions in the field.

Authorization to proceed with this work was received in the form of a signed proposal from Mr. Norm Gutcher, P.E. of Tryck, Nyman, Hayes in November, 2001. Our work was conducted in general accordance with our October 1, 2002 proposal.

2.0 SITE AND PROJECT DESCRIPTION

The project site covers a relatively large swath of land spanning from Port MacKenzie in the south to as far north as Willow, Alaska. A vicinity map is included as Figure 1 showing the general project location. As shown on this figure, Port MacKenzie is only around 3 miles north of Anchorage, however the two locations are separated by the Knik Arm. Currently access to Port MacKenzie is gained via Knik Goose Bay and West Port MacKenzie Roads making travel time to the Port approximately 2 hours from Anchorage or 1 hour from Wasilla. There is currently no rail service to the area with the nearest tracks located more than 20 miles to the north (the main line between Wasilla and Fairbanks).

Recently, increasing development in the Mat-Su Valley, preliminary studies on a Knik Arm bridge crossing and Ferry System, and improvements to Port MacKenzie itself have prompted the ARRC and the State of Alaska (SOA) to explore the possibility of constructing rail access to Port MacKenzie. An accompanying highway has also been considered in the development of this project to provide better access to the Port and surrounding real-estate.

At this time, the project is in a stage of early development and several potential corridors have been delineated for the proposed new railroad spur to the Port. From these possibilities, one favored route was selected, extending north from Port MacKenzie, to the north side of Big Lake, then northeast to the Wasilla area. Later in the project, an alternative route was considered that would carry the tracks northwest out of the Port crossing the Little Susitna River, then north past the west side of Redshirt Lake, and finally northeast, connecting to main line tracks in the Houston area. The approximate locations of each route are included on the site plan in Figure 2.

Construction of a rail spur from Port MacKenzie north to the mainline tracks will present many engineering and logistical challenges. Much of the land between Port MacKenzie and Houston/Wasilla is either privately owned or included within the boundaries of State Park or critical habitat areas. Each corridor also provides for a variety of terrain obstacles such as swampy areas, lakes, rivers, hills, and ridges, and with these various terrains are a wide range of possible soil conditions including soft, compressible organic soils to dense, granular glacial and alluvial soils.

3.0 LITERATURE SEARCH

The most useful literature resource available to us was the United States Department of Agriculture/Natural Resources Conservation Service (USDA/NRCS) Soil Survey of Matanuska-Susitna Valley Area, Alaska. This data was released on CDROM on June 30, 2002 and is available free of charge at the USDA/NRCS regional office in Wasilla, Alaska. Compilation and mapping of soil information included in the package was completed in 1995. Surface soil conditions were generally determined using satellite imagery, high altitude aerial photography, and field visits for confirmation. Original mapping was conducted for the soils included from the ground surface down to a depth of about 5 feet and lateral extents were defined using a 1:24,000 scale. More detailed technical information about the data compilation is available on the above referenced CDROM or on the USDA/NRCS website.

For purposes of this study, three soil types were focused on from the database: Sand Soils, Gravel Soils, and Hydric Soils. Maps were constructed for each of the soils using the electronic database and ArcView 8.1 and are included in Figures 3, 4, and 5. Soil boundaries included on Figures 3 through 5 describe the probability of the surface soils in that area being gravelly, sandy, or hydric in nature. The approximate routes of rail corridors have been superimposed atop these maps. It should be noted that these are only rough corridor locations and that they are subject to realignment in the future. Additionally, we believe that the soils classified and divided in this database and shown on Figures 3 through 5 are too generalized for any purpose other than preliminary planning of a detailed exploration plan. The stations presented on Figures 3 through 5 mark the various locations visited during our field reconnaissance conducted for this project. A detailed description of each station and various photographs taken in the field are presented for the eastern and western corridors in Appendices A and B, respectively.

In addition to the USDA/NRCS Soil Survey, an Alaska Department of Transportation and Public Facilities (ADOT&PF) report issued in 1983 was also reviewed during the literature search. This report was created for initial work on a Knik Arm crossing and included soil terrain mapping and unit descriptions in more specific detail in comparison to the more recent USDA/NRCS report mentioned above. These earlier maps were created by ADOT&PF at 1:63,360 scale. Because the large fold-out maps for this report are poor quality and difficult to read in some areas, they have not been included with this memo, however, the unit descriptions given in the report can be correlated with soil units delineated in the USDA/NRCS Soil Survey which is less detailed.

While the USDA/NRCS survey only breaks the soil types into three categories (gravelly, sandy, and hydric), the ADOT&PF terrain mapping divides the surface soils into nine different physiological units: colluvial, eolian, fluvial, glacial, glaciofluvial, man-made, marine, glaciomarine, and organic. Because of the geologic history of the project area, the differentiated units listed above are very complexly inter-related and, at this point, only simplified generalizations can be made about soil trends in the area. It is our opinion that the USDA/NRCS survey does a relatively good job of making these generalizations by breaking up surface soils into gravelly, sandy, or hydric areas.

4.0 SOIL CONDITIONS

In general, the attached soil maps show that surface soil conditions along the two corridors are variable ranging from well drained sands and gravels to low-lying boggy deposits. Coarse grained sands and gravels are mostly associated with topographic highs (rolling hills and plateaus) within the project area. Hydric soils (or saturated, poorly drained soils) are mostly associated with topographic lows including marshy and boggy areas and flood plains near rivers.

5.0 FIELD RECONNAISSANCE

Field reconnaissance was conducted to “ground proof” the existing data that was researched at the beginning of the project. These activities were conducted during three different times. The first exercise was conducted on May 31, 2002, along the proposed location of the eastern corridor. From November 5th to November 9th, the southern two thirds of the western corridor were explored and the remaining northern section of that corridor was visited on January 14, 2003. During each of the reconnaissance outings, stations were located at various points of interest. Location control during these activities was provided by a handheld global positioning system (GPS) capable of providing geographic locations within approximately 20 feet.

The eastern route was explored by an engineer from our office in late May 2002. At that time, this corridor was the most favored, and as we understand it had been previously approved as a rail corridor some time ago. Access to the various corridor locations was gained with a 4-wheel drive truck traveling on existing roadways and trails. Much of this alignment, except for the northernmost regions just south of the Parks Highway and the ARRC main line, are readily accessible using these existing roads. The abundant roadway access, however, is also indicative of denser populations and the presence of large amounts of private land. Stations were established, the locations of which are shown on Figures 3 through 5, and several soils samples were collected from exposed cuts. Detailed station descriptions, photographs, etc. are included in Appendix A.

Later in the project, increased consideration was given to a western alignment requiring additional explorations. The western corridor was explored over two separate engagements, the first of which (November 2002) consisted of a week-long canoe supported field trip in which two engineers from our office traversed much of the southern two thirds of the corridor on rivers, lakes, and on foot. Due to lack of abundant, natural or man-made soil exposure, small test pits were dug by hand at various locations to glimpse into the subsurface.

The western corridor was revisited in January 2003, and the northern third of the corridor was explored using the existing roadways and trails in the Houston area. Photographs and detailed station descriptions for this corridor are displayed in Appendix B. Station locations along this portion of the project are also presented on Figures 3 through 5.

6.0 GENERAL FIELD OBSERVATIONS

Detailed descriptions of the observations at each station in the field are presented in the attached Appendices A and B for the east and west corridors, respectively. These observations have been generalized and a summary is presented below.

6.1 East Corridor

The northernmost area along this corridor that was visited was the north shore of West Beaver Lake. The stretch of the corridor that spans this northern section (generally north of Big Lake to the Parks Highway), crosses relatively persistent, marshy areas whose extent, location, and shape are generally controlled by long, finger-like, low-lying (less than 100 feet of relief) ridges. The long axes of said ridges are largely oriented northeast to southwest and are quite visible in topographic maps of the region. In the field, the ridges appeared (in exposed locations) to be primarily sandy gravel to gravelly sand. With a lack of significant fine grained materials, the rounded nature of the larger grains, and the linear nature of these features, we believe that the ridges are likely glaciofluvial features, or eskers. Because of the relatively low relief in this area, it is our opinion that the marshy areas are likely to be relatively shallow or less than 10 feet thick, except in marshy areas adjacent to lakes where the depths could be significantly greater.

South of Big Lake to approximately West Ayershire Road, the corridor crosses a section of land that undulates significantly with higher relief than the northern portions of this alignment. As evident from exposed soils in road cuts in this area, the soils along this section typically consisted of silty, sandy gravel and silty, gravelly sand. Additionally, some boulders were observed occasionally; some greater than 1.5 feet in diameter. Many of the low lying areas contained lake and marshy features; however, they were largely limited in size and extent. Observed topography and soil conditions in this section suggest that soils were of glacial origin and are likely reflective of glacial moraines and tills forming kames and kettles. Though probably not of the same origin, this soil is similar to the Elmendorf Moraines found on the other side of Knik Arm in Elmendorf Air Force Base and Fort Richardson.

South of West Ayershire Road, the corridor extends to the south along the eastern edge of a large, plateau-like land feature that has largely been developed for farmland. Soils exposed in this area in road cuts and borrow pits consist primarily of gravelly sand with little or no silt. The flat topography and clean, sandy nature of the soils found on this feature are very similar to features encountered in downtown Anchorage in the Naptowne Outwash. It is our opinion that the large flat area encompassing this portion of the corridor is a similar outwash feature deposited by glacial melt water transporting well graded, clean sediment from a receding glacier. Just to the east on the outwash feature, the topography becomes very undulating and more representative of a glacial moraine-like deposit. This area has been mapped as an extension of the Elmendorf Moraine.

South of the outwash feature described above, the corridor winds down to Port MacKenzie through hilly terrain mapped as the Elmendorf Moraine. This material, as observed in the field, tends to contain more silt and gravel fractions than the outwash soils. Additionally, low-lying areas are swampy and marshy, containing dotted lakes. This area appears quite similar to the portion of land between Big Lake and West Ayershire Road.

6.2 West Corridor

North and west of the ridge west of Redshirt Lake and the Little Susitna River is relatively flat with isolated areas of high ground or hills (usually 30 to 40 feet above the flats). The low, flat areas are typically covered with relatively thick organic material or peat. Examining maps and viewing the landforms, it appears that this area is representative of ancient floodplains or an alluvial bench of the nearby Susitna River. According to several hand probes conducted in area peat, it is on the order of 5 to 10 feet thick. It is unclear if the hand probes conducted in these peats met refusal from hard or dense mineral soils or frozen peat. Several shallow test pits dug on some of the isolated, short hills in the flat lands show a relatively sandy and silty mineral soil horizon on the surface. It is likely that these isolated features are loess (soils deposited by wind action) deposits. Further north along the corridor (as it approaches Vera Lake and the Houston area) the topography slowly gains elevation and the low boggy areas are fewer and isolated primarily to the fringes of the dotted lakes. Exposed soils in gravel pits and road cuts show cross bedded sands and gravels suggesting that these areas are an extension of the floodplains or the alluvial bench noted to the south.

South of these areas, we largely encountered soils and landforms that appeared primarily to be controlled by past glacial activity. The ridge line to the west of Redshirt Lake and the Little Susitna River (that has commonly been referred to as a “moraine”) appeared to more closely resemble a large esker/kame formation with a hummocky surface forming many small kettles or isolated, shallow depressions. While moraines are defined as soil masses deposited directly by ice or melting ice, eskers and kames are deposited by glaciofluvial processes. Moraines (like the Elmendorf Moraine closer to the Knik Arm) are typically comprised of a wide range of well graded particle sizes from silts and clays up to semi-angular gravels and large boulders. Glaciofluvial sediments (those deposited by rivers of water flowing on, through, or beneath glacial ice) tend to contain cleaner sand and gravel with fewer cobble and boulder sized particles. According to our limited explorations and small, hand-dug test pits, it appears that the above mentioned ridge formation is largely gravelly sand to silty, gravelly sand. Additionally, the above discussed formation appeared to be generally well drained. Surface vegetation on the ridge feature are thick stands of cottonwood, spruce trees and low brush.

On the southern end of the corridor where it crosses the Little Susitna River, the topography and soils appears to be controlled by another form of glaciofluvial deposition. Landforms in this area are typically flat high-ground (ranging from 30 to 60 feet above the elevation of the Little Susitna River) with narrow, radiating, finger-shaped ridges that control the meander of the river. Exposures in the river banks and in several shallow test holes revealed similar soils to those found in the higher ridges to the west with the exception that the sand appeared to be coarser in these soils and the included gravel was somewhat more rounded. The dominant soil type appeared to be gravelly sand in this area and the less hummocky nature of the topography suggests that these soils most likely represent a large outwash similar to the Naptowne Outwash found in the downtown Anchorage area. Also well drained, the dominant vegetation tends to be cottonwood with a significant amount of thick white spruce stands.

Near surface soils that were observed in our small test pits in the upper 1 to 1.5 foot below the ground surface were relatively uniform throughout the project area. In areas of good drainage, a 0.5 to 1 foot layer of organics was encountered that included decayed plant matter and roots. Typically a thin layer less than 6 inches thick of gray volcanic ash was found between the organic layer and mineral soils. As stated above, the dominant soils along the alignment are gravelly sand to silty, gravelly sand. Some isolated areas of highly gravelly soils were observed, most were related to the river beds. On average, gravel appeared to make up approximately 20 percent of the soil matrix with an average maximum grain size of around 2 inches. Gravel, cobbles, and boulders larger than 2 inches were very sparsely scattered.

7.0 CONCLUSIONS

We believe that both of the literature sources and observations made in our field reconnaissance are in good agreement. In comparing the two literature sources, there is a strong correlation between hydric soils from the NRCS survey and deposits delineated in the ADOT study as organic deposits and other low-lying, potentially silty deposits like marine, glaciomarine, fluted and lowland tills, and abandoned floodplains. Observations made during our field reconnaissance also agree strongly with the existing literature in that many of the low-lying areas are poorly drained and (especially in the northern and western extents of the eastern corridor) in these areas, many lakes and peat bogs have formed.

As shown in Figures 3 and 4, gravelly and sandy soils are closely related to each other, with the exception that sandy soils have been identified to somewhat of a wider extent mostly around major stream and river features. In examining the ADOT soils report, there are strong correlations to the sand and gravel soils noted by the NRCS survey. Sand and gravel units are closely related to active (and some abandoned) fluvial deposits, glacial moraines, and glaciofluvial deposits (eskers, kames, and outwashes). In addition, sand soil areas in the NRCS survey correlate well with eolian and active floodplain deposits. As with the hydric soils, these conditions (and their mapped locations in the literature) are in close agreement with observations made in the field during our original reconnaissance effort.

Although the correlation between existing literature, and the correlation between these sources and the field observations have been determined to be generally good, there were observations made in the field that suggested a weaker correlation in certain areas. Many of these weaker correlations occur in the extreme north and west portions of the project, specifically along the western corridor. While the ADOT soils report is in general agreement with our field observations, the NRCS survey seems to have a lower level of detail in this area. Field observations along the Little Susitna River and the western ridges revealed areas of apparently higher gravel contents. Except for isolated areas around the Little Susitna River, the NRCS report generally shows sand soils for this relatively large region. It is our opinion that (according to our field observations) this is likely an underestimation of the actual amount of gravel material available in this area. There are many smaller ridges around the Little Susitna River (besides those directly controlling the path of the river) and north of Red Shirt Lake that, while there is no erosion to expose subsoils, likely have a higher chance of containing gravel than suggested by the NRCS map.

As mentioned above, we believe that the available literature on the soils in the project area, on average, has a relatively strong correlation with actual soil conditions observed in the field. However, due to the scale at which both sources were mapped, we believe that the fine details of the surface deposits have probably not been very precisely determined. It is our opinion that the available soils data will be well used if it is considered in generalized route and borrow source selection, project feasibility, and (possibly) in determining rough, preliminary project cost determination. We strongly recommend that, once preliminary studies have been completed, more extensive subsurface explorations be conducted in the design phase of this project.

8.0 CLOSURE AND LIMITATIONS

The analyses, conclusions, and recommendations contained in this report are based on site conditions as they existed at the times of our reconnaissance. It is assumed that the exploratory, hand dug test pits and other observed soil exposures are representative of the subsurface conditions throughout the site, i.e., the subsurface conditions everywhere are not significantly different from those disclosed by the explorations.

During construction or further, more detailed, explorations, subsurface conditions may be different from those encountered in these and prior explorations. If there is a substantial lapse of time between the submittal of this report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, it is recommended that this report be reviewed to determine the applicability of the conclusions.

We recommend that we be retained to perform additional, more detailed explorations, once a final railway corridor has been agreed upon. Additional explorations that may be appropriate could include the advancement of borings or test pits. It is our opinion that the information included in this report should not be used in final design without performing a more detailed exploration program worthy of a design project of this magnitude.

Unanticipated soil conditions are commonly encountered and cannot fully be determined by merely observing surface soil exposures. Such unexpected conditions frequently require that additional expenditures be made to attain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such potential extra costs. Shannon & Wilson has prepared the attachments in Appendix A "Important Information About Your Geotechnical/Environmental Report" to assist you and others in understanding the use and limitations of the reports.

Sincerely,

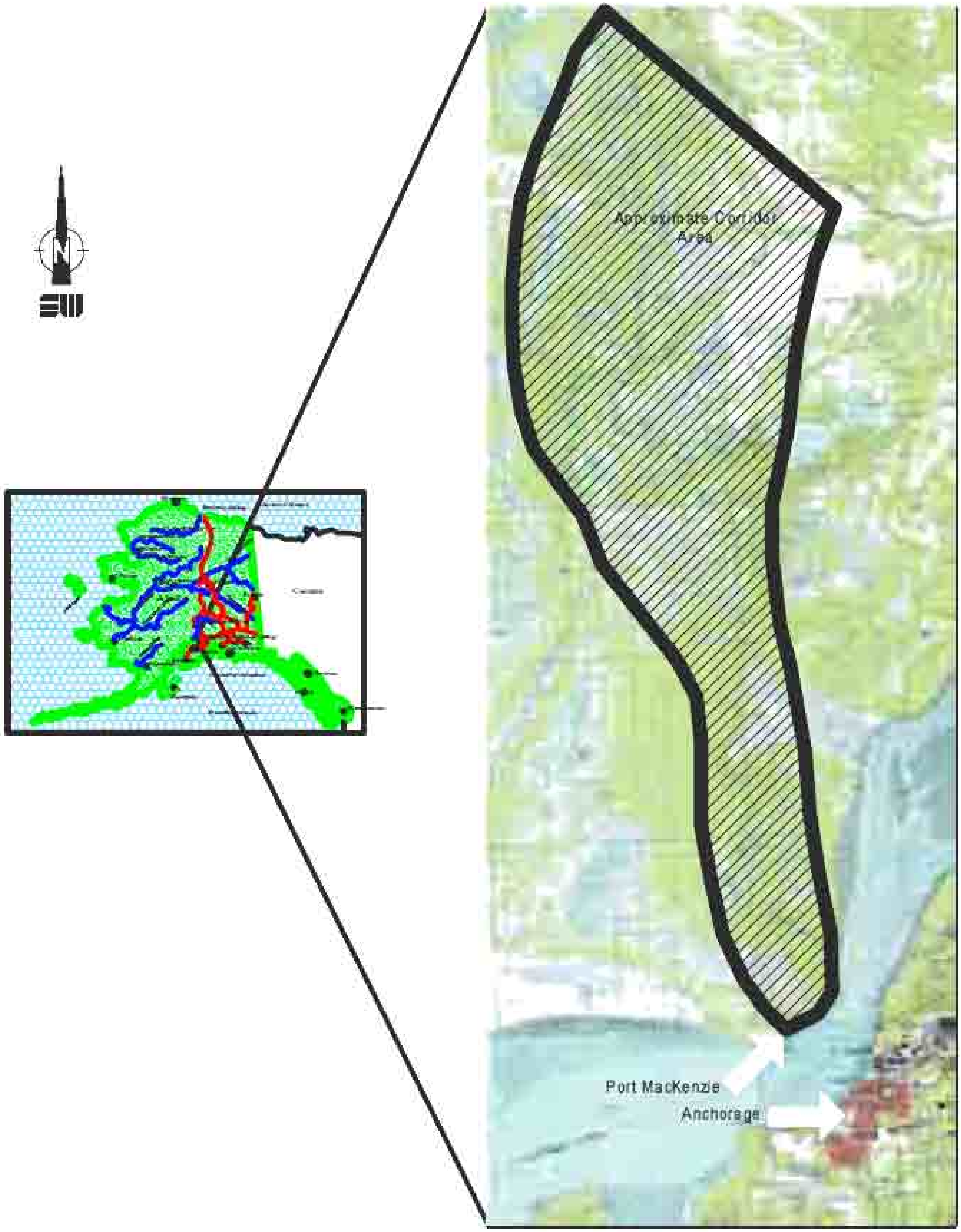
SHANNON & WILSON, INC.

Prepared by:

Kyle Brennan
Geotechnical Engineer

Reviewed by:

William S. Burgess, P.E.
Associate



Mat-Su Rail Corridor
Mat-Su Valley, Alaska

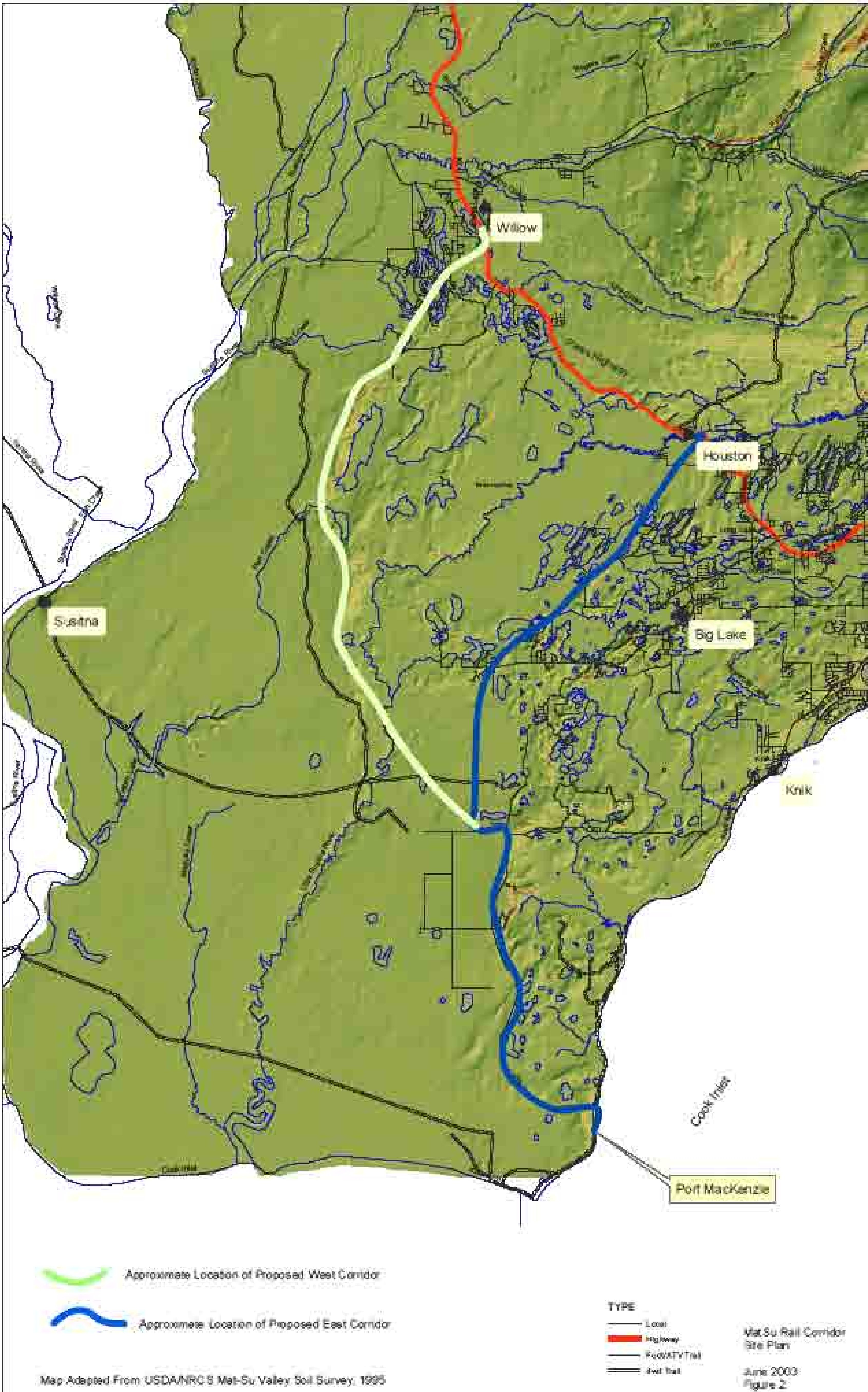
Vicinity Map

July 2003

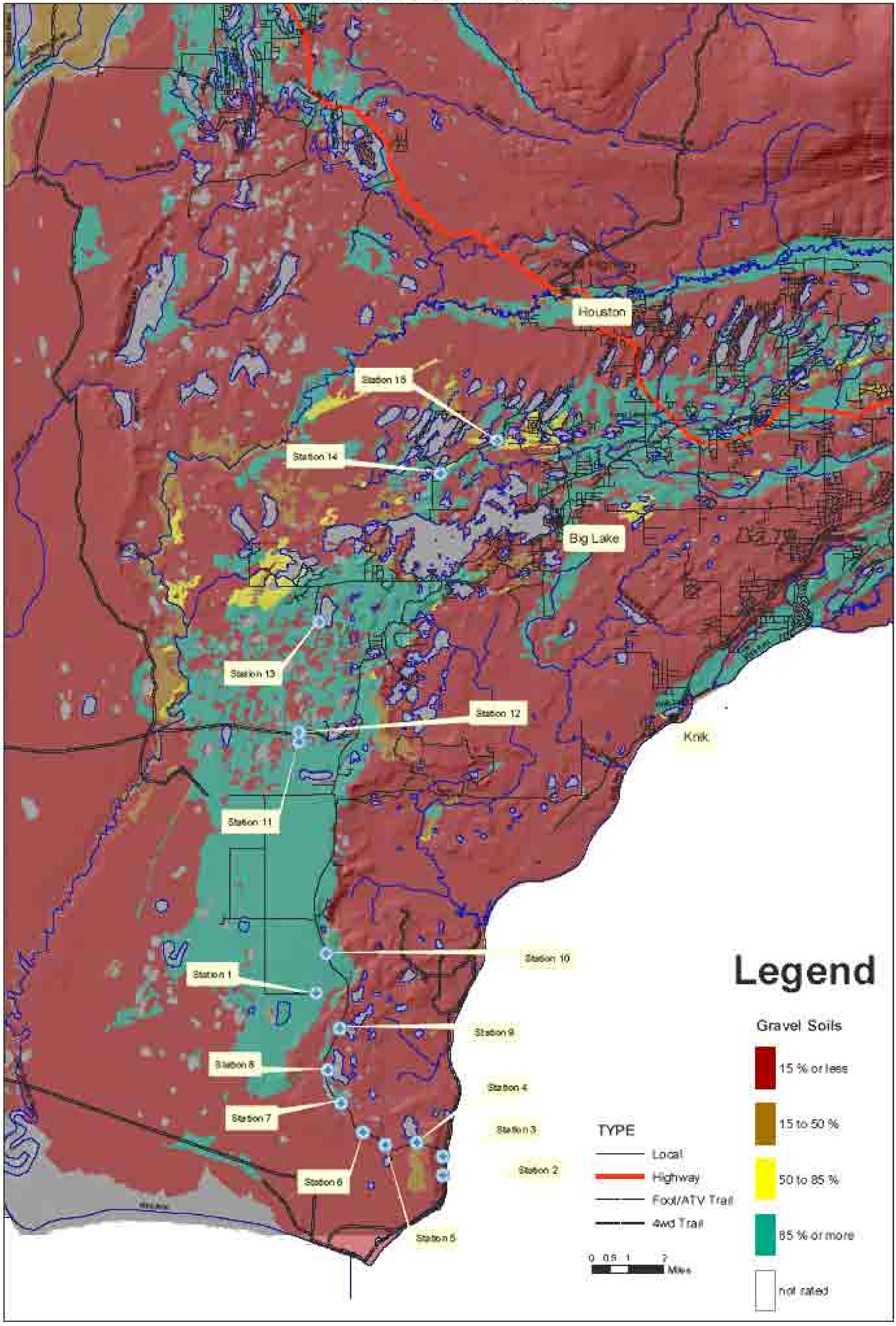
32-1-01506

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

Fig. 1


Willow
Houston
Big Lake
Susitna
Knik
Cook Inlet
Port MacKenzie
Approximate Location of Proposed West Corridor
Approximate Location of Proposed East Corridor
Map Adapted From USDA/NRCS Mat-Su Valley Soil Survey, 1995
TYPE
Local
Highway
Foot/ATV Trail
4wd Trail
Mat Su Rail Corridor
Site Plan
June 2003
Figure 2

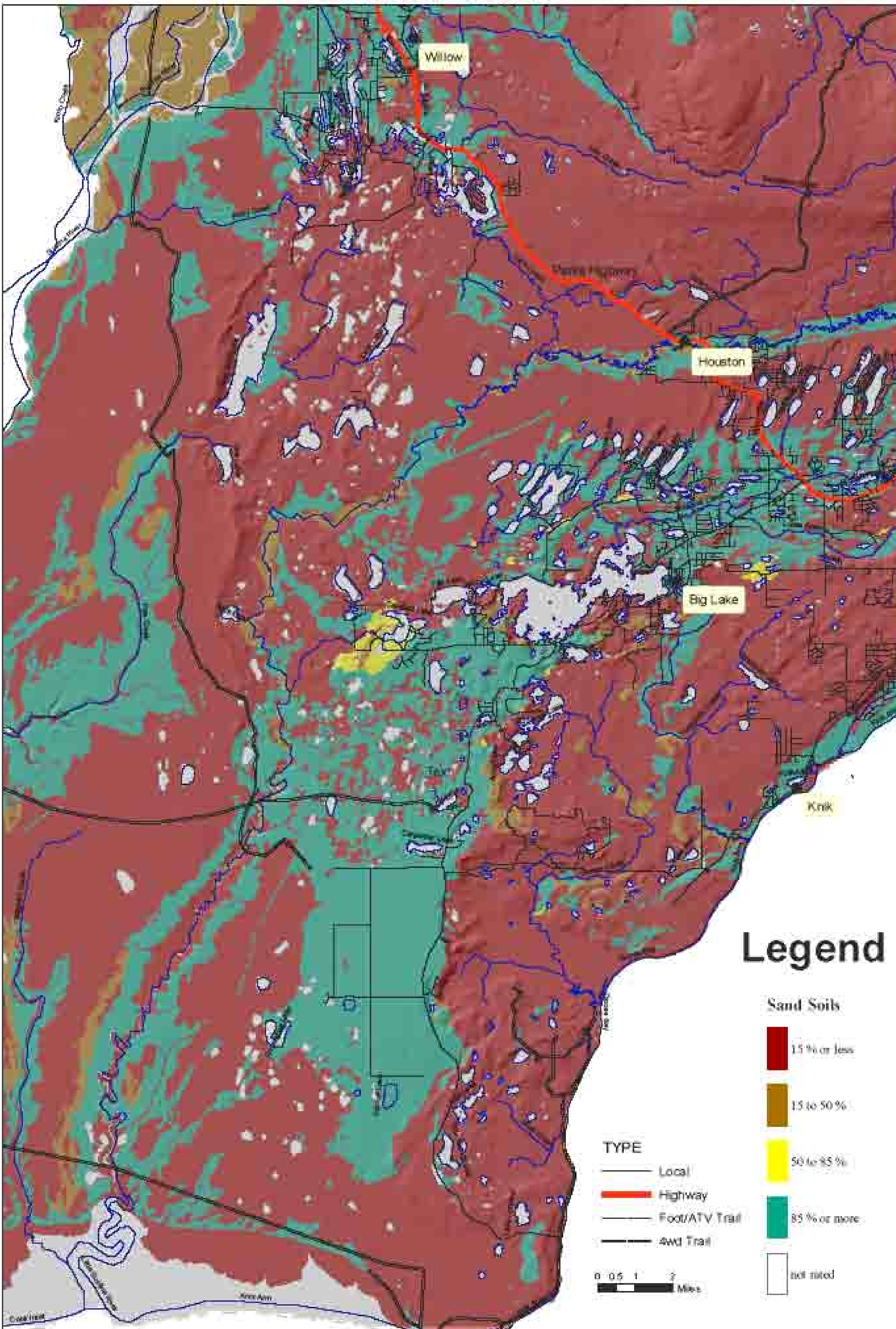
GRAVELLY SOILS



MatSu Rail Corridor
Preliminary Recconnaissance

Figure 1

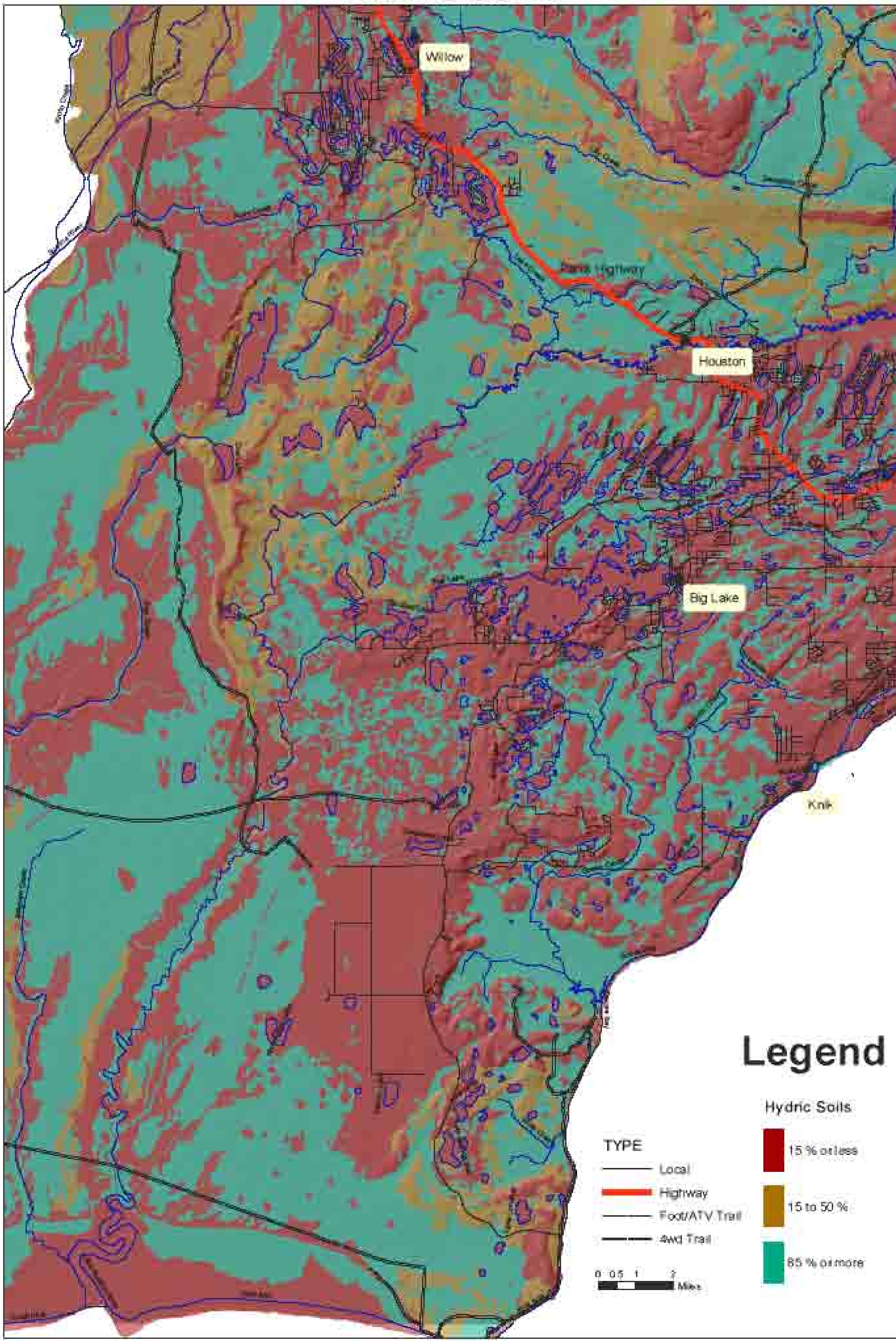
SANDY SOILS



MatSu Rail Corridor
Preliminary Recconnaissance

Figure 2

HYDRIC SOILS



MatSu Rail Corridor
Preliminary Recconnaissance

Figure 3

APPENDIX A

EAST CORRIDOR DETAILS

List of Tables:

List of Figures:

Table A-1
Detailed Station Descriptions East Corridor

Station	Coordinate Location	Station Observations	Photo Reference
East 1	658,859 W 6,804,770 N UTM Zone 5	Small gravel pit off West Reddane Road. Material looks like outwash, possibly related to that found on the Anchorage side of Knik Arm. The farming areas in general are pretty flat and well drained with medium sized spruce, cottonwood and alder coverage.	Photo 1; Figure A-1
East 2	343,344 W 6,796,820 N UTM Zone 6	On West Port MacKenzie Road just north of Port MacKenzie. The ground surface is relatively undulating and vegetative cover is thicker with rather large spruce and cottonwood trees. High ground appears well drained, however low ground appears marshy and hydric. Topography and poorly drained low areas are typical of morainal features found in the Elmendorf Moraine.	Photo 2; Figure A-1
East 3	343,381 W 6,797,275 N UTM Zone 6	Looking north on West Port MacKenzie Road showing typical undulating landscape and dense, large vegetation in undisturbed areas.	Photo 3; Figure A-2
East 4	343,037 W 6,798,246 N UTM Zone 6	A large through cut in West Port MacKenzie Road. Exposed soils appear to consist of primarily slightly silty, gravelly sand to slightly silty, sandy gravel. Topography of surrounding ground is undulating with well drained high areas and marshy low ground. A 4x4 trail branches from the road extending to Lorain Lake from here. Many other 4x4 trails exist in this area.	Photo 4; Figure A-2
East 5	340,792 W 6,798,429 N UTM Zone 6	First significant boggy area to the north of Port MacKenzie. Road grade is approximately 4 feet above the marsh grade with no obvious signs of distress. The road runs approximately east-west here. North of the road is typically hilly morainal terrain; the flat marsh reaches indefinitely to the south.	Photo 5; Figure A-3
East 6	339,519 W 6,798,545 N UTM Zone 6	Small road cut on West Port MacKenzie Road. Exposed soils are silty sand to slightly silty sand. Immediat area around station is typical of morainal topography.	Photo 6; Figure A-3
East 7	659,118 W 6,800,306 N UTM Zone 5	Typical of the multitude of 4x4 trails crossing the landscape. Vegetative ground cover is relatively thick and ground surface is undulating. Lower areas shown in the background are poorly drained and soft, higher ground is well drained. This area is likely still within the boundary of the Elmendorf Moraine.	Photo 7; Figure A-4
East 8	659,145 W 6,801,293 N UTM Zone 5	A large marshy area crossed by West Port MacKenzie Road. The marsh extends on the other side of the road to an approximately equal extent as shown in the photograph. This area is likely a glaciofluvial deposit of fine grained sediments that form this poorly drained basin. To the north of this station, the ground climbs to the higher, flatter, well drained areas used for farming. Although the marsh is laterally expansive, the good condition of the road surface suggests that the thickness of organic/compressible materials may not be very thick.	Photo 8; Figure A-4
East 9	659,660 W 6,803,287 N UTM Zone 5	A shallow road cut on West Port MacKenzie Road in relatively clean, sandy gravel soils. Relatively clean soils (low silt content) and subrounded to rounded particles suggest that these soils are likely outwash soils. Vegetation consists of rather large cottonwood tree stands.	Photo 9; Figure A-5
East 10	659,458 W 6,806,642 N UTM Zone 5	Ground at this location is very flat. To the west of the road (left in the photograph) are flat, well drained farming lands and to the east of the road, the ground slopes down toward Knik Arm and Goose Bay. Because of lack of relief, few road cuts exist in this area. The limited soil exposure suggests that the soils are primarily sands with varying amounts of gravel.	Photo 10; Figure A-5
East 11	657,434 W 6,816,372 N UTM Zone 5	A 4x4 trail north of Carpenter Lake. Topography is more undulating and is typical of glacial moraine deposits. Vegetation includes large spruce and cottonwood trees with high, well drained areas and low, poorly drained basins that are sometimes fill by small kettle lakes. This moraine is likely not related to the Elmendorf Moraine to the east, but may be an older moraine deposit as determined by the less severe topographical relief.	Photo 11; Figure A-6

Table A-1
Detailed Station Descriptions East Corridor

East 12	657,462 W 6,815,870 N UTM Zone 5	Typical small kettle lake north of Carpenter Lake. Land immediately around the lake is relatively marshy surrounded by low lying hills. The lake does not appear to be very deep as the lake bed seems to be relatively flat close to shore, under around 3 to 5 feet of water.	Photo 12; Figure A-6
East 13	658,301 W 6,821,779 N UTM Zone 5	Diamond Lake access point. Diamond Lake is a larger kettle lake amid gently hilly ground. As shown in the photograph, the vegetation is very thick here consisting of tall spruce and cottonwood trees	Photo 13; Figure A-7
East 14	344,762 W 6,828,246 N UTM Zone 6	Large road cut on the south side of West Lakes Road north of Big Lake. Soils are generally slightly silty, gravelly sand with areas of increased gravel content. The terrain begins to flatten out north of this area with significantly more expansive marshy areas. Isolated hills are formed here as relatively linear features oriented northeast to southwest and are likely glaciofluvial esker formations.	Photo 14; Figure A-7
East 15	347,280 W 6,829,446 N UTM Zone 6	An example of the relatively exapnsive marshy areas north of Big Lake. Poorly drained soils dominate the landscape and are often associated with small lakes. Roads constructed on these soil conditions appear to be performing well with no significant differential settlement or rutting. Accordingly, organic soils are likely not excessively deep (probably less than 10 feet thick) along this portion of the east corridor.	Photos 15 & 16; Figure A-8

Photo 1: Station East 1, small borrow pit located at the east end of Reddane Road. Contains relatively clean sands and gravels.

Photo 2: Station East 2, view of Port MacKenzie, Knik Arm, and Anchorage from fore to background.

Mat-Su Rail Corridor Mat-Su Valley, Alaska	
PHOTOS 1 and 2	
June 2003	32-1-01506
SHANNON & WILSON, INC. Geotechnical & Environmental Consultants	**Fig. A-1**

Photo 3: Station East 3, Undulating terrain north of Port MacKenzie looking north.

Photo 4: Station East 4, large through cut on West Point MacKenzie Road.
Exposed are relatively clean sands and gravels.

Mat-Su Rail Corridor Mat-Su Valley, Alaska	
PHOTOS 3 and 4	
June 2003	32-1-01506
SHANNON & WILSON, INC. Geotechnical & Environmental Consultants	**Fig. A-2**

Photo 5: Station East 5, boggy area along Point MacKenzie Road.
Looking southease, road grade approximately 4 feet above marsh elevation.

Photo 6: Station East 6, small cut on West Point MacKenzie Road looking northeast.
Typically dense birch and spruce vegetation shown in background.

Mat-Su Rail Corridor
Mat-Su Valley, Alaska

PHOTOS 5 and 6

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Fig. A-3

Photo 7: Station East 7, one of the many 4x4 trails found in the area penetrating into the dense birch and spruce tree stands in gently undulating terrain.

Photo 8: Station East 8, looking west from Point MacKenzie Road over a large marshy area. The marsh is present on the east side of the road to approximately the same extent.

Mat-Su Rail Corridor Mat-Su Valley, Alaska	
PHOTOS 7 and 8	
June 2003 32-1-01506	
SHANNON & WILSON, INC. Geotechnical & Environmental Consultants	**Fig. A-4**

Photo 9: Station East 9, small road cut on Point MacKenzie Road exposing clean, sands and gravels.

Photo 10: Station East 10, looking north on Point MacKenzie Road showing the very flat topography of this area. To the left is farming land and sloping bluff down to Goose Bay is to the right.

Mat-Su Rail Corridor Mat-Su Valley, Alaska	
PHOTOS 9 and 10	
June 2003	32-1-01506
SHANNON & WILSON, INC. Geotechnical & Environmental Consultants	**Fig. A-5**

Photo 11: Station East 11, 4x4 trail north of Carpenter Road over gently undulating terrain. Shows typical dense alder, spruce, and birch trees.

Photo 12: Station East 12, a typical marshy area that dot the terrain north of Carpenter Lake. High areas surrounding the ponds are evident by the larger trees and are likely well drained sands and gravels.

Mat-Su Rail Corridor
Mat-Su Valley, Alaska

PHOTOS 11 and 12

June 2003 32-1-01506

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Fig. A-6

Photo 13: Station East 13, Diamond Lake parking area surrounded by typically dense alder, spruce, and birch trees.

Photo 14: Station East 14, large road cut on south side of West Lakes Road north of Big Lake. Exposed soils consist of clean sands and gravels. These ridges are long narrow features separated by poorly drained marshes and Lakes.

Mat-Su Rail Corridor
Mat-Su Valley, Alaska

PHOTOS 13 and 14

June 2003 32-1-01506

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Fig. A-7

Photo 15: Station East 15, looking west over typical marsh land with a small pond north of Big Lake.

Photo 16: Station East 15, looking east over same marshy area consisting of a peat bog with sparse black spruce trees. Area was previously burned.

Mat-Su Rail Corridor
Mat-Su Valley, Alaska

PHOTOS 15 and 16

June 2003 32-1-01506

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Fig. A-8

APPENDIX B

WEST CORRIDOR DETAILS

List of Tables:

List of Figures:

Table B-1
Detailed Station Descriptions West Corridor

Station	Coordinate Location	Station Observations	Photo Reference
West 1	651,212 W 6,840,368 N UTM Zone 5	Near Red Shir Lake trailhead on the northern extension of a large ridge that runs north-south on the west side of Red Shirt Lake. Area appears to be an old, overgrown sand/gravel pit. Exposed soils in cut appear to be primarily clean sand with isolated areas of coarse gravel and cobbles and/or silt.	Photo 17; Figure B-1
West 2	650,854 W 6,840,858 N UTM Zone 5	On an isolated, small hill northwest of Station West 1. Topography in the area is dominated by flat, marshy land with sparse, isolated hills. Marshy areas are covered with muskeg and thin, short spruce trees. Walking through marsh it appears that the muskeg or peat is only around 2 to 3 feet deep. Short hills appear to be well drained and covered with tall birch and spruce trees. A hand dug test pit exposed limited surface organices overlying 1 foot of gray volcanic ash on top of tan to brown, silty SAND.	Photo 18; Figure B-1
West 3	650,910 W 6,841,214 N UTM Zone 5	On a slightly larger mound than West 2. A hand dug test pit revealed similar soils exposed in the previous station. It is likely that these small hills are eolian deposited fine sand and silt (old dunes) deposited by adiabatic winds from previous glaciers in the Susitna Valley.	NA
West 4	647,692 W 6,833,013 N UTM Zone 5	South of Redshirt Lake, the terraine is hummocky and typical of glacial deposits of moraines, eskers, or kames. Poorly drained low spots are penetrated by a handheld penetrometer approximately 3 feet, while high spots are penetrated less than 1 foot. Small test pit exposes silty, gravelly sand. A 2 foot diameter erratic was also observed at the site, however, average largest fraction was estimated to be about 1 to 3 inches.	Photos 19 &20; Figure B-2
West 5	647,469 W 6,832,713 N UTM Zone 5	A small marshy area. Ground is flat and covered with peat and sporadic, small spruce trees. A handheld probe penetrated 6 feet. Very difficult to retrieve penetrometer from that depth and tip was clean and cold when removed from the ground. Possible frozen ground (permafrost) at depth.	Photo 21; Figure B-3
West 6	647,253 W 6,831,939 N UTM Zone 5	On the banks of a small creek flowing out of Red Shirt Lake. Topography is similar to glaciofluvial formations like eskers and kames. Significant amount of gravel was observed in the river bed. A 10-foot high bench was formed on the north side of the river. A hand-dug test pit in the side of the bench revealed around 1 foot of sand and silt overlying silty, sandy gravel. Gravel content in soils affected by river action appears to be higher than the average soil condition in the area.	Photo 22; Figure B-3 and Photo 23; Figure B-4
West 7	649,623 W 6,828,333 N UTM Zone 5	At the top of the ridge line that runs north-south, west of the Little Susitna River. Ridge feature is significantly steeper on the east facing side. The west facing side is a generally shallow slope down to the Susitna Valley. The soils look relatively well drained except for isolated lows where water and organics have collected. Organics are primarily decayed plant matter with no peat growth. A hand dug test pit shows upper ash and silt at the surface overlying slightly silty, gravelly sand similar to Photo 18. Coarse particles are rounded suggesting transportation before deposition. The ridge feature could be a large glaciofluvial esker, or a medial moraine.	Photo 24; Figure B-4
West 8	649,144 W 6,828,452 N UTM Zone 5	On western slope of large ridge. Located in a small low lying area on side of the ridge. Test pit dug revealed about 2 feet of decayed organics over hard, tan, sandy silt. The topagraphic feature is typical of low areas dotted around the ridge fromation.	Photos 25 & 26; Figure B-5
West 9	651,605 W 6,828,351 N UTM Zone 5	Approximately 75 foot high bluff on Little Susitna River exposing gravelly sand soils. Gravel is rounded. Finger shaped, small ridge lines (controlling the track of the river) appear to be smaller eskers deposited by past glaciers.	Photo 27; Figure B-6
West 10	650,885 W 6,824,813 N UTM Zone 5	Another bluff on the Little Susitna River that exposes sandy silt to silty sand soils. This bluff is only 30 feet high. The large blocks at the toe of the slope in the photographs are large chunks of frozen silt.	Photo 28; Figure B-6

Table B-1
Detailed Station Descriptions West Corridor

West 11	651,350 W 6,822,683 N UTM Zone 5	A small finger ridge on the banks of the Little Susitna River. A hand dug test pit exposed one foot of ash and silt overlying silty, gravelly sand. The soils here look a lot like the soils encountered on the high portions of the larger ridge explored at Station West 7. This smaller ridge (about 50 feet high) and other numerous ridges like it around the Little Susitna River are likely extensions of the larger feature.	NA
West 12	652,208 W 6,821,489 N UTM Zone 5	A 30 to 50 foot bluff on the Little Susitna River. Exposed soils appear to be primarily sand and silt with isolated areas of gravel. Gravel is typically fine grained or less than 1 inch.	Photo 29; Figure B-7
West 13	653,230 W 6,818,516 N UTM Zone 5	Station located on high, flat ground above the Little Susitna and Cabin Creek. Ground is approximately 50 to 70 feet higher than the drainage elevation. Test pit reveals approximately 6 inches of organics overlying clean sand and sandy gravel. A few small (less than 0.5 inches) pieces of coal were encountered in the hand excavation. Gravel is fine grained and rounded (around 1 inch). Land form and soils suggest that this is an outwash formation deposited by meltwaters beyond the margins of past glacial activity.	Photo 30; Figure B-7
West 14	651,343 W 6,845,444 N UTM Zone 5	Station is located close to private property. The land around the lake is very flat, however does not appear to be boggy. Cottonwood and spruce trees dominate the vegetation cover and encroach close to the banks of the lake. Soil exposure is not present, however the area appears to be relatively well drained.	NA
West 15	651,690 W 6,846,021 N UTM Zone 5	Near a cabin on Boot Lake. The oposite side of the lake appears to contain more topagraphic relief than this side, the lake looks a little boggy around its banks. Vegetation is same as described in Station West 14 otherwise.	Photo 31; Figure B-8
West 16	651,272 W 6,844,699 N UTM Zone 5	Small boggy looking area or an old overgrown pond. Immediate area appears to be poorly drained, however surrounding ground is somewhat higher and is likely well drained.	Photo 32; Figure B-8
West 17	651,663 W 6,844,483 N UTM Zone 5	Walking along the southern banks of Veru Lake. The banks are around 4 feet high with minimal soil exposure. Some soils exposed in the banks appear to be silty, gravelly sand. Areas above the river banks appear to be well drained. No auf ice was observed on the banks of the lake.	NA
West 18	651,976 W 6,844,532 N UTM Zone 5	A relatively fresh excavation around 10 to 15 feet deep. Exposed soils comprise of relatively clean gravelly sand with isolated veines of sandy gravel. Maximum grain size is approximately 3 inches. Average silt content appears to be 3 to 7 percent. Soils are cross bedded just like alluvial deposits.	Photo 33; Figure B-9
West 19	648,636 W 6,846,414 N UTM Zone 5	Area is very flat and appears to be well drained. This site is up on what looks like an old bench of the Susitna River.	NA
West 20	654,593 W 6,844,300 N UTM Zone 5	Station overlooks a small fen that drains into Rainbow Lake. It is pretty hilly in this area with more of the isolated, low bogs and kettle lakes. Could be near a transition from areas of sediment controlled by the Susitna river, and old glacio fluvial action. Some exposed soils on the hill side are primarily silty, gravelly sand with the coarsest material around 2 inches.	Photo 34; Figure B-9
West 21	654,140 W 6,844,824 N UTM Zone 5	A road cut approximately 15 to 20 feet high at the intersection of Crystal Lake Road and Michigan Road. Material consists of silty, gravelly sand to silty, sandy gravel. Material is a little coarser (maximum around 3 to 4 inches) and appears to be silty enough to be a glacio fluvial deposit.	Photo 35; Figure B-10
West 22	655,328 W 6,846,621 N UTM Zone 5	A small cut above Jean Lake exposes several feet of silty, sandy gravel at the surface transitioning to silty, gravelly sand at depth. Topography and soils appear to be kames (high spots) and kettles (low spots). High ground appears to be well drained, low spots look pretty poorly drained.	Photo 36; Figure B-10

Table B-1
Detailed Station Descriptions West Corridor

West 23	654,656 W 6,846,982 N UTM Zone 5	Large borrow pit near Long Lake. Pit walls approaching 40 feet expose pretty uniform slightly silty to silty, gravelly sand. Gravel mostly exists in one to two foot seams and is generally not bigger than 3 to 4 inches. Undisturbed ground around the pit is pretty flat with isolated hills. Soils look like old alluvial deposits, but topography looks more like glacio fluvial. This area could be a margin area, near the boundary of the two different depositional evironments.	Photo 37; Figure B-11
West 24	656,470 W 6,847,370 N UTM Zone 5	This is a small pit behind Radar Hill. The soils exposed in this pit appear to be very similar to those exposed in the pit in Station West 23, however, they may be a littler siltier.	Photo 38; Figure B-11

Photo 17: Station West 1, near Red Shirt Lake trail head. Appears to be an old sand/gravel pit. Soils primarily sand with isolated areas of gravel or silt.

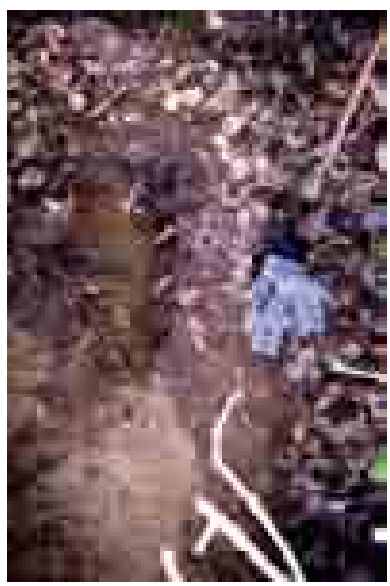

Photo 18: Station West 2, test hole dug exposing thin surface organics and gray ash layer overlying silty sand.

Mat-Su Rail Corridor Mat-Su Valley, Alaska	
PHOTOS 17 and 18	
June 2003	32-1-01506
SHANNON & WILSON, INC. Geotechnical & Environmental Consultants	**Fig. B-1**

Photo 19: Station West 4, erratic encountered south of Red Shirt Lake.

Photo 20: Station West 4, typical high spot in local hummocky terrain. High and low spots (average relief of around 30 to 50 feet) are somewhat elongated like eskers.

Mat-Su Rail Corridor
Mat-Su Valley, Alaska

PHOTOS 19 and 20

June 2003 32-1-01506

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

Fig. B-2

Photo 21: Station West 5, small marshy area surrounded by spruce trees. A probe penetrated 6 feet into ground and was cold and hard to retrieve, possibly frozen at depth.

Photo 22: Station West 6, creek flowing out of Red Shirt Lake (several miles up stream). Sand and a significant amount of gravel was observed in the river bed.

Mat-Su Rail Corridor Mat-Su Valley, Alaska	
PHOTOS 21 and 22	
June 2003	32-1-01506
SHANNON & WILSON, INC. Geotechnical & Environmental Consultants	Fig. B-3

Photo 23: Station West 6, test hole dug into 10 foot bluff on creek bank showing about 1 foot of sand and silt overlying silty, sandy gravel.

Photo 24: Station West 7, atop north-south ridge west of the Little Susitna River. Soils appear well drained with widely spaced spruce and birch trees.

Mat-Su Rail Corridor Mat-Su Valley, Alaska	
PHOTOS 23 and 24	
June 2003 32-1-01506	
SHANNON & WILSON, INC. Geotechnical & Environmental Consultants	**Fig. B-4**

Photo 25: Station West 8, western slope of large ridge from Station West 7. Terraine is hummocky with well drained high areas surrounding isolated, poorly drained low spots.

Photo 26: Station West 8, small test pit showing around 2 feet of decayed organics overlying hard, tan sandy silt.

Mat-Su Rail Corridor Mat-Su Valley, Alaska	
PHOTOS 25 and 26	
June 2003	32-1-01506
SHANNON & WILSON, INC. Geotechnical & Environmental Consultants	**Fig. B-5**

Photo 27: Station West 9, bluff on east side of Little Susitna River exposing gravelly sand soils.

Photo 28: Station West 10, bluff along west edge of Little Susitna River exposing silty sand soils. Large blocks are chunks of frozen silt.

Mat-Su Rail Corridor
Mat-Su Valley, Alaska

PHOTOS 27 and 28

June 2003 32-1-01506

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

Fig. B-6

Photo 29: Station West 12, bluff on west side of Little Susitna River exposing sand and silt with isolated areas of fine gravel.

Photo 30: Station West 13, on high ground east of the Little Susitna River. Topography and rounded grains in test hole suggest the terrain has transitioned to an outwash plain.

Mat-Su Rail Corridor
Mat-Su Valley, Alaska

PHOTOS 29 and 30

June 2003 | 32-1-01506

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

Fig. B-7

Photo 31: Station West 15, Boot Lake. Surrounded by boggy areas. Higher ground on opposite side contains larger trees and is likely well drained like high ground observed on the east corridor north of Carpenter Lake.

Photo 32: Station West 16, small boggy area surrounded by tall spruce and birch trees. Likely an overgrown pond.

Mat-Su Rail Corridor
Mat-Su Valley, Alaska

PHOTOS 31 and 32

June 2003 | 32-1-01506

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

Fig. B-8

Photo 33: Station West 18, a fresh excavation about 10 to 15 feet deep exposing relatively clean gravelly sand. Soils are crossbedded like an alluvial deposit.

Photo 34: Station West 20, small creek that drains a boggy area into Rainbow Lake. Sand and gravel observed in the creek bed.

Mat-Su Rail Corridor
Mat-Su Valley, Alaska

PHOTOS 33 and 34

June 2003 | 32-1-01506

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Geotechnical & Environmental Consultants

Fig. B-9

Photo 35: Station West 21, a 15 to 20 foot road cut on Crystal Lake Road exposing sands and gravels ranging from clean to slightly silty.

Photo 36: Station West 22, small cut on the east hillside above Jean Lake. Areas with no ice or snow cover reveal relatively gravelly soils.

Mat-Su Rail Corridor
Mat-Su Valley, Alaska

PHOTOS 35 and 36

June 2003 | 32-1-01506

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

Fig. B-10

Photo 37: Station West 23, a very large borrow pit east of Long Lake.
Soils in cut are clean, interbedded sands and gravels, likely alluvial.
The cut face is approximately 30 feet high.

Photo 38: Station West 24, a small borrow pit at Radar Hill exposing
clean sands and gravels, pit wall is about 20 feet high.

Mat-Su Rail Corridor
Mat-Su Valley, Alaska

PHOTOS 37 and 38

June 2003 | 32-1-01506

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

Fig. B-11

APPENDIX C

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Attachment to and part of Report 32-1-01506

Date: June 23, 2003
To: Ted Trueblood, P.E.
Tryck, Nyman, Hayes, Inc.

Important Information About Your Geotechnical/Environmental Proposal

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors, which were considered in the development of the report, have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the
ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland

APPENDIX I

Public Involvement report

PUBLIC INVOLVEMENT REPORT

TNH took a practical and active approach to the public involvement component of the Location Study Report. The intent was to involve the public, landowners, and agencies throughout the planning process. This has been found to be key to the successful completion of such studies. A proactive public involvement program was devised to inform area residents, landowners, and other interests about the nature of the proposed study. The program was designed to identify concerns and set the stage for the public meeting process. The following are the key components to TNH's public involvement plan.

PUBLIC INVOLVEMENT PLAN

The purpose of the Public Involvement Plan (PIP) is to ensure that the public and state and federal agencies are informed about the study. The PIP serves as a guide for gathering relevant information from stakeholders that can be used in project development. The critical milestones where public input was gathered include:

Critical Milestone	Approximate Schedule
⇒ Issues Identification	Spring 2002
⇒ State and Federal Agency Coordination	Spring 2002
⇒ Office Study	Summer/Fall 2002
⇒ Field Reconnaissance	Summer 2002
⇒ Route Alternatives Development & Evaluation	Fall 2002
⇒ Alternatives Presentation	Winter 2002
⇒ Route Recommendation	Winter/Early Spring 2003
⇒ Route Recommendation Presentation	Spring 2003

MAILING LIST

A study mailing list of individuals and groups with an interest in the study area was developed (Appendix ???). A comprehensive list of property owners was obtained from the MSB. In addition, the mailing list includes businesses, local government departments, and state and federal resource agencies. To date, the list has approximately 10,000 names on it.

STUDY FLYERS

At the beginning of the study a postcard mailer was distributed to all parties on the mailing list providing information regarding the status and schedule of the study, and inviting the public to a public meeting on May 15, 2002 in Houston.

For the second workshop, a two-sided, 8.5 x 11-inch flyer was mailed to an expanded mailing list containing names towards the Willow area. The flyer summarized issues identified at the May 15, 2002, meeting and invited the public to a route analysis workshop on November 20, 2002, in Houston.

A third flyer was prepared for the April 2, 2003 open house and was mailed to all names on the mailing list. This flyer described the proposed route and information on the rationale behind the selection.

PUBLIC MEETINGS

TNH held three public meetings during the course of the study.

#1 Issues Identification Meeting

At the May 15, 2002 Public Meeting, TNH presented the study objectives, a review of past studies, and the schedule. The presentation was followed by a facilitated discussion. Comments were recorded on flip charts and are located in Appendix ???? Ninety-four people attended the meeting held in the Houston High School Cafeteria. Comments are organized by issue:

Route Issues

- What is the purpose of the rail and road project? How does this study relate to the Knik Arm Crossing and the Wasilla Rail Relocation Study currently underway?
- A cost-benefit analysis is critical to the study.
- Can the existing dock facility support the anticipated commodity or passenger traffic?
- Presentation of route analysis and route selection needs to more broadly publicized with more advance notice.

Recreation Issues

- Many recreational users are not local – they come from Anchorage and surrounding areas.
- Users need to be notified of study process and route alternatives.

Land Use Issues

- More full-time residents in the area than were a decade ago. More property acquisition could be necessary.
- Many residents and property owners strongly oppose any road or rail routes through the proposed study area.
- There are strong concerns about impacts from road and rail traffic on recreational uses in the area – trail crossings, limiting access to recreation areas.
- Past public comments on previous studies needs to be considered in this study.
- MSB and State of Alaska land disposals had and will continue to have an impact on the amount of private property that continues to be made available.
- Once a route is chosen, transfers of public lands into private ownership should be minimized.

#2 Alternatives Presentation Workshop

On November 20, 2002, TNH held workshop in Houston to go over route options. At the workshop there were three workstations where the public could review the proposed route options and supporting technical information. TNH had on hand information from the commodities study, soils constraints analysis, baseline environmental data on wetlands, fish and wildlife habitat and archeological sites, traffic volume estimates, and land status. A ranking sheet was distributed to the participants. Eighty-four participants turned in the ranking sheet. The following table displays their first choice for roadway and railroad corridor. It also describes the most important development criteria. Participants ranked the proposed roadway corridors from 1-4 with 1 being the highest. They ranked the railroad corridors from 1-3 with 1 being the highest. Participants rated the development criteria from 1-5 with 1 being the most important criteria.

ROADWAY	RATED AS FIRST CHOICE	RAILROAD	RATED AS FIRST CHOICE
Corridor 4	16	**Corridor 3**	**66**
Corridor 5	8	Corridor 4	9
Corridor 7	21	Corridor 5	6
Corridor 10	**30**		
Add a Roadway Corridor 3	6	No Rail/No project	1

PROJECT CRITERIA FOR ROADWAY	RATED #1 in importance	PROJECT CRITERIA FOR RAILROAD	RATED #1 in importance
Construction Cost	14	Construction Cost	9
Wetlands Impact	12	Wetlands Impact	12
Private Property Impact	**41**	**Private Property Impact**	**51**
Public Property Impact	4	Public Property Impact	5
Access to undeveloped area	9	Access to undeveloped area	9
Reduced commute time	16	Reduced commute time	7
Build Road and Rail together			3

Comment sheets were also distributed and copies of these can be found in Appendix ????

#3 Recommended Route Presentation Open House

TNH held an open house on April 2, 2003, to present the recommended route option. Participants were invited to examine the information gathered to date on the route options and to review the rationale behind the selection. Exhibits include information on landownership, environmental impacts, trail crossings, typical cross section for roadway and railroad, construction cost estimates, bridge crossings, and traffic analysis. One-hundred forty-six participants signed in for the open house.

Agency Pre-application Meeting

An agency pre-application meeting was held on May 13, 2002, at the offices of URS Consulting in Anchorage. The purpose of the meeting was to introduce the study team, go over the study objectives and hold a roundtable discussion among local, state, and federal resource agencies regarding route location constraints, environmental baseline conditions, and information needs for future project permitting. The agenda, sign-in sheet, and notes from the meeting are found in Appendix ????

Media Contacts

Newspaper announcements and Public Service Announcements (PSA) were published in advance of each of the three public meetings. For the newspaper, display advertisements were designed and published at least one week prior to the meeting in the Anchorage Daily News and the Frontiersman.

PSAs inviting the public to the meetings were sent to the following radio stations: KMBQ (Houston), KNIK, KSKA, KASH/KENI and KNBA.

Additional Outreach and Communications

The TNH Project Manager made several presentations during the course of the study to the following groups:

- ✓ Matanuska-Susitna Borough Port Commission
- ✓ Knik-Goose Bay Community Council
- ✓ Matanuska-Susitna Borough Transportation Advisory Board

APPENDIX L

Preliminary Environmental Review

1.0 INTRODUCTION

The following is a preliminary environmental analysis of the two selected transportation corridor that were selected as potential alignments for developing both road access from Port MacKenzie to the Parks Highway and rail access from the port to a connection with the existing Alaska Railroad line. The study area for the project was a broad corridor that encompassed all of the viable routes connecting Port MacKenzie with the existing transportation facilities between Wasilla to Willow (Figure 1-1). This intent of this analysis is to identify the key environmental effect of developing the selected alignments on the human environment. This analysis is not intended to satisfy the requirements of the National Environmental Policy Act (NEPA) and once a decision has been made to carry forward either of these projects and develop a new access to Port MacKenzie, a formal NEPA document, either an Environmental Assessment (EA) or Environmental Impact Statement (EIS) would be initiated.

Key environmental constraints used in selection the preferred alignments included land status, land use, wetlands and aquatic sites, and extent of organic soils (peat).

2.0 PHYSICAL ENVIRONMENT

2.1 GEOLOGY AND SOILS

2.1.1 Affected Environment

The project area for consists of a complex of old floodplains and stream terraces along the Susitna River and glacial landforms and associated structures for the Quaternary Glaciation (Pewe 1975). These glacial landforms include nearly level and undulation outwash and till plains, pitted outwash plains, steep hills and wind deposited sand sheet (USDA, Natural Resource Conservation Service (NRCS, 1998). Thick deposits of glacial drift often cover the underlying bedrock at the lower elevations. The dominant features of the landscape within the Project Area are low rolling moraine hills and nearly level to undulating outwash are interspersed with many small poorly drained muskegs and small to large lakes. The entire area is free of permafrost (Reiger, et al. 1979).

One of the prominent geologic features in the Project Area is the Castle Mountain Fault (Figure 2-1). This fault extends at least 300 km from Copper River Basin west-southwestward to the Matanuska-Susitna Lowlands. This fault is the only active fault in the MatSu region region with undisputed surficial expression, which occurs in the northern portion of the Project area near Houston. (Combellick, et al. 1994). Detterman et al. (1974) studied the fault in the regions from Houston and westward and from the Hatcher Pass Road area and eastward (Detterman et al., 1976). Limited age control data indicated that the most recent surface rupture in the Susitna segment southwest of Houston occurred between 225 and 1,700 year ago. Surface expression of the fault is highly variable. Southwest of Houston, the fault is clearly visible in air photographs but is obscured by floodplain deposits of the Little Susitina River and late-Wisconsian glacial drift at the point where it is crossed by Corridor 3. Earthquake hazards within the areas of the fault are discussed at length in Haeussler (1994).

Overall, this prominent geologic feature is not expected to be a major constraint to development of the railroad alignment to Port Mackenzie. This fault is covered by outwash deposits from the Susitna River at the Corridor 3 crossing location and the infrequent activity at the fault suggest this would not be a major concern. The existing Alaska Railroad alignment currently crosses the Castle Mountain fault a few miles southeast of Houston.

Soils in the Project Area are characterized as well drained and were formed in a thin mantle of silty loess over thick deposits of very gravelly glacial drift (Reiger et. al 1979). Most of the material is in this region consist of gravelly glacial deposits and range from gravelly clay loam to very gravelly sand, primarily on the terraces and outwash plains. The hill, terraces and outwash planed are mantled with sitly wind-deposited material of varying thickness. The material, loess, is primarily from the flood plains of river carrying glacial outflow water and volcanic ash originating in mountains to the west. Permafrost is not known to occur in this area. The dominant soil associations in the Project Areas are classified as typic cryorthods, and are typically formed in a thin mantle over deposits of gravely glacial drift. These soils are typically well drained and present few to moderate limitations as far as road construction. In depressions and shallow basins, soils are generally a poorly drained organic soil or peat (sphagnic borofibrists and terric borohemists), formed from decomposed mosses and sedges. These peat deposits can be up to 10 feet thick and can present severe limitations to construction of roads (Reiger, et al. 1979). Histic cryaquepts, a poorly drained soils with a relatively thin covering of peat, occur at the edges of muskeg and in low-lying areas adjacent streams. These soils also present some limitations for construction of roads or building (Reiger, et al. 1979).

Soils map developed by the NRCS (NRCS, 1994) were used as a key factor in screening suitable corridor alignments for both the rail road and road to Port MacKenzie.

2.1.2 Environmental Consequences

Corridor 3: Corridor 3, from crosses moraine deposits in the Port MacKenzie area and west and north to the Little Susitna River where it travels over primarily outwash deposits of the little Susitna River, Susitna River, and Willow Creek to the intersection with the existing roalroad alignment. Organic soils or peats account for approximately 183 acres in the corridor with an additional eight acres at the rail turnaround at Port MacKenzie out of the total land cover of 558 acres affected (assuming a 150-foot right-of-way).

Some of the more common upland soil associations encountered in Corridor 3 include the Benka silt loam, Estelle silt loam, Kashwitna silt loam, Kichatna-Delyndia complexes (NRCS, 1998).

The Castle Mountain Fault is not expected to be a major constraint to development of the railroad alignment to Port Mackenzie. The location of the fault is well known and at the crossing location, is covered by outwash deposits from the Susitna River. The existing Alaska Railroad alignment currently crosses the Castle Mountain fault a few miles southeast of Houston.

Corridor 7: Corridor 7, which follow the existing road for much of its length, primarily crosses moraine deposits for it entire length and soils would not be expected to be major issue. Approximately 18 acres of peat or organic soils would be encountered in upgrading and widening the diving surface of a new road and in developing new sections of road to straighten several curves. The total area within Corridor 7 is approximately 870 acres but this includes the footprint of the existing road. The amount of peat soils encountered with the expanded ROW for the road alignment could vary greatly depending on the final design but it is expected that most would be in areas adjacent to the existing road.

Other common soil associations encountered within the corridor include Deception silt loam, Estelle silt loam, Kashwitna silt loam, and Kichatna-Delyndia silt loams (NRCS, 1998).

2.2 Water Resources

2.2.1 Affected Environment

Surface water resources in the Project Area include non-glacial rivers, such as the Little Susitna River and Willow Creek, small perennial streams, which drain the moraine deposits, and numerous small lakes and ponds, and large lakes. Lakes with ½ mile of the centerline of Corridor 3 include Lorrain Lake, My Lake, North Rolly Lake, Vera Lake and Little Lonely Lake.

For Corridor 7, non-glacial perennial streams the cross the corridor include Fish Creek, Meadow Creek and one unnamed tributary to Meadow Creek. Small and large lakes within ½ mile of the centerline of this corridor include Lorraine Lake, Twin Islands Lake, Lost Lake, Carpenter Lake, Jewell Lake, Anna Lake, Big Lake and Echo Lake.

Goundwater resources in the general area of the project have been described from well data by Montgomery (1990). Regional water tables in the central Matanuska Valley generally slope towards the Matanuska River. Water well logs indicate that goundwater in the Big lake area is typically less than 60 feet whereas in the Knik Road and Goose Bay regions, groundwater is form 120 to 150 feet deep.

2.2.2 Environmental Consequences

Corridor 3. An effort was made to avoid all lakes or large ponds in the siting of a railroad route, but since a rail route is limited in its turning ability, some filling of lake or pond habitat could occur such as with Little Lonely Lake. Final design could possibly avoid direct fill in the lake. Corridor 3 would require new bridge structures for the crossing of Willow Creek and the Little Susitna River, and possibly several small tributaries. Bridge and culvert designs would need to ensure that there would be no adverse impact to water quality or to other criteria, such as essential fish habitat (EFH). Erosion protection and hydroseeding would be used to minimize erosion in the adjacent ponds, lakes and streams. During construction, silt fences would also be used in the appropriate locations to minimize the amount of silt deposited into the surface water.
Groundwater resources are not likely to be affected by development of this corridor.

Corridor 7. No lake habitat would be directly affected by the construction of the rail bed for this corridor. Some culverts would likely need to be extended and portions of some small ponds may be filled to in new areas where there alignment departs form the existing road or to widen the road surface. Groundwater resources are unlikely to be affected.

3.0 BIOLOGICAL ENVIRONMENT

3.1 VEGETATION

3.1.1 Affected Environment

The Project Area is primarily covered by forest vegetation with interspersions of small lakes and ponds, muskegs, and open grassy meadows. Upland forests consist of deciduous forests of paper birch and balsam poplar, and mixed needleleaf and deciduous forest of paper birch, balsam poplar and white spruce (*Picea glauca*). These upland forest communities often contain a high percentage of aspen (*Populus tremula*). In poorly-drained lowland areas, the vegetation is dominated by black spruce (*Picea mariana*) forests or dwarf tree woodlands with ericaceous shrub understory. Black spruce is also found in uplands situations within old burn areas (Hegg, 1970). Shrub communities include both open and closed tall shrub thickets dominated by alder (*Alnus sinuata or A. tenuifolia*) and willows (Salix spp). Open graminoid meadows of primarily bluejoint reed-grass (*Calamagrostis canadensis*) and fireweed (*Epilobium angustifolium*) also occur in some areas.

Disturbed areas, such as agricultural fields, clearings, roadways, utility corridors, and residential areas, support a mixture of vegetation communities in various stages of succession. Agricultural fields support a variety of cultivated crops, primarily feed crops, such as hay. Fields that have not been maintained or allowed to re-vegetate, typically support early seral communities of young trees such as birch, cottonwood, and tall shrubs such as willows.

3.1.2 `Environmental Consequences

Corridor 3: Development of Corridor 3 would require clearing the right-of-way of all tall vegetation, primarily deciduous forest, mixed deciduous/needleleaf forest, and black spruce forest. The amount of area cleared would depend on the final alignment and design. Assuming a 150-foot wide footprint, the cleared area would be approximately 560 acres. Clearings would likely occur during the fall or winter months to avoid impacts to nesting songbirds. Vegetation communities along the corridor are typical for this region and the direct loss is not expected to be regionally significant.

Corridor 7: Direct impacts to vegetation along Corridor 3, which primarily consists of deciduous and mixed deciduous/needleleaf forests and small amounts of black spruce forests, include the loss of vegetation from the clearing of additional right-of-way to widen the existing road and in areas where the new alignment departs from the present road. The actual amount of clearing would also depend on the final alignment and design features and is difficult to calculate at this time, but would likely be over 100 acres.

Vegetation communities are generally similar to those in the surrounding area and the direct loss is not expected to be regionally significant.

3.2 WETLANDS

3.2.1 Affected Environment

Wetlands within the project area have been mapped and categorized by the National Wetlands Inventory (NWI, 1980) for the entire study area at a scale of 1:63,360. These maps are not available in digital format, therefore the wetland boundaries had to be scanned into Arcview GIS and superimposed over air photo base maps of the project area (Figure 3-1). Boundaries of wetlands intersected by the corridors were individually digitized to calculate the total area of wetlands within each corridor for comparison among routes. Potential wetlands impact for this analysis was calculated based on an assumed right-of-way wide of 150 feet for both the road and the rail bed. Actual wetland area filled during development will depend on final alignment and the design for each area.

Wetlands with the project area corridors and their NWI Classification include

- Palustrine forested wetlands (muskegs)– PFO4
- Palustrine scrub-shrubs wetlands (shrub bogs, shrub thickets) – PSS1, PSS4
- Palustrine persistent emergent wetlands (wet meadows, marshes)– PEM5

Aquatic habitats include lakes, small ponds, small perennial streams and rivers.

- Palustine open water (small ponds under 20 acres)- POW
- Lacustrine open water areas (large lakes >20 acres) – L1OW
- Riverine systems (persistent open water areas of rivers and streams) – R3

Palustrine Forested or Scrub Shrub Wetlands: Palustrine forested and scrub-shrub wetlands include forested wetlands of black spruce, bogs and muskegs dominated by dwarf trees (black spruce), tall shrubs (willow and alders), or low ericaceous shrub species. Other wetland types, which are classified as palustrine, include tall shrub thickets of willow (*Salix spp.*) and thinleaf alder, and riparian shrub communities adjacent to streams and rivers. These wetlands generally occur throughout the project area in both outwash plains and in depression in moraine area resulting from depressions form glacial activity. Palustrine wetlands serve a variety of important functions, such as wildlife habitat for moose and black bear, food chain support, flood water storage, and groundwater recharge.

Palustine Emergent Wetlands: Freshwater emergent and submergent aquatic vegetation is found in the shallow water areas of ponds and lakes, and consists of: yellow pond lily (*Nuphar polysepalum*), white water lily (*Nymphaea tetragona*), pondweeds (*Potomageton spp.*), and mare's tail (*Hippuris spp.*) (NWI, 1980). Other emergent wetlands types include mesic and wet herbaceous grass meadows dominated by bluejoint reed-grass, floating bogs, and emergent freshwater marshes at the edges of lakes dominated by sedges (*Carex spp*). Aquatic vegetation provides important habitat for both fish and wildlife species, such as loons, waterfowl, and shorebirds, as well as mammals such as muskrat, beaver, river otter, and mink. These areas also provide feeding habitat for moose during summer, summer and fall.

Riverine Systems: The riverine classification under wetlands includes the wetted area of a stream or rivers. In the Project Area, this aquatic habitat includes the small area of water crossed at the little Susitna River and Willow Creek. The surface area of the smaller streams are generally too small to be mapped and are not included in the total riverine area potentially affected by the project. Riverine areas are important as fish habitat as well as support for numerous wildlife species.

3.2.2 Environmental Consequences

Corridor 3: Wetland fill required for the development of Corridor 3 is projected to be approximately 295 acres (Table 3.2-1). A vast majority of the wetlands affected would be the scrub shrub wetlands (266 acres). Only a relative small amount of emergent wetlands would be affected from the development of this alignment. The direct loss of this amount of wetlands would likely be considered adverse due to total area affected, the pristine nature of much of the area and cumulative impact of wetland loss in the MatSu Valley. However, the loss of the wildlife habitat function of these wetlands over the length of the corridor would likely not affect any species at the population level. Mitigation of wetland loss would need to provide replacement of the functions and value for the wetlands affected by the project.

Corridor 7. Since Corridor 7 follows an existing road over most of its length, improving the road and building new sections at key locations would result in a direct loss of approximately 25 acres of wetlands. Most of the wetlands affects would be scrub shrub or shrub bogs with forested wetland types only making up 5 acres. Most of these areas are adjacent to the existing road. Mitigation for wetland loss from development of the road corridor would be substantially less than Corridor 3 since much of the areas is already developed.

Table 3.2-1
Wetland types and areas within Corridor 3 ROW

Wetland Type	**NWI Wetland Classification**	**Hydrology**		**Total Area (acres)**
Palustrine forested wetlands –black spruce	PFO4B	saturated		52.8
	PFO4/SS1B	saturated		13.8
	PFO4/EM5B	saturated		27.2
			Subtotal	**86.2**
Palustine scrub shrub wetlands - shrub bogs, dwarf tree woodlands, and riparian shrub	PSS1B, PSS1/4B, PSS4/1B, PSS4B PSS4/EM5B	saturated		158.9
	PSS1A	temporarily flooded		2.5
	PSS1/EM5C	seasonally flooded		12.6
	PSS1/EM5F	semi-permanently flooded		91.8
			Subtotal	**265.8**
Emergent wet meadows and marshes	PEM5B	saturated		1.4
	PEM5F	semi-permanently flooded		10.1
	PEM5H	permanently flooded		2.4
			Subtotal	**13.9**
Aquatic habitats				
Rivers and Streams	R3OWH	permanently flooded		0.6
			Subtotal	**0.6**
			Total	**294.3**

Table 3.2-1
Wetlands types and areas with the Corridor 3 ROW

Wetland Habitats	NWI Wetland Classification	Hydrology		Total Area (acres)
Forested wetlands	PFO4B	saturated		4.8
			Subtotal	**4.8**
Scrub Shrub - Shrub bogs, dwarf tree woodlands, and riparian shrub	PSS1/EM1B	saturated		4.2
	PSS1/EM1C	Seasonally flooded		9.3
	PSS1F	Semi-permanently flooded		3.7
			Subtotal	**17.2**
Emergent wet meadows and marshes	PEM1B, PEM1/SS1B, PEM1/SS4B	saturated		2.3
	PEM1C	Seasonally flooded		0.4
	PEM1F	Semi-permanently flooded		0.4
			Subtotal	**3.1**
			Total Area	**25.1**

3.3 FISHERIES RESOURCES

3.3.1 Affected Environment

The lakes, streams, and rivers of the Project Area support a wide variety of both anadromous fish, fish that return to spawn in fresh water after spending time rearing at sea, and resident fish, which spend there entire life in fresh water. Anadromous fish include all five species of Pacific salmon: Chinook or king (*Onchorhynchus tshawytscha*), coho (*O. kisutch*), sockeye (*O. nerka*), pink (*O. gorbuscha*), and chum (*O. keta*). In addition, anadromous populations of Dolly Varden (*Salvenius malma*), could also occur in some streams in this region (ADNR, 1991, ADF&G, 1992).

Resident fish species of the Project Area include rainbow trout (O. mykiss), round whitefish (*Prosopium cylindraceum*), resident Dolly Varden, arctic grayling (*Thymallus arcticus*), threespine and ninespine stickleback (*Gasterosteus aculeautus* and *G. pungitius*), slimy and coastrange sculpins (*Cottus cognatus, C. aleuticus*) and longnose sucker (*Catosomus catisomus*) (ADNR 1991). Northern pike (Esox lucius) have been introduced to the Susitna River drainage but its not known if they occur in these streams.

The Little Susitna River, Willow Creek and Fish Creek support substantial sport fisheries for both salmon and resident fish (ADF&G, 2002).

3.3.2 Environmental Consequences

Corridor 3: Corridor 3, the proposed rail alignment, after crossing the Point MacKenzie Agriculture project, travels north through undeveloped land to the intersection with the exiting track north of Willow Creek. The development of this alignment would require the crossing of six individual anadromous fish streams (Figure 3-2). The names and locations of the crossings are summarized in the Table 3.2-1.

Table 3.2-1
Anadromous Fish Stream Crossings – Corridor 3

Stream Name	Anadromous Fish Stream Catalog No.	Latitude	Longitude	Species
Unnamed tributary of Little Susitna River	247-41-10100-2080	150°7'51"W	61°26'27"N	CS, PS, SS, CS, CoS
Unnamed tributary of Little Susitna River	247-41-10100-2090	150°7'23"W	61°28'23"N	CS, PS, SS, CS, CoS
Little Susitna River	247-41-10100	150°8'54"W	61°29'16"N	CS, PS, SS, CS, CoS
Fish Creek	247-41-10200-2020	150°15'15"W	61°34'46"N	CS, PS, SS, CS, CoS
Unnamed tributary of Willow Creek	247-41-10200-2120-3010	150°6'46"W	61°46'3"N	CS, PS, SS, CS, CoS
Willow Creek	247-41-10200-2120	150°6'4"W	61°46'25"N	CS, PS, SS, CS, CoS

Table source: Catelog of Streams Important ot Anadromouns fish, 1992

Anadromous fish species in the Little Susitna River, Fish Creek, Willow Creek and their tributaries are similar and consist of all five species of eastern Pacific salmon (ADF&G 1992).

The crossing of the Little Susitna River and Willow Creek would likely require bridge structures and crossings of the smaller streams would use culverts. A State of Alaska Fish Habitat Permit (Title 16) would be required for each crossing of an anadromous fish stream. Consultation with National Oceanographic and Atmospheric Administration (NOAA) Fisheries on EFH would also have to occur since the proposed activities involve potential effects on federally managed species. Specific conditions would be included with these permits/authorizations to prevent adverse impacts to anadromous fish habitat both during construction and operation. For non-anadromous stream, fish passage would have to be maintained to ensure fish movement between upstream and downstream habitats. Adverse impacts to anadromous fish habitat or resident fish passage are not anticipated for any of the streams crossed by the alignment.

Corridor 7: The proposed road alignment for Corridor 7 travels along an existing road for most of its length and currently crosses a total of three anadromous fish streams (Table 3.2-2). Culverts already exist for each of these crossings, but would likely need to be extended or replaced to accommodate the expanded road surface. All five species of eastern Pacific salmon use these streams for either spawning or rearing (ADF&G, 1992).

Table 3.2-2
Anadromous Fish Stream Crossings – Corridor 7

Stream	Anadromous Fish Stream No.	Latitude	Longitude	Species
Fish Creek	247-50-10330	149°49'30"W	61°32'3"N	KS, PS, SS, CS, CoS
Unnamed Tributary of Meadow Creek	247-50-10330-2050-3030	149°47'23"W	61°34'3"N	KS, PS, SS, CS, CoS
Little Meadow Creek	247-50-10330-2050-3050	149°43'21"W	61°34'33"N	KS, PS, SS, CS, CoS

Table source: __Catelog of Streams Important ot Anadromouns fish, 1992

Overall, the construction activities associated with the development of Corridor 7 are not expected to result in adverse impacts to anadromous fish habitat or resident fish passage. Title 16 Fish Habitat permits and EFH consultation with NOAA Fisheries would be required for modification of the existing culverts.

3.4 WILDLIFE RESOURCES

3.4.1 Affected Environment

The terrestrial and aquatic habitats of the Project Area support a wide range of both small and large mammals as year-round residents or as seasonal migrants from other areas in the Matanuska and Susitna River watersheds (Table 3.4-1).

Table 3.4-1
Common Mammal of the Project Area

Common Name	Scientific Name
Masked Shrew	*Sorex cinereus*
Little Brown Bat	*Myotis lucifigus*
Least Weasel	*Mustela nivalis*
Short-tailed Weasel (Ermine)	*Mustela erminea*
Mink	*Mustela vison*
River Otter	*Lontra canadensis*
Red Squirrel	*Tamiasciurus hundsonicus*
Northern Flying Squirrel	*Glaucomys sabrinus*
Beaver	*Castor canadensis*
Redbacked Vole	*Clethrionmys rutilus*
Meadow Vole	*Microtus pennsylvanicus*
Muskrat	*Ondatra zibethicus*

Common Name	Scientific Name
Porcupine	*Erethizon dorsatum*
Snowshoe Hare	*Lepus americanus*
Wolf	*Canis lupus*
Coyote	*Canis latrans*
Lynx	*Lynx canadensis*
Red Fox	*Vulpes vulpes*
Black Bear	*Ursus americanus*
Brown Bear	*Ursus arctos*
Moose	*Alces alces*

Sourse; ADF&G 1986

Moose are the most abundant large mammals in the area and occur as residents in these areas, with higher concentrations during the winter as snow forces animals out of the higher elevations of the Talkeetna Mountains to the north and the Alaska Range (Game Management Unit 16) on the western side of the Susitna Valley. Large numbers of moose cross the Project Area in an east/west direction moving to local areas of concentration for moose, including the Palmer Hay Flats and the Point Mackenzie Agriculture Project lands (J. Del Frate, ADF&G, Wildlife Biologist, personal communication). Shrub and sapling re-growth in the fallow fields of the Agricultural Project have attracted large numbers of moose in recent years (B. Quirk, U.S. Army, Fort Richardson Environmental Resources, personal communication).

Habitats within the Project Area support a larger variety of song birds such as swallows, warblers, sparrows, thrushes, and finches, and flycatchers, primarily during the summer months. Raptors include resident species, such as the northern goshawk, sharp-shined hawk, great horned owl, boreal owl, sawhet owl, and great gray owl and migrant species include red-tailed hawk, rough-legged hawks, merlins, kestrels, and golden eagles. Bald eagles, protected under the Eagle Protection Act, are also residents and breeders in the Project Area. Nest locations are typically near lakes, larger rivers and along the coast, but nesting density in the Project Area is expected to be rather low in comparison to coastal areas.

The wetlands and aquatic habitat in the Project Area and in adjacent areas, such as the Susitna River Flats State Game Refuge and Goose Bay Refuge, provide valuable habitat for migrating waterfowl, shorebirds and cranes, especially during spring and fall migration. The Susitna Flats have been identified as a concentration area for the migration of trumpeter swans and local lakes support scattered breeding pairs (ADF&G, Habitat Maps) (Figure 3-1).

3.4.2 Environmental Consequences

Corridor 3: Direct impacts of the development of Corridor 3 would be related to the loss of 120 acres of habitat from clearing of the right-of-way, the placement of fill for the rail bed and the displacement of birds and mammals from adjacent areas during construction.

The habitat lost along this alignment would be primarily upland and lowland deciduous forest with smaller amounts of scrub shrub and wet meadows. Because the corridor is relatively narrow and the upland vegetation communities disturbed are abundant on either side of the corridor, impacts of habitat loss are not expected to adversely affect any species of wildlife at the population level. Indirect effects of the development of Corridor 3 on wildlife would be from increased access to adjacent areas by hunters, ATVs, and snowmachines. Controlling trespass on the tracks would be difficult, considering the remoteness of the area and the relatively light projected rail traffic to Port MacKenzie. Adjustments to hunting regulations might be required if increased access leads to substantial increases in harvest. Another indirect impact is the potential increase in moose mortality from collisions with trains. Since this alignment is perpendicular to major moose movement, corridors between the Susitna River and concentration area to the east, such as Palmer Hay flats, some level of train/moose collision is expected. Actual mortality would be related to the frequency of trips, speed of the trains and annual snow conditions along the corridor. If collision mortality becomes a problem in a specific portion of the corridor, mitigation measures would likely be developed to reduce mortality to acceptable levels.

Waterfowl that nest and rear their broods in the lakes and wetlands of the Project Area and the Susitna Flats State Game Refuge, west of the Corridor 3, would not be expected to be adversely affected by development of Corridor 3. Some waterfowl habitat would be lost from filling of emergent wetlands (approximately 14 acres) and there would be some potential displacement of nesting waterfowl from areas adjacent to the right-of-way due to disturbance during construction and operation. However, since the footprint of the project is relatively narrow and adjacent habitat are generally similar, any displaced birds would likely move in adjacent areas.

There are no known bald eagle nests along Corridor 3 (USFWS, bald eagle nest database, 2002). However, comprehensive surveys of the area have likely not been conducted. Prior to final design, a nest survey of the entire corridor would need to be conducted to locate any bald eagle nests. If encounter activities within a primary (330 feet [100 m]) and secondary (660 feet) buffer zone around the nest would be restricted to avoid disturbing nesting birds. The alignment might need to be adjusted to accommodate an active nest if one is located.

Corridor 7. Development of Corridor 7 would result in the direct loss of a relatively small amount of wildlife habitat from land clearing where the road would deviate from the existing road alignment (less than 100 acres). This loss is expected to have only minor effects on wildlife species since it follows existing roads for most of its length and most of the habitat lost would be in a narrow strip adjacent to the road or in newly cleared areas. The habitats along the existing road corridor are common throughout much of the surrounding area.

Indirect effects such as increased mortality from vehicle/moose collisions could occur from increased traffic to Port MacKenzie. However, the actual traffic volume is unknown at this time, therefore, the effect on moose would be unknown, but would not be expected to be greater than other major roads in the general area. The increase in access for hunters would be minimal since there is currently access to all adjacent areas along the existing road system.

There are no known bald eagle nests within Corridor 7, although comprehensive surveys of the area have likely not been conducted. Prior to final design, a thorough survey of the corridor would need to be conducted to ensure that no nests would be disturbed (USFWS, bald eagle nest database, 2002).

3.4 THREATENED AND ENDANGERED SPECIES

There are no threatened or endangered wildlife species within the project area. The Steller's eider (*Polysticta stelleri*), is listed as threatened under the Endangered Species Act (62 FR 31748) that winters in lower Cook Inlet, could potentially occur in the upper Cook Inlet area, but would not be expected to be found near the project area. There are no threatened or endangered plant species that occur in this area of Alaska.

4.0 SOCIOECONOMICS ENVIRONMENT

4..1 AREA DEMOGRAPHIC, HOUSING, ECONOMIC, AND QUALITY OF LIFE

4.1.1 Affected Environment

Area Demographic Profile

Population: In the 1960s, the MSB had a population of just over 5,000 people. Between 1980 and 1990, the Borough population more than doubled from 17,816 to 39,683. During the past decade, the population grew forty-nine percent, compared to thirteen percent statewide and fourteen percent in Anchorage. The following is a table of Federal Census Designated Places (CDPs) within the MSB for the year 2000.

Table 4.1-1
Federal Census Designated Places – Population Figures

2000 CDPs	Year 2000
Big Lake	2,635
Buffalo Soapstone	699
Butte	2,561
Chase	41
Chickaloon	213
Farm Loop	1,067
Fishhook	2,030
Gateway	2,952
Glacier View	249
Houston City	1,202
Knik River	582
Knik-Fairview	7,049
Lake Louise	88
Lakes	6,706
Lazy Mountain	1,158
Meadow Lakes	4,819
Palmer City	4,533
Petersville	27
Point MacKenzie	111
Skwetna	111
Susitna	37
Sutton-Alpine	1,080
Talkeetna	772
Tanaina	4,993
Trapper Creek	423
Wasilla City	5,469
Willow	1,658

Y	956
Remainder of Borough	5,101
TOTAL	**59,322**

MSB 2002 Fact Book

The locations in the borough closest to the two project corridors include the following CDPs: Big Lake, Houston City, Point McKenzie, Wasilla, and Willow. The potentially affected population is the sum of these CDPs, which are 11,075. Estimated MSB population for 2008, based on Department of Labor figures is 77,074.

Age, Sex, and Race Breakout in the year 2000: The median age in the MSB for the year 2000 was 34.1 years, compared to 32.4 in the state and 35.3 in the nation. Thirty-five percent of the MSB population is under that age of 20, and six percent over the age of 65. The retirement age category has been relatively stable over the past 10 years. Fifty-two percent of the MSB population is male and forty-eight percent female. About eighty-eight percent of the population is white and six percent American Indian or Alaska Native. The remaining population is listed as other races or two or more races.

Area Housing Profile

The MSB has a higher owner occupancy rate than the state. About seventy-five percent of the 20,556 occupied houses are owner-occupied, the remaining are renter-occupied. The average number of persons per household is nearly three. The vast majority of the unoccupied units in the MSB are considered seasonal, recreational, or occasional use units.

About half of the MSB population is located in the "core area", which encompasses approximately 100 square miles between and around the cities of Palmer and Wasilla. Other MSB residents live along or near the Glen Highway and the Parks Highway, which provide access to Fairbanks and Anchorage.

Within the study area, housing can be roughly broken into four categories: primary residences located in Wasilla and along main road systems such as the Parks Highway; primary residences located along secondary road systems and more developed areas such as Big Lake; primary residences located in more rural or remote areas; and second or vacation homes located in Big Lake and more remote or rural areas, primarily on lakes. The area along Corridor 7 includes a mix of all four types of housing. The area along Corridor 3 primarily includes residences located in more rural or remote areas, and second/vacation homes located in more remote or rural areas. The number and density of housing is much greater along Corridor 7 than Corridor 3.

Area Economic Profile

Employment: As with population, and in many cases directly related to population growth, employment has grown considerably faster in the MSB than elsewhere in the state. During the past decade, employment in the MSB grew at nearly six percent per year, three times faster than the rest of the state. Two-thirds of the growth came from retail and services. Services represent one quarter of all wage and salary employment in the MSB. Health care is one of the fastest growing service industries, with business and social services close behind. As population and second home use has grown, retail and service establishments have also grown, particularly in areas outside the primary cities of Palmer and Wasilla. Year 2000 employment data for the MSB is listed in the table below.

Table 4.1-2
Area Employment

Employment	**Number**
Total Potential Work Force (Age 16+)	42,705
Total Employment	25,356
Civilian Employment	24,981
Military Employment	375
Civilian Unemployed (seeking work)	2,867
Percent Unemployed	10.3%
Adults Not in Labor Force (not seeking work)	14,482
Percent of All 16+ Not Working (unemployed + not seeking)	40.6%
Private Wage and Salary Workers	16,925
Self-Employed Workers (in own not incorporated business)	2,734
Government Workers (City, Borough, State, Federal)	5,186
Unpaid Family Workers	136

MSB 2002 Fact Book

In 2001, the unemployment rate in MSB was listed at 7.7 percent, compared to 6.3 percent for the state and 4.8 percent for the nation.

Wage and Income: In 1999, the average annual wage in the MSB was $26,893 compared to $35,557 in Anchorage. The primary reason for the discrepancy can be found in a higher percentage of employment in sectors such as services and retail compared with a higher Anchorage percentage in the sectors of oil, government, and transportation.

Table 4.1-3
Employment by Industry

Industry	Number
Agriculture, Forestry, Fishing and Hunting, Mining	1,413
Construction	2,841
Manufacturing	594
Wholesale Trade	606
Retail Trade	3,217
Transportation, Warehousing and Utilities	2,046
Information	977
Finance, Insurance, Real Estate, Rental and Leasing	924
Professional, Scientific, Management, Administrative and Waste Management	1,659
Education, Health and Social Services	5,312
Arts, Entertainment, Recreation, Accommodation and Food Services	2,059
Other Services (except Public Administration)	1,348
Public Administration	1,985

MSB 2002 Fact Book

The following list represents income statistics for families in the MSB:

Per Capita Income	$21,105
Median Household Income	$51,221
Median Family Income	$56,939
Persons in Poverty	6,419
Percent Below Poverty	11.0%

Quality of Life Considerations

Many people chose to have primary or secondary residences in the MSB because of quality of life values. These include larger lots and rural residential settings, less traffic and other urban problems (such as noise and air quality), and access to recreation opportunities such as hunting, fishing, boating and snowmobiling. The locations of the two corridors under consideration have been adjusted to a certain degree to minimize adverse effects on quality of life considerations.

Many quality of life issues are discussed elsewhere in this document (for example, noise and recreation). However, further research may need to be done to determine impacts to other quality of life issues like 1) facilities and activities; 2) annual local events; and 3) open space.

4.1.2 Environmental Consequences

Area Demographic Environmental Consequences

Development of either Corridor 3 and 7 are not likely to generate long-term population growth unless there is significant resource development, which is not currently forecast. Some short-term population increase associated with construction employment could occur, but would not be permanent.

Area Housing Environmental Consequences

Effects on housing would come from short-term increased demand from construction workforce. Due to its more remote location, development of Corridor 3 may require construction of a construction camp to house the workforce. Construction crews working on widening the route for Corridor 7 likely will use existing facilities for lodging during construction periods. Widening the route for Corridor 7 might involve some property takes that would affect housing.

Area Economic Environmental Consequences

Construction of the proposed project in both Corridors 3 and 7 would generate construction employment, and likely would result in increased earnings for materials suppliers. The number of positions and length of employment will vary depending on the route chosen, the contractors selected, and the construction schedule. Corridor 3 would generate some operation employment and associated income. Construction crews working on widening the route for Corridor 7 likely will use existing facilities for food and lodging during construction periods, which would likely have a positive economic benefit to the area. Widening the road for Corridor 7 might involve some property takes that would affect local businesses.

Area Quality of Life Environmental Consequences

There are obvious short and long-term quality of life effects from construction traffic, noise and dust, and operation traffic and noise. Widening of Corridor 7 would affect more people than construction of 3. The railroad associated with Corridor 3 will represent a significant change in the nature of the area and likely interfere with valued aspects of rural living (for example recreational values like trails, and quiet and solitude). Many social impacts, such as quality of life issues, are subjective in nature and cannot be accurately quantified.

4..2 LAND USE

4.2.1 Affected Environment

Land Ownership/Status

The two potential corridor routes evaluated traverse private, Borough, Native Corporation, State, Alaska Mental Health Trust Lands, and University of Alaska lands. No Federal lands are involved in either corridor route.

Private: For the purposes of this study, private land holdings are properties owned by individuals or businesses, but not by Native Corporations, certified Alaska Native Allotments, municipal governments, or the state or federal governments. Concentrations of private lands are located primarily along Corridor 7, although some private lands are located in the vicinity of Corridor 3.

Borough: Borough-owned properties were conveyed by the State of Alaska as Municipal Entitlement Lands (MEL), and also were acquired through tax foreclosure, purchase, and donation. MEL lands are used to generate revenue through sales, leases, and permits; to provide sites for public facilities; and to offer public recreational opportunities. Both corridors pass through lands owned by the MSB.

Native Corporation: Under the Alaska Native Claims Settlement Act of 1971, Native Corporations were allowed to select lands from federal land holdings. These selections were then adjudicated and conveyed to the Native Regional and Village Corporations. Cook Inlet Region Incorporated (CIRI) is the Native Regional Corporation for the Cook Inlet area. CIRI owns lands within the study area. Corridor 7 is the only route that passes through CIRI owned land.

State: The State of Alaska was granted over 100 million acres of land when it achieved statehood in 1959. The State owns land in both study corridors, although Corridor 3 impacts more State land.

Alaska Mental Health Trust Lands: State of Alaska Mental Health Trust Lands were granted to the territory by the federal government prior to statehood, to generate revenue to support Alaska's mental health programs. In 1978, the state legislature waived the trust status of these lands, allowing land to be leased, sold, and transferred to municipalities. In the 1980s, mental health advocates sued, and the state was ordered to "reconstitute, as nearly as possible the holdings which comprised the trust when the 1978 law became effective." A new Mental Health Trust Land Unit under ADNR has been created to manage these trust lands. Both corridors minimally involve Mental Health Trust Lands within the study area.

University of Alaska: The land owned and managed by the University of Alaska was originally granted to the University by the federal government in accordance with two Acts of Congress dated March 4, 1915, and January 21, 1929. This property, and other trust land which was subsequently deeded to the University by the State of Alaska, is for the exclusive use and benefit of the University of Alaska, and therefore, is not state public domain land. Both corridor routes pass through a minimum acreage of University land, although Corridor 3 potentially affects more land.

Generalized Land Use

Land uses in the study area are a mix of public recreation use and wildlife habitat on state lands, low-density residential uses; light industrial uses; commercial enterprises, commercial and noncommercial aviation uses; forestry; agriculture; and mineral resource development. The study area is also commonly used for subsistence and sport hunting, fishing, and gathering. Land use along Corridor 7 includes more residential and commercial use, due to the existing road access and development near Port MacKenzie. Land use in the vicinity of Corridor 3 includes more public recreation and wildlife habitat, with some rural residential use.

Recreation is one of the area's major land uses. The study area is the focus of much recreational activity on the part of the MSB and Anchorage residents and tourists (see section 4.3, Recreational Resources). Wildlife habitat is abundant in the study area.

Formally Classified Lands

Formally classified lands include nationally or state designated lands, such as wildlife refuges, national parks, and other areas. No nationally designated lands exist in the project area. Corridor 3 will pass adjacent to Nancy Lake State Recreation Area and the Susitna Flats State Game Refuge, and will traverse Willow Creek State Recreation Area and Little Susitna State Recreation Area. Corridor 7 will pass adjacent to the Goose Bay State Game Refuge. Both corridors pass over the Iditarod Trail route.

State and Local Plans

State and Local land management plans that may affect the planning area include the following.

- Matanuska-Susitna Borough Coastal Management Plan (State and local)
- Willow Sub-Basin Area Plan (State)
- Susitna Basin Recreation Rivers Management Plan (State)
- Susitna Flats State Game Refuge Management Plan (State)
- Matanuska-Susitna Borough Comprehensive Development Plan: Transportation
- Matanuska-Susitna Borough Comprehensive Development Plan: Public Facilities
- Matanuska-Susitna Borough 1990 Solid Waste Management Plan Update (local)
- Point Mackenzie Area Which Merits Special Attention Plan (State and local)
- Big Lake Management Plan
- Other lake management plans

These plans address allowable uses and provide guidance for potential development projects.

4.2.2 Environmental Consequences

Private: Private lands owners are expected to be more sensitive to construction and operation of a railroad route on their property than State or MSB land management agencies. Privately owned lands in the study area are primarily used for residences and small businesses. Construction and operation of the proposed project would create temporary impact on existing land uses for Corridor 7 during construction, but would not result in any change in land use outside of the ROW, except potentially at the Point Mackenzie port site. The land use most sensitive to siting of a railroad is low density residential. The land use that is typically least sensitive to siting of a railroad is industrial. Between these two extremes, various land uses are more or less sensitive to a railroad siting, depending on the specific area. In this study area the highest potential land use conflicts occur in the residential areas of Corridor 7 as private land “takings”, and the residential and recreational areas of Corridor 3 (especially in and around the state recreational set asides).

State and Borough: State and Borough lands are more often managed to allow multiple uses that are in the public interest, including rail projects. The proposed project would primarily require ROW permits for construction and operation of the project across state lands for both corridors, although Corridor 3 impacts more State land. Corridor 3 will traverse the Willow Creek State Recreation Area and Little Susitna State Recreation Area, which is land dedicated to recreational pursuits. Both corridors pass through lands owned by the MSB.

State and Borough lands within the project area are primarily managed for wildlife habitat and recreation. Construction and operation of the railroad are not expected to substantially affect the use of the study area for wildlife habitat, particularly because the habitats crossed are abundant locally, and a small percentage of total available habitat will be lost. There is also a substantial amount of recreational use of the area, including use by hunters, fishermen, trappers, skiers, boaters, snowmachiners, and many others. Limitations on access across to wildlife and recreation are the most likely issues. Construction and operation of the railroad are not expected to substantially affect recreation, as discussed in Section 4.3, Recreational Resources.

Mental Health, University, and Native Corporation Lands: Both corridors minimally impact Mental Health Trust Lands within the study area. Both corridor routes pass through a minimum acreage of University land, although Corridor 3 impacts more land. Corridor 7 is the only route that passes through CIRI owned land. These lands are generally undeveloped and project development would not create land use conflicts at this time. However, should any of these lands be required for the proposed project, property acquisition or obtaining ROW will be required.

4..3 RECREATIONAL RESOURCES/TRAILS

4.3.1 Affected Environment

Recreational Resources

Recreation is one of the area’s major land uses. The study area is the focus of much recreational activity on the part of the MSB and Anchorage residents and tourists. In almost every plan reviewed for this report, recreational resources were listed as one of the primary reasons for living in the MSB. The area’s abundance of surface water is an important recreational feature, used for fishing, water sports, and winter travel. Corridor 3 will pass adjacent to Nancy Lake State Recreation Area and the Susitna Flats State Game Refuge, and will traverse Willow Creek State Recreation Area and the Little Susitna State

Recreation Area. Nancy Lake State Recreation Area, Willow Creek State Recreation Area, and the Little Susitna State Recreation Area offer year-round opportunities for fishing, canoeing, cross-country skiing, snowmobiling, and camping. Corridor 7 will pass adjacent to the Goose Bay State Game Refuge. In addition to these designated recreations areas, there are numerous lakes, rivers, trails, and roads that are used for recreation purposes.

The rivers, lakes, and wooded areas are accessible through numerous trails and are actively used for the following activities:

- dog mushing
- skiing
- sport fishing
- sport hunting
- trapping
- flightseeing
- river and lake boating (including airboating, power boating, kayaking, and rafting)
- snowmachining
- hiking
- berry picking
- wildlife observation
- photography
- camping
- backpacking
- canoeing
- OHVs
- horseback riding
- golfing at Settlers Bay
- other private and commercial recreation activities

Trails

Land and lake trails play a key role in the enjoyment of residents and visitors alike in the project area. Many trail opportunities exist for those who enjoy hiking, OHVs, horseback riding, biking, and canoeing in the summer, or snowmaching, skiing, and dog mushing in the winter.

A largely undeveloped trail network serves non-road-accessed areas. The most notable of the many trails is the historic Iditarod Trail. The Iditarod National Historic Trail, which crosses the project area, was the winter route used to transport mail and supplies from Seward to Nome during the early part of the 1900s. The Iditarod National Historic Trail and the Iditarod Race Trail cross the project area on borough and state lands near Yohn Lake. The race trail has used alternate routes in recent years. Trails in the immediate vicinity of the two corridor routes are as follows:

Corridor 3

- Susitna West Trail
- Rolly Creek, Ramp Hill
- West Gateway Trail
- Red Shirt Lake Trail
- Iditarod Trail
- Four primitive trails

Corridor 7

- West Parks Highway
- Iditarod Trail
- Big Lake Road Trail
- Hollywood Road Trail
- Three Mile Lake Trail
- Burma Road Trail
- South Big Lake Trail
- One primitive trail

4.3.2 Environmental Consequences

The project area as noted earlier, especially Corridor 3, has a high value in terms of recreational resources. Numerous trails exist in the area and people enjoy the outdoors through hiking, camping, boating, fishing, hunting, skiing, snowmaching, airboating, flying and other means. The project would be expected to have some direct impacts on recreation, especially trail use and limiting access to recreation sites, particularly if mitigation measures such as below or above ground crossings over trails for example are not utilized. Users who are seeking a natural landscape for their recreational activity may experience visual or noise impacts from the presence of the railroad corridor. Much of the area crossed is remote, and although it is actively used for recreation, users are typically spread out through the area, and impacts are expected to occur for few people and on an infrequent basis. Indirect impacts such as increasing the number of people accessing the area are not expected, as the development of the corridor is not expected to increase recreation access.

During public involvement for this project, public concern was expressed over the potential recreational and developmental pressures that might be imposed on local fish and wildlife habitat, game refuges, and resources of the area as a result of development of Corridor 3. In the past, the public expressed concern over the potential recreational and developmental pressures that might be imposed on local fish and wildlife habitat, game refuges, and resources of the area as a result of the development of new residential areas, support facilities, and new transportation corridors. Improved access to the area around Corridor 3 could generate conflicts between habitat management and seasonal and weekend visitor-industry demands in the surrounding area. Sports fishing and hunting pressures are anticipated to increase over time as the population of the area grows, and corridor development could potentially infringe on limited open space areas.

Construction impacts to recreation users are expected to be of short duration. Wintertime construction could cause some temporary disturbance to hunters, trappers, snowmachiners, and skiers recreating on the Willow Creek State Recreation Area and Little Susitna State Recreation Area. Summer construction in the same area could potentially impact backcountry hikers, fishermen, hunters, and trappers where Corridor 3 crosses rivers and trails. However, because much of the rail corridor area is relatively remote and users of these areas are dispersed, the number of people impacted should be low.

As mentioned earlier, mitigation of potential recreation impacts will be important. Mitigation should include providing above or below ground passage for recreation trails, and scheduling construction to minimize potential effects. With proper mitigation, Route 3 is expected to have minimal impact on recreational uses.

Development of Corridor 7 is expected to have minimal impacts, primarily due to construction activities. Construction may delay access to recreation areas along the corridor such as Fish Creek and Settlers Bay and result in some noise and dust, but will be temporary for the duration of construction.

4.4 RESOURCE USE (SUBSISTENCE, PERSONAL USE, SPORT, AND OTHER)

4.4.1 Affected Environment

Important uses of fish and game in Alaska include subsistence, sport fishing, personal use fishing, and general hunting including trapping. Subsistence refers to the customary and traditional non-commercial use of wild resources (ADF&G 1990). Subsistence hunting and fishing are closed in non-rural areas of Alaska by both federal and state programs. The Alaska Joint Board of Fisheries and Game and the Federal Subsistence Board have determined that the areas around Anchorage, Mat-Su, Kenai, Fairbanks, Juneau, Ketchikan, and Valdez are non-rural areas, where fish and game harvests may be allowed under sport or personal use but not under subsistence regulations. No federal lands exist in the project area. No state recognized subsistence occurs on the state lands in the project area.

Personal use fishing is similar to subsistence fishing with nets, except that it is allowed in areas generally closed to subsistence and is for residents of urbanized areas. Sport fishing and hunting both contribute food to urban areas, but differ from subsistence because they are primarily conducted for recreational values and not as a major part of a family's nutritional requirements.

The project area supports sport fishing, personal use fishing, general hunting including trapping, and other resource use including use of berries, bird eggs, and wood and roots for fuel and art. Although the project area is closed to subsistence uses, fishers and hunters have harvest opportunities via general fishing and hunting regulations, and personal use net fisheries.

The following plants, animals, and fish are taken for sport, personal, and other use near or in the project area: bear, moose, all five species of Alaska salmon, rainbow trout, dolly varden, beaver, muskrat, mink, marten, lynx, red fox, bird eggs, berries, and roots. Fish Creek along Corridor 7 is particularly important for personal use fishing.

4.4.2 Environmental Consequences

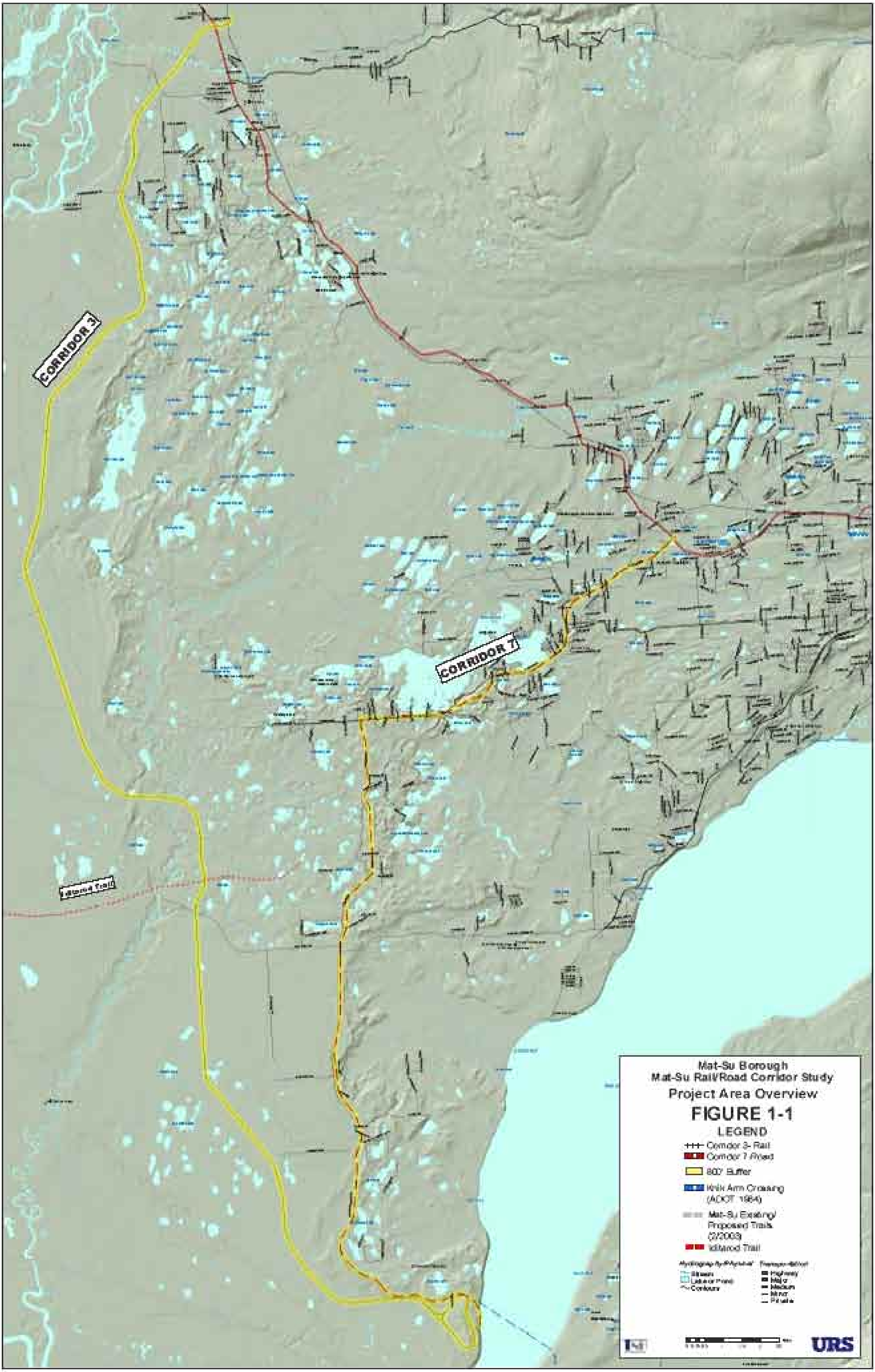
Corridor 3: Construction activities may temporarily disrupt wildlife and reduce resource use opportunities in the areas adjacent to the rail corridor. Because the duration of construction activities in any one location would be short, no substantial construction effects on use of resources beyond one season is expected. There is the potential for obstruction of access by creating an elevated rail embankment. Mitigation is likely to result in providing access through or over the embankment. Placement of access should involve consultation with local residents.

The minimal clearing of vegetation along the ROW is not expected to reduce access to berries, roots, and other vegetation used within the study area. The amount of vegetation lost through clearing is expected to be negligible compared to the available vegetation.

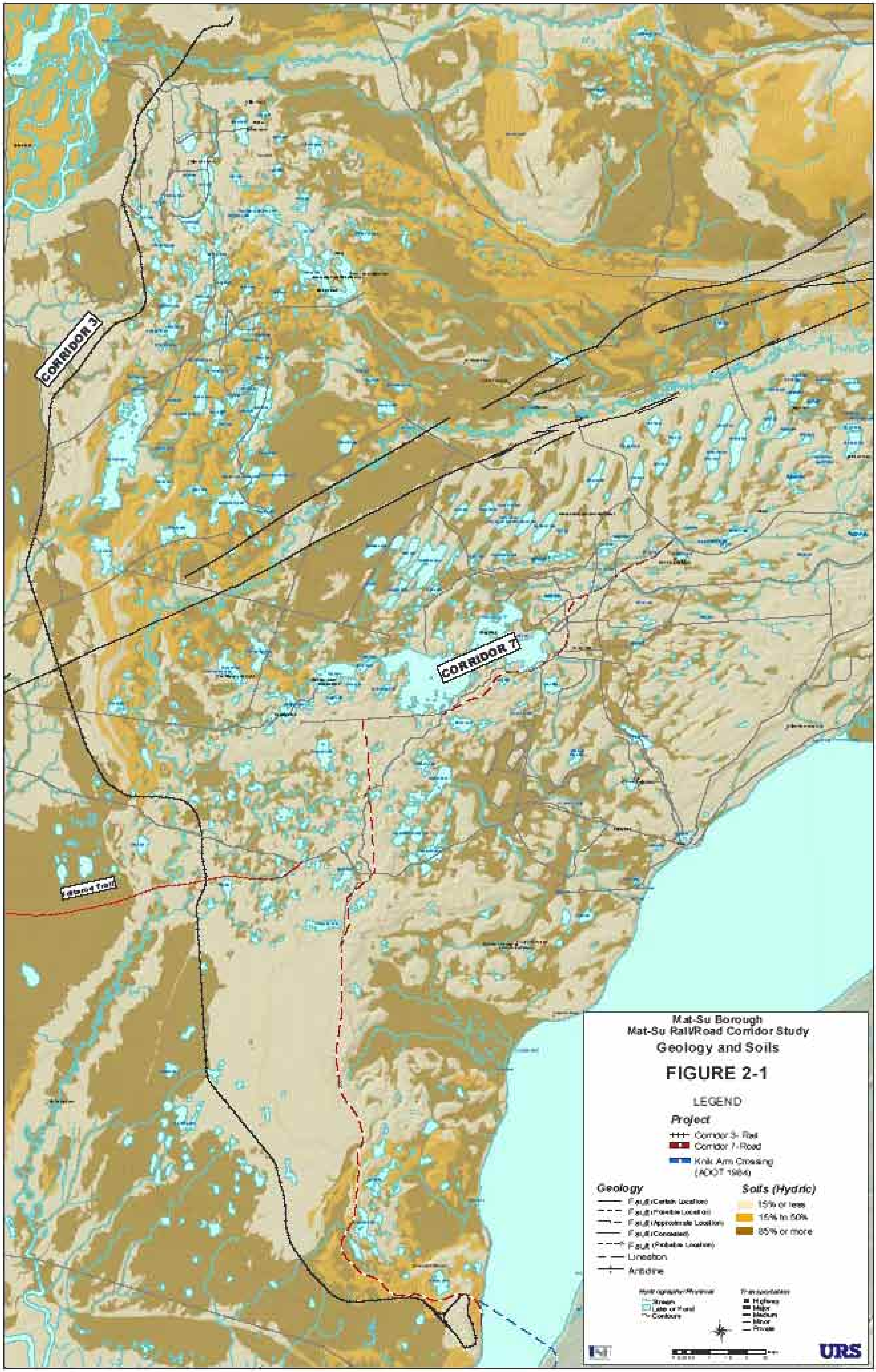
The clearing of vegetation along a ROW may in some cases reduce or diminish habitat quality for some wildlife species, while enhancing habitat for other species. The area crossed is currently used for sport and personal use fishing, general hunting, and other resource use, and access exists throughout the year. Because of controls placed on public access along rail corridors, Corridor 3 is not expected to increase access into areas.

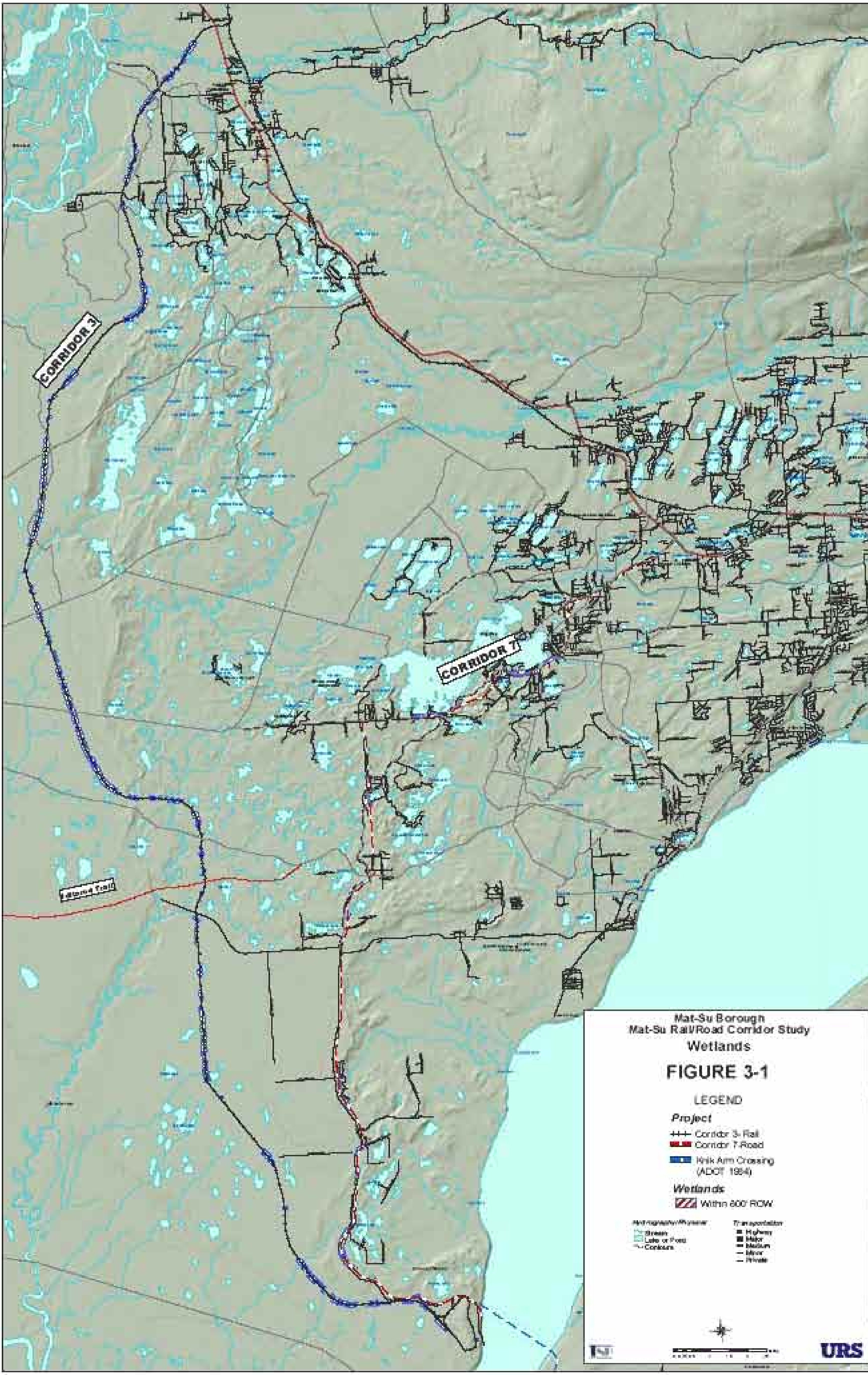
Operation of the line is not expected to have a substantial impact on resources. There may be occasional temporary disturbance to localized wildlife populations during rail maintenance, but based on the intermittent nature of these activities, resource use activities should not be substantially impacted.

Corridor 7: Minimal disruption of use of resources is expected. The road systems along this corridor are used for access to Fish Creek when it has been open for personal use fishing, and to Point Mackenzie. Any interference with access to resource use activities will be temporary during construction improvements to the road system.



CORRIDOR 3
CORRIDOR 7
Iditarod Trail
Mat-Su Borough
Mat-Su Rail/Road Corridor Study
Project Area Overview
FIGURE 1-1
LEGEND
Corridor 3- Rail
Corridor 7 Road
800' Buffer
Knik Arm Crossing
(ADOT 1984)
Mat-Su Existing/
Proposed Trails
(2/2003)
Iditarod Trail
Highway
Major
Medium
Minor
Contours
URS


CORRIDOR 3
CORRIDOR 7
Mat-Su Borough
Mat-Su Rail/Road Corridor Study
Geology and Soils
FIGURE 2-1
LEGEND
Project
Corridor 3- Rail
Corridor 7-Road
Knik Arm Crossing
(ADOT 1984)
Geology
Fault (Certain Location)
Fault (Possible Location)
Fault (Approximate Location)
Fault (Concealed)
Fault (Probable Location)
Lineation
Anticline
Soils (Hydric)
15% or less
15% to 50%
85% or more
Stream
Lake or Pond
Contours
Highway
Major
Medium
Minor
Private
URS


CORRIDOR 3
CORRIDOR 7
Mat-Su Borough
Mat-Su Rail/Road Corridor Study
Wetlands
FIGURE 3-1
LEGEND
Project
Corridor 3- Rail
Corridor 7-Road
Knik Arm Crossing
(ADOT 1984)
Wetlands
Within 600' ROW
Stream
Lake or Pond
Contours
Highway
Major
Medium
Minor
Private
URS

APPENDIX M

Letter from Railroad

ALASKA RAILROAD CORPORATION

Corporate Address: P.O. Box 107500, Anchorage, Alaska 99510
327 Ship Creek Avenue, Anchorage, Alaska 99501

Strategic Planning
Telephone:(907) 265-2468
Facsimile: (907) 265-2638
e-mail: *carrh@akrr.com*

December 11, 2002

Mr. Norm Gutcher, P.E.
Tryck Nyman Hayes Inc
911 W. 8th Avenue
Anchorage, Alaska 99501

Re: Mat-Su Rail Corridor Feasibility Study Comments

Dear Mr Gutcher:

Thank you for the opportunity to comment on the proposed rail corridor from Port MacKenzie northward. I would like to compliment you on the public presentation at Houston High School on November 20, 2002. The presentation material was plentiful and your staff was knowledgeable about issues concerning the project. I was particularly impressed with the way your staff handled several of the more hostile comments from the public. Their demeanor was professional and polite.

The Alaska Railroad (ARR) supports the newly defined Corridor 3. It is the only corridor which now fulfills the appropriate purpose of a rail link to the port: to move natural resources into and out of the port with a minimum of disruption to current and projected transportation corridors servicing economic development in the Pt MacKenzie area.

ARR's concern with all the other corridors fall into two areas:

1) ARR still ends up in the immediate Wasilla area
2) ARR splits the current and projected future growth areas in Pt. MacKenzie

ARR's market for natural resources is from the north. Except for corridor three, ARR will be forced to continue to bring all trains through the growing Nancy Lake to Wasilla area before gaining the Pt. MacKenzie spur. This is counter-productive for Wasilla and places the Railroad in the middle of residential areas currently under construction and projected residential development in the future. ARR is facing re-alignment in the Wasilla area now to accommodate Wasilla's desire for a better economic development environment. While this need has taken fifty years to develop, it is clear that Pt. MacKenzie is a rapidly growing area and ARR has no desire to try and re-align another spur in the next twenty years which is likely to happen with the other corridors.

Based on the comments I heard at the public meeting, Corridor 3 appears to be favored by the public. Additionally, it appears that property ownership concerns are less of an obstacle than other corridors, geography/geology appears to favor this route more, and it places the connection back into ARR's mainline far north of Wasilla. Corridor three has the added benefit of appearing to align with the Knik Arm Crossing more favorably especially as a transportation link from Anchorage to Fairbanks.

ARR continues to be very interested in this project and continues to encourage you to keep us informed as the study progresses.

Sincerely,

Bruce Carr
Director, Strategic Planning

CC: Wendy Lindskoog, ARR
Tom Brooks, ARR