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Comment Due Date: February 2, 2009

Draft Environmental Impact Statement

STB Finance Docket No. 34658

Alaska Railroad Corporation Construction and Operation of a Rail Line between North Pole and Delta Junction, Alaska

Volume I




Lead Agency:
Surface Transportation Board

Information Contacts:
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Cooperating Agencies:
U.S. Department of Defense Alaskan Command
Bureau of Land Management
Federal Transit Administration
Federal Railroad Administration
U.S. Air Force 354th Fighter Wing Command from Eielson AFB
U.S. Army Corps of Engineers
U.S. Coast Guard
Alaska Department of Natural Resources

SURFACE TRANSPORTATION BOARD
Washington, DC 20423

Office of Economics, Environmental Analysis and Administration

December 12, 2008

Re: STB Finance Docket No. 35468, Alaska Railroad Corporation – Petition for Exemption – To Construct and Operate a Rail Line Between North Pole, Alaska and Delta Junction, Alaska; Issuance of Draft Environmental Impact Statement

Dear Reader:

The Board's Section of Environmental Analysis (SEA) is pleased to provide you with your copy of the Draft Environmental Impact Statement (Draft EIS) for the proposed construction and operation of the Northern Rail Extension by the Alaska Railroad Corporation (ARRC). This Draft EIS analyzes the environmental impacts that might occur if ARRC were to construct and operate the proposed action, an approximately 80-mile long rail line from North Pole, Alaska to Delta Junction, Alaska. The Draft EIS analyses the potential environmental impacts of the proposed action and alternatives, including the no-action alternative.

Eight cooperating agencies assisted SEA in the preparation of the Draft EIS. The cooperating agencies include the U.S. Bureau of Land Management, Alaska State Office; U.S. Army Corps of Engineers, Alaska District; U.S. Department of Defense, Alaskan Command; U.S. Air Force 354th Fighter Wing, Eielson Air Force Base; Federal Transit Administration; Federal Railroad Administration; U.S. Coast Guard, Seventeenth District; and Alaska Department of Natural Resources.

In addition to analyzing the proposed action and alternatives, the Draft EIS sets forth SEA's preliminary recommended mitigation, ARRC's voluntary mitigation measures, and encourages mutually acceptable negotiated agreements to mitigate adverse environmental impacts should the Board approve the project.

SEA and the cooperating agencies invite public comment on all aspects of the Draft EIS and are providing a 45-day public comment period, which begins upon the U.S. Environmental Protection Agency's issuance of a notice of availability in the *Federal Register* on December 19, 2008. Comments on the Draft EIS must be received or postmarked by February 2, 2009. Instructions on how to submit comments, and a list of the locations, dates, and times of public meetings are attached to this letter in a separate Fact Sheet. After your review of the Draft EIS, we appreciate your comments on ways to improve our analyses, make corrections, compliment what we have done well, and supplement what you feel needs further work. The more specific your comments are, the better we will be able to respond to them.

After the close of the public comment period on the Draft EIS, SEA and the cooperating agencies will prepare a Final EIS in response to comments on the Draft EIS. The Board will then issue a final decision, based on the entire environmental record, including the record on the transportation merits, the Draft EIS, the Final EIS, and all public and agency comments received. The Board then will decide whether to approve the proposed project, deny it, or approve it with mitigating conditions, including environmental conditions. The cooperating agencies may also issue separate decisions, approvals or denials related to the proposed project.

The Draft EIS is also available for viewing and downloading via the Board's website at http://www.stb.dot.gov, under "E-Library," then under "Decisions & Notices," beneath the date "12/12/08." You may also visit the Board's website (www.stb.dot.gov) and look for Key Cases under Environmental Matters.

SEA has distributed the Draft EIS widely for public review and comment. Approximately 1,700 copies of the Draft EIS have been distributed to parties on SEA's environmental distribution list, which includes interested Federally recognized tribes, key governmental agencies, and persons expressing an interest in receiving a copy of the Draft EIS or participating in the environmental review process for this proceeding. SEA has also distributed the Draft EIS to all parties of record (official participants), as well as making additional print copies of the Draft EIS available for review in three public libraries in the project area.

SEA appreciates the efforts of all interested parties who have participated in this environmental review to date. We look forward to receiving your comments.

Sincerely,

Victoria Rutson
Chief,
Section of Environmental Analysis

FACT SHEET

The Surface Transportation Board's Section of Environmental Analysis (SEA) is implementing a public and agency outreach effort to ensure that the public, agencies, and communities have the opportunity to actively participate and comment on the Draft EIS and the Board's environmental review process. Comments on the Draft EIS must be received or postmarked by **February 2, 2009**.

Beginning on January 12, 2009, SEA and the cooperating agencies will host four public meetings in the project area to receive public comments on the Draft EIS. At the beginning of each meeting, SEA will give a brief overview of the environmental review process and will invite interested parties to make oral comments in an orderly fashion before meeting participants. SEA will have a transcriber present to record these oral comments. Written comments can also be submitted during the meeting. The dates, locations and times of the meetings are shown below:

- January 12, 2009, 5:00-8:00 PM, Pike's Waterfront Lodge, 1850 Hoselton Road, Fairbanks, AK
- January 13, 2009, 5:00-8:00 PM, City Council Chambers, 125 Snowman Lane, North Pole, AK
- January 14, 2009, 5:00-8:00 PM, Salcha Senior Center, 6062 Johnson Road, Salcha, AK
- January 15, 2009, 5:00-8:00 PM, Jarvis West Building, Milepost 1420.5 Alaska Highway, Delta Junction, AK

Written Comments: Comment forms will be provided at the public meetings and will be accepted at the meetings or the forms can be submitted later by mail. Comment forms or written letters may be mailed to:

David Navecky
STB Finance Docket No. 34658
Surface Transportation Board
395 E Street S.W.
Washington, DC 20423-0001

Recorded Comments: A court reporter will be at the public meetings to transcribe the oral comments.

Electronic Comments: Comments may be filed electronically on the Board's web site, www.stb.dot.gov, by clicking on the E-FILING link. Then select "Environmental Comments," which does not require a Login Account. Please refer to STB Finance Docket No. 34658 when filing.

Library Distribution: SEA has also distributed the Draft EIS to the repositories listed below and requested that the entire Draft EIS be made publicly available in their reference sections.

Delta Community Library
Delta Junction, AK 99737
(907) 895-4656

Noel Wein Public Library
1215 Cowles Street
Fairbanks, AK 99701
(907) 459-1020

North Pole Branch Library
601 Snowman Lane
North Pole, AK 99705
(907) 488-6101

Deadline: All electronic and written comments must be received or postmarked **February 2, 2009**.

All comments received – written, e-filed, or transcribed – will carry equal weight in helping to complete the EIS process and guide the Board in its decision-making on this matter.

Additional Information: For lands under state ownership that are crossed by the proposed Northern Rail Extension, the Alaska Department of Natural Resources (ADNR) would consult with ARRC and potentially affected parties to determine whether the location of the rail line would minimize adverse effects on existing and potential rights-of-way and land uses associated with the location, construction, and operation of a gas pipeline in a manner that is in the best interest of the state, pursuant to Alaska Statute (AS) 42.40.460, Extension of the Alaska Railroad (2005). ADNR will be present at STB's public meetings for the proposed NRE, to hear comments about the project, and, in particular, how the proposed location of the project may affect public access to state lands along and adjacent to the proposed transportation corridor. ADNR will provide additional opportunities for potentially affected parties to comment on its process for meeting the obligations under AS 42.40.460. For additional information, please contact ADNR Division of Mining, Land and Water at 907-451-2740.

DRAFT ENVIRONMENTAL IMPACT STATEMENT
STB Finance Docket No. 34658
Alaska Railroad Corporation Construction and Operation of
a Rail Line between North Pole and Delta Junction, Alaska

Lead Agency: Surface Transportation Board; **Cooperating Agencies**: U.S. Department of Defense, Alaskan Command (ALCOM); Bureau of Land Management, Alaska State Office (BLM); Federal Transit Administration (FTA); Federal Railroad Administration (FRA); U.S. Air Force 354th Fighter Wing Command, Eielson Air Force Base (354th); U.S. Army Corps of Engineers, Alaska District (USACE); U.S. Coast Guard, Seventeenth Coast Guard District (USCG); and Alaska Department of Natural Resources (ADNR)

Proposed Action: Construction and operation of approximately 80 miles of new rail line from North Pole, Alaska to Delta Junction, Alaska and related support and passenger transport facilities.

Location: The proposed rail line would be located in Interior Alaska, southeast of the City of Fairbanks, Alaska. The proposed rail line would be constructed between North Pole, Alaska and Delta Junction, Alaska, and would extend the existing Alaska Railroad Corporation (ARRC, or the Applicant) rail line that currently ends at Eielson Air Force Base.

Abstract: On July 6, 2007, ARRC filed a petition with the Surface Transportation Board (STB or the Board) pursuant to 49 United States Code (U.S.C.) 10502 for the authority to construct and operate approximately 80 miles of new rail line from North Pole, Alaska to Delta Junction, Alaska. Referred to as the Northern Rail Extension (NRE), the proposed rail line would extend ARRC's existing freight and passenger rail service to the region south of North Pole. The rail extension would begin at the east end of the Chena River Overflow Bridge—north of Eielson Air Force Base (AFB)—and end at the south side of Delta Junction. The Applicant has stated that the purpose of the project is to provide freight and passenger rail service to the region, provide a transportation alternative to Richardson Highway for individuals traveling between Fairbanks and Delta Junction, and allow year-round ground access to the Tanana Flats and Donnelly training areas for the U.S. Army and U.S. Air Force. The Board's Section of Environmental Analysis (SEA) and the cooperating agencies have prepared this Draft EIS, which identifies and evaluates the potential environmental impacts associated with the Proposed Action and Alternatives, including the No-Action Alternative. The Proposed Action and Alternatives, with the exception of the No-Action Alternative, could have adverse noise impacts and could adversely affect wetland, surface water, biological, land use, visual, and cultural resources. SEA has included recommended preliminary mitigation measures in this Draft EIS. The mitigation measures will be considered by the Board as potential conditions if the Board decides to grant ARRC authority to construct and operate the rail line. The Proposed Action and Alternatives would cause negligible impacts on all other resource areas. The cooperating agencies' Federal actions include the USCG's decision on issuing bridge permits under Section 9 of the Rivers and Harbors Act of 1899 (33 U.S.C. 401 et seq.) and the General Bridge Act of 1946 (33 U.S.C. 525 et seq.), the decision by the BLM to issue a linear right-of-way grant under the Federal Land Policy and Management Act (43 U.S.C. 1701 et seq.) to pass through BLM-managed lands, the decision of ALCOM and the 354th to grant permission for construction in areas under their control, and the decision of the USACE to issue a discharge permit under Section 404 of the Clean Water Act of 1977 (33 U.S.C. 1251-1376) and a permit to perform work or place a structure in navigable waters under Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

Comment Period: The public and any interested parties are encouraged to make written comments on all aspects of this Draft EIS. All comments must be submitted within the comment period, which will close February 2, 2009.

Contacts: Written comments on the Draft EIS may be submitted to:

David Navecky
STB Finance Docket No. 34658
Surface Transportation Board
395 E Street, S.W.
Washington, D.C. 20423-0001

Further information about the project can be obtained by calling SEA's toll-free number at 1-800-359-5142 (TDD for the hearing impaired 1-800-877-8339). This Draft EIS is also available at the Board's website at: www.stb.dot.gov.

Public Meetings: In addition to receiving written comments, SEA and the cooperating agencies will host public meetings on the Draft EIS at the following locations, dates and times. Interested parties may submit written comments or make oral comments at these meetings.

Pike's Waterfront Lodge, 1850 Hoselton Road, Fairbanks, Alaska: 5-8 PM, Monday, January 12, 2009
City Council Chambers, 125 Snowman Lane, North Pole, Alaska: 5-8 PM, Tuesday, January 13, 2009
Salcha Senior Center, 6062 Johnson Road, Salcha, Alaska: 5-8 PM, Wednesday, January 14, 2009
Jarvis West Building, Milepost 1420.5 Alaska Highway, Delta Junction, Alaska: 5-8 PM, Thursday, January 15, 2009

SUMMARY

On July 6, 2007, Alaska Railroad Corporation (ARRC or the Applicant) filed a petition with the Surface Transportation Board (STB or the Board) pursuant to 49 United States Code (U.S.C.) 10502 for the authority to construct and operate approximately 80 miles of new rail line from North Pole, Alaska, to Delta Junction, Alaska. Referred to as the Northern Rail Extension (NRE), the proposed rail line would extend ARRC's existing freight and passenger rail service to the region south of the community of North Pole, and would also include construction of related structures, such as a passenger facility, communications towers, and sidings.

The Board's Section of Environmental Analysis (SEA), together with eight cooperating agencies (the Agencies), prepared the Environmental Impact Statement (EIS)[1] in accordance with the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) NEPA implementing regulations, and the Board's environmental rules. The EIS is intended to provide Federal, State of Alaska, local agencies, Alaska Natives and the public with clear and concise information about the potential environmental impacts of the proposed action and alternatives, including a No-Action Alternative.

The Agencies are issuing the Draft EIS for public review and comment, and will consider all comments received on the Draft EIS and respond to all substantive comments in a Final EIS. The Final EIS will include the Agencies' final recommended environmental mitigation conditions, as applicable. The Board will consider the entire environmental record, the Draft and Final EISs, all public and agency comments, and SEA's environmental recommendations in making its final decision on the ARRC application to construct and operate the proposed NRE.

S.1 Purpose and Need

The Alaska Railroad network extends from Seward, Alaska, through Anchorage and Fairbanks, ending at Eielson Air Force Base (AFB) through the Eielson Branch rail line (see Figure S-1). The existing Eielson Branch rail line serves Eielson AFB and the North Pole Refinery. At present, commercial freight, other than that associated with Eielson AFB and the refinery, generally enters and leaves the project area by truck via Richardson Highway (Alaska Route 4 from Valdez to Delta Junction and Alaska Route 2 from Delta Junction to Fairbanks) or the Alaska Highway (Alaska Route 2 from Delta Junction to Tok and beyond). The Applicant has stated that the proposed NRE would provide an alternative to Richardson Highway for freight service for commercial and military users and would provide dependable year-round ground access to the Tanana Flats and Donnelly training areas (TAs) on the southwestern side of the Tanana River and west side of the Delta River. The Applicant has also stated that the NRE would provide a transportation alternative to the Richardson Highway for individuals traveling between Fairbanks and Delta Junction, where, at present, there is no public transportation. The rail line would be less susceptible to inclement winter weather than the highway and also could increase tourism in the area.

[1] While much of the EIS generally refers only to SEA, the document reflects input from all eight cooperating agencies.

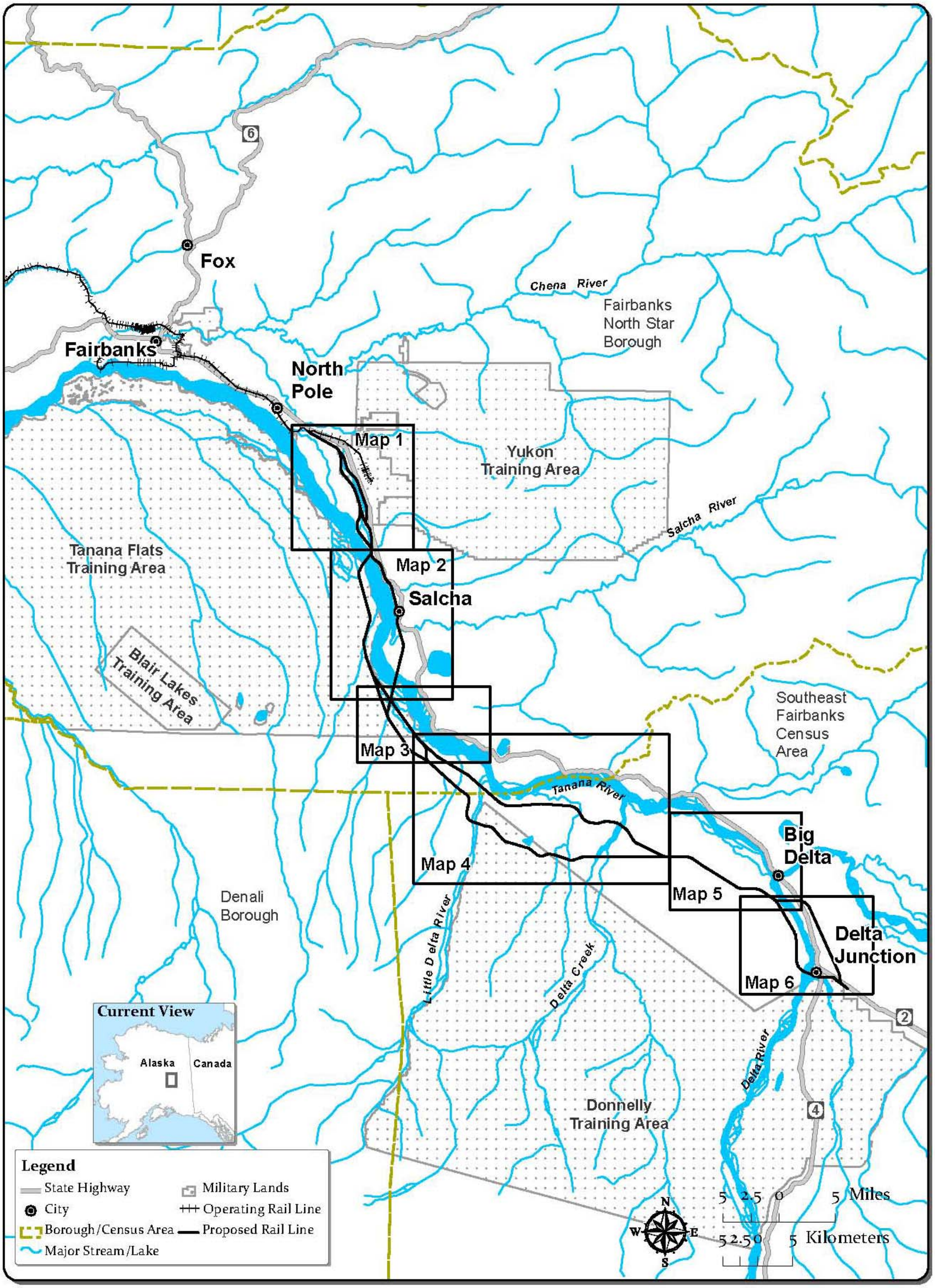

Figure S-1 - Map Key for Areas along the Proposed Northern Rail Extension

S.2 Scoping and Public Involvement

On November 1, 2005, SEA published the Notice of Intent to Prepare an EIS, Draft Scope of Study, Notice of Scoping Meetings, and Request for Comments in the *Federal Register* (*FR*) (70 *FR* 65976). SEA prepared and distributed a newsletter that introduced the proposed NRE, announced SEA's intent to prepare an EIS, requested comments, and gave notice of three public scoping meetings to more than 400 citizens, elected officials, Federal, state, and local agencies, tribal organizations, and other potentially interested organizations. The distribution encompassed the communities surrounding the area of the proposed action and alternatives and groups outside the project area that could have an interest in the project. SEA also posted meeting notices in public locations (*e.g.*, post offices, grocery stores, and restaurants) in the project area and initiated a toll-free project hotline. SEA placed notices of the scoping meetings in several newspapers, including the *Fairbanks Daily News Miner* and the *Anchorage Daily News*. SEA sponsored public scoping meetings in North Pole, Delta Junction, and Anchorage in December 2005. Approximately 80 people attended the scoping meetings, including citizens, representatives of organizations, elected officials, and officials from Federal, state, and local agencies.

SEA considered the agency and public input to the scoping process and on April 3, 2008, issued the final scope of study for the EIS (73 *FR* 18323). SEA placed the final scope of study on the STB Web site, and mailed it to approximately 700 individuals, agencies, and other interested parties on SEA's project mailing list.

SEA consulted with federally recognized tribes and other tribal organizations throughout the preparation of the EIS. SEA also prepared a Government-to-Government Consultation and Coordination Plan, which listed the federally recognized tribes, tribal groups, and Alaska Native Regional Corporations included in SEA's consultation efforts, described the objectives and approach to the consultation process, and provided an opportunity for the recipients to indicate how they wanted to further participate in government-to-government coordination for the proposed NRE.

S.3 Alternatives Considered in the SEA Environmental Review

Under the proposed action, ARRC would construct and operate a single-track rail line in Interior Alaska starting south of the community of North Pole and ending south of the community of Delta Junction. ARRC proposes a 200-foot-wide right-of-way (ROW) that would contain the rail line, sidings at several locations, a power line, a buried communications cable, and an access road. ARRC would construct other facilities, such as communications towers and a passenger platform in Delta Junction, to support rail line operations. ARRC also would build temporary construction support facilities, which ARRC would remove after construction activities ended.

The proposed action and alternatives include common segments, alternative segments, and connector segments, as described in this section, listed in Table S-1, and shown in Figures S-1 through S-7. Table S-1 also identifies the alternative segments and connector segments that comprise ARRC's preference for implementation of the proposed action. SEA does not identify preferred segments in the Draft EIS.

Table S-1
Alternative Segments

Alternative Segments Evaluated in the EIS	The Applicant's Preferred Segments[a]
North Common Segment	✓
Eielson Alternative Segments 1, 2 and 3	**Alternative Segment 3**
Salcha Alternative Segments 1 and 2	**Alternative Segment 1**
Connector Segments A, B, C, and D	**Connector B**
Central Alternative Segments 1 and 2	**Alternative Segment 2**
Connector Segment E	✓
Donnelly Alternative Segments 1 and 2	**Alternative Segment 1**
South Common Segment	✓
Delta Alternative Segments 1 and 2	**Alternative Segment 1**

[a] SEA does not identify preferred segments in the Draft EIS.

The rail line would generally follow the Tanana River and would require one crossing of the Tanana River (for both rail and vehicles), and crossings of the Delta River, Little Delta River, Delta Creek, and possibly the Salcha River. The Little Delta River and Delta Creek would have separate bridges for the track and vehicles; no vehicle access would be provided over the Salcha and Delta Rivers.

S.3.1 North Common Segment

The North Common Segment would start at the east end of the Chena River Overflow Bridge off of the Eielson Branch and extend 2.7 miles southeast to meet the selected Eielson alternative segment (Figure S-2). North Common Segment would run roughly parallel to Richardson Highway, cross Eielson Farm Road, and run along the east side of the Tanana River.

S.3.2 Eielson Alternative Segments

SEA is considering three alternative segments through the Eielson area that would start about 0.5 mile southeast of Eielson Farm Road (Figure S-2). Each segment would pass between the fence line of Eielson AFB on the east and the Eielson Farm Community on the west. If authorized by the Board, the selected Eielson alternative segment would connect with the selected Salcha alternative segment.

S.3.3 Salcha Alternative Segments

SEA is considering two alternative segments for the Salcha section that would start approximately 0.3 mile northwest of the intersection of Old Richardson Highway and Bradbury Drive (Figure S-3). The segments would cross the Tanana River at different places, and, if authorized by the Board, the selected Salcha alternative segment would meet the selected connector segment (A, B, C, or D) to connect to the selected Central alternative segment.

S.3.4 Central Alternative Segments

SEA is considering two alternative segments between the Salcha and Donnelly alternative segments. Both Central alternative segments would run parallel to the west bank of the Tanana River in a southeasterly direction (Figure S-4). If selected, Central Alternative Segment 1 would

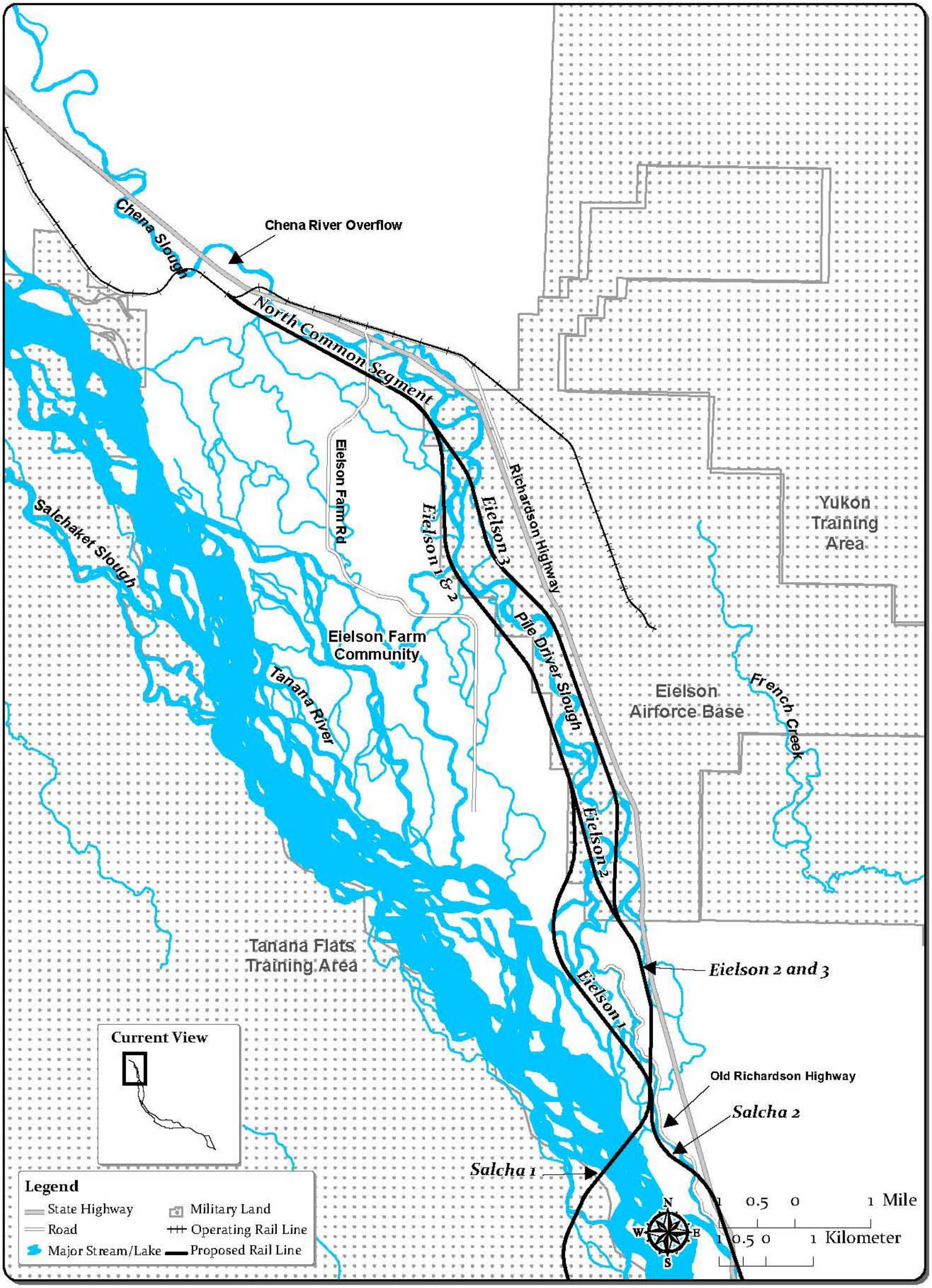

Figure S-2 - North Common Segment and Eielson Alternative Segments within Map Area 1

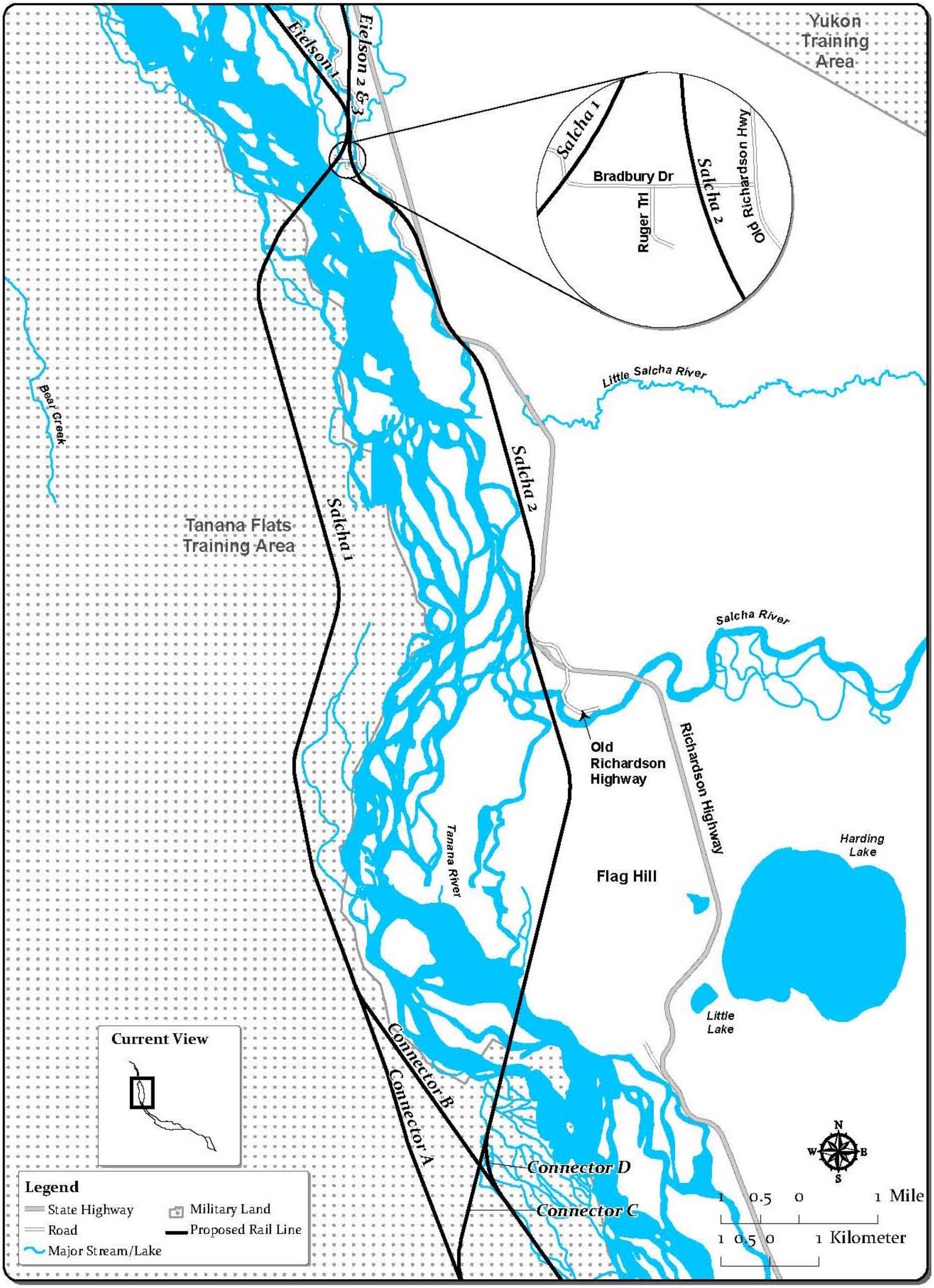

Figure S-3 - Salcha Alternative Segments within Map Area 2

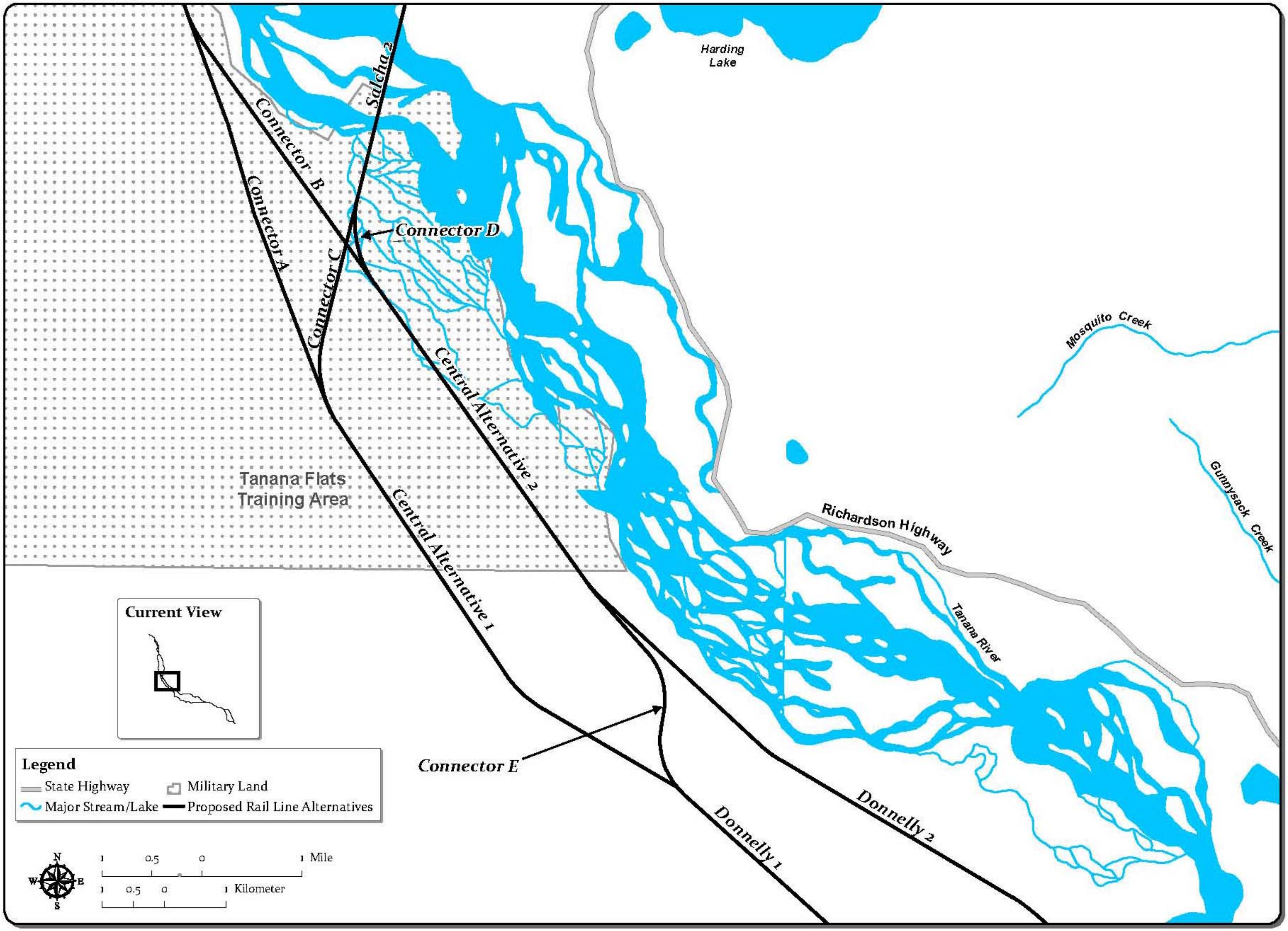

Figure S-4 - Central Alternative Segments and Adjoining Alternative Segments within Map Area 3

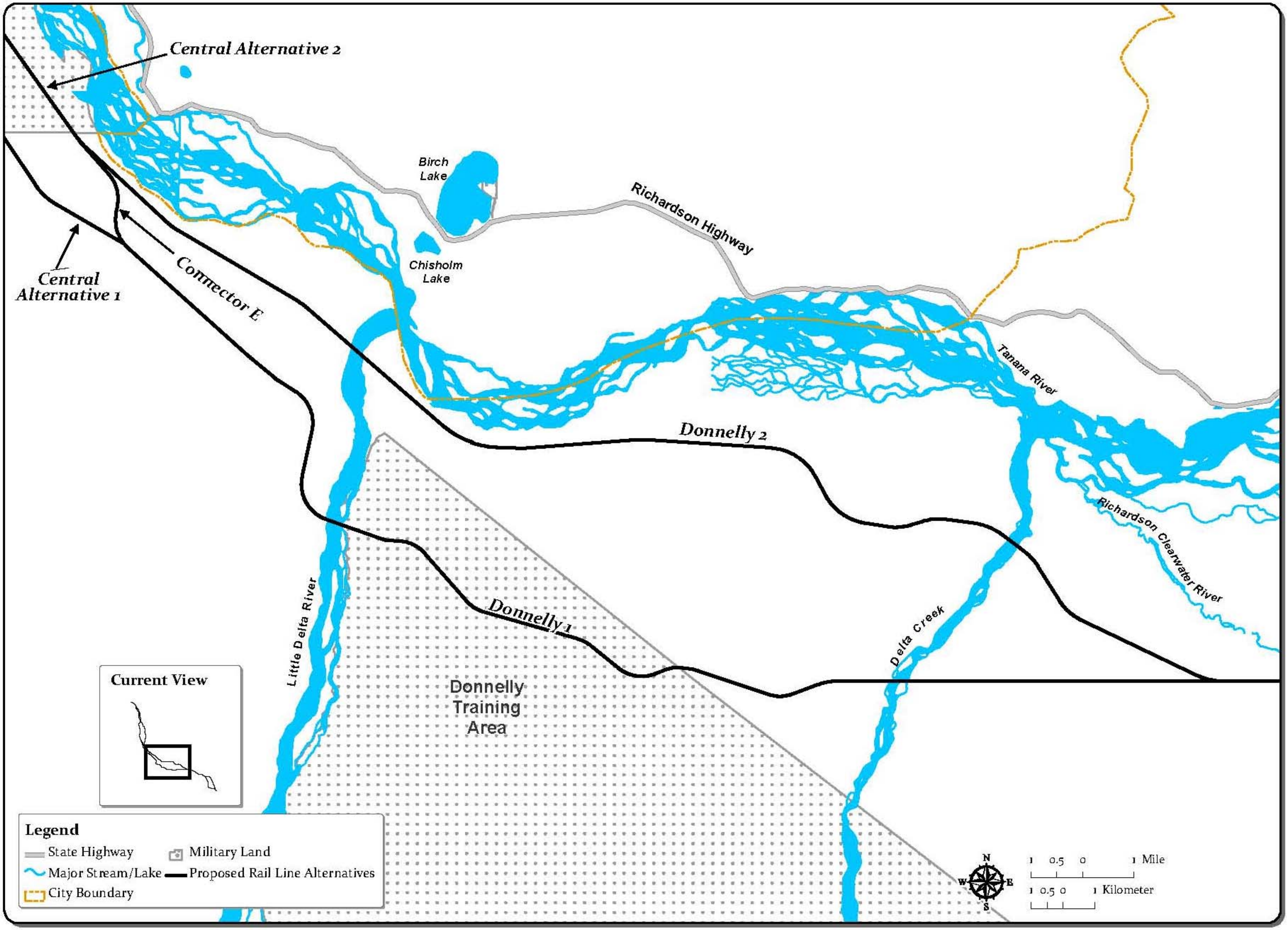

Figure S-5 - Donnelly Alternative Segments within Map Area 4

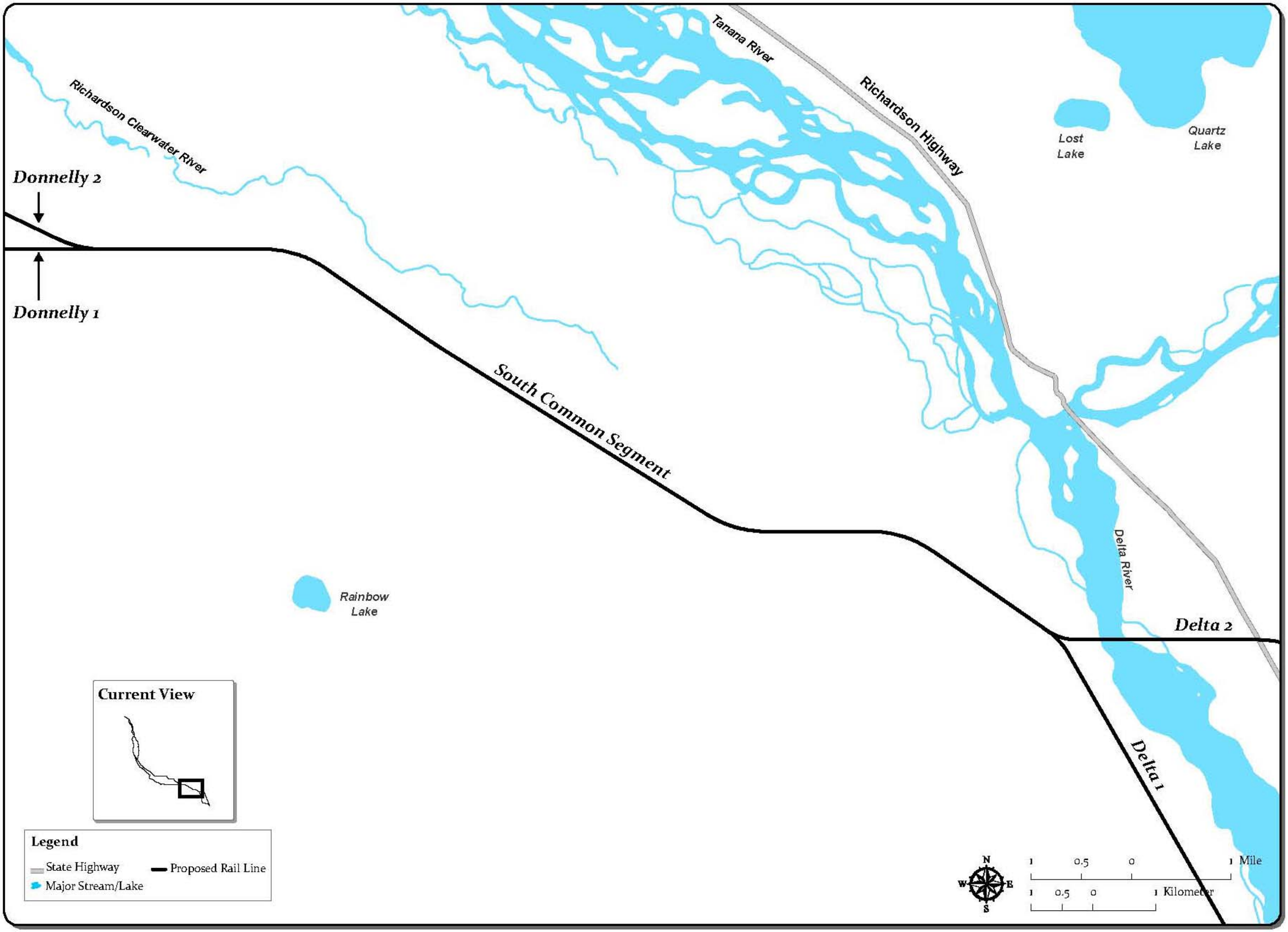

Figure S-6 - South Common Segment and Alternative Segments within Map Area 5

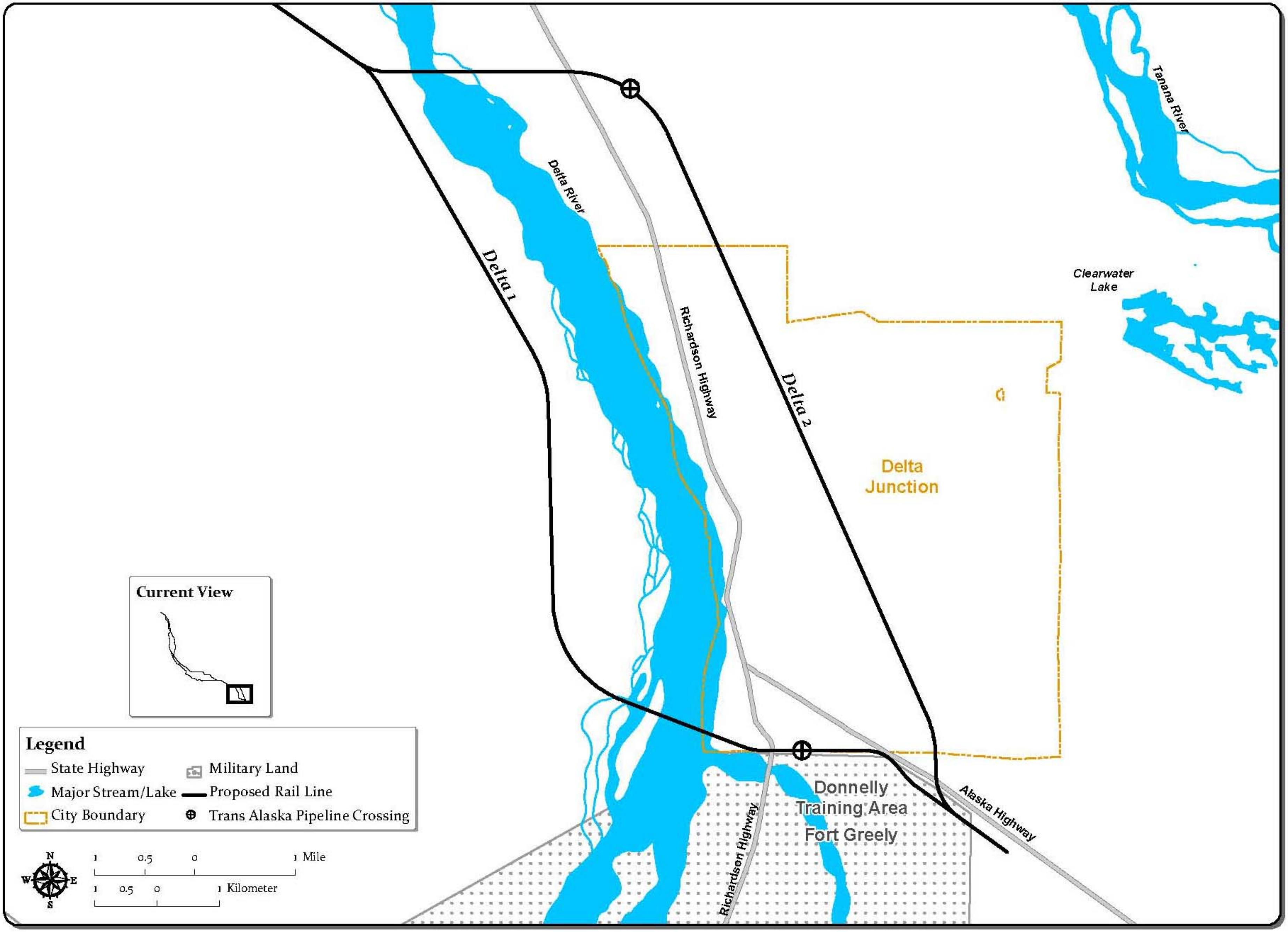

Figure S-7 - Delta Alternative Segments within Map Area 6 connect directly to Donnelly Alternative Segment 1 (if selected). If selected, Central Alternative 2 would connect directly to Donnelly Alternative Segment 2 (if selected) or would connect to Donnelly Alternative Segment 1 (if selected) via Connector Segment E.

S.3.5 Donnelly Alternative Segments

SEA is considering two alternative segments for the Donnelly area (Figure S-5). Both would run on the southwestern side of the Tanana River and end approximately 4 miles east of Delta Creek, where the selected alternative segment would meet South Common Segment. Each alternative segment would cross Delta Creek and the Little Delta River but would run through distinct terrains with different elevation profiles.

S.3.6 South Common Segment

This segment would connect the selected Donnelly alternative segment to the selected Delta alternative segment (Figure S-6). The segment would roughly parallel the Tanana River and be approximately 10.5 miles long.

S.3.7 Delta Alternative Segments

SEA is considering two alternative segments for the Delta area. Each of these segments would cross the Delta River, one north and one south of Delta Junction. The selected alternative segment would end at the terminus of the proposed rail line about 3 miles east of the Tanana River, adjacent to the Alaska Highway (Figure S-7).

S.3.8 No-Action Alternative

The EIS also considers a No-Action Alternative. Under the No-Action Alternative, ARRC would not construct an extension of the existing rail line or construct a dual-modal bridge over the Tanana River.

S.4 Alternatives Eliminated From Detailed Study

With the purpose and need for the proposed action as a primary focus, SEA and the Agencies reviewed the initial ARRC-developed alternative segments and alternative segments proposed during scoping for the EIS. Generally, SEA and the Agencies eliminated from further detailed study alternative segments that would not meet fundamental components of the purpose and need, led to substantial adverse environmental impacts, featured insurmountable construction or operational limitations, or did not provide an environmental or economic advantage over other alternative segments. Specific reasons for the elimination of alternatives included intrusion into military training and operations areas, geological instability, unfavorable topography, potential impacts to important wildlife habitat, and private property concerns.

S.5 Overview of Affected Environment

The project area is southeast of Fairbanks, Alaska, and the proposed rail line would extend between North Pole and Delta Junction. The area is relatively rural, with several large military facilities nearby. Much of the proposed rail line would parallel the Tanana River, a large tributary of the Yukon River, and would also roughly parallel Richardson Highway, one of the major highways in Interior Alaska. The northern end of the project area is adjacent to Eielson

AFB and the southern end in Delta Junction is near the Fort Greely Army installation. There are two military training areas on the western side of the Tanana River, Tanana Flats and Donnelly. The Tanana River Basin is composed of generally flat bottomlands and a prevalence of spruce and hardwood forests, with riparian features such as meandering rivers, side sloughs, and oxbow lakes. The area also provides important habitat for wildlife, such as fish and moose. There is recreational boating on the river in the summer, snowmachining along certain sections in the winter, and numerous state recreation areas nearby.

S.6 Summary of Environmental Consequences

SEA performed an in-depth review of the Applicant's proposal, which included independent environmental analysis of potential project impacts and evaluation of issues raised by government agencies and the public. The following discussion provides an overview and comparison of the potential impacts of the alternative segments. Table S-2 at the end of this Summary compares noteworthy impact variations among the alternative segments.

S.6.1 Topography, Geology, and Soils

Impacts on soil from construction of the proposed rail line would mostly be associated with excavation and fill activities required to maintain the grade of the railbed, or with removal of unsuitable construction material. The existing soil profile would be eliminated in areas subject to excavation or filling.

Salcha Alternative Segment 2, Donnelly alternative segments 1 and 2, and Delta Alternative Segment 1 would require grading and fill to meet the design standard of no more than a 1-percent grade for the rail line. Construction of the railbed would cause some thawing of the permafrost, potentially leading to irregular subsidence of the surrounding soil. The predicted amount of permafrost encountered by each segment would range from 5 to 90 percent of total segment area, and overburden would range from 2 feet to 14 feet. Salcha Alternative Segment 2 (75 to 90 percent, 2 to 7 feet overburden), Central Alternative Segment 1 (2 to 75 percent, 7 to 14 feet overburden), and Donnelly Alternative Segment 1 (5 to 90 percent, 2 to 14 feet overburden) would encounter a greater amount of permanently frozen ground when compared to the rest of the alternative segments.

Seismic activity in the area could affect the entire proposed NRE; however, the Salcha alternative segments cross the Salcha seismic zone, and would have a greater potential for train derailment resulting from a seismic event. Mass wasting events such as landslides, rockslides, or slump would be more likely to affect Salcha Alternative Segment 2. Earthquake-induced soil liquefaction would be an additional risk to the stability and integrity of the proposed NRE.

S.6.2 Water Resources

Impacts to water resources could result from the building of unpaved access roads, excavation of gravel for use in construction, construction of bridges and culverts, use of ice roads and ice bridges, water-supply withdrawals, transportation, and staging areas. The following paragraphs summarize the relevant effects of such project-related activities on surface water, water quality, groundwater, wetlands, and floodplains.

Surface Water and Water Quality

The Applicant would construct bridges and culverts to convey water under the rail line and, on the west side of the Tanana River, convey water under the access road. Bridges would either completely or partially span (or clear) the stream channel and would require construction activities along the streambanks to construct abutments and/or in the channel to construct piers and footings. The construction of culverts would require work in the channel and along streambanks. Impacts from bridges could include changes to natural drainage, sloughing and erosion of the streambank, impacts to permafrost, increased stages and velocities of floodwater, and increased channel scour or bank erosion. The construction of single or multiple culverts in waterbodies could result in localized disturbance of waterway banks to gain access to the channel and disturbance of the channel bed when installing the culverts. The installation of bridges and culverts would result in temporary impacts to water quality from increased sediment transport, increased sediment load, and increased turbidity due to bank and waterbody bed disruption.

Generally, the more bridges or culverts along a given segment as shown in Table S-2, the greater the occurrence of these impacts; however, the magnitude of effects at individual crossings would also depend on site-specific factors. Large bridge crossings along the Salcha, Donnelly, and Delta alternative segments would all likely result in impacts to surface waters due to altered flood hydraulics, increased scour surrounding the piers and downstream aggradation, and could increase the potential for overbank flooding and ice/debris jams.

The construction of the railbed or access roads and the use of floodplains as staging areas or work camps could affect sheet surface water flow if adequate cross drainage is not provided or if fill materials capture surface or subsurface flows and redirect them. In porous floodplain systems, there is the potential for fills associated with access roads to alter subsurface flows. The excavation of borrow areas could affect sheet surface water flow by capturing surface or subsurface flows.

Groundwater

Impacts to groundwater could include effects from infiltration, increased groundwater discharge through ponds created by borrow areas, contamination and comingling of surface water and groundwater from geotechnical boreholes, permanent changes to permafrost thickness and vertical location of the active thaw zone, and temporary groundwater elevation declines from pumping for potable and construction water. The extraction of materials from the borrow areas would likely affect groundwater due to the changes in local hydrogeologic regime resulting from the removal of saturated materials and the creation of new ponds that would serve as sources of groundwater discharge through evaporation during the summer and sources of groundwater recharge during major rainstorms and the break-up of ice.

Wetlands

Loss of wetland vegetation, disturbance of hydric soils, and alteration of wetland hydrology would contribute to the alteration or loss of wetland functions for affected wetlands. Within the project area, most forested, scrub/shrub, and emergent wetlands have high functional capacities for water quality improvement, nutrient export, and contributions to the abundance and diversity of wetland flora and fauna. In addition, hydrology of wetlands near the railbed could be altered, potentially creating new wetland areas or drying existing wetland areas if the water source is cut off.

A total of 33 percent of the area within 500 feet of the proposed alternative segments is wetlands. Assuming that the amount of wetlands on the sites of proposed construction and operations support facilities is the same as the area in general, those facilities would affect 203.3 acres of wetlands and other waters. In addition, construction in the ROW along any of the alternative segments would affect wetlands and other waters. The primary wetlands in the area are palustrine forested and palustrine scrub-shrub wetlands. The ROW of the Applicant's preferred route includes 1,046 acres of wetlands and other waters.

The minimum alternative[2] would include 884 acres of wetlands and other waters, while the maximum alternative[3] would include 1,111 acres. Among the sets of alternatives, Eielson Alternative Segment 3 (100.3 acres), Salcha Alternative Segment 2 (262.3 acres), Connector Segment A (56.2 acres), Central Alternative Segment 1 (51.0 acres), Donnelly Alternative Segment 1 (397.0 acres), and Delta Alternative Segment 1 (94.9 acres) would affect substantially greater areas of wetlands and other waters than their counterpart alternative segments.

Floodplains

Portions of the proposed NRE would be constructed within the floodplain of the Tanana and Delta rivers and some of their tributaries. Portions of the rail line, access road, staging areas, and camps would likely be placed within the 100-year flood zone. The affected areas would be small compared to the total floodplain storage available; thus, effects on floodplain storage would be minimal. Borrow areas in the floodplain could alter the hydraulics and conveyance of the watercourse during flood stage, leading to short-term increase in flood storage or the development of meander cutoffs and a change in sinuosity of the affected reaches. Effects would be more likely in streams crossing broad shallow floodplains and less likely for entrenched streams.

At the sites of the Tanana River bridges on Salcha alternative segments 1 and 2, rock revetments (and a levee, in the case of Option 1 for Salcha Alternative Segment 1) would control surface flow and reduce the width of the floodplain near the bridge, but would not prevent flooding from groundwater upwelling on the upland side of the revetments.

There are a number of differences in floodplain impacts among alternative segment groups. Central Alternative Segment 2 would be within the 100-year floodplain; Central Alternative Segment 1 would be outside the 100-year floodplain. Connector Segment A would be within the 100-year floodplain, Connector segments E and C would be within the 100-year floodplain along half their routes, and Connector segments B and D would be outside the 100-year floodplain.

S.6.3 Biological Resources

Rail line and facilities construction and operations would impact biological resources. The following paragraphs summarize the relevant effects of these project-related activities on vegetation, fisheries, wildlife, and birds. During consultations with Federal and State of Alaska

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[2] The minimum alternative affects the fewest acres of wetlands and is also referred to as the "minimum project area." It is made up of the following segments: North Common Segment, Eielson Alternative Segment 2, Salcha Alternative Segment 1, Connector Segment B, Central Alternative Segment 2, Donnelly Alternative Segment 2, South Common Segment, and Delta Alternative Segment 2.

[3] The maximum alternative affects the most acres of wetlands and is also referred to as the "maximum project area." It is made up of the following segments: North Common Segment, Eielson Alternative Segment 1, Salcha Alternative Segment 2, Connector Segment C, Central Alternative Segment 1, Donnelly Alternative Segment 1, South Common Segment, and Delta Alternative Segment 1.

resource agencies, no Federal or state listed threatened, endangered, or candidate plants or animals were identified as occurring within the project area.

Vegetation Resources

The effects of proposed NRE construction and operation on vegetation would be influenced by the vegetation type, soil conditions, and extent of topographic modification required for construction. Primary impacts from the project would be similar across vegetation types; vegetation would be removed and soil structures would be altered. Twenty-seven rare plants are known to occur in the vicinity of the project area and one rare willow was identified along Delta Alternative Segment 2 during field investigations for wetlands.

Impacts to vegetation would occur through direct clearing for construction of the rail line, access roads, and other support facilities, and through the introduction and potential spread of noxious and invasive plants. Estimated vegetation clearing for common support facilities would be 721.6 acres. The ROW of the Applicant's preferred route includes 2,820 acres of vegetation cover. The minimum area alternative would include 2,790 acres of vegetation cover; the maximum area alternative would include 2,885 acres. Some cleared areas would likely be restored after construction; other areas would be covered by fill and permanently impacted. Vegetation clearing would be a long-term impact for forest communities due to the length of recovery time and the need to maintain cleared areas adjacent to the rail line and access road.

Fisheries Resources

Construction of the rail line would result in short-term disturbance and long-term habitat modification to resident and anadromous fisheries. Construction- and operations-related impacts would include the loss or alteration of instream and riparian habitats due to placement of structures. mortality from instream construction. alteration of stream hydrology and blockage of fish movement. and degradation of water quality.

All alternative segments would cross streams or waterbodies with fish resources and would potentially cause the impacts described above. The Applicant's preferred route would cross 27 fish-bearing streams. Among the sets of alternatives, the following segments would result in substantially greater numbers of fish-stream crossings than their counterpart alternative segments: Eielson Alternative Segment 3 (7 crossings), Salcha Alternative Segment 2 (9 crossings), Connector Segments C and D (6 and 4 crossings, respectively), and Donnelly Alternative Segment 2 (8 crossings). Construction and operation of the Tanana River bridge and in-river revetments and channel plugs associated with Salcha Alternative Segments 1 and 2 would result in direct adverse impacts to aquatic habitat in the vicinity.

Regarding the proposed Salcha Alternative Segment 2 crossing of the Tanana River, the Alaska Department of Natural Resources has stated that flow through the side channel, which would be blocked and redirected by the proposed bridge, as designed, is critical for anadromous fish use of the area.

Wildlife Resources

Impacts of the proposed NRE to game mammals (particularly, bears, caribou, moose, wolves, bison, and furbearers) would be influenced by the animal's dependence on specific habitats, the availability of preferred and used habitats, the amount of preferred habitat affected by the project, ecology and life history, and past and current population trends. Because game mammal populations are managed for sustainable human harvest, project-related effects on population abundance, distribution, available habitat, and predator-prey relationships would also affect management of these game mammals. Common construction-related impacts would include habitat loss and fragmentation, direct mortality from construction, and reduced winter survival and lowered breeding success from exposure to construction noise and human activity. Common operations impacts would include mortality due to collision with trains, reduced survival from attractions to or displacement from the area around the rail line, reduced breeding success due to disturbance, and disruption of predator-prey relationships.

One BLM-listed Alaska Special Status Species, the Canada lynx, has been documented in the project area and could be affected through a loss of habitat and reduction in habitat suitability. The Eielson alternative segments would have the highest occurrences of moose and furbearers. Salcha Alternative Segment 1 and Donnelly Alternative Segment 2 would have higher densities of moose and furbearers than Salcha Alternative Segment 2 and Donnelly Alternative Segment 1. Central Alternative Segment 2 and Connector segments B, C, and D would contribute to the fragmentation of large areas of closed needleleaf forest core habitats and there could be mixed effects to wildlife. All game mammals except bison would be expected to be more common along Delta Alternative Segment 1 than Delta Alternative Segment 2. Among the sets of alternatives, Salcha Alternative Segment 2, Connector Segment A, and Central Alternative Segment 1 would result in substantially greater losses of habitat for most game mammals than their counterpart alternative segments.

Bird Resources

In general, the proposed NRE would affect a small proportion of the available habitat and a small proportion of the total avian population within the project area, with the greatest potential for significant impacts to forest nesting raptors, owls and landbirds. The proposed NRE would reduce the acreage of available habitat for nesting and migratory birds within the Tanana River Valley. Segments constructed through late-succession forest habitats would have the greatest impact on forest nesting landbirds. Power lines and communication towers built to support the rail line would increase collision mortality for all birds, especially when placed near raptor nests and foraging sites or between wetland or agricultural foraging habitats and riverine roosting habitats used by sandhill cranes, geese, swans, and ducks during migration. Twenty-five bird species of conservation concern and seven bird species listed as Bureau of Land Management Alaska Special Status Species have been documented within the project area and would be affected through a loss of habitat and reduction in habitat suitability.

Construction of Eielson alternative segments 1 and 2 and Central Alternative Segment 2 would result in impacts to identified bald eagle and large-raptor nests; Eielson Alternative Segment 3 and Central Alternative Segment 1 would not. Construction of Salcha Alternative Segment 2 would have a notably greater effect on nesting raptors than Salcha Alternative Segment 1. Construction of Connector segments A and B would affect one nesting pair of owls, while Connector segments B, C, and D would contribute to the fragmentation of raptor habitat. Construction of Donnelly Alternative Segment 2 would affect two raptors or their nests, while Donnelly Alternative Segment 1 would only affect one raptor nest.

S.6.4 Cultural Resources

Surface and subsurface disturbances from construction activities would be the sources of potential direct effects to historic properties and archaeological sites, and there could be indirect project effects from increased erosion and watershed changes. Impacts to cultural resources could include direct disturbance or destruction, contamination of organic residues of a site, exposure of archaeological resources, impacts to the aesthetics and visual site setting (depending on proximity), and changes to groundwater that affect soil pH levels and harm preservation of buried artifacts.

Negligible impacts to prehistoric and historic resources are expected from North Common Segment, the Eielson alternative segments, Salcha Alternative Segment 1, the Central alternative segments, and Connector alternative segments A, B, C, and D because they lie in areas with relatively low archaeological sensitivity for prehistoric sites, low or moderate sensitivity for historic sites, and have no known cultural resources within the Area of Potential Effect (APE). Salcha Alternative Segment 2 is in an area that has high potential for both prehistoric and historic sites. A prehistoric site and an historic site associated with Salchaket Village lie within or near the APE. The Donnelly alternative segments are in areas with relatively high potential for prehistoric resources. Donnelly Alternative Segment 1 contains more identified archaeological sites than Donnelly Alternative Segment 2. There are eight buried prehistoric sites within the APE of Donnelly Alternative Segment 1. Seventeen additional cultural resources were identified within 1,312 feet of the APE boundary for Donnelly Alternative Segment 1. Radiocarbon dating indicated that one of the sites is approximately 13,000 years old (after date calibration), which would make it one of the earliest human habitation sites in North America. Four prehistoric archeological sites were recorded along Donnelly Alternative Segment 2, and 11 archaeological sites were identified within 1,312 feet of the APE boundary. Prehistoric sites were also identified within the APE for South Common Segment (low potential for historic and prehistoric resources), and Delta Alternative Segment 2 (moderate potential for prehistoric and high potential for historic resources). No cultural resources were identified within the APE for Delta Alternative Segment 1 (moderate potential for historic and prehistoric resources).

SEA has developed a draft Programmatic Agreement for the NRE that would guide further cultural resources identification and evaluation efforts. The PA provides for the completion of the Level 2 identification survey if the Board authorizes the project and the locations of ancillary facilities have been established. Additionally, the PA establishes responsibilities for the treatment of historic properties, the implementation of mitigation measures, and ongoing consultation efforts.

S.6.5 Subsistence

Subsistence impacts associated with the proposed NRE would result from restrictions on user access to use areas, including traplines, and resource availability in those areas. The project area lies within the Alaska Department of Fish and Game Fairbanks nonsubsistence designated area, meaning all harvests of wildlife and fish in the project area do not qualify as subsistence activities and are instead managed under general sport hunting regulations, or by personal use or sport fishing regulations. Therefore, SEA evaluated potential impacts to subsistence by examining changes in use areas, user access, resource availability, and competition.

Subsistence resource uses in and near the project area would be affected similarly by the proposed rail line, regardless of the alternative segments selected. Restricted access along the proposed rail line would create a linear barrier preventing free range of hunters and other users across the area. The proposed rail line could limit the movement of wildlife, especially west of the Tanana River, which subsistence users from the east generally access by traveling across the river. Moose mortality due to train-moose collisions could affect moose availability in the area. More limited access and hunting success in the area could cause harvesters to utilize use areas in other communities, increasing the number of harvesters competing for resources in those places.

Delta Junction, Healy Lake, Nenana, Salcha, and Tok would be mostly like to experience such effects.

Impacts to resident and anadromous fish resources resulting from construction, including loss of riparian and stream habitat and potential blockage of fish movements, could decrease the availability of these fish species to harvesters. Construction activities would affect harvest activities, depending on construction timing, access points to the use area, and availability of alternate harvest locations.

S.6.6 Climate and Air Quality

SEA evaluated the potential impacts of increased emissions of National Ambient Air Quality Standards air pollutants by developing emissions estimates for proposed rail line construction and operations. The estimated emissions for all of the alternative segments would be similar because the length of new rail line would be similar regardless of alternative segments selected. Construction-related and estimated annual average operations emissions would be expected to be small fractions of the Fairbanks North Star Borough (FNSB) total annual emissions and would be minimal in the context of existing conditions. Construction-related emissions of nitrogen oxides, particulate matter less than 10 microns, and particulate matter less than 2.5 microns would range from 0.6 to 0.9 percent of FNSB total emissions for each pollutant. These emissions would be spread over the length of the new rail line, and approximately half the rail line would be outside FNSB. None of the construction would occur in the Fairbanks and North Pole carbon monoxide maintenance areas, and estimated emissions would be well below the *de minimus* conformity thresholds (100 tons per year for each pollutant). Operations emissions of nitrogen oxides would represent the greatest increase compared the existing area transportation conditions (highway vehicle emissions), but would still be relatively low. The proposed action would result in a 6.3 percent increase in carbon dioxide emissions by rail operations in Alaska, but the overall effect would be less than a 0.02-percent increase for the state as a whole. Also, carbon dioxide emissions from existing highway activity could decrease as a result of the proposed action to the extent that transportation activity by car or truck would shift to rail. Therefore, the incremental emissions and impacts to climate change from the proposed NRE would be very small.

S.6.7 Noise and Vibration

SEA evaluated whether the alternatives would result in vibration impacts or rail line noise levels (attributable to wayside noise and the locomotive warning horn) that would equal or exceed a 65 decibel day-night average noise level (DNL) and/or result in an increase of 3 a-weighted decibels (dBA) or greater. An estimated 446 receptors along the existing Eielson Branch between the Fairbanks Depot and the connection point for the proposed NRE would experience an adverse noise impact greater than or equal to 65 DNL and an increase of 4 to 10 dBA as a result of the additional rail traffic. An estimated 32 noise receptors near Salcha Alternative Segment 2, and an estimated four receptors near Eielson Alternative Segment 3 would be exposed to adverse noise effects of greater than 65 DNL and an increase in noise level of 15 to 30 dBA. An estimated four receptors along Salcha Alternative Segment 2 would experience vibration levels exceeding the 80-vibration-decibels criterion for human annoyance. The proposed rock storage and transfer facility adjacent to the Eielson Branch near Eielson AFB would generate additional, but temporary, construction noise. Based on the Federal Transit Administration General Assessment method and assuming daytime construction only, there would be no construction noise and vibration impacts from the proposed NRE.

S.6.8 Energy Resources

SEA expects that proposed NRE construction and operations would cause a diversion of freight from truck to rail transport, resulting in no change or a slight decrease in fuel usage. Any fuel savings would result from the substantial fuel efficiency advantage of rail versus truck transport in the movement of freight. SEA has conservatively assumed that operation of the rail passenger service would represent a decrease in energy efficiency because the Applicant has not estimated the shift of passenger traffic from road to rail. However, given the increased efficiency resulting from truck-to-rail diversions of freight, SEA estimates rail line operations would not decrease overall energy efficiency.

S.6.9 Transportation

Impacts to transportation operations could result from the building of the rail line (and associated facilities) and from rail line operations. The paragraphs below summarize the relevant effects of these project-related activities.

Safety

Using available statistics on accidents per train mile, SEA estimated that the proposed NRE would result in an increase of 0.59 predicted train accident per year. The increase would be essentially the same for all routes from North Pole to Delta Junction because the difference in the length of the routes is comparatively small. Similarly, the potential consequences of moving 63 railcars containing hazardous materials annually would be the same for all routes. The potential impacts of the project on road safety would be small during construction, and minimal to potentially positive during operations, which would be equal for all routes. SEA's analysis of highway-rail grade crossing safety indicates that, during operations, accident frequency at each of the existing public at-grade crossings that would be used by proposed NRE rail traffic would range from a minimum rate per year of 0.0093 and a maximum of 0.413 (*i.e.*, one predicted accident every 2.4 to 108 years). The total estimated increase in predicted accident frequency of 0.54 accident per year (from 1.18 to 1.72) for all existing crossings that would be used by proposed NRE traffic is independent of the route of the rail line extension, because the same existing crossings would be used for all routes. For new at-grade crossings, predicted accident frequency would be expected to be much lower than for the existing grade crossings, because total estimated vehicle traffic at the new crossings would be less than 2 percent of that for the existing crossings for any of the alternative routes from North Pole to Delta Junction.

Delay

SEA does not expect that trains on the existing rail line would experience noticeable delays as a result of project construction or proposed increased operations. Construction activities would generate vehicle trips, and construction transportation could cause increased road delays. There would be temporary delays where existing roads were widened to access the Tanana River bridge location on Salcha alternative segment 1 or 2, and for traffic on Richardson Highway in the Salcha area during relocation of the highway for construction of Salcha Alternative Segment 2. Construction of grade-separated and highway/rail at-grade crossings could also cause temporary delays.

SEA anticipates that the impacts of road transportation delay from drivers' commutes to rail stations would be minimal. Vehicle trips on Richardson Highway could decrease slightly during operations because some of the military and commercial freight hauled there could move on the proposed rail line. SEA estimates that the number of vehicles delayed by rail traffic would increase as a result of the proposed NRE from approximately 1 percent of all vehicles using the highway/rail at-grade crossings to approximately 1.6 percent, and that the average delay experienced by each delayed vehicle would decrease from approximately 1.67 minutes per vehicle to 1.34 minutes per vehicle (because the average train length would decrease). Operations impacts on emergency vehicle response time would be small.

S.6.10 Navigation

Where the selected alternative segments would cross a navigable waterway, as designated by the U.S. Coast Guard and Alaska Department of Natural Resources, there could be small temporary effects to navigability due to temporary bridges and normal bridge construction activities (*e.g.*, setting piers and construction equipment operations). No long-term adverse impacts are expected during rail line operations, because ARRC would construct bridges over designated navigable waterways to allow continued use by vessels. Bridges over designated navigable waters would be required to meet Coast Guard, the Department of Natural Resources, and the Alaska Department of Fish and Game permit requirements, and no construction would begin prior to permit determination.

Bridges across the Tanana River could affect aircraft navigation. When weather conditions are bad, some pilots use the Tanana River to navigate back to Fairbanks. In times of severe fog, pilots might fly very low so they can see the river. Federal Aviation Administration requirements could apply to bridge structures crossing the Tanana River (*e.g.*, lighting) for aircraft safety.

S.6.11 Land Use

The Federal Government, the State of Alaska, and private entities own most of the land the proposed NRE would directly affect. No tribal lands or native allotments have been identified in the ROW of any of the alternative segments. Federal and state lands are used primarily for military training, recreation, hunting, fishing, mining, and timber harvest. Privately owned lands are primarily in agricultural and residential use or in a natural state. Existing land use in the rail line ROW would be permanently changed. Any non-rail associated activities within the ROW would require a permit from ARRC, and any permissions required by the agency, corporation, or individual that owns the property. Permanent support facilities that would be constructed outside of the ROW include permanent access roads, communications towers, and facilities to support rail line operations, including a passenger terminal. Existing land ownership or control and use in these areas would be permanently changed to allow for facility operations. Lands that would be affected by the project are generally undeveloped and away from residences and businesses, with some exceptions. There would be temporary indirect effects to residences and business during construction, primarily from noise and changes to the visual landscape, but these effects would generally be minor.

Commercial timber would be cleared for construction of the rail project. The volume of commercial timber within areas that would be cleared for the project ROW has not been quantified by a timber survey, and ARRC has not developed specific plans for timber salvage from lands that would be cleared for the ROW.

Recreation Resources

Because recreation activities within the project area are generally dispersed over a large area, most potential impacts to recreation would be common to all alternative segments.

Construction-related impacts would include temporary closure of some trails and limited access to some navigable rivers and other access routes. Culverts used to convey water under the rail line would typically limit access for winter and summer use of the waterway. Main river access routes to areas west of the Tanana River via larger rivers and streams (Fivemile Clearwater Creek, Little Delta River, Delta Creek), would be maintained through use of bridges with ample clearance.

Access to recreation resources would be impeded primarily by prohibition of crossing or use of the rail line ROW. Pedestrians or vehicles crossing the rail line ROW where there is no designated crossing would be trespassing and such crossings would be prohibited by law. This legal prohibition would also extend to walking along the tracks. Though illegal ROW crossing would likely occur on occasion, enforcement of the ROW crossing prohibition would generally result in decreased or denied access to hunting and other recreation activities on public lands bisected by the rail line.

Unserialized trails are quite common on state lands along many of the proposed alternative segments. Individuals are not required to report the use or location of these trails to the Alaska Department of Natural Resources. The Alaska Division of Mining, Land & Water has indicated that it would consider closure of these generally allowed trails to be an impact, would require further investigation to determine their location and use, and would require accommodation of these trails.

Section 4(f) Evaluation

SEA identified potential U.S. Department of Transportation Act Section 4(f) resources that would be affected by the proposed NRE. Most these properties are recreational trails used for dogsledding, snowmachining, and skiing; two are cultural resource sites. Ten alternative segments would require use of Section 4(f) resources, based on preliminary determination. By the criteria of Section 4(f) evaluation, the combination of segments that minimize effects to Section 4(f) properties would include the following: North Common Segment, Eielson Alternative Segment 3, Salcha Alternative Segment 1, any of the connector segments, either Central alternative segment, Donnelly Alternative Segment 2, South Common Segment, and either Delta alternative segment. There might be opportunities to minimize or mitigate impacts to Section 4(f) resources, including scheduling construction to avoid times of heavy trail use, and minimizing dust and noise emissions. Coordination is ongoing with appropriate agencies to determine the significance of resources protected under Section 4(f) that would be affected by the proposed NRE.

Hazardous Materials/Waste Sites

There could be environmental impacts from hazardous materials as a result of excavating contaminated sites during construction of roadbeds and railbeds, hill cuts, grade separations, and retaining walls. Borrow areas developed for fill materials could disturb or move contaminated materials. Eleven sites in the project area were identified that present potential risks due to site contamination if excavation were to occur at these locations. Potential sites in the project area include former highway construction camp sites and a petroleum pipeline ROW. The Applicant would use information regarding the locations of these sites, and standard best management practices, to avoid excavation in contaminated areas.

S.6.12 Visual (Aesthetic) Resources

For the most part, the proposed action and alternative segments would meet BLM visual resource management (VRM) objectives.[4] However, in some cases the proposed alternative segments would not be consistent with the VRM objectives related to water crossings, proximity to communities, and geologic disturbance. Salcha Alternative Segment 1 would not meet VRM objectives at its crossing of the Tanana River. Salcha Alternative Segment 2 would not meet VRM objectives due to a hill cut, crossings of the Tanana and Salcha rivers, and its proximity to the community of Salcha. SEA anticipates that the Donnelly alternative segments would not meet VRM management objectives at their crossings of Delta Creek and Little Delta River, and that Delta alternative segments 1 and 2 would not meet VRM management objectives at their crossings of the Delta River and at highway crossings. Visual impacts from temporary facilities would be strong during construction where visible. However, these facilities would be removed and the sites restored after construction is complete, and SEA believes they would likely meet VRM objectives in the long term. Depending on their location, some of the permanent communications towers could have a moderate to strong contrast with the surrounding landscape due to the elevation of the terrain and areas permanently cleared of vegetation surrounding the tower.

S.6.13 Socioeconomics

Most socioeconomic effects would result from the project as a whole, and not from specific combinations of alternative segments that the Board may ultimately authorize. However, there are some socioeconomic effects that would differ across alternative segments, including effects on communities and neighborhoods. Salcha Alternative Segment 2 would require that ARRC relocate the Salcha Elementary School. The effects of all alternatives on community cohesion would be minimal. Eielson Alternative Segment 1 would result in the loss of approximately 2 acres of farming surface area from the Eielson Farm Community, but would have negligible effects on existing travel patterns, social interactions, and agricultural output within the community. The effects of the proposed NRE on public services and housing in the project area would also be minimal. SEA estimates that NRE operations and maintenance would result in the creation of between 10 and 17 ARRC full-time direct and secondary jobs. Because the number of new ARRC full-time employment positions would be small, the effects on housing and public facilities and services would be negligible.

S.6.14 Environmental Justice

SEA did not identify any high and adverse impacts to human populations in the project area. Therefore, there would be no high and adverse impacts to environmental justice populations as a result of the proposed NRE.

S.6.15 Cumulative Effects

SEA evaluated the cumulative impacts for situations where planned or reasonably foreseeable projects would overlap with the NRE in terms of geographic area and timeframe. These projects

[4] The BLM uses its VRM system to measure the scenic quality of a landscape, establish the management objectives for levels of acceptable visual impact, and measure the contrast caused by a project on that landscape from traveled observation points.

could have common potential actions and impacts. Reasonably foreseeable activities within the project area include the expansion or expanded use of the Donnelly Training Area, replacement of or upgrades to the Fort Wainwright rail loading facility, improvements along Richardson Highway, and construction of the Alaska Natural Gas Pipeline. The cumulative effects of these projects and the proposed NRE could result in additional adverse effects for geology and soils, water resources, biological resources, cultural resources, climate, subsistence, noise, transportation safety, land use, and visual resources.

Table S-2 summarizes and compares potential impacts for resource areas and topics for which there are noteworthy differences among the alternatives. Table S-2 does not include resource areas for which the potential impacts would be essentially the same for all the alternatives. Similarly, the table does not include the No-Action Alternative because, under that alternative, existing conditions would remain the same and there would be no impacts.

Table S-2
Summary and Comparison of Potential Impacts

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Eielson Branch (existing)	Not applicable	Not applicable	Not applicable	Not applicable	Adversely affected noise receptors: 446	Not applicable	Not applicable
North Common Segment	Minimal grading/filling 25% permafrost, 5 feet overburden	Crossings would include 1 bridge and 1 culvert.[b] Impacts to wetlands and other waters (acres): 3.5 (forested 0, scrub/shrub 2.6, emergent 0.3, other waters 0.6)	Total vegetation cleared (acres): 61.6 Fish-bearing stream crossings: 2 (2 spawning, 1 anadromous habitat) Direct habitat loss (acres): Bears, 60.5 Caribou, 21.7 Moose, 60.5 Wolves, 61.6 Furbearers, 42.0	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	Federal/state land ownership Impacts to fishing 4(f) resource present Potential hazardous material/waste sites	Consistent with VRM objectives

Table S-2
Summary and Comparison of Potential Impacts (cont'd)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Eielson Alternative Segment 1	Minimal grading/filling 25% permafrost, 5 feet overburden	Crossings would include 13 culverts and 1 small bridge.[b] Impacts to wetlands and other waters (acres): 16.8 (forested 6.9, scrub/shrub 7.1, emergent 1.5, other waters 1.3)	Total vegetation cleared (acres): 246.4 Fish-bearing stream crossings: 2 (2 spawning, 2 anadromous habitat) Direct habitat loss (acres): Bears, 246.4 Caribou, 123.8 Moose, 246.4 Wolves, 247.3 Furbearers, 237.2 1 bald eagle and 1 red-tailed hawk nest affected	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	52 acres private land; 2 acres in agricultural use 2 to 3 residences directly affected 11 recreation access route intersections 4(f) resource present	Consistent with VRM objectives

Table S-2
Summary and Comparison of Potential Impacts (cont'd)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Eielson Alternative Segment 2	Minimal grading/filling 25% permafrost, 5 feet overburden	Crossings would include 10 culverts and 3 small bridges.[b] Impacts to wetlands and other waters (acres): 70.8 (forested 23.3, scrub/shrub 43.1, emergent 3.5, other waters 0.9)	Total vegetation cleared (acres): 241.0 Fish-bearing stream crossings: 3 (2 spawning, 2 anadromous habitat) Direct habitat loss (acres): Bears, 241.0 Caribou, 146.4 Moose, 241.0 Wolves, 241.2 Furbearers, 222.9 1 bald eagle and 1 red-tailed hawk nest affected	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	78 acres private land; 2 acres in agricultural use 8 recreation access route intersections 4(f) resource present	Consistent with VRM objectives
Eielson Alternative Segment 3	Minimal grading/filling 25% permafrost, 5 feet overburden	Crossings would include 14 culverts and 3 small bridges.[b] Impacts to wetlands and other waters (acres): 100.3 (forested 36.7, scrub/shrub 48.6, emergent 5.7, other waters 9.3)	Total vegetation cleared (acres): 238.5 Fish-bearing stream crossings: 7 (1 spawning, 1 anadromous habitat) Direct habitat loss (acres): Bears, 238.5 Caribou, 124.5 Moose, 238.5 Wolves, 239.3 Furbearers, 222.0	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	Adversely affected noise receptors: 4	55 acres private land 6 recreation access route intersections 4(f) resource present	Consistent with VRM objectives

Table S-2
Summary and Comparison of Potential Impacts (cont'd)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Salcha Alternative Segment 1	Minimal grading/filling 5 to 25% permafrost, 2 to 5 feet overburden Potential for seismic events	Crossings would include 12 culverts and 1 large bridge[b]; large bridge crossing of the Tanana River would result in high impacts due to altered flood hydraulics, increased scour, and downstream aggradation. Impacts to wetlands and other waters (acres): 179.9 (forested 32.2, scrub/shrub 56.7, emergent 0.2, other waters 90.8)	Total vegetation cleared (acres): 434.9 Fish-bearing stream crossings: 3 (2 spawning, 1 anadromous habitat); adverse impact from bridge Higher density of game mammals (particularly bears, wolves, furbearers) than Salcha 2; potential impact to prime moose calving area Direct habitat loss (acres): Bears, 434.9 Caribou, 175.2 Moose, 434.9 Wolves, 447.6 Furbearers, 426.4 1 pair bald eagles, 1 pair great horned owls affected	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	14 acres private land 25 to 30 residences directly or indirectly affected Impacts to fishing 1 recreation access route intersection	Inconsistent with VRM objectives: bridge crossing

Table S-2
Summary and Comparison of Potential Impacts (cont'd)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Salcha Alternative Segment 2	Substantial grading/filling 5 to 75% permafrost, 2 to 7 feet overburden Potential for seismic events and mass wasting	Crossings would include 12 culverts, 2 small bridges and 4 large bridges[b]; large bridge crossing of the Tanana River would result in high impacts due to altered flood hydraulics, increased scour, and downstream aggradation. Impacts to wetlands and other waters (acres): 262.3 (forested 58.5, scrub/shrub 120.1, emergent 3.0, other waters 80.7)	Total vegetation cleared (acres): 536.8 Fish-bearing stream crossings: 9 (7 spawning, 7 anadromous habitat); adverse impact from bridge Direct habitat loss (acres): Bears, 535.1 Caribou, 299.1 Moose, 536.2 Wolves, 580.4 Furbearers, 506.0 2 pair bald eagles and 3 nest structures; 3 pair peregrine falcon affected	High potential for impacts to historic and prehistoric resources Identified sites within APE: 2	Adversely affected noise receptors: 32 Adversely affected vibration receptors: 4	92 acres private land; 150 homes or businesses temporarily or permanently affected, including the Salcha School 3 recreation access route intersections; impacts to fishing and hunting Potential hazardous material/waste sites 4(f) resource present	Inconsistent with VRM objectives: hill cut, bridge crossing, community

Table S-2
Summary and Comparison of Potential Impacts (cont'd)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Central Alternative Segment 1	Minimal grading/filling 75 to 90% permafrost, 7 to 14 feet overburden	Crossings would include 9 culverts and 1 small bridge.[b] Impacts to wetlands and other waters (acres): 51.0 (forested 22.5, scrub/shrub 24.1, emergent 4.2, other waters 0.2) Would lie outside 100-year floodplain	Total vegetation cleared (acres): 122.6 Fish-bearing stream crossings: 1 (1 spawning habitat) Direct habitat loss (acres): Bears, 122.6 Caribou, 65.9 Moose, 122.6 Wolves:, 22.8 Furbearers, 88.9	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	Impacts to hunting	Consistent with VRM objectives

Table S-2
Summary and Comparison of Potential Impacts (cont'd)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Central Alternative Segment 2	Minimal grading/filling 25% permafrost, 5 feet overburden	Crossings would include 9 culverts and 2 small bridges.[b] Impacts to wetlands and other waters (acres): 6.5 (forested 0, scrub/shrub 6.5, emergent 0) Would lie within 100-year floodplain of the Tanana River	Total vegetation cleared (acres): 84.9 Fish-bearing stream crossings: 2 (no spawning or anadromous habitat) Fragmentation of closed needleleaf habitat (benefit to moose, mixed adverse impact to furbearers) Direct habitat loss (acres): Bears, 84.9 Caribou, 72.5 Moose, 84.9 Wolves, 86.9 Furbearers, 84.3 1 pair bald eagles affected	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	Impacts to hunting	Consistent with VRM objectives

Table S-2
Summary and Comparison of Potential Impacts (cont'd)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Connector Segment A	Minimal grading/filling 25% permafrost, 5 feet overburden	Crossings would include 3 culverts and 1 small bridge.[b] Impacts to wetlands and other waters (acres): 56.2 (forested 31.9 , scrub/shrub 23.0, emergent 1.1, other waters 0.2) Would lie within 100-year floodplain	Total vegetation cleared (acres): 105.7 Fish-bearing stream crossings: 1 (1 anadromous habitat) Direct habitat loss (acres): Bears, 105.7 Caribou, 64.1 Moose, 105.7 Wolves, 105.7 Furbearers, 91.0 1 pair great horned owls affected	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	Federal/state land ownership 1 recreation access route intersection; impacts to hunting and fishing	Consistent with VRM objectives

Table S-2
Summary and Comparison of Potential Impacts (cont'd)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Connector Segment B	Minimal grading/filling 25% permafrost, 5 feet overburden	Crossings would include 2 culverts and 1 small bridge.[b] Impacts to wetlands and other waters (acres): 1.6 (forested 0.3, scrub/shrub 0.4, emergent 0.2, other waters 0.7) Would lie outside 100-year floodplain	Total vegetation cleared (acres): 78.5 Fish-bearing stream crossings: 2 (1 spawning, 2 anadromous habitat) Fragmentation of closed needleleaf habitat (benefit to moose, mixed adverse impact to furbearers) Direct habitat loss (acres): Bears, 78.5 Caribou, 68.9 Moose, 78.5 Wolves, 78.5 Furbearers, 78.5 1 pair great horned owls affected	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	Federal/state land ownership 1 recreation access route intersection; impacts to hunting and fishing	Consistent with VRM objectives

Table S-2
Summary and Comparison of Potential Impacts (cont'd)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Connector Segment C	Minimal grading/filling 25% permafrost, 5 feet overburden	Crossings would include 4 culverts and 3 small bridges.[b] Impacts to wetlands and other waters (acres): 26.3 (forested 10.4, scrub/shrub 13.2, emergent 1.3, other waters 1.4) Half of segment would lie within 100-year floodplain	Total vegetation cleared (acres): 55.6 Fish-bearing stream crossings: 6 (1 spawning, 5 anadromous habitat) Fragmentation of closed needleleaf habitat (benefit to moose, mixed adverse impact to furbearers) Direct habitat loss (acres): Bears, 55.6 Caribou, 41.4 Moose, 55.6 Wolves, 55.6 Furbearers, 45.3	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	Federal/state land ownership Impacts to hunting	Consistent with VRM objectives

Table S-2
Summary and Comparison of Potential Impacts (cont'd)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Connector Segment D	Minimal grading/filling 25% permafrost, 5 feet overburden	Crossings would include 1 culvert and 3 small bridges.[b] Impacts to wetlands and other waters (acres): 2.9 (forested 0, scrub/shrub 1.5, emergent 0.2, other waters 1.2) Would lies outside 100-year floodplain	Total vegetation cleared (acres): 21.2 Fish-bearing stream crossings: 4 (4 anadromous habitat) Fragmentation of closed needleleaf habitat (benefit to moose, mixed adverse impact to furbearers) Direct habitat loss (acres): Bears, 21.2 Caribou, 19.7 Moose, 21.2 Wolves, 21.2 Furbearers, 21.2	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	Federal/state land ownership Impacts to hunting	Consistent with VRM objectives
Connector Segment E	Minimal grading/filling 25% permafrost, 5 feet overburden	Crossings would include 5 culverts and 1 small bridge.[b] Impacts to wetlands and other waters (acres): 3.5 (forested 0.7, scrub/shrub 2.1, emergent 0.3, other waters 0.4) Half of segment would lie within 100-year floodplain	Total vegetation cleared (acres): 58.2 Fish-bearing stream crossings: 1 (1 spawning, 1 anadromous habitat) Direct habitat loss (acres): Bears, 58.2 Caribou, 16.3 Moose, 58.2 Wolves, 58.4 Furbearers, 24.5	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	6 acres private land Impacts to hunting and fishing	Consistent with VRM objectives

Table S-2
Summary and Comparison of Potential Impacts (cont'd)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Donnelly Alternative Segment 1	Substantial grading/filling 5 to 90% permafrost, 2 to 14 feet overburden	Crossings would include 31 culverts, 4 small bridges, and 2 large bridges[b]; large bridge crossing of Delta Creek and Little Delta River would result in high impacts due to altered flood hydraulics, increased scour, downstream aggradation, and increased potential for overbank flooding and/or debris jams. Impacts to wetlands and other waters (acres): 397.0 (forested 125.8, scrub/shrub 214.0, emergent 2.2, other waters 55)	Total vegetation cleared (acres): 627.5 Fish-bearing stream crossings: 6 (no spawning or anadromous habitat) Fragmentation of closed needleleaf habitat (benefit to moose, mixed adverse impact to furbearers) Direct habitat loss (acres): Bears, 626.9 Caribou, 475.3 Moose, 626.9 Wolves, 658.8 Furbearers, 549.8 1 northern goshawk nest affected	High potential for impacts to historic and prehistoric resources Identified sites within APE: 8	No adversely affected noise/vibration receptors	Federal/state land ownership 6 recreation access route intersections; impacts to hunting 4(f) resource present	Consistent with VRM objectives

Table S-2
Summary and Comparison of Potential Impacts (cont'd)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Donnelly Alternative Segment 2	Substantial grading/filling 4 to 12% permafrost, 4 to 12 feet overburden	Crossings would include 44 culverts, 2 small bridges, and 2 large bridges[b]; large bridge crossing of Delta Creek and Little Delta River would result in high impacts due to altered flood hydraulics, increased scour, downstream aggradation, and increased potential for overbank flooding and/or debris jams. Impacts to wetlands and other waters (acres): 302.5 (forested 144.1, scrub/shrub 99.0, emergent 4.2, other waters 55.2)	Total vegetation cleared (acres): 636.4 Fish-bearing stream crossings: 8 (3 spawning, 3 anadromous habitat) Fragmentation of open and closed needleleaf (benefit to moose, mixed adverse impact to furbearers) and closed broadleaf habitat; higher occurrence of furbearers than Donnelly 1 Direct habitat loss (acres): Bears, 636.4 Caribou, 370.2 Moose, 636.4 Wolves, 669.7 Furbearers, 564.9 1 pair peregrine falcons, 1 bald eagle nest affected	High potential for impacts to historic and prehistoric resources Identified sites within APE: 4	No adversely affected noise/vibration receptors	4 acres private land 3 recreation access route intersections; impacts to hunting Potential hazardous material/waste sites 4(f) resource present	Consistent with VRM objectives

Table S-2
Summary and Comparison of Potential Impacts (cont'd)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
South Common Segment	Minimal grading/filling 50 to 85% permafrost, 3 to 4 feet overburden	Crossings would include 11 culverts and 3 small bridges.[b] Impacts to wetlands and other waters (acres): 55.5 (forested 11.3, scrub/shrub 43.4, emergent 0.8, other waters 0.3)	Total vegetation cleared (acres): 251.2 Fish-bearing stream crossings: 3 (2 spawning, 2 anadromous habitat) Direct habitat loss (acres): Bears, 251.2 Caribou, 166.3 Moose, 251.2 Wolves, 251.2 Furbearers, 244.2 2 red-tailed hawk, 2 great gray owl, and 1 great horned owl nest affected	Low potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	Federal/state land ownership 2 recreation access route intersections; impacts to fishing 4(f) resource present	Consistent with VRM objectives

Table S-2
Summary and Comparison of Potential Impacts (cont'd)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Delta Alternative Segment 1	Substantial grading/filling 5 to 85% permafrost, 3 to 7 feet overburden	Crossings would include 1 culvert and 1 large bridge[b]; large bridge crossing of the Delta River would result in high impacts due to increased scour, bank erosion and/or downstream aggradation. Impacts to wetlands and other waters (acres): 94.9 (forested 14.0, scrub/shrub 34.0, emergent 0.1, other waters 46.8)	Total vegetation cleared (acres): 261.7 Fish-bearing stream crossings: 1 (no spawning or anadromous habitat) All game animals except bison more common than Delta 2; fragmentation of closed needleleaf habitat (benefit to moose, mixed adverse impact to furbearers) Direct habitat loss (acres): Bison, 14.6 Bears, 256.4 Caribou, 198.2 Moose, 256.4 Wolves, 311.2 Furbearers, 247.5	Moderate potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	3 acres private land Federal/state land ownership No recreation access route intersections; numerous legal, informal trails Potential hazardous material/waste sites 4(f) resource present	Inconsistent with VRM objectives: highway crossing

Table S-2
Summary and Comparison of Potential Impacts (cont'd)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Delta Alternative Segment 2	Minimal grading/filling 5 to 85% permafrost, 2 to 7 feet overburden	Crossings would include 1 large bridge[b]; large bridge crossing of the Delta River would result in high impacts due to increased scour, bank erosion and/or downstream aggradation. Impacts to wetlands and other waters (acres): 60 (forested 4.2, scrub/shrub 19.6, emergent 1.1, other waters 35)	Total vegetation cleared (acres): 281.1; one rare willow identified. Fish-bearing stream crossings: 1 (no spawning or anadromous habitat) Greater disturbance of potential bison habitat than Delta 1; negligible impact to bison Direct habitat loss (acres): Bison, 74.2 Bears, 211.4 Caribou, 104.6 Moose, 211.4 Wolves, 304.0 Furbearers, 209.0	Moderate potential for impacts to historic and prehistoric resources; greater direct impacts on historic resources than Delta 1 Identified sites within APE: 1	No adversely affected noise/vibration receptors	59 acres of private land in agricultural and residential use 1 recreation access route intersection; numerous legal, informal trails Potential hazardous material/waste sites 4(f) resource present	Inconsistent with VRM objectives: highway crossing

[a] Known trails and streams not including all trapping trails and other small winter trails.
[b] Generally, the more bridges or culverts, the greater the potential for the following environmental consequences: bridge construction impacts could include changes to natural drainage, sloughing, and erosion of the streambank, impacts to permafrost, increased stages and velocities of floodwater, and increased channel scour or bank erosion; impacts from construction of single or multiple culverts would likely include localized disturbance of the streambank to gain access to the channel and disturbance of the channel bed when installing the culverts.

S.7 Summary of SEA's Preliminary Recommended Mitigation Measures

SEA encourages applicants to develop voluntary mitigation to address concerns that go beyond the Board's jurisdiction. Accordingly, the Applicant in this case has submitted proposed voluntary mitigation measures for SEA's consideration. The Applicant developed these voluntary mitigation measures in consultation with local communities and interested agencies.

Based on the independent environmental analysis, consultations with appropriate agencies, and available project information, SEA developed preliminary recommended mitigation to address the environmental impacts of the proposed NRE. In addition, SEA intends to recommend that the Board impose the Applicant's proposed voluntary mitigation measures as a condition of petition approval. The proposed action would have negligible effects on all other impact areas.

SEA specifically requests meaningful comments on the preliminary recommended mitigation identified in the Draft EIS and potential additional mitigation measures. SEA will make its final recommendations to the Board on environmental mitigation in the Final EIS after considering all public comments on the Draft EIS. The Board will then make its final decision regarding this project and any environmental conditions it might impose.

S.8 Request for Comments on the Draft EIS

The public and any interested parties are encouraged to submit written comments on all aspects of this Draft EIS. SEA will consider all such comments in preparing the Final EIS, which will include responses to all substantive comments, SEA's final conclusions on potential impacts, and SEA's final recommendations. **The deadline for comments is February 2, 2009.** When submitting comments on the Draft EIS, the STB encourages commenters to be as specific as possible and substantiate concerns and recommendations.

Please mail written comments on the Draft EIS to the address below.

David Navecky
STB Finance Docket No. 34658
Surface Transportation Board
395 E Street, S.W.
Washington, D.C. 20423-0001

Environmental comments may be filed electronically on the Board's Web site at www.stb.dot.gov by clicking on the "E-FILING" link. Comments submitted electronically will be given the same weight as mailed comments; therefore, persons submitting comments electronically do not have to also send comments by mail.

Please refer to STB Finance Docket No. 34658 in all correspondence addressed to the Board, including e-filings.

Further information about the project can be obtained by calling SEA's toll-free number at 1-800-359-5142 (telecommunications device [TDD] for the hearing impaired is 1-800-877-8339).

This Draft EIS is also available on the Board's Web site at www.stb.dot.gov.

S.9 Public Meetings

In addition to receiving written comments on the Draft EIS, SEA and the cooperating agencies will host public meetings. SEA will involve the cooperating agencies in the planning and conduct of the public meetings.[5] At each meeting, SEA will give a brief presentation and interested parties may then make oral comments. SEA will have a transcriber present at each meeting to record the oral comments. Written comments may also be submitted at the meetings. Meetings will be held at the following locations, dates, and times:

Pike's Waterfront Lodge, 1850 Hoselton Road, Fairbanks, Alaska: 5-8 PM, Monday, January 12, 2009

City Council Chambers, 125 Snowman Lane, North Pole, Alaska: 5-8 PM, Tuesday, January 13, 2009

Salcha Senior Center, 6062 Johnson Road, Salcha, Alaska: 5-8 PM, Wednesday, January 14, 2009

Jarvis West Building, Mile 1420.5 Alaska Highway, Delta Junction, Alaska: 5-8 PM, Thursday, January 15, 2009

[5] ADNR will be present at STB's public meetings for the proposed NRE, to hear comments about the project, and in particular, how the proposed location of the project may affect public access to state lands along and adjacent to the proposed transportation corridor. ADNR will provide additional opportunities for potentially affected parties to comment on its process for meeting the obligations under AS 42.40.460. For additional information, please contact ADNR Division of Mining, Land and Water at 907-451-2740.

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Glossary

Adverse environmental impact	A negative effect, resulting from the implementation of a proposed action that serves to degrade or diminish an aspect of human or natural resources.
Advisory Council on Historic Preservation (ACHP)	An independent Federal agency charged with advising the President and Congress on historic preservation matters and administering the provisions of Section 106 of the National Historic Preservation Act.
Alaska Department of Environmental Conservation (ADEC)	State agency in charge of protecting human health, natural resources, and the environment.
Alaska Department of Natural Resources (ADNR)	ADNR's goal is to maintain the state's resources. ADNR manages all state-owned land, water, and natural resources with the exception of fish and game.
Alaska Railroad Corporation (ARRC)	State-owned corporation that owns and operates all common carrier rail lines in Alaska.
Alluvial Fans	Fan-shaped fluvial area composed of clay, silt, and sand, transported by water and deposited on a floodplain.
Ambient Noise	The existing noise, or the sum of all noise (from human and naturally occurring sources), at a specific location over a specific time.
Applicant	Any person or entity seeking Surface Transportation Board action whether by application, petition, Notice of Exemption, or any other means that initiates a formal Board proceeding.
Aquifer	A permeable geological stratum or formation that can both store and transmit water in significant quantities.
Armor Stone	A durable stone that prevents erosion or degradation of a railbed.
At-grade crossing	The location where a local street or highway crosses rail line tracks at the same level or elevation.
Attainment area	An area that EPA has classified as complying with the National Ambient Air Quality Standards (NAAQS) specified under the Clean Air Act.
Automatic block signal	A block signal which is activated by track circuit or in conjunction with interlocking or controlled point circuits. This block signal automatically indicates track condition and block occupancy.

Automatic Block Signal System (ABS)	A series of consecutive blocks governed by block signals, cab signals, or both, actuated by a train, engine, or by certain conditions affecting the use of a block.
A-weighted sound level (dBA)	The most commonly used measure of noise, expressed in "A-weighted" decibels (dBA). It is a single-number measure of sound severity that accounts for the various frequency components in a way that corresponds to human hearing.
Ballast	Crushed stone that forms the railbed upon which rail line ties are laid. It is packed between, below, and around the ties and is used to facilitate drainage of water, and to distribute the load from the rail line ties.
Bedding and Parting Planes	The surface separating two successive layers of stratified rock.
Best Management Practices (BMPs)	Techniques that various parties (e.g., the construction industry) use to minimize impacts to the environment.
Biological Assessment	Information prepared by, or under the direction of, a Federal agency to determine whether a proposed action is likely to: 1) adversely affect listed species or designated critical habitat; 2) jeopardize the continued existence of species that are proposed for listing; or 3) adversely modify proposed critical habitat. Biological assessments must be prepared for "major construction activities."
Block	1) A defined length of track, with defined limits, on which operators govern train movements. 2) A group of freight cars handled as one unit for a portion, or all, of their journey from origin to destination.
Block group	The smallest geographic unit for which the U.S. Census provides information on racial background, ethnic heritage, and household income. The population of a block group typically ranges from 600 to 3000 people and is designated to reflect homogeneous living conditions, economic status, and population characteristics. Block group boundaries follow visible and identifiable features, such as roads, canals, railroads, and aboveground high-tension power lines.
Blocking	The process of aggregating freight cars into blocks.
Board	The Surface Transportation Board.
Borrow area (Borrow pit)	Site from which earthen material is excavated and used at a different site, usually as fill to create the proper grade.
Branch line	A secondary line of rail line usually handling light volumes of traffic.
Carload	A unit of measure used to describe commodities transported by rail line typically in a boxcar, tank car, flat car, hopper car, or gondola.
Census block group	See *Block group*.
Channel plug	A natural or manmade plug that blocks the flow of water through a riverbed or culvert.

Cirques	An amphitheater-shaped basin at the head of a glacier valley.
Class II Railroads	A railroad with annual operating revenue of more than $20.5 million but less than $277.7 million. These railroads are usually regional, mid-sized rail lines that have the capacity to haul both freight and passengers.
Clean Air Act (Clean Air Act Amendments)	The primary Federal law that protects the nation's air resources comprised of the Clean Air Act of 1970 and the subsequent amendments, including the Clean Air Act Amendments of 1990 (42 U.S.C. 7401-7671g). This act establishes a comprehensive set of standards, planning processes, and requirements to address air pollution problems and reduce emissions from major sources of pollutants.
Clean Water Act	The Federal Water Pollution Control Act Amendment of 1972 (33 U.S.C. 1251 *et seq*.) is the primary Federal law that protects the nation's waters, including lakes, rivers, aquifers, and coastal areas. The act provides a comprehensive framework of standards, technical tools, and financial assistance to address the many causes of pollution and poor water quality. The Act protects valuable wetlands and other aquatic habitats through a permitting process that ensures land development activities and other activities are conducted in an environmentally sound manner.
Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. 9601-9675; P.L. 96-510); Liability Act (CERCLA)	Provides EPA with authority to clean up inactive hazardous waste sites and distribute the clean-up costs among the parties who generated and/or handled the hazardous substances at these sites.
Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS)	Federal database containing information on potential hazardous waste sites that states, municipalities, private companies, and private persons have reported to the EPA, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act. This database contains sites that are either currently on, or proposed for inclusion on, the National Priorities List (NPL) and sites that are in the screening and assessment phase for possible inclusion on the NPL.
Condition	A provision that the Surface Transportation Board imposes as part of any decision that requires action by an Applicant.
Consist	The number and type of locomotives and cars included in a train, considering special factors such as the tonnage and the placement of hazardous materials cars and "high-wides" (oversize dimension cars).
Construction Camp	Housing facilities designed and intended to be used for a temporary period of time to house construction-related workers.
Construction staging area	A designated area where vehicles, supplies, and construction equipment are positioned for access and use to a construction site.

Council on Environmental Quality (CEQ)	The council within the Executive office of the President that coordinates Federal environmental efforts and works closely with agencies and other White House offices in the development of environmental policies and initiatives. The CEQ developed regulations and guidance for implementing the National Environmental Policy Act.
Criteria of significance	The criteria which the Section of Environmental Analysis has developed to determine whether a potential adverse environmental effect is significant and may warrant mitigation.
Criteria pollutant	Any of six emissions (lead, carbon dioxide, sulfur dioxide, nitrogen dioxide, ozone, and particulate matter) regulated under the Clean Air Act, and for which areas must meet national air quality standards.
Critical habitat	The specific site within the geographical area occupied by threatened or endangered species that includes the physical or biological features essential to the conservation of the species. These areas may require special management considerations or protection. These areas may include specific sites outside the geographical areas occupied by the species at the time of the listing that are essential for the conservation of the species.
Cultural resource	Any prehistoric or historic district, site, building, structure, or object that warrants consideration for inclusion in the National Register of Historic Places. A cultural resource that is listed in or is eligible for listing in the National Register of Historic Places is considered a historic property (or a significant cultural resource). The term generally applies to resources more than 50 years old.
Cumulative effects	Impact on the environment which results from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of which agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts result from individually minor but collectively significant actions taking place over a period of time.
Culvert	A sewer or drain conduit crossing under a road or embankment.
Cryoturbation	Cryoturbation is the mixing of soil by freezing and thawing, resulting in broken soil horizons.
Cenozoic	The most recent of the three classic geological eras; covers the 65.5 million years since the Cretaceous–Tertiary extinction event at the end of the Cretaceous period. The Cenozoic era is ongoing.
Day-night average noise level (DNL)	The energy average of A-weighted decibels (dBA) sound level over a 24-hour period; includes a 10 decibel adjustment factor for noise between 10 p.m. and 7 a.m. to account for the greater sensitivity of most people to noise during the night. The effect of nighttime adjustment is that one nighttime event, such as a train passing by between 10 p.m. and 7 a.m., is equivalent to 10 similar events during the daytime.

dBA (A-weighted decibels)	Adjusted decibel level. A measure of noise level used to compare noise from various sources. A-weighting approximates the frequency response of the human ear.
Decibel (dB)	A standard unit for measuring sound pressure levels based on a reference sound pressure of 0.0002 dyne per square centimeter. This is nominally the lowest sound pressure that people can hear.
Diorite	An extremely hard igneous rock produced by the melting of parent rock in a subduction zone.
Dispatcher (train)	The railroad employee responsible for issuing on-track movement and/or occupancy authority through the use of remotely controlled switches, signals, visual displays, voice control, written mandatory directives, and/or all of the above.
Emissions	Air pollutants that enter the atmosphere.
Emergent vegetation	An aquatic plant with growth that emerges above the water.
Endangered species	A species of plant or animal that is in danger of extinction throughout all or a significant portion of its range and is protected by state and/or Federal laws.
Environmental Impact Statement (EIS)	A document that Federal agencies must prepare for major projects or legislative proposals that describes the positive and negative environmental effects of the undertaking and alternative actions and measures to reduce or eliminate potentially significant environmental impacts. The EIS is generally a tool for decisionmaking.
Environmental justice	For purposes of this document, SEA defines environmental justice as the mission discussed in Executive Order (EO) 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (59 FR 7629, February 11, 1994). This EO directs Federal agencies to identify and address "disproportionately high and adverse human health or environmental effects" of their programs, policies, and activities in minority and low-income populations in the United States. EO 12898 also calls for public notification for environmental justice populations, as well as meaningful public outreach activities of environmental justice populations.
Environmental justice population	A population within an Area of Potential Effect whose minority and low-income composition meets at least one of the following Criteria: 1) the percentage of minority and low-income population in the Area of Potential Effect is greater than 50 percent of the total population in the Area of Potential Effect, or 2) the percentage of minority and low-income population in the Area of Potential Effect is at least ten percentage points greater than the percentage of minority or low-income population in the County or Borough of which the Area of Potential Effect is a part.
Environmental resource category	Any of the environmental issues that serve as the major topics of impact analysis for this EIS. Examples include land use, biological resources, noise, hazardous materials, cultural resources, water quality, or air quality.

Equipment	For a railroad, a term used to refer to the mobile assets of the railroad, such as locomotives, freight cars, and on-track maintenance machines. This term is also used more narrowly as a collective term for freight cars operated by this railroad.
Essential Fish Habitat (EFH)	Essential Fish Habitat refers to those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (Magnuson-Stevens Act, 16 U.S.C. 1801 *et seq*). Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and spawning, breeding, feeding, or growth to maturity covers a species' full life cycle.
Estuary	A semi-enclosed body of sea water where salinity is measurably diluted by freshwater.
Executive Order (EO) 11990	The Executive Order for the protection of wetlands. Issued in 1977, it directs Federal agencies to avoid the adverse impacts associated with the destruction or modification of wetlands.
Executive Order (EO) 11988	The Executive Order on Floodplain Management. It requires Federal agencies to take actions to reduce the risk of flood damage and directs agencies to evaluate the potential effects of actions they may take or allow in floodplains and to consider alternatives to avoid adverse effects.
Executive Order (EO) 12898	The Executive Order on Environmental Justice. Issued in 1994, it directs Federal agencies to identify and address as appropriate "disproportionately high and adverse human health or environmental effects" including interrelated social and economic effects of their programs, policies, and activities on minority populations and low-income populations in the United States.
Fault System	A system of faults that interact with each other in an area.
Fill	1) The term used by the U.S. Army Corps of Engineers (USACE) that refers to the placement of materials (e.g., soils, aggregates, concrete structures, etc.) within water resources under USACE jurisdiction. 2) General term for materials (e.g., soils, aggregates, etc.) deposited in an area for construction purposes, such as to modify a grade.
Flood Insurance Rate Maps	Maps available from the Federal Emergency Management Agency (FEMA) that delineate the flood insurance rates of an area. The maps are based on the potential for 100-year and 500-year flooding in the area.
Floodplain	The lowlands adjoining inland and coastal waters and relatively flat areas and flood-prone offshore islands, including, at a minimum, those areas that have a one percent or greater chance of flood in any given year (also known as a 100-year or a Zone A floodplain).

Floodway	The portion of the available flow cross section that cannot be obstructed without causing an increase in the water-surface elevations resulting from a flood with a 100-year average return period of more than a given amount.
Geographic Information System (GIS)	A computer system designed to store, retrieve, manipulate, analyze, and display geographic data. GIS combines mapping and databases.
Glacial Moraine	Material, ranging from silt to boulders, deposited by the movement and melting of glaciers.
Gneissic Rock	Coarse-grained, banded metaplutonic igneous rock composed of mineral grains large enough to be seen with the naked eye.
Grade crossing	See *at-grade crossing*.
Grade separation	See *separated grade crossing*.
Gross ton-mile	A measure of railroad production that represents the weight of cars and freight movement in terms of total tons per mile transported system-wide or over a specific rail line segment. Specifically, one ton of railcar and loading carried one mile.
Habitat	The place(s) where plants or animal species generally occur(s) including specific vegetation types, geologic features, and hydrologic features. The continued survival of the species depends upon the intrinsic resources of the habitat.
Hazardous materials	Substances or materials that the Secretary of Transportation has determined are capable of posing an unreasonable risk to human health, safety, and property when transported in commerce, as designated under 49 CFR Parts 172 and 173.
Hazardous wastes	Waste materials that, by their nature, are inherently dangerous to handle or dispose of (e.g., old explosives, radioactive materials, some chemicals, some biological wastes), as designated under 40 CFR 261. Usually, industrial operations produce these waste materials.
Hertz (Hz)	A unit of frequency equal to one cycle per second.
Highway/rail at-grade road crossing	See *at-grade crossing*.
Historic Property	Any prehistoric or historic district, site, building, structure, or object that warrants consideration for inclusion in the National Register of Historic Places (NRHP). The term "eligible for inclusion in the NRHP" pertains to both properties that the Secretary of Interior has formally determined to be eligible and to all other properties that meet NRHP listing criteria.
Horn noise (train)	Noise that occurs when locomotives sound warning horns in the vicinity of highway/rail at-grade crossings.

Ice jam	The build-up of ice chunks resulting from rapid breakup of frozen waterbodies. Occurs when the combination of warm temperatures and heavy rain cause snow to melt rapidly which then can cause frozen waterbodies to swell and experience multiple ice breaks. Ice jams can cause flooding in areas by blocking the flow of water.
Igneous Rock	Basic rock type that has solidified and crystallized from molten rock.
Impaired Waterbody	Any waterbody that is too polluted to maintain its beneficial uses as defined by state and tribal water quality standards.
Indian tribe	According to the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450-458; P.L. 93-638), any Indian tribe, band, nation, or other organized group or community recognized as eligible for special programs and services that the United States provides to Indians because of their status as Indians.
Instrumental Landing System (ILS)	A ground-based radio system designed to provide horizontal and vertical guidance for aircraft landing at an airport.
Intermodal facility	A facility for the transfer of trailers and containers between rail and highway, or between rail and marine modes of transportation. Usually a site consisting of tracks, lifting equipment, and paved (and/or unpaved) areas that are used in the receiving, loading, unloading, and dispatching of goods between transportation modes.
Jurisdictional wetland	Wetlands that the U.S. Army Corps of Engineers regulates under Section 404 of the Clean Water Act (33 U.S.C. 1344).
Ldn	The day-night average noise sound level, which is the receptor's cumulative noise exposure from all noise events over a full 24 hours. This is adjusted to account for the perception that noise at night is more bothersome than the same noise during the day.
Leq	The level equivalent, which is the energy-averaged sound pressure level over a specified time interval.
Level of Service (LOS)	A degree of peak congestion experienced by roadway vehicle traffic that considers factors such as vehicle delay, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. Traffic analysts express LOS as letter grades, ranging from LOS A (free flowing) to LOS F (severely congested); they measure LOS by the average for all vehicles. Specifically, LOS A describes operations with very low delay (less than 5.0 seconds per vehicle); LOS B describes operations with delay in the range of 5.01-15.0 seconds per vehicle; LOS C describes operations with delay in the range of 15.1 to 25.0 seconds per vehicle; LOS D describes operations with delay in the range of 25.1 to 40.0 seconds per vehicle; LOS E describes operations with delay in the range of 40.1 and 60.0 seconds per vehicle; and LOS F describes operations with delay in excess of 60.0 seconds per vehicle.
Lineament	Geologic mapping that is important for site selection of construction sites and for seismic assessments.

Localizer Antenna (LOC)	As part of the ILS, the LOC provides horizontal guidance.
Locomotive, road	A locomotive (or engine) designed to move trains between yards or other designated points.
Locomotive, switching	A locomotive (or engine) used to switch cars in a yard, between industries, or in other areas where cars are sorted, spotted (placed at a shipper's facility), pulled (removed from a shipper's facility), and moved within a local area.
Low-income population	A population composed of persons whose median household income is below the Department of Health and Human Services poverty guidelines.
Mainline	Railroad line used by through trains traveling between terminals.
Manual Block Signal System (MBS)	A series of consecutive blocks, governed by block signals operated manually upon information by telegraph, telephone, or other means of communication.
Metamorphosed	A change in composition, form, or shape.
Metaplutonic	Rocks that have been subjected to high pressure and have changed form (for example, gneiss).
Metasedimentary	Sedimentary rock that has been subjected to forces that have altered its form.
Metavolcanic	Volcanic rock that has been subjected to forces that have altered its form.
Minority population	A population composed of persons who are Black (non-Hispanic), Hispanic, Asian American, American Indian, or Alaska Native.
Mitigation	An action taken to prevent, reduce, or eliminate adverse environmental effects.
Moraines	A deposit of earthen material left on the ground by receding glaciers. These are often composed of boulders, stones, gravel, sand, and other debris deposited on the landscape in the form of ridges, mounds, and irregular masses.
Motive power	Locomotives operated by the railroad.
National Ambient Air Quality Standards (NAAQS)	Air pollutant concentration limits established by EPA for the protection of human health, structures, and the natural environment.
National Environmental Policy Act (NEPA)	The National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321-4347; P.L. 91-190) is the basic national charter for the protection of the environment. It establishes policy, sets goals, and provides means for carrying out the policy. Its purpose was to establish the Council on Environmental Quality and to instruct Federal agencies on complying with Federal environmental regulations.

National Flood Insurance Plan (NFIP)	The NFIP is a Federal program administered by FEMA that enables property owners to purchase insurance as protection against flood losses in exchange for state and community floodplain management regulations that reduce future flood damages.
National Historic Preservation Act (NHPA)	The National Historic Preservation Act of 1966, as amended (16 U.S.C. 470-470 *et seq*.; P.L. 89-665), is the basic legislation of the Nation's historic preservation program and that established the Advisory Council on Historic Preservation. Section 106 of the NHPA requires every Federal agency to 'take into account' the effects of its undertakings on historic properties.
National Priorities List (NPL)	A subset of CERCLIS; EPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action under the Superfund Program.
National Register of Historic Places (NRHP)	Administered by the National Park Service, the NRHP is the Nation's master inventory of known historic properties, including buildings, structures, sites, objects, and districts that possess historic, architectural, engineering, archaeological, or cultural significance at the Federal, state, or local levels.
National Wetlands Inventory (NWI)	An inventory of wetland types in the U.S. compiled by the U.S. Fish and Wildlife Service.
Native American	According to the Native American Graves Protection and Repatriation Act of 1990, as amended (25 U.S.C. 3001 *et seq*.; P.L. 101-601), of or relating to a tribe, people or culture that is indigenous to the U.S.
Native American lands	According to the regulation of the Advisory Council on Historic Preservation in 36 CFR 800.2 all lands under the jurisdiction or control of an Indian tribe, including all lands within the boundaries of any American Indian reservation.
No-Action Alternative	The choice not to undertake a project. In contrast to the proposed action alternatives, the No-Action is the alternative option of not going forward with the project.
Noise	Any undesired sound or unwanted sound.
Noise contour	Line plotted on a map or drawing connecting points of equal sound levels.
Noise-sensitive receptor	Location where noise can interrupt ongoing activities and can result in community annoyance, especially in residential areas. The Surface Transportation Board's environmental regulations include schools, libraries, hospitals, residences, retirement communities, and nursing homes as examples of noise-sensitive areas.
Non-attainment area	An area that EPA has classified as not complying with the National Ambient Air Quality Standards promulgated under the Clean Air Act.
Operating practices	Safety and operating rules, practices, and procedures contained in operating rule book, timetable, special instructions or any other company-issued instructions. Includes the management decisions implementing those rules and instructions that govern the movement of trains and work on or around active tracks.

Operating rules	Written rules of a railroad governing the operation of trains and the conduct of employees responsible for train operations when working on or around active tracks.
Outwash Fan	Fan-shaped glacial stream deposits from meltwater-fed streams that occur beyond a glacier's morainal deposits.
Overburden	Material that lies above an excavation area of interest.
Paleozoic	Era of time spanning from roughly 542 million years ago to roughly 251 million years ago.
Palustrine wetland	Non-tidal wetland dominated by trees, shrubs, or persistent emergent vegetation. Includes wetlands traditionally classified as marshes, swamps, or bogs.
Particulate matter (PM)	Airborne dust or aerosols.
Passby	The passing of a train past a specific reference point.
Peak Particle Velocity (PPV)	The measure of ground movements. Technically the maximum instantaneous positive or negative peak of the vibration signal, measured as a distance per unit of time (such as millimeters or inches per second). PPV is typically used to evaluate shock-wave type vibrations from actions like blasting, pile driving, and mining activities, and their relationship to building damage.
Point source	A distinct stationary source of air or water pollution such as a factory or sewer pipe.
Precursor	A term used in reference to air quality, meaning an initial ingredient contributing to a subsequent air quality pollutant.
Prime farmland	According to the Natural Resources Conservation Service, land having the best combination of physical and chemical characteristics for producing food, feed forage, fiber, and oilseed crops.
Quartzite	A hard, metamorphic rock that was originally sandstone and converted through heating and pressure.
Rail line segment	For the purposes of this Draft EIS, portions of rail lines that extend between two junction points.
Rail line switch	See *turnout*.
Rail route	Line of railroad track between two points on a rail system.
Rail yard	A location or facility with multiple tracks where rail operators switch and store railcars.
Rare species	Species that have small total populations that presently are not in danger or vulnerable, but are at risk for extinction.

Receptor	See *noise-sensitive receptor*.
Resource Conservation and Recovery Information System (RCRIS)	Federal database containing information on facilities that generate, transport, store, treat, and/or dispose of hazardous waste.
Resource Conservation and Recovery Act (RCRA)	The Resource Conservation and Recovery Act of 1976 (42 U.S.C. 6901 *et seq*.; P.L. 94-580) is a Federal act governing the generating, storing, transporting, treating, and disposing of hazardous waste.
Revetment	A structure installed on river banks that functions as a protective shoreline barrier by absorbing energy from incoming water.
Right-of-way	The strip of land for which an entity (e.g., a railroad) has a property right (e.g., by fee simple ownership or easement) to build, operate, and maintain a linear structure, such as a road, rail line, or pipeline.
Riparian	Generally describes vegetative communities located on the banks of natural waterbodies such as rivers, lakes, and tidewater areas.
Riprap	Hard rock used to protect sensitive areas, such as a shoreline, from erosion.
Riverine	All wetlands and deepwater habitats contained with in a channel, either naturally or artificially created.
Root-mean-square velocity (VdB)	A measure of ground vibration in decibels used to compare vibration from various sources.
Root-mean-square vibration velocity (VdB)	An average or smoothed vibration amplitude, commonly measured over 1-second intervals. It is expressed on a log scale in *decibels (VdB)* referenced to 0.000001 inch per second and is not to be confused with noise *decibels*.
Route miles	Length of rail line, regardless of the number of tracks.
Schist	Medium-grade metamorphic rock that flakes easily; derived from clays and muds that have been metamorphosed.
Schistose-Gneissic Unit	An area of hard igneous rock composed of a combination of schistose and gneissic rocks.
Schistose Rock	Hard quartzose semi-crystalline rock.
Schistose Units	A rock unit composed of schist.

Scoping	Scoping is a process designed to examine a proposed project early in the EIS environmental analysis/review process, and is intended to identify the range of issues raised by the proposed project and to outline feasible alternatives or mitigation measures to avoid potentially significant environmental effects. The scoping process inherently stresses early consultation with responsible agencies, trustee agencies, tribal governments, and any Federal agency whose approval or funding of the proposed project will be required for completion of the project. Scoping is considered an effective way to bring together and resolve the concerns of other agencies potentially affected by the project as well as other stakeholders such as businesses and the general public.
Scour	The destructive effect that flowing water has on a submerged object over time.
Section 106	Refers to Section 106 of the National Historic Preservation Act (NHPA) of 1996, as amended through 1992 (16 U.S.C. 470). Section 106 requires that Federal undertakings take into account the effects of the action on historic properties.
Seismic Source	Tool that generates controlled seismic energy that is used in both reflection and refraction seismic surveys.
Seismicity	The production of seismic waves, either intentionally to gather subsurface images for exploration purposes, or unintentionally (earthquakes and tremors).
Sensitive receptor	See *noise-sensitive receptor*.
Separated grade crossing	The site where a local street or highway crosses rail line tracks at a different level or elevation, either as an overpass or as an underpass.
Siding	A track parallel to a main track that is connected to the main track at each end. A siding is used for the passing and/or storage of trains.
Sinistral-slip Faults	A geologic fault with a left handed movement of one tectonic plate past another tectonic plate.
Slough	A term to describe a marshy or reedy pool, pond, inlet, backwater, or similar waters.
Sloughing	Deposition of material from the banks of a river or stream into the body of water.
Sole source aquifer	USEPA defines a sole or principal source aquifer as one which supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. These areas have no alternative drinking water source(s) which could physically, legally, and economically supply all those who depend upon the aquifer for drinking water.
Sound	A physical disturbance in a medium (e.g., air) that is capable of being detected by the human ear.

Sound Exposure Level (SEL)	The means of measuring a transient noise event such as a passing train. It is equivalent to the maximum A-weighted sound level that would occur if all of the noise energy associated with the event were restricted to a time period of one second. The SEL accounts for both the magnitude and the duration of the noise event; noise analysts use SEL to calculate the day-night average noise level.
Spill Prevention Control and Countermeasure (SPCC) Plan	Plan that describes the protective measures to be used to minimize possible contamination from oil spills or other chemical discharges that could result from construction equipment and facilities, and for how accidental spills would be treated and contained.
Subduction	The act of two plates of crust colliding, where the more dense crust dives beneath the less dense continental plate.
Switch	The portion of the track structure used to direct cars and locomotives from one track to another.
Switching	The activity of moving cars from one track to another in a yard or where tracks go into a railroad customer's facility.
Tanana Chiefs Conference	Tribal consortium of 42 villages of Interior Alaska that advances tribal governments, economic and social development, promotes physical and mental wellness, educational opportunities, and protects language, traditional and cultural values.
Take or taking	Refers to the removal of property, an acquisition of right-of-way, or a loss and/or degradation of species' habitat.
Tank car	A type of freight car that shippers use to ship liquids and liquefied gasses in bulk.
Thermokarst lakes	A body of freshwater that is formed in a depression by meltwater from thawing permafrost.
Threatened species	A species that is likely to become an endangered species within the foreseeable future throughout all or part of its range, and is protected by state and/or Federal law.
Threshold for environmental analysis	A level of proposed change in rail line activities that determines the need for SEA's environmental review. SEA first applies the Board's thresholds for environmental analysis at 49 CFR Part 1105. The Board thresholds apply specifically to air quality and noise. For other issue areas, SEA developed appropriate thresholds to guide its environmental review.
Ton mile	The movement of one ton of cargo or equipment over a distance of one mile.
Toxic	Toxic refers to effects of, relating to, or caused by a poisonous substance.
Toxic Substances Control Act (TSCA)	Act that gives the EPA the ability to track the 75,000 industrial chemicals currently produced or imported into the United States. EPA repeatedly screens these chemicals and can require reporting or testing of those that may pose an environmental or human-health hazard. EPA can ban the manufacture and import of those chemicals that pose an unreasonable risk.

Track class	Designation between one and nine by the Federal Railroad Administration to characterize the quality and condition of track. The track geometry and type of track structure govern the allowable speed over the track and the level of upkeep to maintain the track. For Class II track, the maximum allowable operating speed for freight trains is 25 mph and 30 mph for passenger trains.
Turnout	The portion of rail line structure where a single track divides into two tracks.
Unclassified Fill	Fill material that has not been categorized by size and type.
Unit train	A train consisting of cars carrying a single commodity, e.g., a coal train.
U-shaped Valley	Valley gouged by a glacier, resulting in the valley floor resembling a U-shape.
Wapiti	The Cree Indian term for elk.
Water resources	An all-inclusive term that refers to many types of permanent and seasonally wet/dry surface water or groundwater features including springs, creeks, streams, rivers, ponds, lakes, wetlands, canals, harbors, bays, sloughs, mudflats, sewage-treatment and industrial ponds, aquifers, and others.
Wayside	Adjacent to the rail line, as in "wayside signals" or "wayside defect detectors."
Wayside train noise	Train noise adjacent to the right-of-way that comes from sources other than the horn, such as engine noise, exhaust noise, and noise from steel train wheels rolling on steel rails.
Wetlands	According to 40 CFR Part 230.41, those "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions," generally including swamps, marshes, bogs, and similar areas.

1. PURPOSE AND NEED FOR ACTION

1.1 Introduction

On July 6, 2007, Alaska Railroad Corporation (ARRC or the Applicant) filed a petition with the Surface Transportation Board (STB or the Board)[1] pursuant to 49 United States Code (U.S.C.) 10502 for the authority to construct and operate approximately 80 miles of new rail line from North Pole, Alaska, to Delta Junction, Alaska (see Figure 1-1 for a map of the region). Referred to as the Northern Rail Extension (NRE), the proposed rail line would extend the Applicant's existing freight and passenger rail service to the region south of North Pole.

The rail extension would begin at the east end of the Chena River Overflow Bridge—north of Eielson Air Force Base (AFB)—and end at the southern side of Delta Junction. In addition to constructing the rail line, rail line operations would require construction of new structures, such as bridges, a passenger facility, communications towers, access roads for rail line construction and operations, and sidings.

The Board, pursuant to 49 U.S.C. 10901, is the agency responsible for granting authority for the construction and operation of new rail lines and associated facilities. Accordingly, the Board, through its Section of Environmental Analysis (SEA), is the lead agency responsible under the National Environmental Policy Act (NEPA) for preparing this Environmental Impact Statement (EIS) to identify and evaluate the potential environmental impacts associated with the proposed action and alternatives.

The proposed action is the construction and operation of a rail extension from North Pole, Alaska, to Delta Junction, Alaska. The proposed action includes ARRC's preferred route for the proposed rail extension. The preferred route consists of several segments. For all but two of the segments, alternative route options are analyzed in detail in this EIS. For any of the alternatives, rail line operations would be the same; however, some construction features would be different.

In addition to ADNR, seven Federal agencies are cooperating agencies pursuant to Council on Environmental Quality (CEQ) regulations at 40 Code of Federal Regulations (CFR) 1501.6. CEQ regulations emphasize agency cooperation early in the NEPA process and allow a lead agency (in this case, the Board) to request the assistance of other agencies with either jurisdiction by law or special expertise in matters relevant to preparing an EIS assessment. Table 1-1 lists each cooperating agency and describes its roles and responsibilities.

SEA and the cooperating agencies (collectively the Agencies) prepared this EIS[2] in accordance with NEPA, CEQ regulations, and the Board's environmental regulations (49 CFR 1105) to provide the Board, the cooperating agencies, other Federal, State of Alaska, and local agencies, Alaska Natives, and the public with clear and concise information on the potential environmental

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[1] The STB is a bipartisan, decisionally independent adjudicatory body, organizationally housed within the U.S. Department of Transportation (USDOT). The Board was established by the ICC [Interstate Commerce Commission] Termination Act of 1995 (49 U.S.C. 10101 *et seq.*; P.L. 104-88, December 29, 1995) to assume some (but not all) functions of the ICC, particularly those related to the regulation of freight rail lines. The STB has jurisdiction over rail line rate and service issues, and rail structuring transactions, such as new line construction, line sales, line abandonments, and rail line mergers.

[2] While much of the EIS generally refers only to SEA, the document reflects input from all eight cooperating agencies.

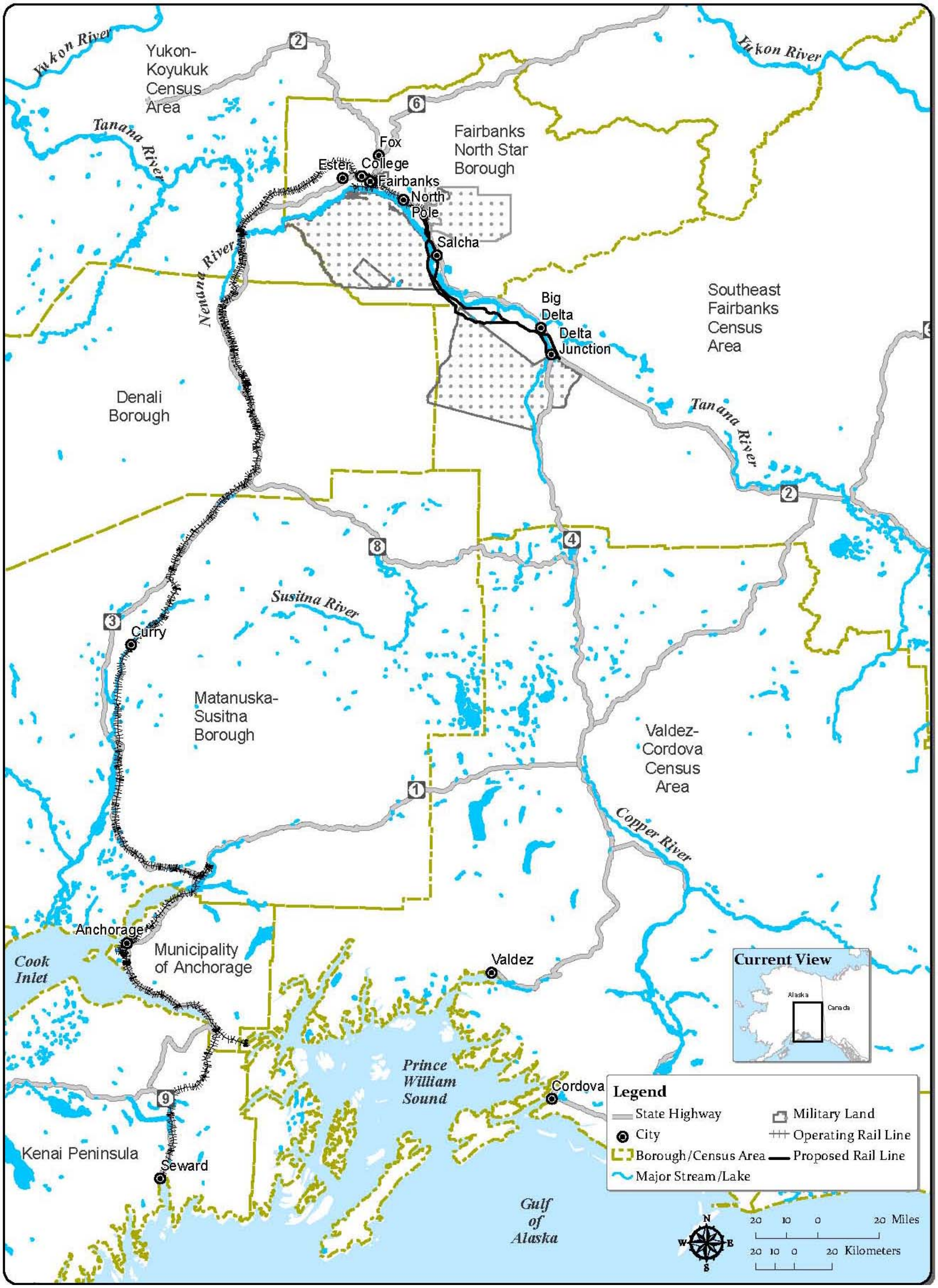

Figure 1-1 - Map of the Northern Rail Extension Region

Table 1-1
Cooperating Agency Involvement in the Northern Rail Extension

U.S. Department of Defense Alaskan Command (ALCOM)	May grant the proposed rail line access across the Tanana Flats and Donnelly training areas on the west side of the Tanana River. May use the rail line or associated infrastructure to access these training areas.
Bureau of Land Management (BLM)	May approve or deny a right-of-way grant for the proposed rail line across BLM-managed lands, which include the Tanana Flats and Donnelly training areas.
Federal Transit Administration (FTA)	May provide funding for the purchase of equipment for the passenger component of the rail extension.
Federal Railroad Administration (FRA)	Administered funding for the EIS and preliminary engineering to construct the rail line.
U.S. Air Force 354th Fighter Wing Command from Eielson AFB	May decide to grant a right-of-way crossing through a portion of Eielson AFB.
U.S. Army Corps of Engineers (USACE)	May issue or deny a Section 404 Clean Water Act permit and/or a Section 10 Rivers and Harbors Act permit.
U.S. Coast Guard (USCG)	May issue bridge permits.
Alaska Department of Natural Resources (ADNR)	May convey land to ARRC for the purpose of the rail line.

impacts of the proposed action and alternatives, including the No-Action Alternative. Under the No-Action Alternative, ARRC would not construct an extension of the existing rail line or construct the dual-modal bridge over the Tanana River to transport commercial freight, military cargo and personnel, or passengers.

This EIS was also prepared in accordance with BLM H-1790-1—The National Environmental Policy Act Handbook, and the Department of the Interior's manual guidance on NEPA (516 Department Manual [DM] 1-7); FRA's NEPA guidance at 64 CFR 28545; FTA's NEPA-implementing regulations at 49 CFR 622, Air Force Instruction 32-7061—Environmental Impact Analysis Process; USACE NEPA-implementing regulations at 33 CFR 230; USCG COMDTINST M16475.1D—NEPA-Implementing Procedures and Policy for Considering Environmental Impacts; and the Army's NEPA implementing regulations at 32 CFR 651.

SEA is issuing the EIS for public review and comment. SEA will consider all comments received on the Draft EIS and respond to all substantive comments in a Final EIS. The Final EIS will include final recommended environmental mitigation conditions, as applicable. The Board will consider the entire environmental record, the Draft and Final EISs, all public and agency comments, and SEA's environmental recommendations in making its final decision on the application to construct and operate the proposed NRE.

The Board will decide whether to approve, approve with conditions (which would include conditions designed to mitigate impacts on the environment), or deny the Applicant's request for a license to construct and operate a new rail line to Delta Junction.[3] The cooperating agencies that will be issuing individual decisions concerning the proposed action intend to use information in the EIS for decisionmaking purposes.

[3] As established by the ICC Termination Act of 1995, the Board shall authorize construction and operation "unless the Board finds that such activities are inconsistent with the public convenience and necessity" (49 U.S.C. 10901; P.L. 104-88, December 29, 1995).

1.2 Purpose and Need

The Applicant has stated that the purpose of the project is to provide freight and passenger rail service to the region south of North Pole, Alaska. The Applicant has stated that the proposed NRE would provide an alternative to the Richardson Highway for commercial freight service for businesses, military, and communities in or near the rail line, including existing industries in the agricultural, mining, and petrochemical sectors in the Delta Junction region. At present, both the agricultural community and the mineral industries in this area receive their desired import materials indirectly. Such materials are first shipped by rail to or near Fairbanks, offloaded, and then transported by truck over Richardson Highway for approximately 90 miles to Delta Junction.

The Applicant has also stated that the proposed NRE would provide a transportation alternative to Richardson Highway for individuals traveling between Fairbanks and Delta Junction. At present, there are no public transportation opportunities between these two areas. According to ARRC, passenger service could also support area tourism and provide an opportunity for tourists to travel by rail beyond the existing Fairbanks terminal to a proposed passenger facility at Delta Junction.

The proposed NRE would also provide year-round access to the Tanana Flats and Donnelly training areas on the southwestern side of the Tanana River and west side of the Delta River. At present, U.S. Army and U.S. Air Force ground access to this area is limited to winter months by way of ice bridges. The construction of a combined road-rail bridge over the Tanana River for the rail line would provide U.S. Army and U.S. Air Force dependable year-round ground access to these training areas.

1.3 Agency Responsibilities

The EIS considers actions by the Board, BLM, FTA, FRA, ALCOM, USCG, USACE, the 354th Fighter Wing, and ADNR. These agencies may be issuing decisions concerning the proposed action and alternatives and could use this Draft EIS for the disclosure and analysis of potential environmental impacts related to those decisions, as required by NEPA. Additional Federal agencies have review of and oversight responsibilities for the EIS and other components of the environmental review process. These agencies and their responsibilities are briefly discussed below.

1.3.1 Lead Agency

Surface Transportation Board

The Board, pursuant to 49 U.S.C. 10901, is the agency responsible for granting authority for the construction of new rail line facilities and their subsequent operation and maintenance. Accordingly, the Board, through SEA, is the lead agency responsible for preparation of the EIS.

1.3.2 Cooperating Agencies

Bureau of Land Management

BLM administers Federal land in the project area and has authority under the Federal Land Policy and Management Act (43 U.S.C. 1701 *et seq.*) to issue a linear right-of-way grant for the proposed NRE to pass through those federally managed lands. The Applicant would need to apply to BLM for a right-of-way grant to authorize the land needed to construct the rail line and ancillary facilities. For Federal lands managed by BLM but withdrawn for military use, BLM would consult with ALCOM as part of process of considering whether to issue a right-of-way grant. Rights-of-way may also be required to build any access roads, construction camps, and borrow areas that are located on BLM-administered land. BLM intends to use this EIS to fulfill its NEPA requirements in its consideration of any right-of-way application under 43 CFR Part 2800.

Federal Railroad Administration

FRA administers rail line assistance programs and consolidates government support of rail transportation activities. FRA is administering grant funding to ARRC for preliminary engineering and environmental analysis for the proposed NRE. FRA develops and enforces rail line safety regulations and would enforce these regulations on ARRC's proposed rail line.

Federal Transit Administration

FTA provides financial assistance to develop new public passenger or transit systems and improve, maintain, and operate existing services. ARRC intends to apply for FTA grant funds to purchase equipment for the passenger component of the proposed rail line. FTA ensures that public transit systems follow Federal mandates, statutory procedures, and administrative and safety requirements. FTA intends to use this EIS to fulfill its NEPA requirements associated with a potential decision to fund equipment purchases and maintenance of the rail line for passenger rail service.

U.S. Air Force, 354th Fighter Wing Command, Eielson Air Force Base

The proposed rail line would pass through Eielson AFB. The 354th Fighter Wing is a cooperating agency in the preparation of this EIS to represent the interests of the U.S. Air Force and to provide its expertise on issues concerning the potential use of its property. If the Board were to grant authority for the Applicant to construct one of the Eielson alternative segments, the Applicant would need permission from Eielson AFB (see Section 2.2.2, Alternatives Eliminated by SEA from Detailed Study, for more detail). The 354th Fighter Wing intends to use this EIS to fulfill its NEPA requirements associated with any decision to grant permission for the Applicant to construct one of the Eielson alternative segments.

U.S. Army Corps of Engineers

USACE, under Section 404 of the Clean Water Act of 1977 (91 Statute 1566; Public Law 95-576), has jurisdiction over activities that result in the discharge of dredge or fill material into waters of the United States, including lakes, rivers, streams, oxbows, ponds, and wetlands. Activities that affect these systems require a Section 404 permit from USACE. Construction of the proposed rail line extension would impact waters of the United States and; therefore, the Applicant would have to obtain a Section 404 permit prior to commencing project construction.

In addition, USACE is responsible for activities that may affect navigable waters of the United States, pursuant to Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 401 *et seq.*). Section 10 requires any entity proposing to perform work or place a structure in a navigable water to obtain a Section 10 permit from USACE prior to commencing the activity. Construction proposed rail line extension would involve crossing navigable waters of the United States; therefore, the Applicant would have to obtain a Section 10 permit prior to commencing project construction. USACE intends to use this EIS to fulfill its NEPA requirements associated with permit evaluation under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act.

U.S. Coast Guard

The USCG, under Section 9 of the Rivers and Harbors Act of 1899 (33 U.S.C. 401 *et seq.*), the General Bridge Act of 1946, as amended (60 Statute 847; 33 U.S.C. 525, *et seq.*), and the Department of Transportation Act of 1966 (80 Statutes 931–950; Public Law 89–670; 49 U.S.C. 1651–1659), has authority for approval of bridges over navigable waters of the United States. The USCG has a responsibility to assess the navigational and environmental impacts of the construction, maintenance, and operation of the proposed bridges associated with the NRE. This assessment will form a component of the USCG review of whether to issue bridge permits under Section 9 of the Rivers and Harbors Act. USCG intends to use this EIS to fulfill its NEPA requirements associated with any decision to grant bridge permits.

U.S. Department of Defense, Alaskan Command

ALCOM is a sub-unified command of the U.S. Pacific Command and is made up of military forces from the U.S. Air Force, U.S. Army, and U.S. Navy. Among other missions, ALCOM is charged with conducting joint training for the rapid deployment of combat forces. ALCOM is a cooperating agency in the preparation of this EIS because of its interest and expertise in the large military training areas that would be affected by the project, including the Tanana Flats and Donnelly Training Areas. Specifically, the proposed rail line would pass through one or both of the training areas. Therefore, ARRC’s proposed project has the potential to result in direct or indirect impacts on military training and other activities. Any alternative segment located on military training areas would also require ALCOM service component concurrence. ARRC has indicated that it would pursue the U.S. military as a customer of the proposed rail line, specifically for the potential movement of troops and equipment to and from the Tanana Flats and Donnelly training areas. In conjunction with the rail line, ARRC is also proposing to construct a dual-modal bridge over the Tanana River. This would provide the military road access in addition to rail access to the training areas. Road access over the dual-modal bridge would be coordinated by a Memorandum of Agreement between ARRC and ALCOM, with physical access facilitated by the Fort Wainwright Range Control office.

Alaska Department of Natural Resources

For lands under state ownership, ADNR would consult with ARRC and potentially affected parties to determine whether the location of the proposed rail line would minimize adverse effects on existing and potential rights-of-way and land uses associated with the location, construction, and operation of a gas pipeline in a manner that is in the best interest of the state, pursuant to Alaska Statute (AS) 42.40.460, Extension of the Alaska Railroad (2005). If it is determined that the location of the proposed rail line would be in the best interest of the state, ADNR would cooperate with ARRC to identify, to the extent practicable, potential crossings for economic development and public access along the land reserved for the rail line. ADNR intends to use this EIS to fulfill its statutory review requirements in its consideration of any rail line identified by ARRC on state-owned land.

Using information from the EIS and other sources, the Alaska Department of Fish and Game, Division of Habitat (ADF&G) could determine whether and under what conditions to issue Fish Habitat Permits for work within ordinary high water of fishbearing waterbodies.[4]

Other State Agencies

A number of other state agencies, including the Alaska Department of Transportation and Public Facilities and the Alaska Department of Environmental Conservation would also have permitting authorities that affect the proposed action and would likely use information from this Draft EIS during their reviews.

1.3.3 Other Federal Agencies

U.S. Environmental Protection Agency (USEPA)

USEPA has broad oversight and implementing responsibility for many Federal environmental laws, including the:

- Clean Air Act (CAA);
- Clean Water Act (CWA);
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA);
- Superfund Amendment and Reauthorization Act (SARA);
- Toxic Substances Control Act (TSCA); and
- Resource Conservation and Recovery Act (RCRA).

USEPA also provides guidance on compliance with certain Executive Orders (EOs), including EO 12898 on Environmental Justice, EO 11990 on the Protection of Wetlands, and EO 11988 on Floodplain Management. Under Section 309 of the CAA (42 U.S.C. 7609), USEPA reviews and comments on the environmental impacts of major Federal actions for which an EIS is prepared under NEPA. The USEPA's Office of Federal Activities, which is responsible for reviewing EISs, evaluates and comments on the quality of analysis in the EIS and the extent of the proposal's impact on the environment. USEPA also announces the availability of any Draft EIS for public comment in the *Federal Register*. SEA will consider USEPA's evaluations and comments on this Draft EIS in the Final EIS.

Advisory Council on Historic Preservation (ACHP)

The National Historic Preservation Act (NHPA), administered by the ACHP, requires Federal agencies to consider the effects of their actions on historic and cultural resources. Under the NHPA, the STB consults with the appropriate State Historic Preservation Officer and the ACHP. For the proposed action and alternatives, the STB has consulted with the State Historic Preservation Officer at the Alaska Office of History and Archaeology, a part of ADNR. The ACHP is an independent Federal agency created under the authority of NHPA. It is responsible for advocating consideration of historic values in agency decisionmaking, issuing regulations to implement Section 106 of the NHPA, and reviewing Federal programs and policies to further historic preservation. SEA is providing the Draft EIS to ACHP and the Alaska Office of History and Archaeology for review.

[4] Alaska Executive Order 114 transferred the duties, authorities, functions, and personnel of the ADNR Office of Habitat Management and Permitting to the Alaska Department of Fish and Game, Division of Habitat (ADF&G), effective July 1, 2008. This organization, now part of ADF&G Division of Habitat, will continue to participate with ADNR as a cooperating agency.

ACHP is also responsible for ensuring that projects are in compliance with other requirements concerning historic and cultural resources. These include the Archaeological Resource Protection Act, the Native American Graves Protection and Repatriation Act, American Indian Religious Freedom Act, and Executive Orders requiring consultation with Native American Tribes.

U.S. Fish and Wildlife Service (USFWS)

USFWS is the Federal agency with primary expertise in fish, wildlife, and natural resources issues. USFWS is responsible for implementation of the Endangered Species Act (ESA) and, through its field offices, for consulting with other Federal agencies on potential impacts on threatened and endangered species.

Under Section 7 of the ESA, USFWS is responsible for the review of Federal agency actions and potential impacts on threatened and endangered species. The USFWS may issue a determination, in the form of a biological opinion, that details projected impacts on threatened and endangered species in the area of a proposed agency action. The STB is responsible for initiation of Section 7 consultation with the USFWS. SEA will provide the Draft EIS to the USFWS for review. There are no threatened or endangered species in the project area. However, migrating birds, waterfowl, and raptors use the Tanana River Valley. These species are managed by the USFWS under the purview of the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

National Marine Fisheries Service (NMFS)

The Magnuson-Stevens Fishery Conservation and Management Act requires Federal agencies to consult with the NMFS on Federal actions that could adversely affect Essential Fish Habitat (EFH) (50 CFR 600.905-930). The Act requires coordination between the STB and the NMFS in achieving EFH protection, conservation, and enhancement. The NMFS has requested an assessment of the potential effect of the NRE on EFH in the area of the proposed action and alternatives. SEA has prepared a Finding and EFH Assessment (see Appendix G) relative to the proposed action and alternatives and determined that the chum salmon, coho salmon, and Chinook salmon fisheries are protected within the project area as EFH. SEA is providing the Draft EIS to NMFS for review.

1.4 Scoping and Public Involvement

1.4.1 Scoping Notice and Public Meetings

On November 1, 2005, SEA published the Notice of Intent to Prepare an EIS, Draft Scope of Study, Notice of Scoping Meetings, and Request for Comments in the *Federal Register* (70 *FR* 65976). SEA prepared and distributed a newsletter that introduced the NRE; announced SEA's intent to prepare an EIS; requested comments; and gave notice of three public scoping meetings to over 400 citizens, elected officials, Federal, State of Alaska, and local agencies, tribal organizations, and other potentially interested organizations. The distribution encompassed the communities surrounding the proposed action and alternatives and groups outside the project area that may have an interest in the project. SEA also posted meeting notices in public locations (*e.g.,* post offices, grocery stores, and restaurants) in the project area and initiated a toll-free project hotline. SEA placed notices of the scoping meetings in several newspapers, including the *Fairbanks Daily News Miner* and the *Anchorage Daily News*.

Public scoping meetings were held in North Pole, Delta Junction, and Anchorage on December 6, 7, and 8, 2005, respectively. SEA used a workshop format to allow attendees to provide comments to and ask questions of SEA. Approximately 80 people attended the scoping meetings including citizens, representatives of organizations, elected officials, and officials from Federal, state, and local agencies. Some attendees submitted comment sheets during the meetings and SEA received additional scoping comment forms and letters by mail. The scoping comment period closed on January 13, 2006.

SEA also held agency scoping meetings in Fairbanks and Anchorage on December 6 and 9, 2005, respectively. Federal and state agency representatives, including cooperating agency representatives participated in these meetings.

SEA considered the agency and public input to the scoping process and on April 3, 2008, issued the final scope of study for the EIS (73 *FR* 18323). SEA placed the final scope of study on the STB web site, and mailed it to approximately 700 individuals, agencies, and other interested parties on SEA's project mailing list.

As part of the environmental review process to date, SEA has conducted broad public outreach activities to inform the public about the proposed action and to facilitate public participation. SEA consulted with and will continue to consult with Federal, state, and local agencies, tribal organizations, affected communities, and all interested parties to gather and disseminate information about the proposal.

1.4.2 Tribal and Government-to-Government Consultation

SEA consulted with federally recognized tribes and other tribal organizations throughout the preparation of the EIS. Prior to the issuance of the Notice of Intent to Prepare an EIS, SEA informed tribal organizations of the proposed NRE and requested comments on the project. SEA also prepared a Government-to-Government Consultation and Coordination Plan, which listed the federally recognized tribes, tribal groups, and Alaska Native Regional Corporations included in SEA's consultation efforts (see Table 1-2). The plan describes the objectives and approach to the consultation process and provided an opportunity for the recipients to indicate how they wanted to participate further in the government-to-government coordination for the proposed NRE.

After mailing the government-to-government plan and following up with phone calls, SEA received nine questionnaires from federally recognized tribes, tribal groups, and Alaska Native Regional Corporations. Of these nine questionnaires, three organizations had no interest in the project and indicated that further consultation would not be required. Six organizations requested to continue to receive project information by mail and to participate in the public involvement process. The Tanana Chiefs Conference requested a meeting with the STB.

The SEA met with the Tanana Chiefs Conference in November 2006 and continues to brief the Tanana Chiefs Conference on the results of cultural and archeological fieldwork and findings.

1.5 EIS Organization and Format

This EIS is organized in a manner consistent with NEPA and CEQ regulations at 40 CFR 1502.10. It is intended to provide clear and concise information on the proposed action and alternatives to agency decisionmakers and the public. The EIS describes the proposed action and alternatives, existing environmental conditions, and potential environmental impacts associated with the proposed action and alternatives. Chapters and specific topics within each chapter are outlined in the Table of Contents to aid the reader in locating areas of interest. Tables and figures are listed numerically by the chapter and section in which they appear. Appendices are denoted with alphabetic characters and are ordered alphabetically at the end of the Draft EIS.

Table 1-2
Federally Recognized Tribes, Tribal Groups, and Alaska Native Regional Corporations Contacted for the NRE EIS Government-to-Government Consultation and Coordination Plan

Native Village of Cantwell
Cheesh-Na Tribe (formally the Native Village of Chistochina)
Circle Native Community
Dot Lake Village Council
Native Village of Eagle
Healy Lake Village (Tribal Council)
Manley Hot Springs Village
Mentasta Traditional Council Office
Native Village of Minto
Nenana Native Association (Nenana Native Council)
Northway Village (Tribal Council)
Rampart Village
Native Village of Stevens
Native Village of Tanacross (Tanacross Village Council)
Native Village of Tanana
Native Village of Tetlin (Tetline Village Council)
Alaska Federation of Natives
Council of Athabascan Tribal Governments
Tanana Chiefs Conference
Tok Native Association
Yukon River Inter-Tribal Watershed Council
Ahtna, Inc.
Doyon Limited

1.6 Request for Comments on the Draft EIS

The public and any interested parties are encouraged to submit written comments on all aspects of this Draft EIS. SEA will consider all such comments in preparing the Final EIS, which will include responses to all substantive comments, SEA's final conclusions on potential impacts, and SEA's final recommendations. All comments on the Draft EIS must be submitted within the published comment period, which will close 45 days after the Notice of Availability of the Draft EIS is published in the *Federal Register*. When submitting comments on the Draft EIS, the STB encourages commenters to be as specific as possible and substantiate concerns and recommendations.

Please mail written comments on the Draft EIS to the address below.

David Navecky
STB Finance Docket No. 34658
Surface Transportation Board
395 E Street, S.W.
Washington, DC 20423-0001

Due to delays in the delivery of mail currently being experienced by Federal agencies in Washington, DC, SEA encourages that comments be submitted by email. Comments submitted by email will be given the same weight as mailed comments; therefore, persons submitting comments by email do not have to also send comments by mail. Environmental comments may be filed electronically on the Board's web site at www.stb.dot.gov by clicking on the "E-FILING" link.

Please refer to STB Finance Docket No. 34658 in all correspondence addressed to the Board, including e-filings.

Further information about the project can be obtained by calling SEA's toll-free number at 1-800-359-5142 (telecommunications device [TDD] for the hearing impaired is 1-800-877-8339).

This Draft EIS is also available on the Board's web site at www.stb.dot.gov.

1.7 Public Meetings

In addition to receiving written comments on the Draft EIS, SEA will host public meetings. SEA will involve the cooperating agencies in the planning and conduct of the public meetings.[5] At each meeting, SEA will give a brief presentation and interested parties may then make oral comments. SEA will have a transcriber present at each meeting to record the oral comments. Written comments may also be submitted at the meetings. Meeting locations, dates, and times are as follows:

- Pike's Waterfront Lodge, 1850 Hoselton Road, Fairbanks, Alaska, 5 to 8 PM, Monday, January 12, 2009
- City Council Chambers, 125 Snowman Lane, North Pole, Alaska, 5 to 8 PM, Tuesday, January 13, 2009
- Salcha Senior Center, 6062 Johnson Road, Salcha, Alaska, 5 to 8 PM, Wednesday, January 14, 2009
- Jarvis West Building, Milepost 1420.5 Alaska Highway, Delta Junction, Alaska, 5 to 8 PM, Thursday, January 15, 2009

[5] ADNR will be present at STB's public meetings for the proposed NRE, to hear comments about the project, and in particular, how the proposed location of the project may affect public access to state lands along and adjacent to the proposed transportation corridor. ADNR will provide additional opportunities for potentially affected parties to comment on its process for meeting the obligations under AS 42.40.460. For additional information, please contact ADNR Division of Mining, Land and Water at 907-451-2740.

2. PROPOSED ACTION AND ALTERNATIVES

This chapter describes the Alaska Railroad Corporation (ARRC or the Applicant) proposed action and alternatives for the proposed Northern Rail Extension (NRE). The chapter also describes the No-Action Alternative. In addition, this chapter discusses the development of potential alignments and a reasonable range of alternatives for analysis from among the potential alignments considered. Appendix D provides additional details concerning the development and elimination of alternatives.

2.1 Background

ARRC is a Class II rail carrier owned by the State of Alaska that provides freight and passenger services. The Alaska Railroad network extends from Seward, Alaska, through Anchorage and Fairbanks, ending at Eielson Air Force Base (AFB) through the Eielson Branch rail line (see Figure 2-1). The existing Eielson Branch rail line service Eielson AFB and the North Pole Refinery. At present, commercial freight, other than fuels transported to and from Eielson AFB and the refinery, generally enters and leaves the project area by truck via Richardson Highway (Alaska Route 4 from Valdez to Delta Junction and Alaska Route 2 from Delta Junction to Fairbanks) or the Alaska Highway (Alaska Route 2 from Delta Junction to Tok and beyond).

The Applicant proposes to provide commercial freight service for communities and businesses, with an approximately 80-mile rail extension from North Pole and Eielson AFB to Delta Junction, Alaska. At present, there are no public transportation services between North Pole and Delta Junction. The proposed rail line would provide an alternative to Richardson Highway for area residents, visitors, and commercial and military freight.

U.S. Army Alaska (USARAK) maintains units at Fort Wainwright and Fort Richardson and significant numbers of combat enablers (Sustainment, Aviation, Maneuver Enhancement, Engineers and Military Police). Nearly all collective training requirements larger than company level conducted in Alaska occur in the Donnelly, Yukon, and Tanana Flats training areas (TAs). Military vehicles, including Strykers, travel Richardson Highway south (up to 100 miles) from Fort Wainwright or more than 300 miles north from Fort Richardson to the vicinity of the TAs.

Access to the Donnelly TA west of the Delta River and Tanana Flats TA is restricted by the Tanana River and Delta River. There are no permanent bridges across those rivers in the area of the proposed rail extension. In winter, the U.S. Army and U.S. Air Force construct ice bridges to transport vehicles, troops, and supplies to the TAs. The Army and Air Force also access the TAs by helicopter, plane, or boat during summer (USARAK, 2004).

USARAK has experienced more than 120-percent growth in assigned troop strength since 2003 and is projected to continue to expand through 2013. As USARAK grows the force in both numbers and capabilities, increases in collective training requirements are anticipated to result in additional TA usage. Gaining year-round ground access to the more than 1 million acres of training land in the Tanana Flats and Donnelly West TAs could contribute to providing safe and multi-spectrum training for forces training in Alaska.

The Tanana Flats and Donnelly West TAs are significant components of the ongoing growth in training infrastructure in the Pacific Alaska Range Complex. A combined vehicle and rail bridge providing access across the Tanana River could facilitate continuing range, trail, and TA infrastructure and maintenance improvements that would be needed for expanded training

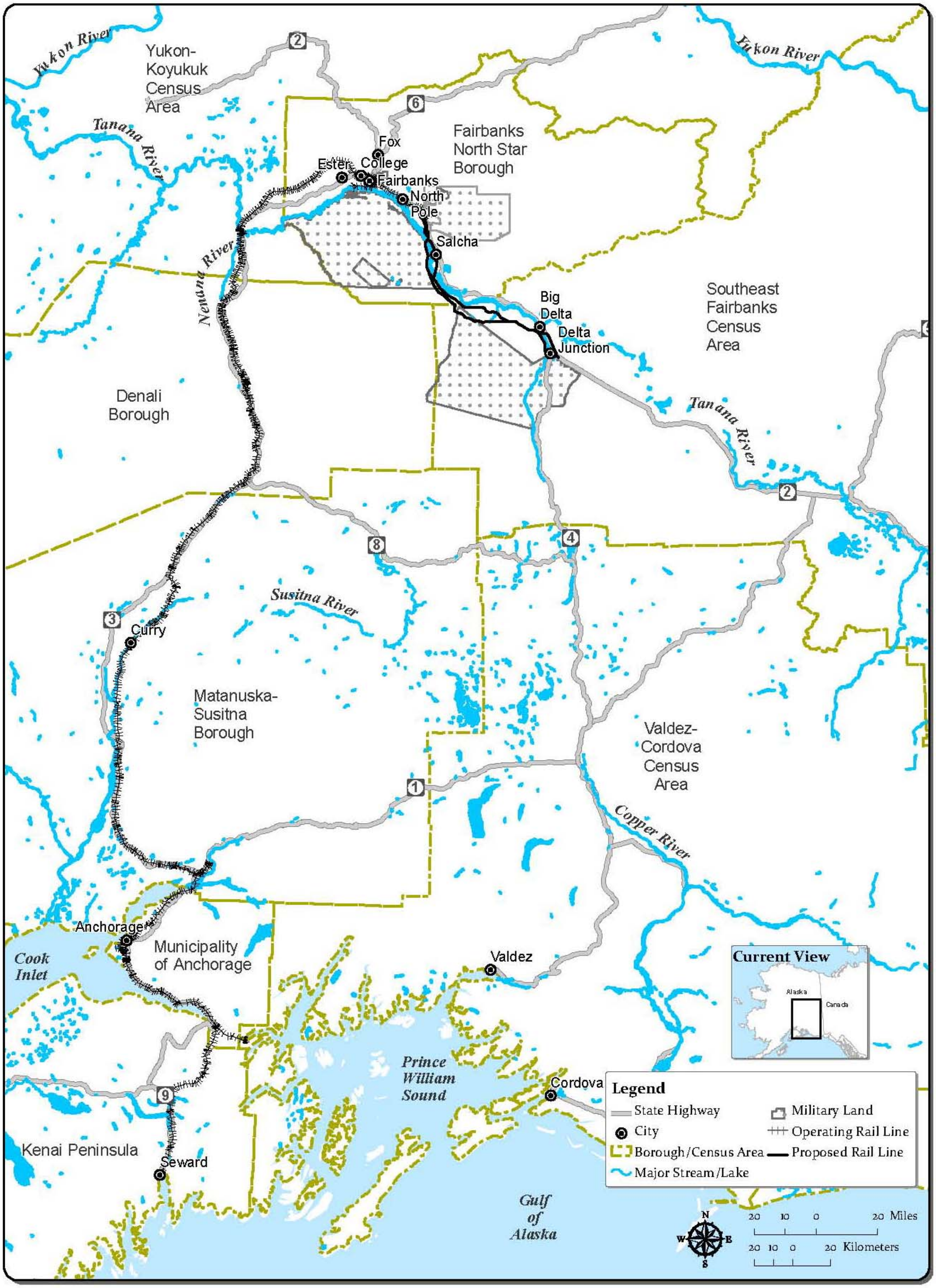

Figure 2-1 - Map of the ARRC Rail Network and Proposed Project Area

activities. The U.S. Department of Defense (DoD) Alaska Command (ALCOM) (Joint Headquarters) supports this requirement as a Joint Initiative. As changes in force structure necessitate planning for increased training in the Tanana Flats and Donnelly West TAs, ALCOM would need to complete an assessment of the potential environmental impacts of future expansion of DoD training and associated infrastructure requirements.

2.2 Alternatives Development and Elimination

In 2005, ARRC presented potential alignments (routes) for the proposed NRE. Since that time, those potential routes, together with additional alignments developed subsequently, were refined and evaluated during this environmental review process. This section provides information about the alternatives development process and the process used to consider these alternatives and eliminate some from further detailed study.

Section 2.3, Proposed Action and Alternatives, describes the alternatives that the Surface Transportation Board (STB or the Board) Section of Environmental Analysis (SEA) has identified for detailed analysis.

2.2.1 Alignment Development

In July 2007, ARRC filed a petition with the STB for the authority to construct and operate a new rail extension. As part of this application, ARRC defined its proposed action, which included a preferred alternative for the approximately 80-mile rail line. In arriving at its preferred alternative, ARRC identified and considered several other potential alignments, which are shown in Figure 2-2. ARRC's process for developing various alignments is described below, followed by an overview of SEA and cooperating agency input to ARRC's alignment development process.

Alignment Development Process

ARRC conducted its own public outreach to obtain opinions from communities, agencies, and Alaska Natives. ARRC developed a project Internet site, mailed project newsletters to stakeholders, and conducted a series of open houses. ARRC used feedback from stakeholders to refine alignments to reduce potential impacts. SEA reviewed all ARRC alignment changes and asked follow-up questions as needed.

According to ARRC's 2006 Alternatives Analysis Study (ARRC, 2006), the alignment development process started with a risk assessment and management process, which ARRC implemented as part of its early planning process for the NRE. The risk assessment and management process was launched with ARRC's Initial Risk Workshop in April 2005. At the workshop, risks to project success, such as resource needs for construction, environmental constraints, data availability and military impacts, were identified and characterized and mitigation measures were discussed. The alignment development process continued until ARRC filed its petition to construct and operate the proposed rail line extension with the Board in July 2007.

Existing topographic and other data were used in the early phases of alignment generation and analysis. ARRC's alignment generation and refinement process occurred in three general phases, as described below.

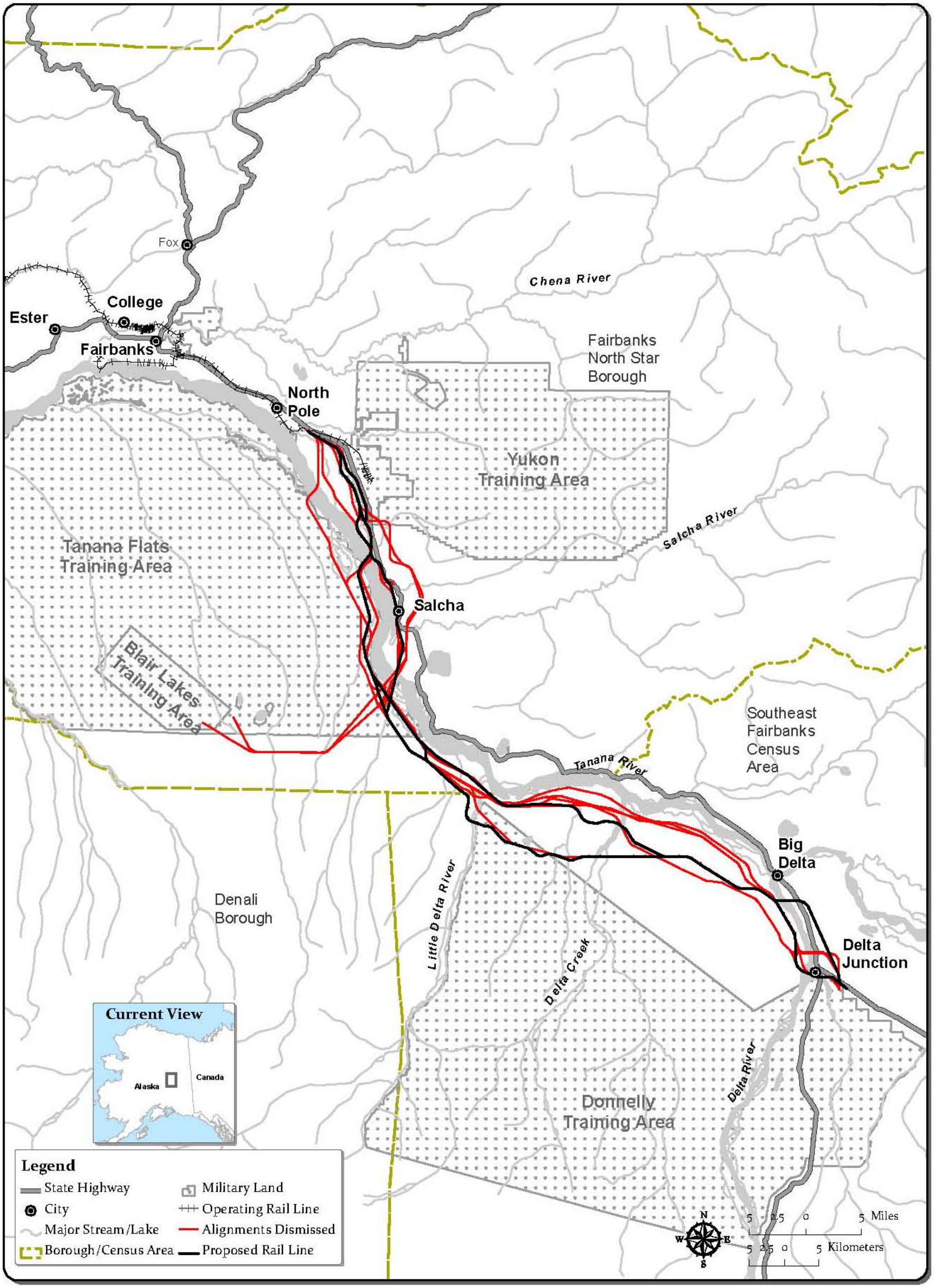

Figure 2-2 – Overview Map of the ARRC Alignments Considered

Phase 1 – Study Area Identification

According to ARRC's 2006d Alternatives Analysis Study, the goals of Phase 1 were to define the general study area within which the rail line extension could be developed, identify potential Tanana River crossing locations within that study area, and identify a number of representative route corridors. The study area was defined by developing two alignments with common start and end points (North Pole and Delta Junction) consistent with the intended purpose of providing access to the Tanana Flats and Donnelly West TAs and extending rail freight and passenger service to Delta Junction. One alignment was developed as far to the west as practicable and the other was developed as far to the east as practicable, with the location of the western alignment limited by military TAs and the eastern alignment limited by Eielson AFB in the north and hilly topography. The area between and including these alignments was considered to be the initial study area. Delineation of this initial study area enabled ARRC to begin the collection of data and to define the area to be flown over for aerial photography and mapping.

Phase 2 – Corridor Development

Phase 2 included a preliminary screening of the representative routes and Tanana River crossing locations identified in Phase 1 to eliminate any alignment with fatal flaws before continuing with corridor development (ARRC, 2006d). This phase began after the initial study area was defined and continued until ARRC's March 2007 Preferred Route Study. The remaining corridors were further developed in Phase 2 based primarily on technical and practical considerations including natural barriers such as rivers and topography; engineering design; cost-effectiveness; geological considerations; and general land use patterns. Based on the data collected and analyzed, and on input from various project stakeholders, corridors were generated and refined, and new corridors were identified to address specific issues.

Phase 3 – Corridor Analysis

This phase involved a comparison of alignment corridors. The corridor analysis phase involved a qualitative comparison of the relative advantages and disadvantages of various alignment corridors. The evaluation of each corridor's relative merits was based primarily on engineering and environmental considerations, including issues raised by regulatory or resource agencies or the public during agency coordination and public outreach efforts. Many of the preliminary alignment corridors were eliminated or combined with other similar alignments because they presented no clear advantages over adjacent alignments or they had more disadvantages than other alternatives.

SEA and Cooperating Agency Input to ARRC's Initial Alignment Development Process

During SEA's scoping process, SEA received comments from agencies and the public on the alignments developed by ARRC and suggestions for alternative alignments. SEA reviewed the alignments presented by ARRC and the comments received. In consultation with Alaska Natives and the cooperating agencies, SEA requested that ARRC consider refinements to their alignments, and consider the feasibility of additional alignments.

As the alignment development evolved through this process, so did the nomenclature used to distinguish the alignments. In the draft scope of study for the Northern Rail Extension Environmental Impact Statement (NRE EIS), alignments were named according to whether they were north or south of the Tanana River crossing at Flag Hill. Alignments were designated with an N for north and an S for south, and given a number and sometimes also a letter. Because the nomenclature did not clearly identify locations or distinguish between sets of alignments, SEA suggested that ARRC adopt new nomenclature for future publications. The new nomenclature distinguished among project areas (*i.e.*, Eielson, Salcha, Tanana, Donnelly, and Delta) and among alignments by using relative location terms such as east and west.

Through the process described above, ARRC provided SEA with several versions of the potential alignments. ARRC presented the latest alignment versions and its preferred alignment to SEA in two key sources:

- ARRC's Preferred Route Alternative Report published in March 2007 (ARRC, 2007e); and
- ARRC's filing of its preferred route with the Board on July 6, 2007 (ARRC, 2007f).

2.2.2 Alternatives SEA Eliminated from Detailed Study

SEA and the cooperating agencies used the purpose and need for the proposed action as described in Chapter 1 as the main factor in their review of the alignments initial ARRC alignments and alignments proposed in scoping comments. Through this review, SEA and the cooperating agencies selected a set of reasonable alternatives to study in detail, and eliminated alternatives and alternative segments from detailed study. Alignments (or alternative segments) that did not meet fundamental components of the purpose and need, would lead to substantially greater adverse environmental impacts, or featured insurmountable construction or operational limitations, were eliminated from detailed study. Table 2-1 lists the alternatives eliminated from detailed study and explains why each was eliminated. Figure 2-2 illustrates the general location and alignment for each of these eliminated alternative segments. Appendix D provides more information about these alternatives and their elimination.

2.3 Proposed Action and Alternatives

The alternative development process resulted in a number of potentially feasible alignments (routes) between the communities of North Pole and Delta Junction. In addition, it became clear that portions of each of these alignments could be interchanged to provide additional routes between the two communities. To facilitate comparison of sections of the proposed project, SEA divided the alignments into segments based on common start, end, or intersection points that would allow direct comparison of the alternatives to each other or combined and compared as full or partial alternative alignments. Figure 2-3 illustrates this concept.

Three types of segments were identified as part of this process:

- Common segments are portions of the rail line with a single route option;
- Alternative segments provide multiple route options; and

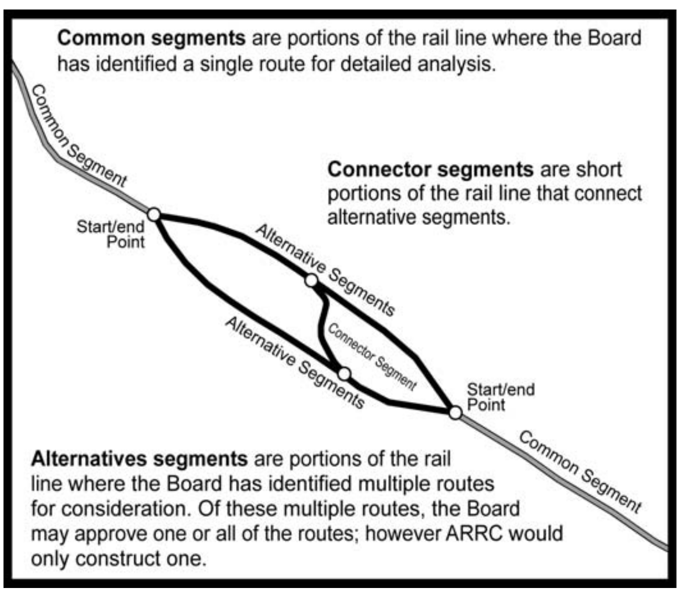

Figure 2-3 - Conceptual Display of Common and Alternative Segments

- Connector segments are short pieces of a rail line that would connect alternative segments.

2.3.1 Proposed Action

Under the proposed action, ARRC would construct and operate a single-track rail line in Interior Alaska starting south of the community of North Pole and ending south of the community of Delta Junction. The rail line would be designed and constructed to Class 5 standards[1] and ARRC proposes to transport commercial freight, military supplies, and passengers on the rail line. Other facilities such as communications towers, offload structures, and a passenger platform in Delta Junction would be constructed to support rail line operations.

The rail line would generally follow the Tanana River, which is a relatively fast-moving river with a wide floodplain and a braided channel. The rail line would require one crossing of the Tanana River and crossings of the Delta River, Little Delta River, Delta Creek, and potentially the Salcha River. The Tanana River bridge would be a dual-modal structure able to support both rail and military vehicular traffic. The Little Delta River and Delta Creek would have separate bridges for the track and vehicles. The proposed action does not include providing vehicle access over the Salcha and Delta Rivers. The rail line would also have multiple grade crossings and a possible relocation of a portion of Richardson Highway and Salcha Elementary School, depending on which alternative segments may be authorized by the Board.

ARRC proposes a 200-foot-wide right-of-way (ROW) for the rail line. For this EIS, it is assumed that all construction activities would occur within this ROW unless otherwise noted. The width of the ROW may be reduced, as necessary, to minimize the impact on sensitive resources or accommodate the terrain. The ROW would contain the rail line, sidings at several locations, a power line, a buried communications cable, and an unpaved access road (see Figure 2-4). Section 2.3.3, Rail Construction, explains the difference between the facilities anticipated in the ROW on the east and west sides of the Tanana River. The area in the ROW that is cleared of vegetation for construction but not needed for permanent structures would be restored to natural conditions, to the extent possible, consistent with rail line operating requirements.

ARRC would need to receive a ROW grant from the Bureau of Land Management (BLM) to use a corridor for the construction and operation of segments that run through BLM-administered public lands. The land covered by the ROW grant would include the 200-foot right-of-way. Where the ROW grant would involve lands withdrawn for military use, BLM would be required to obtain formal concurrence from the U.S. Army before issuing such a grant. ARRC also would need to go through a conveyance process specified under Alaska Statute (AS) 42.40.460 with the Alaska Department of Natural Resources (ADNR) to obtain rights for lands under state ownership. ARRC is working with ADNR per SB31 (2004 legislature) to obtain a fee-title ROW over state lands. Under Alaska Statute 42.40.460, ARRC would need to obtain a 500-foot reserved corridor for the construction of the rail line from ADNR on lands managed by the state. Upon completion of the project, the corridor width would be reduced to 200 feet and conveyed to ARRC for operation of the proposed rail line, while the remainder of the initially reserved corridor would continue to be administered by ANDR. In addition, ARRC would need to acquire some private lands.

[1] The Federal Railroad Administration (FRA) establishes the standards for class of track and maximum operating speed for passenger and freight on each class of track (49 Code of Federal Regulations [CFR] 213). Design and construction of the proposed NRE to Class 5 standards would be required for ARRC's desired operating speed for passenger (79 miles per hour) and freight (60 miles per hour) service.

Table 2-1
Summary of Alternatives Eliminated by SEA and the Cooperating Agencies

Alternative	Brief Description	Reason for Elimination
Eielson Area Alignments	N1 would cross the Tanana River from the Eielson Farm Community into the Tanana Flats TA. The alignment would then continue south through the TA on the western side of the Tanana River N2 alignment similar to N1	ALCOM expressed concern about the amount of encroachment this alignment would have on the TA. Strong concerns about the alignment passing through a prime moose calving area.
	Alternative through Eielson AFB along the east side of Richardson Highway	Proximity to the Eielson AFB was infeasible due to encroachment on the operating and runway/taxi areas.
	Alternative that would cross the Tanana River shortly before or after the Chena River overflow, bypassing the Eielson Farm Community	Would create further intrusion into the Tanana Flats TA and also affect important moose habitat; was not practicable because of the current grade crossing of Richardson Highway and topography.
	Alternative would cross Richardson Highway at Milepost 0. The recommended alignment would either continue through Eielson AFB using an existing track or go around the AFB to the east.	Use of the existing track through Eielson AFB for through-movement of trains highly undesirable. Potential private property impacts, concerns over existing land use, and steep topography.
Salcha Area Alignments	N1 on the western side of the Tanana River N3 on the eastern side of the Tanana River	N1 would have potential conflict with military use. N3 would affect approximately 300 acres of wetlands (nearly three times as many acres as other segment alternatives that were retained for analysis) and would more directly affect cultural resources including the remains of the historic Salchaket Village.
Alignments Proposed in Scoping Comments	Would cross the eastern-most main channel of the Tanana River to a pair of islands. Would continue south of the bluff and traverse the islands before crossing back to the east bank of the Tanana River.	Not feasible due to the river hydraulics, instability of the islands in this area, and long-term serviceability.
Richardson Highway	Would parallel Richardson Highway all the way to Delta Junction.	The hilly topography on the east side of the Tanana River is considerably less favorable for rail line construction south of Flag Hill. Would not provide access to military training lands on the southwestern side of the Tanana River.
Blair Lakes Spur	Spur to the Blair Lakes Range and/or other facilities to support military operations including sidings, offload facilities, and end-of-track facilities.	Military has indicated that they do not want such a spur.

Table 2-1
Summary of Alternatives Eliminated by SEA and the Cooperating Agencies (continued)

Alternative	Brief Description	Reason for Elimination
Donnelly Area Alignments	Donnelly East (S2) alignment would hug the west side of the Tanana River Donnelly East Revised shifted farther inland from the Tanana River due to fish habitat concerns.	Both alignments would create adverse impacts through the displacement of summer homes and vacation cabins that other alignments avoid, and would traverse steep hills with potential icing problems as well as areas that exhibit groundwater upwelling and quicksand-type conditions.
Delta Area Alignments	Delta Central (S1) located in the Delta Junction area would cross the Delta River from the Donnelly alignments and continue to the proposed rail terminus on the south side of Delta Junction.	Would involve greater adverse impacts to residential and commercial property in Delta Junction than the other alignments. Would affect approximately 83 acres of wetlands, more than 40 percent more than the two alternative segments being retained for detailed analysis.
Alignment along the Alaska Range	Alignment would connect to the ARRC mainline in the vicinity of Healy and run along the foothills of the Alaska Range to the military TAs on the west side of the Tanana River. Included non-rail alternative.	Did not meet two of the purposes of the proposed Northern Rail Extension: to provide passenger train service between Fairbanks and Delta Junction and to provide common carrier rail service to Delta Junction.

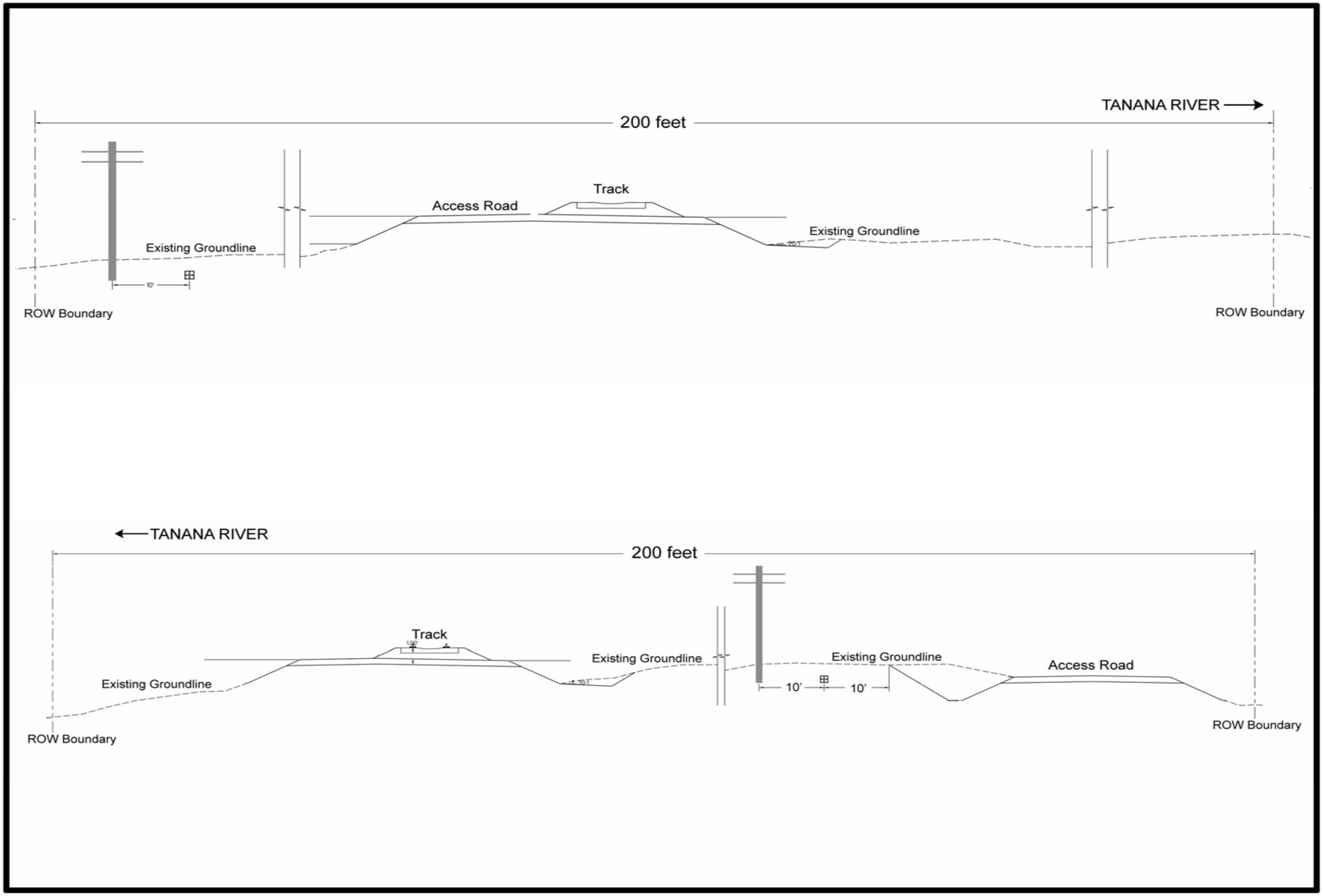

Figure 2-4 – Cross Sections of Rail Line Right-of-Way on East Side (top) and West Side (bottom) of Tanana River

Operations support facilities would be constructed in addition to the rail line. The location of some of the facilities would vary depending on which alternative segments were constructed. Temporary construction support facilities would also be built, but would be removed after construction is completed.

Most facilities would require permanent or temporary access roads. Locations for communications towers have been identified, but exact locations for other facilities would be determined in the final construction design. Some communications towers would have helicopter-only access. Sidings, a passenger facility, and bridge staging areas would be sited, where possible, in the 200-foot ROW.

2.3.2 Alternatives Considered in SEA's Environmental Review

The alternatives include common segments, alternative segments, and connector segments, as listed in Table 2-2 and shown in Figures 2-5 to 2-11. Table 2-2 also identifies the ARRC preferred segments. There are two common segments—North Common Segment and South Common Segment—with a combined length of 13.1 miles. Between these common segments are five sets of alternative segments with two or three segments each. Figure 2-5 shows the common segments, alternative segments, and connector segments, and divides the project into six areas. The six areas are shown in more detail in Figures 2-6 through 2-11.

Table 2-2
Potential Rail Line Segments

Segments Evaluated in this EIS	Applicant's Preferred Segments[a]
North Common Segment	✓
Eielson Alternative Segments 1, 2 and 3	**Alternative Segment 3**
Salcha Alternative Segments 1 and 2	**Alternative Segment 1**
Connector Segments A, B, C, and D	**Connector B**
Central Alternative Segments 1 and 2	**Alternative Segment 2**
Connector Segment E	✓
Donnelly Alternative Segments 1 and 2	**Alternative Segment 1**
South Common Segment	✓
Delta Alternative Segments 1 and 2	**Alternative Segment 1**

[a] SEA does not identify preferred segments in the Draft EIS.

ARRC filed its proposed action with the Board on July 6, 2007 (ARRC, 2007f). Both common segments are part of ARRC's preferred alignment. The descriptions below identifies the ARRC preferred segments listed in Table 2-2. SEA does not identify a preferred set of alternatives in the Draft EIS.

In addition to these alternatives, this EIS considers a No-Action Alternative. Under the No-Action Alternative, ARRC would not construct an extension of the existing rail line or construct the bridge over the Tanana River to transport commercial freight, military cargo and personnel, or passengers by rail.

North Common Segment

North Common Segment would start at the east end of the Chena River Overflow Bridge off of the Eielson Branch and extend 2.7 miles southeast to meet the selected Eielson alternative segment. The segment would run roughly parallel to Richardson Highway, cross Eielson Farm Road and Piledriver Slough, and run along the east side of the Tanana River (see Figure 2-6).

Eielson Alternative Segments

SEA is considering three alternative segments through the Eielson area that would start about 0.5 mile southeast of Eielson Farm Road. Each alternative segment has at least one shared segment section. The alternative segments would pass between the fence line of Eielson AFB on the east and the Eielson Farm Community on the west. The selected Eielson alternative segment would connect to the selected Salcha alternative segment (see Figure 2-6).

Eielson Alternative Segment 1 would take the most westerly route, closer to the farm community and farthest from Richardson Highway. The segment would cross through some farm community property while staying to the west along Piledriver Slough. The segment would cross a few roads before hugging the Tanana River for approximately the last 3 miles of the alternative segment. This alternative segment would cross Twentythreemile Slough and would be 10.3 miles long.

Eielson Alternative Segment 2 would follow the same route as Eielson Alternative Segment 1 for approximately 5.7 miles, at which point Eielson Alternative Segment 2 would bear more to the southeast, cross Piledriver Slough, and follow a route closer to Richardson Highway. The last 2.2 miles of Eielson Alternative Segment 2 share the same route as Eielson Alternative Segment 3. This alternative segment would be 10.0 miles long.

Eielson Alternative Segment 3 would take the most easterly route, remaining closer to Richardson Highway and located largely within Eielson AFB property, but outside the Base fence line. The segment would cross Piledriver Slough approximately 0.5 mile into its route and then stay east of the slough for approximately 4.2 miles before crossing Piledriver Slough again. This alternative segment would be 10.1 miles long. This is ARRC’s preferred alternative segment.

Salcha Alternative Segments

SEA is considering two alternative segments for the Salcha section, each starting approximately 0.3 mile northwest of the intersection of Old Richardson Highway and Bradbury Drive. The segments would cross the Tanana River at different places and the selected Salcha alternative segment would meet the selected connector segment (A, B, C, or D) to connect to the selected Central alternative segment (see Figure 2-7).

Salcha Alternative Segment 1 would cross the Tanana River just west of the intersection of Bradbury Drive and Ruger Trail. After crossing the river, the alternative segment would run through the Tanana Flats TA on the west side of the river. The segment would be 11.8 miles long and would require a dual-modal bridge of approximately 3,600 feet in length to cross the Tanana River. This is ARRC’s preferred alternative segment.

Salcha Alternative Segment 2 would remain on the east side of the Tanana River for most of its 13.8-mile route. For approximately the first 9 miles, the route would parallel the Tanana River and Richardson Highway. The river then curves east while the route would maintain a southerly direction. The segment would cross the river at Flag Hill, where it would connect with one of the Central alternative segments. ARRC has proposed crossing the Tanana River at Flag Hill

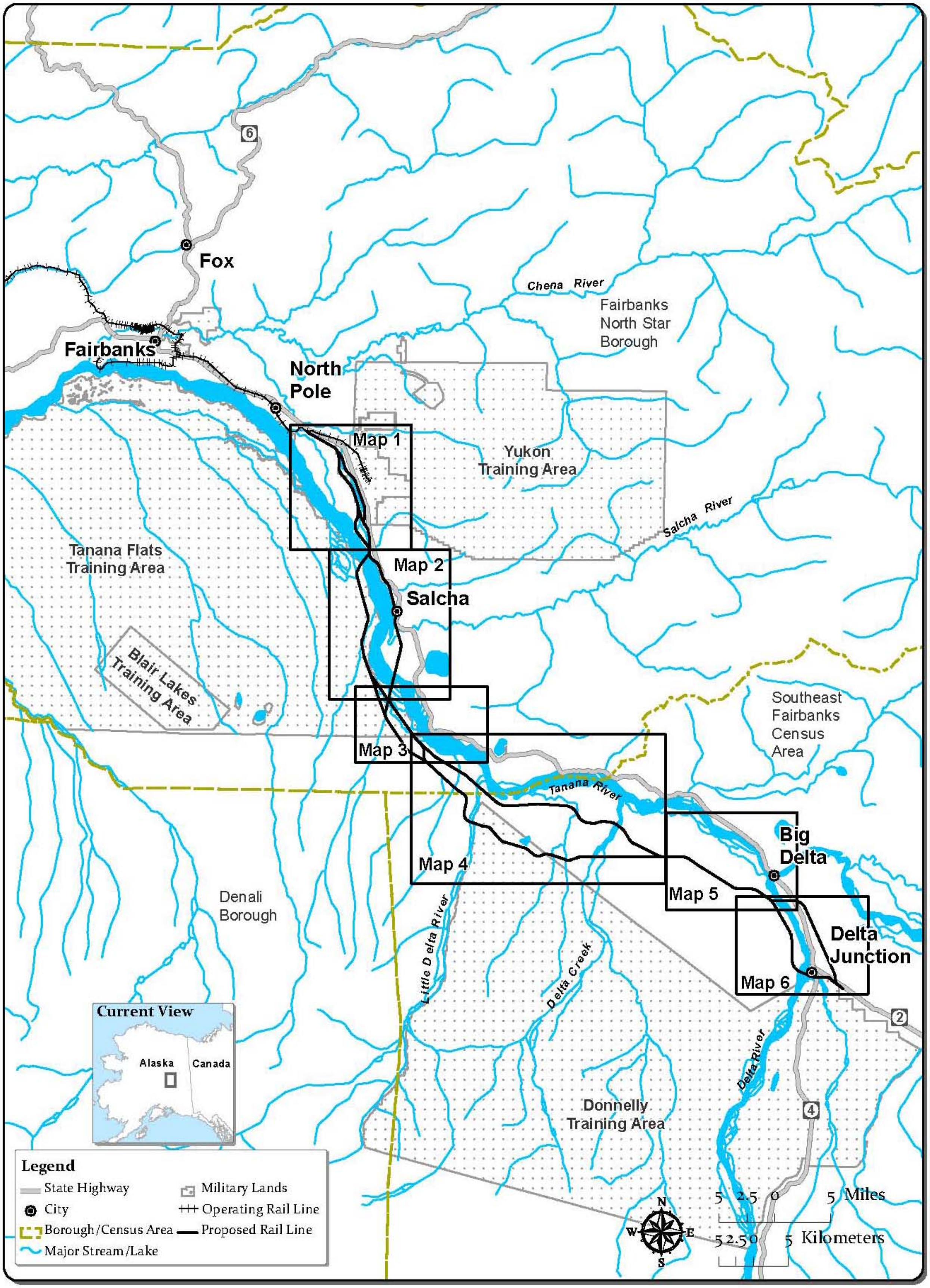

Figure 2-5 – Map Key for Areas Along the Proposed Northern Rail Extension

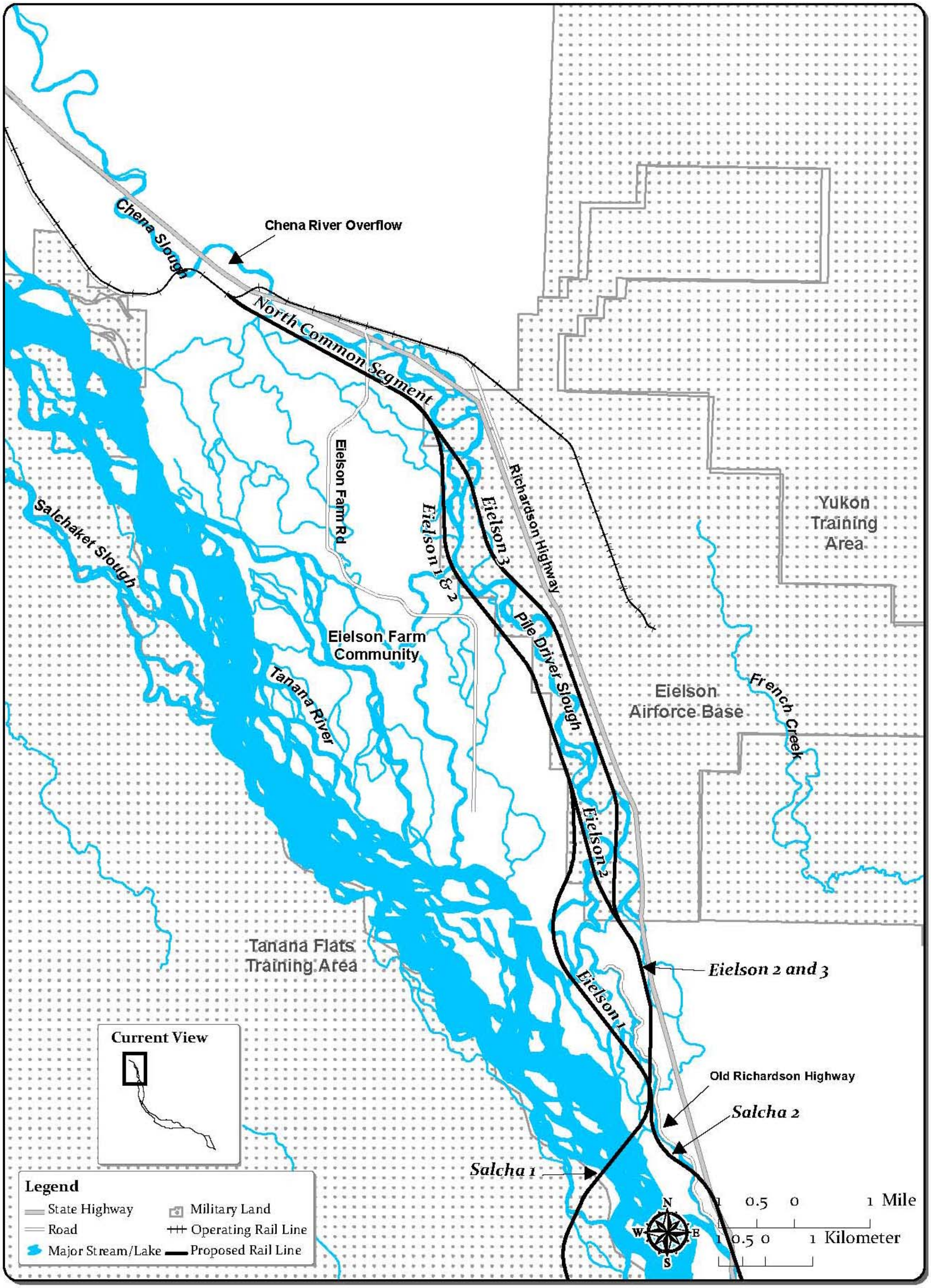

Figure 2-6 – North Common Segment and Eielson Alternative Segments Within Map Area 1

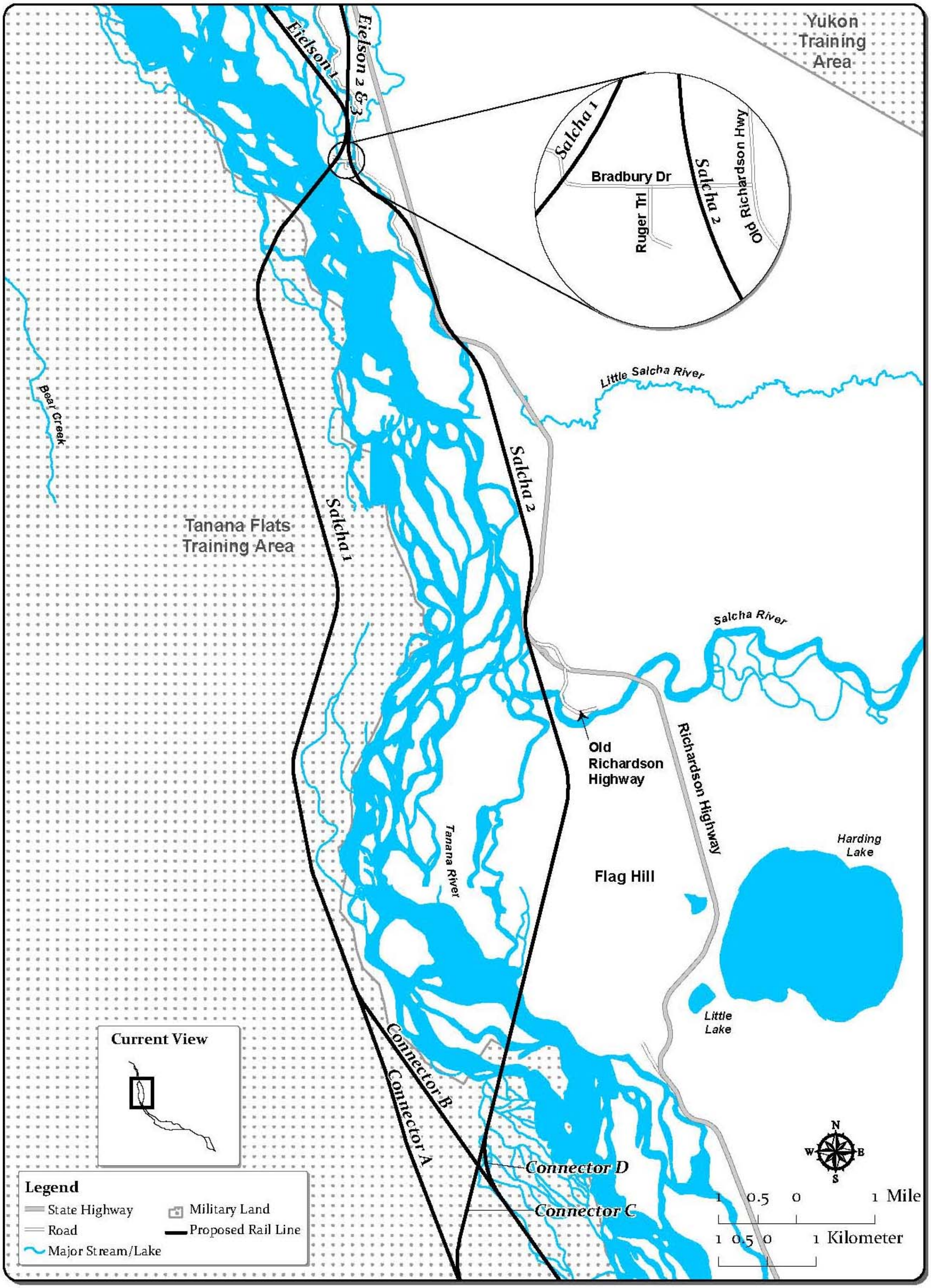

Figure 2-7 – Salcha Alternative Segments Within Map Area 2

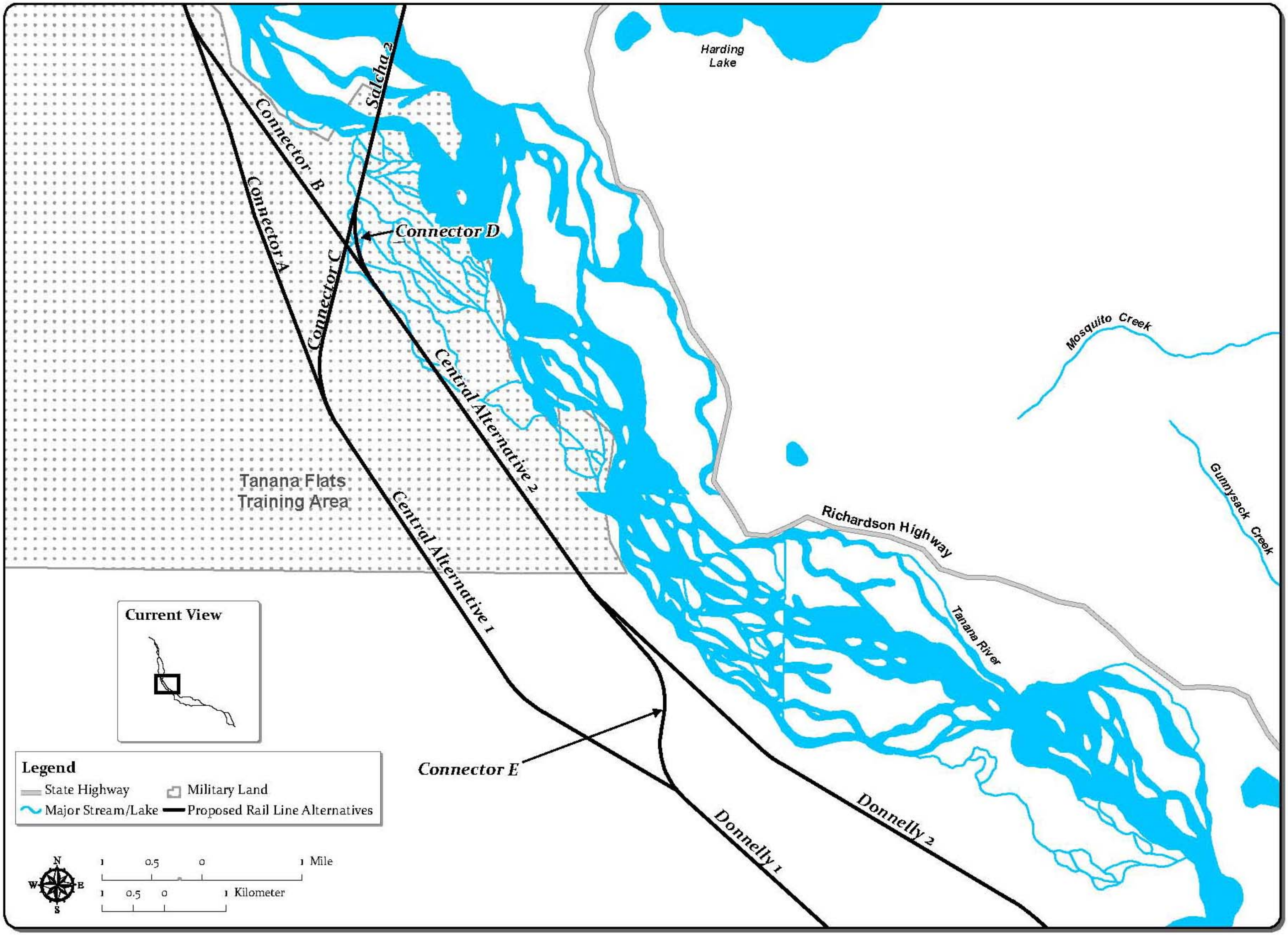

Figure 2-8 – Central Alternative Segments and Adjoining Alternative Segments Within Map Area 3

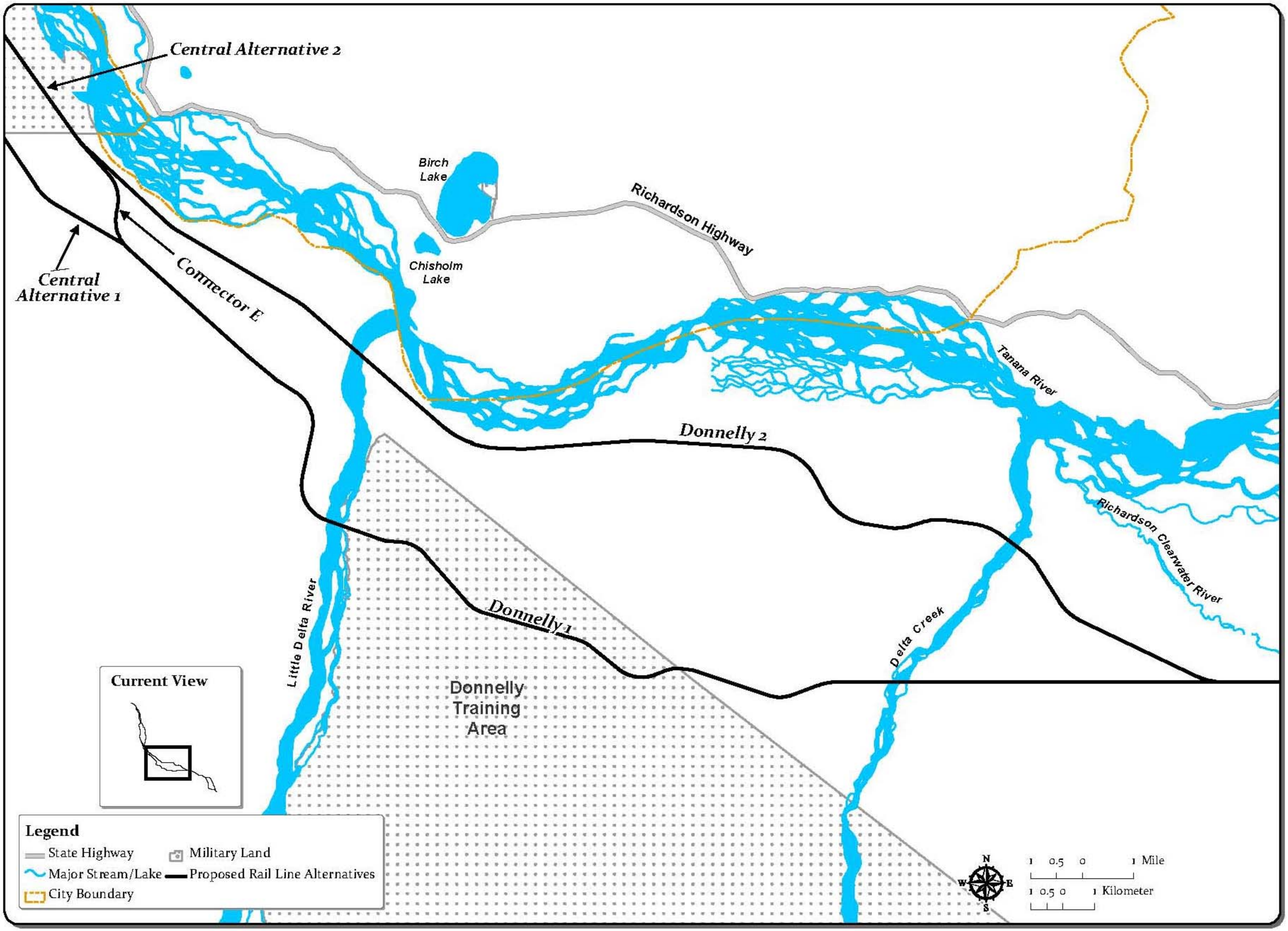

Figure 2-9 – Donnelly Alternative Segments Within Map Area 4

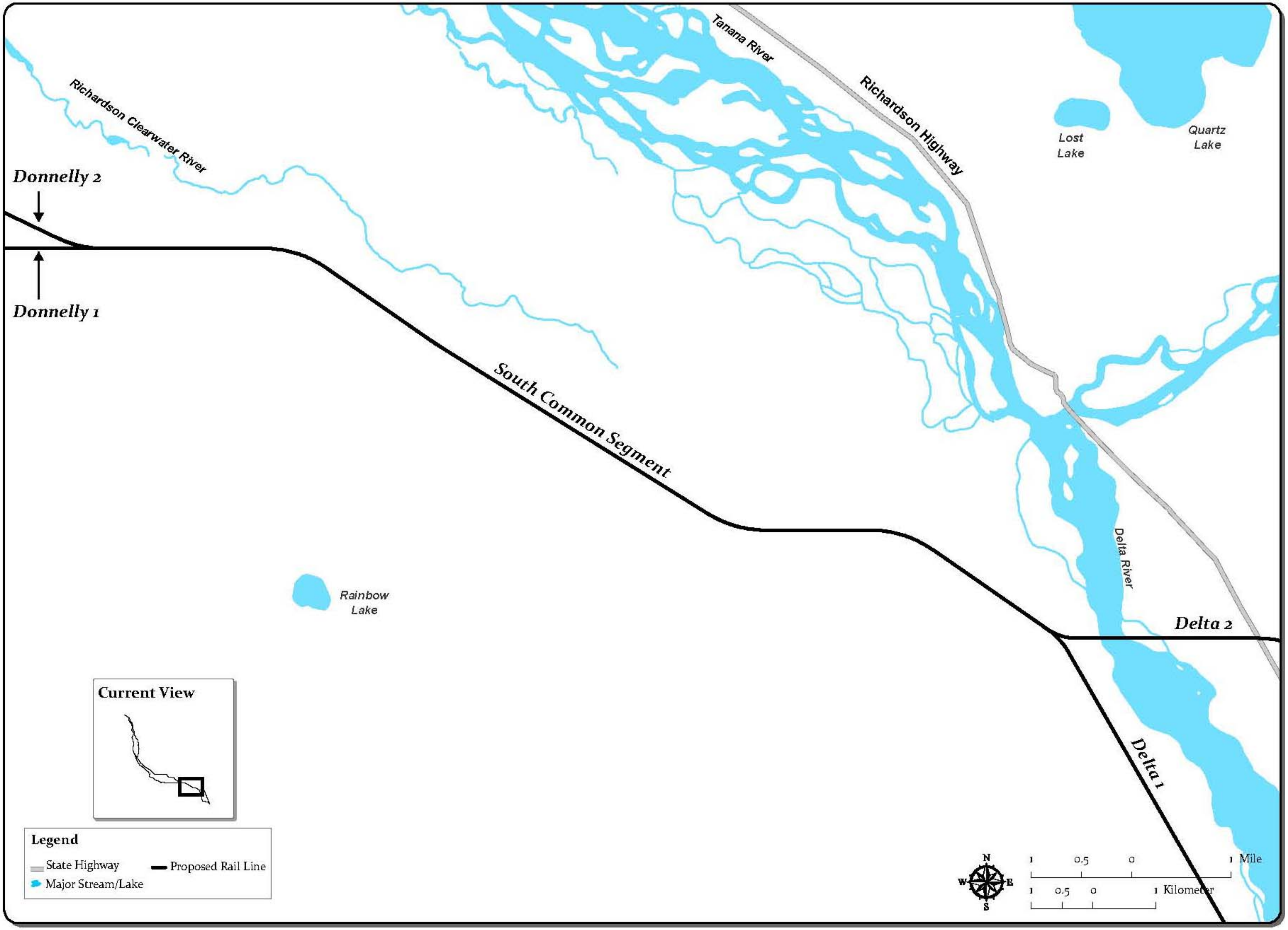

Figure 2-10 – South Common Segment and Alternative Segments Within Map Area 5

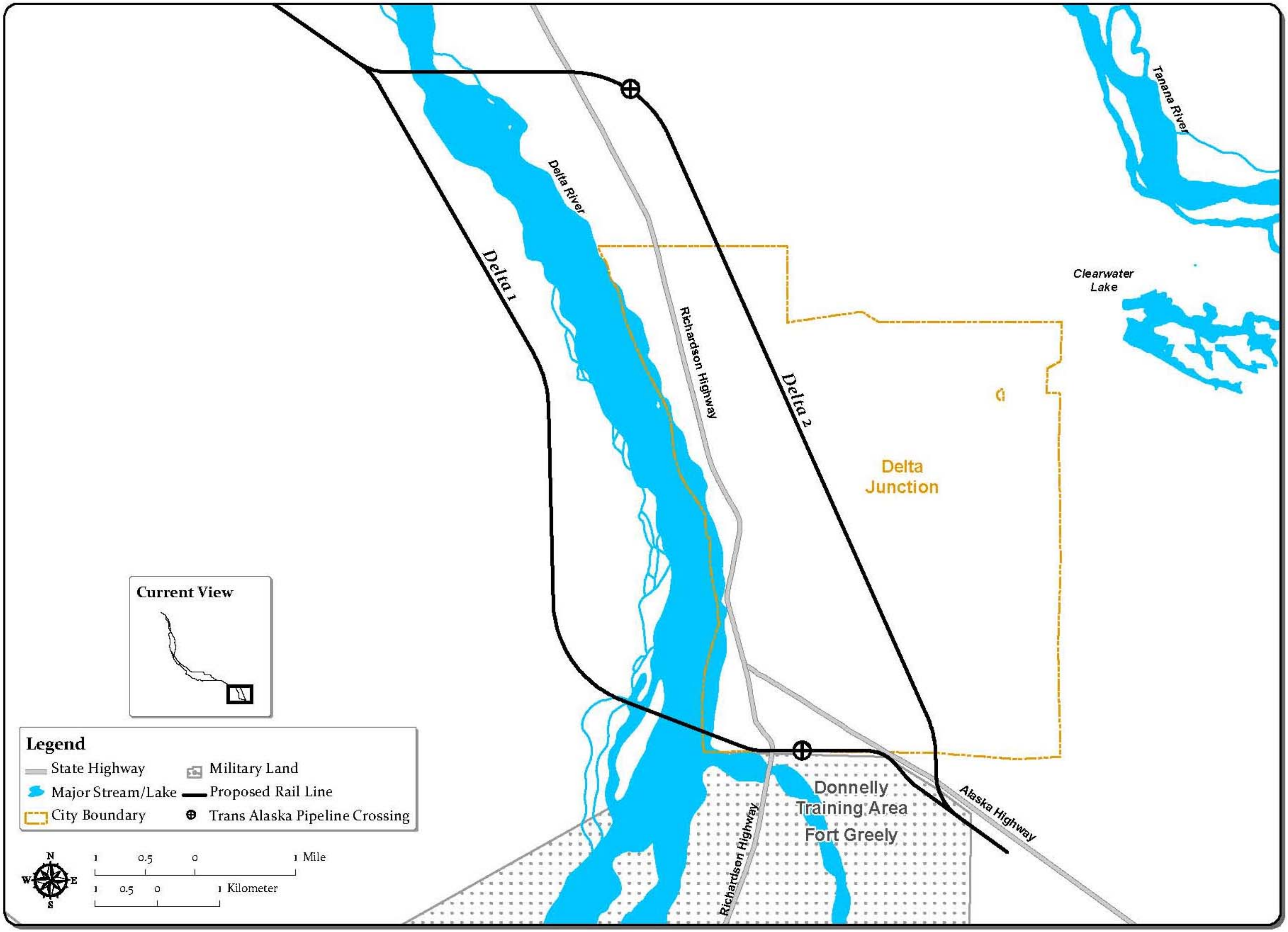

Figure 2-11 – Delta Alternative Segments Within Map Area 6

with a dual-modal bridge of approximately 4,000 feet in length. This alternative segment would require relocation of portions of Richardson Highway and Salcha Elementary School (see Figure 2-12) to provide adequate space for the highway and the rail line to pass between the river and the adjacent bluff. Approximately 2 miles of the highway would need to be relocated farther into the river bluff and the rail line would assume the location of the highway by the river. In addition to the Tanana River main channel crossing, the alternative segment would cross some Tanana River side channels, the Little Salcha River, and the Salcha River.

Connector Segments

The connector segments are short pieces of rail alignment between 0.9 and 4.4 miles long that would connect alternative segments that do not have a common start and end point. There are five connector segments on the west side of the Tanana River that would connect the Central alternative segments to the Salcha and Donnelly alternative segments (see Figure 2-8). Connector Segments B and E are part of ARRC's preferred route.

Central Alternative Segments

SEA is considering two alternative segments between the Salcha and Donnelly alternative segments. Both Central alternative segments would run parallel to the west bank of the Tanana River in a southeasterly direction (see Figure 2-8).

Central Alternative Segment 1 would connect to the Salcha alternative segments via Connector Segment A from Salcha Alternative Segment 1 or Connector Segment C from Salcha Alternative Segment 2 and would be farther from the Tanana River than Central Alternative Segment 2. The alternative segment would be 5.1 miles long and outside of the Tanana River floodplain. Central Alternative Segment 1 would not connect to Donnelly Alternative Segment 2 due to terrain considerations.

Central Alternative Segment 2 would connect to the Salcha alternative segments via Connector Segment B from Salcha Alternative Segment 1 or Connector Segment D from Salcha Alternative Segment 2. The alternative segment would be within the floodplain of the Tanana River and would cross several clearwater streams. Central Alternative Segment 2 would be 3.6 miles long and is ARRC's preferred alternative. The alternative segment would connect directly to Donnelly Alternative Segment 2 and to Donnelly Alternative Segment 1 via Connector Segment E.

Donnelly Alternative Segments

SEA is considering two alternative segments for the Donnelly area (see Figure 2-9). Both would run on the southwestern side of the Tanana River and end approximately 4 miles east of Delta Creek, where they would meet the South Common Segment. Both alternative segments would cross Delta Creek and the Little Delta River but run through distinct terrains with different elevation profiles.

Donnelly Alternative Segment 1 would take the southern route, farther from the Tanana River and through the northeastern corner of the Donnelly TA. This segment would be 25.8 miles long and would cross steep grades. The route would cross the Delta Creek paleochannel, an ancient water channel that appears to be no longer active but could become active during periods of high flow. This is ARRC's preferred alternative segment.

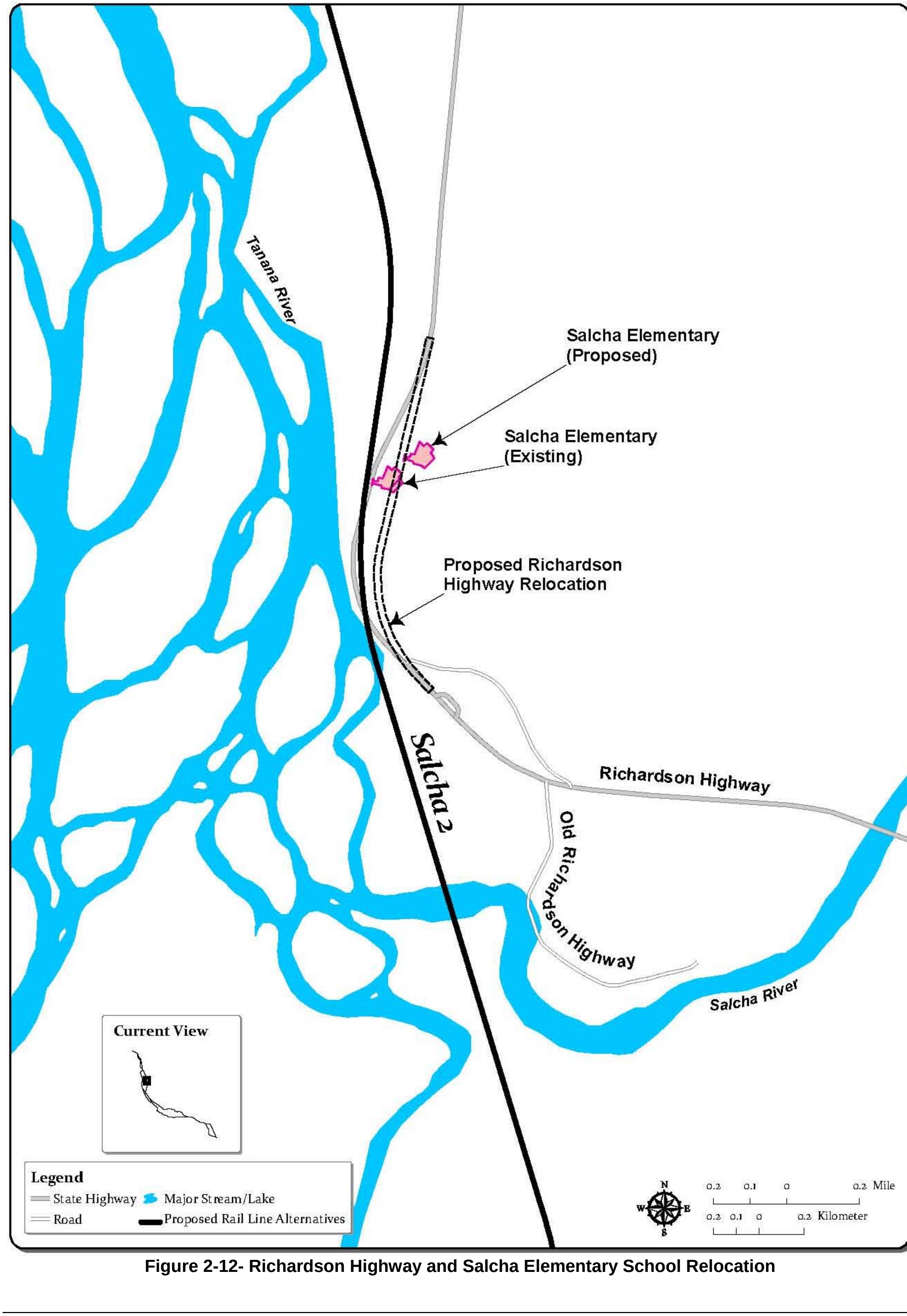

Figure 2-12- Richardson Highway and Salcha Elementary School Relocation

Donnelly Alternative Segment 2 would run closer to the Tanana River than Donnelly Alternative Segment 1. This segment would 26.2 miles long and would cross milder grades than Donnelly Alternative Segment 1, but would face more difficult geotechnical considerations than the other Donnelly alternative segment.

South Common Segment

This segment would connect the selected Donnelly alternative segment to the selected Delta alternative segment. The segment would begin approximately 4 miles east of Delta Creek and run roughly parallel to the Tanana River before curving southerly to parallel the Delta River near Big Delta. The segment would be 10.5 miles long (see Figure 2-10).

Delta Alternative Segments

SEA is considering two alternative segments for the Delta area. Each of these segments would cross the Delta River, one north and one south of Delta Junction. The alternative segment that would cross the Delta River south of Delta Junction, Delta Alternative Segment 1, is ARRC's preferred alternative segment. Delta Alternative Segment 1 would cross the Delta River just downstream of Jarvis Creek and would run toward the east until turning toward the southeast to parallel the Alaska Highway. Delta Alternative Segments 1 and 2 would both end at the end of the alignment about 3 miles east of the Delta River, adjacent to the Alaska Highway (see Figure 2-11).

2.3.3 Rail Construction

This section describes construction of the proposed rail line extension, including a description of ROW needs, rail line construction components and materials, roadways, bridges, and permanent and temporary facilities. This section also describes the general construction process and schedule.

Right-of-Way

Unless otherwise indicated, construction activities would occur within the 200-foot ROW. For purposes of analysis, it is assumed that the entire ROW would be permanently cleared of vegetation for construction and then operations; however, some areas might not require full use of the ROW, and those lands would be restored after construction or left undisturbed if not needed. State land would be reserved for construction of the rail line at a width of 500 feet in accordance with AS 42.40.460. Upon completion, the corridor width would be reduced to 200 feet and conveyed to ARRC for rail line operations.

Rail Line Access Roads

For rail line construction and post-construction operations, ARRC would build a permanent access road parallel to the rail alignment within the 200-foot ROW. The access road would be constructed before the rail line and would be used for construction of the rail line.

On the east side of the Tanana River, where access to the rail line construction area would be possible at multiple points from existing roads, a 13-foot-wide gravel access road would be constructed in the ROW. The road typically would be offset from the centerline of the proposed track by 12 feet.

On the west side of the Tanana River, which is a remote area without permanent, all-season road infrastructure, a 24-foot-wide permanent all-season access road would be constructed along the rail line. The road would be used to move construction personnel, equipment, and material along the rail line during construction. Following construction, ARRC would use the road to support rail line operations and the military could also sue the road. In general, this road would be offset from the centerline of the proposed NRE track by approximately 40 feet to avoid interference of vehicle traffic with the rail line during both construction and operations. However, in difficult terrain this offset might be greater. The road would require culverts or vehicle bridges for all stream crossings, as described in more detail below.

ARRC would not maintain these roads as public roads. However, the military could use the access road on the west side of the Tanana River to access TAs.

Railbed Construction

Before any track could be placed, ARRC would construct a suitable railbed. The railbed would form the base upon which the ballast, rail ties, and rail would be laid. Construction of the railbed would require clearing, excavating earth and rock on previously undisturbed land, and removing and stockpiling topsoil where needed. Construction would require both cuts and fills. Suitable material excavated from cuts would be used as fill material in other areas. Unsuitable material would be placed in borrow areas and used for restoration of disturbed areas.

Track Construction

In-place track construction would consist of placing ties, rail, and ballast on top of the railbed. First the ties would be placed on the subballast. ARRC would weld rails together to form rail strings. ARRC would then use special equipment to unload and secure the rail onto the ties, unload ballast from rail ballast cars or trucks, and dump ballast evenly along the skeleton track. Equipment would then be used to raise the rail line until the proper ballast depth is achieved.

Alternatively, skeleton track would be constructed as panels at ARRC facilities in Birchwood, Healy, Nenana, or Fairbanks. These panels, 40 to 80 feet in length, would consist of rails, ties, and fastening systems constructed and loaded onto railcars for delivery to the construction site. At the construction site, the panels would be lifted from the railcars and placed in their final location. The panels would be fastened together to form the skeletonized track.

Acquisition of Materials for Rail Line Construction

Ballast, subballast, large armor rock, rail ties, and rail would be required for construction of the proposed rail line and bridges. This section briefly describes the acquisition and use of these materials.

Approximately 491,000 cubic yards of ballast would be needed along the rail line. ARRC would obtain ballast from existing commercial quarries and/or the existing ARRC quarry in Curry, Alaska. Ballast would be transported from Curry to the project area by rail or by a combination of rail and truck. ARRC anticipates that ballast from other sources would likely be trucked directly to the construction site, or transloaded into railcars on the north side of the Tanana River for final placement along the route.

Approximately 600,000 cubic yards of subballast may be needed along the rail line. ARRC would obtain subballast primarily from materials excavated during railbed construction, from existing commercial sources, and from borrow areas established along the rail line ROW. Generally, borrow areas for embankment material are estimated to occur at approximately 3 to 5 mile intervals along the rail line and may or may not contain material suitable for subballast. The sites would each cover approximately 17 acres and reach excavation depths up to 20 feet. Some stripping of vegetation and organic soils would be required to obtain the desired material. Generally, the excavation would be completed with off-road scrapers or convenient loading equipment. In areas with high groundwater tables, a dragline might be required to excavate below the water table. For areas with shallow groundwater, it could be difficult to reach the 20-foot excavation depth, even with the use of a dragline. In these circumstances, the borrow area may need to be larger than 17 acres.

As part of the final design and permitting process, the locations of borrow areas would be identified through geotechnical testing to identify locations with suitable material. Some of the borrow areas might not be needed, but ARRC plans to maintain short intervals between sites to decrease average haul distance. Any excess material (overburden) from these activities would be distributed evenly along the embankments as nonstructural fill to support revegetation.

The large armor rock would be needed for Tanana River training structures to protect the dual-modal bridge by directing channel flow. ARRC anticipates that the rock would come from its existing quarry in Curry, Alaska, and would be transported to the project area by rail or by a combination of rail and truck. As further discussed below, a facility for transloading to trucks also may be used.

ARRC may use glacial streams to acquire granular construction material, subject to need and permit approval. These sites would be located in glacial stream crossings on the south and west side of the Tanana River, including the Little Delta River, Delta Creek, and Delta River. Large quantities of granular material would be available at these locations as glacial streams provide continuous replacement. Each site would cover approximately 20 acres on each river. Material source sites within the limits of ordinary high water in fishbearing water bodies would include an outlet designed to prevent fish entrapment.

ARRC would obtain rail ties and steel rail from commercial sources to create rail strings. ARRC anticipates that these materials likely would be shipped to the project area by rail. For delivery of welded rail, the rail would be welded into strings either at a portable welding plant associated with the Eielson construction staging area, or at the railroad's existing facilities in Birchwood or Healy. Otherwise, the rail would be delivered to the site in short lengths individually, or as pre-constructed track panels. The rail would then be welded in place after the track had been fully constructed.

Construction Staging Areas

The proposed rail line might require construction staging areas to store material, weld sections of the rail line, and otherwise support rail construction activities. These staging areas would be outside the 200-foot ROW. SEA is considering the impacts of four construction staging areas that were identified by ARRC. The exact location of each of these staging areas would depend on which alternative segments were selected.

The Eielson Construction Staging Area would cover approximately 140 acres at a site near the Eielson Branch and North Common Segment. The site would be south of the Chena Overflow Bridge and would have road access to Richardson Highway and the existing Eielson Branch rail line. The site could be used for the rail welding operation and/or storage. The rail welding operation would involve welding 80-foot rail sections into quarter-mile strings. It is possible that this site would include a construction camp with space for recreational vehicles.

The second staging area, the Delta Construction Staging Area, would cover approximately 40 acres along South Common Segment. This site would be used for staging, storing, and maintaining earth-moving equipment and for construction camp facilities.

If ARRC chose to follow a phased construction scenario and constructed the Tanana River bridge before the rail line, then ARRC would need an interim rail-to-truck transload and staging site and 2,000-foot siding for materials and equipment shipped to the Fairbanks area via the Alaska Railroad. This structure would be located along the existing Eielson Branch and ARRC has identified two potential locations for this facility.

The first, and preferred location, would be on the north side of the Eielson Branch and would be along an existing gravel road and gravel pit (see Figure 2-13). The staging site would not require vegetation clearing. The pit has only been partially developed on speculation of construction work that did not develop. If selected, trucks would transport material approximately 13 miles from the staging site to the Salcha Alternative Segment 1 Tanana River bridge construction site and 26 miles to the Salcha Alternative Segment 2 Tanana River bridge construction site.

ARRC identified a second potential location for the rail-to-truck transload and staging site at the intersection of Richardson Highway and Claude Street (Figure 2-14). This staging site would require vegetation clearing and would require road improvements to accommodate the storage and staging of materials.

Along with these staging areas, ARRC indicated that there was potential for storing material at the storage yard at the Alaska Railroad Depot in Fairbanks. Construction material would be stored there until it was needed at the project site. This would limit the need for additional storage areas along the proposed rail line.

Construction Camps

ARRC has indicated that because construction of the proposed rail line would occur in an area with a limited workforce and infrastructure, it anticipates that up to three construction camps could be required. Such camps would provide housing for workers and a logistical base to conduct construction activities. The camps would include sleeping quarters, a cooking area, and a well for water.

The Eielson Construction Camp would be collocated with the Eielson Construction Staging Area described above. The camp would be located near the Eielson Branch and North Common Segment and would also contain space for recreational vehicles or motor home facilities.

The Tanana/Donnelly Construction Camp would possibly be collocated with a siding for the Tanana Flats TA. The 40-acre camp would be a combined construction camp with recreational vehicle facilities and an area for staging and maintenance of earth-moving equipment. Sleeping quarters could also be constructed. Although the exact location has not been determined, the site would be located near the southern Tanana River crossing alternative and would be closest to either Donnelly Alternative Segments 1 and 2 or the Central alternative segments.

The Big Delta Construction Camp would be located along South Common Segment and would cover 40 acres, although the exact location has not been identified by ARRC. The camp would be used until one of the Delta River bridge alternatives was constructed. It would contain an area for recreational vehicle facilities and could be collocated with a construction staging area.

Figure 2-13 – ARRC's Preferred Transload and Staging Site

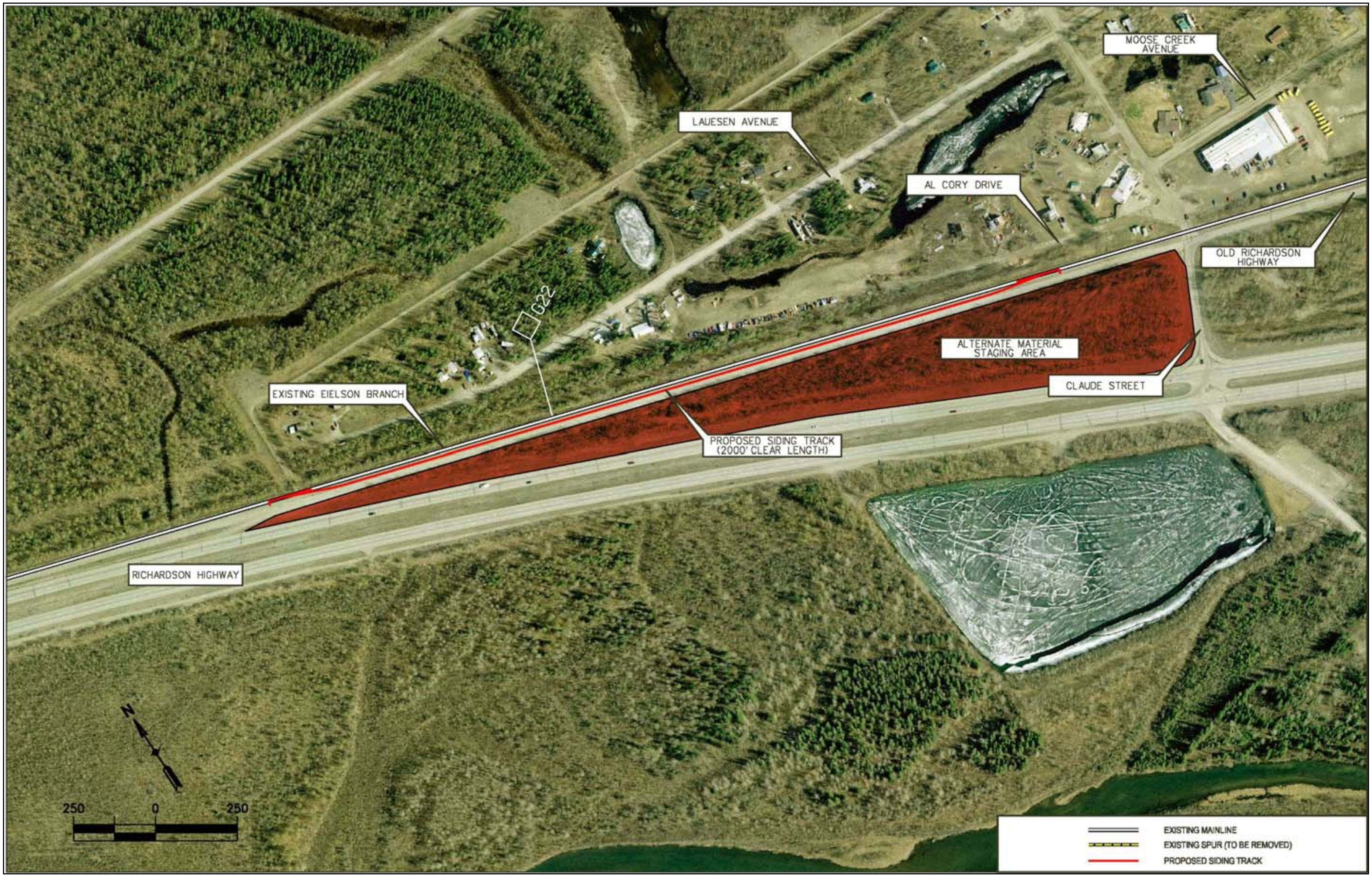

Figure 2-14 – ARRC's Alternative Transload and Staging Site

Bridges and Culverts

Rail bridges and culverts would be required for crossing water bodies, including streams, rivers, and some wetlands. As discussed in greater detail in Chapter 4, Water Resources, stream and river crossings are categorized as "large" or "small" depending on the size and hydrologic characteristics of the channel. Table 2-3 provides a summary of bridges and culverts proposed by ARRC; actual types and sizes of conveyance structures would be determined during final design and permitting. In general, conveyances were sized to equal or exceed the measured channel width or 90 percent of bank full width (to meet or exceed the Alaska Department of Fish and Game [ADF&G]/Alaska Department of Transportation and Public Facilities [ADOT&PF] mode of action fish passage requirements even where fish presence is undetermined). ARRC proposed bridges where the recommended conveyance width is longer than 20 feet. On the west side of the Tanana River, bridges and culverts for vehicles would also be constructed as part of a permanent, separate and parallel access road.

Table 2-3
Permanent Bridges and Culverts for Rail Crossings of Water Bodies by Alternative Segment

Alternative Segment	Small Bridges	Large Bridges[a]	Total Bridges	Culverts	Total Bridges and Culverts
North Common	1	0	1	1	2
Eielson 1	1	0	1	13	14
Eielson 2	3	0	3	10	13
Eielson 3	3	0	3	14	17
Salcha 1	0	1	1	12	13
Salcha 2	2	4[b]	6	12	18
Connector A	1	0	1	3	4
Connector B	1	0	1	2	3
Connector C	3	0	3	4	7
Connector D	3	0	3	1	4
Connector E	1	0	1	5	6
Central Alternative 1	1	0	1	9	10
Central Alternative 2	2	0	2	9	11
Donnelly 1	4	2	6	31	37
Donnelly 2	2	2	4	44	48
South Common	3	0	3	11	14
Delta 1	0	1	1	1	2
Delta 2	0	1	1	0	1
Minimum for entire rail line	11	4	15	77	92
Maximum for entire rail line	14	7	21	93	114

[a] Large bridges include bridges over the Tanana, Salcha, Delta, and Little Delta Rivers and Delta Creek.
[b] One large bridge would cross the Tanana and two side channels, but for the purposes of the impact analysis in the EIS, it is considered three separate large bridge crossings of the three waterbodies.

The proposed rail line would require construction of a major rail bridge across the Tanana River on one of the Salcha alternative segments. There are two options for the bridge location along Salcha Alternative Segment 1, and one proposal for the crossing on Salcha Alternative Segment 2, as described below.

Salcha Alternative Segment 1 Tanana River Bridge

The Tanana River at the proposed crossing location for Salcha Alternative Segment 1 has a relatively narrow channel that appears to be relatively stable based on vegetation and historical aerial photography. At this location, ARRC is proposing to construct an approximately 3,600-foot bridge, widen and upgrade access roads, place channel plugs in side channels to prevent future migration of the main channel of the Tanana River, extend a ADOT&PF revetment, and construct new revetments (see Figures 2-15 and 2-16).

Road improvements to Tom Bear Trail (also known as Grieme Road), Old Richardson Highway between Tom Bear Trail and Bradbury Road, and Bradbury Road would include widening and resurfacing.

ARRC would place several channel plugs in two channels on the west side of the Tanana River to ensure that surface water does not inundate the channels during high-water events. This would prevent the Tanana River from trying to reclaim these channels as major stems of the braided river system. ARRC would also combine two channels on the west side of the Tanana River into one at the northern-most crossing location. A natural bottom pipe structure would be sized to accommodate local drainage and fish habitat needs.

ARRC is proposing two options for stabilizing the eastern bank of the Tanana River. The first option would raise and extend Tom Bear Trail to act as a levee along an existing section line easement (see Figure 2-15). This levee would tie into a revetment to be constructed on the eastern side of the main channel of the Tanana River.

The second option would extend the eastern bank revetment upstream nearly 2 miles to an existing ADOT&PF revetment (see Figure 2-16). This revetment extension would prevent surface floodwater from inundating private property in the immediate area and force it under the proposed Tanana River bridge. The levee would either be placed in the Tanana River or along its bank. This revetment would not address groundwater up-welling associated with flooding in the area.

Salcha Alternative Segment 2 Tanana River Bridge Option

At the proposed location of the Tanana River bridge on Salcha Alternative Segment 2, the Tanana River has multiple channels that are widely dispersed and show greater fluctuation in both morphology and the volume of water carried than at the proposed Salcha Alternative Segment 1 bridge location. ARRC has indicated that highly permeable gravel to depths exceeding 50 feet at the Salcha Alternative Segment 2 crossing location makes it impractical to construct in-stream structures to control the volume of water in each channel, making crossings of individual channels impractical, and that a bridge structure over the entire length of the river channel would be approximately 6,100 feet long. As discussed further in Appendix D, ARRC has stated that a bridge of this length would be cost-prohibitive because it would cost approximately $80 to $100 million more than the Salcha Alternative Segment 1 Tanana River crossing. To provide an alternative with a bridge length comparable to that of Salcha Alternative Segment 1, ARRC has proposed forcing the flow of the river along the north bank, using revetments, multiple channel plugs, and fill in the river bed on the south side (see Figure 2-17; see also Appendix D for additional information on alternative crossing concepts considered but eliminated from detailed study). With this approach, the bridge would be approximately 4,000 feet long.

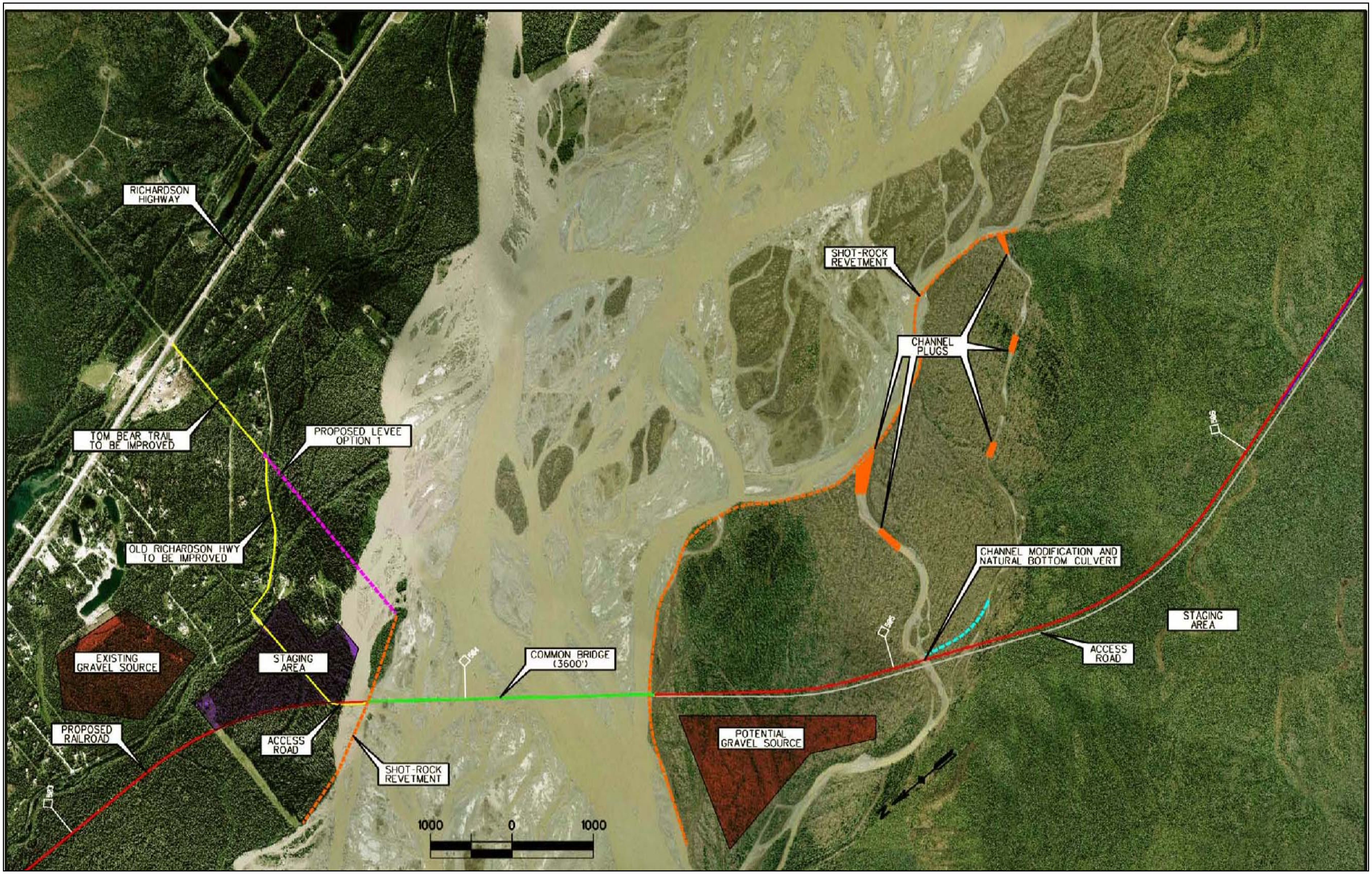

Figure 2-15 – Salcha Alternative Segment 1 Tanana River Crossing Option 1

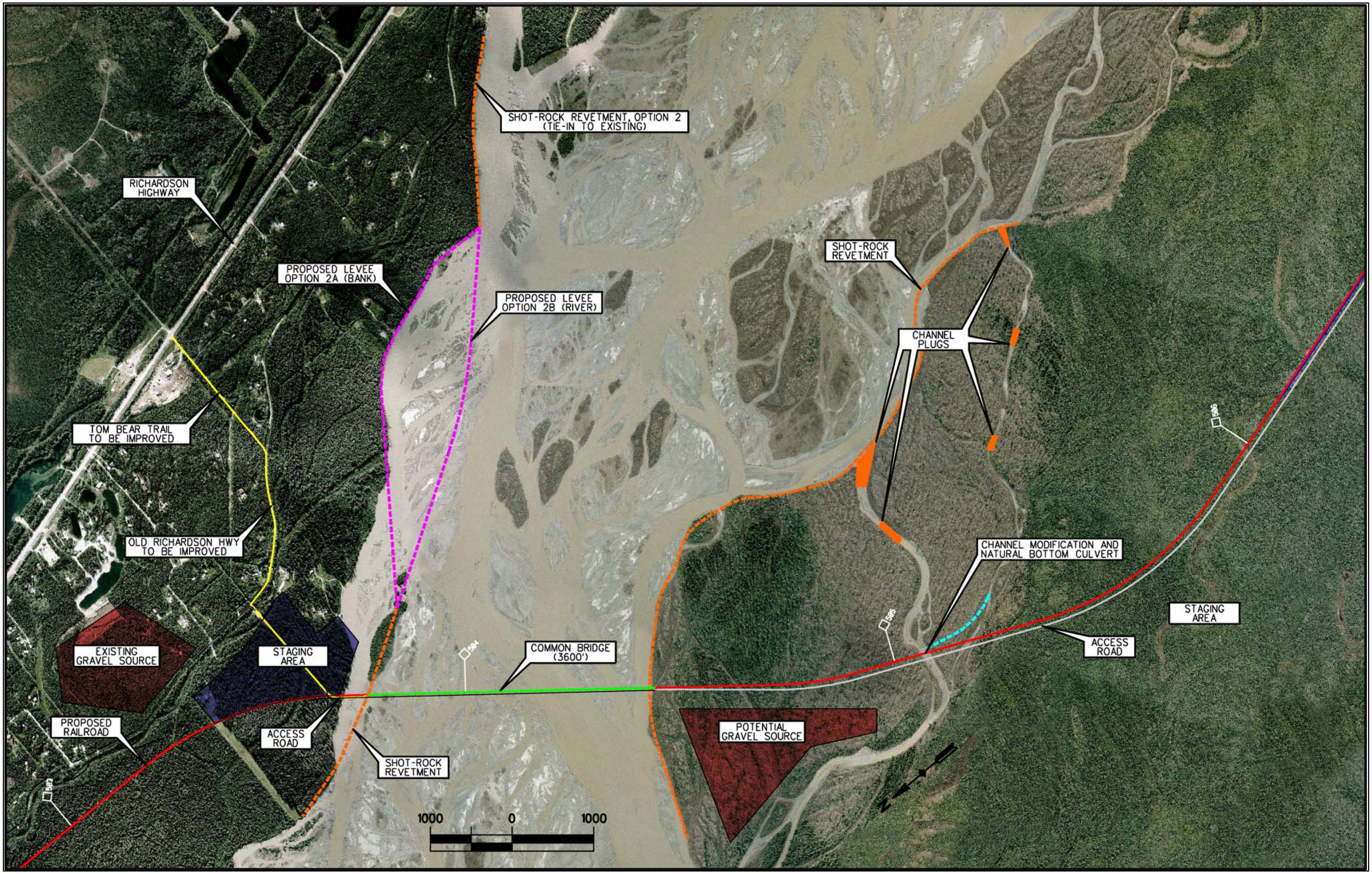

Figure 2-16 – Salcha Alternative Segment 1 Tanana River Crossing Option 2

Figure 2-17 – Salcha Alternative Segment 2 Tanana River Crossing

For either Salcha Alternative Segment 1 or 2, the Tanana River bridge would be a dual-modal bridge capable of providing both rail and vehicular access across the Tanana River. The bridge would consist of steel deck girders up to 150 feet long, supporting a common railroad-roadway deck (see Figure 2-18). The deck would be supported by concrete piers. These piers would either be excavated or driven to depth or have additional foundation features below the normal water surface elevation.

River training structures would consist of armored revetments, bank stabilization, and secondary channel plugs. The revetments would consist of rocks to protect the bank and would extend from the river floor to an elevation above the predicted 100-year flood elevation to hold back surface water (see Figure 2-19). Where revetments extended into the river, it is possible that the area behind them would fill with material. ARRC would maintain access roads on or behind revetments for inspection and maintenance.

Vehicular bridges would be required during construction for the movement of equipment, materials, and labor along the west side of the Tanana River. ARRC does not plan to construct vehicular bridges for the access road on the east side of the river because of the multiple points at which the rail line ROW could be accessed from existing roads. Rail bridges would not be wide enough to accommodate large earth-moving equipment (greater than 18 feet wide) and would not be useable for vehicles once track is placed on them. The vehicular bridge spans would be equal to or wider than the rail bridge spans. ARRC would likely use prefabricated spans obtained from commercial sources placed on pile piers and abutments. Following construction, vehicular bridges would be left in place to support long-term operation of the rail line and for possible use by the military.

Culverts would be built into the railbed and vehicle roadbeds to allow water to flow under the rail line and access roads. The project would require between 77 and 93 culverts along the rail line. On the west side of the Tanana River there would be culverts for the access road at between 55 and 80 locations. Culverts would be designed to allow fish passage when necessary.

In addition, major rail bridge crossings would also be required at Little Delta River, Delta Creek, Delta River, and—for one alternative segment—the Salcha River. Major rail bridges would include a combination of 150-foot main spans (for the Tanana River crossing), and combinations of 75-foot (see Figure 2-20) and similar 35-foot spans, and abutments. Numerous other crossings of smaller water systems would also be required. Small rail bridges would range between 40 and 800 feet in length and would include a combination of shorter to medium span lengths.

Temporary bridges, ice roads, or scaffolding might be needed to aid in construction of some of the bridges. These structures would be removed after bridge construction was completed.

At a minimum, large rail bridges would be designed for a 100-year flood to pass through with less than 1 foot of rise in the tail-water elevation. The designs would also consider local and broad backwater effects associated with large flood events on major tributaries, including potential flooding scenarios associated with the Chena River Flood Control project. At a maximum, large rail bridges would span a channel's width, as measured from vegetation to vegetation. Final bridge lengths would be determined during the final design process. Small bridges and culverts would also be designed for the 100-year flood stage.

ARRC would likely use prefabricated bridge sections for rail bridges to the greatest extent possible to limit the duration of bridge construction and area required for staging. Existing

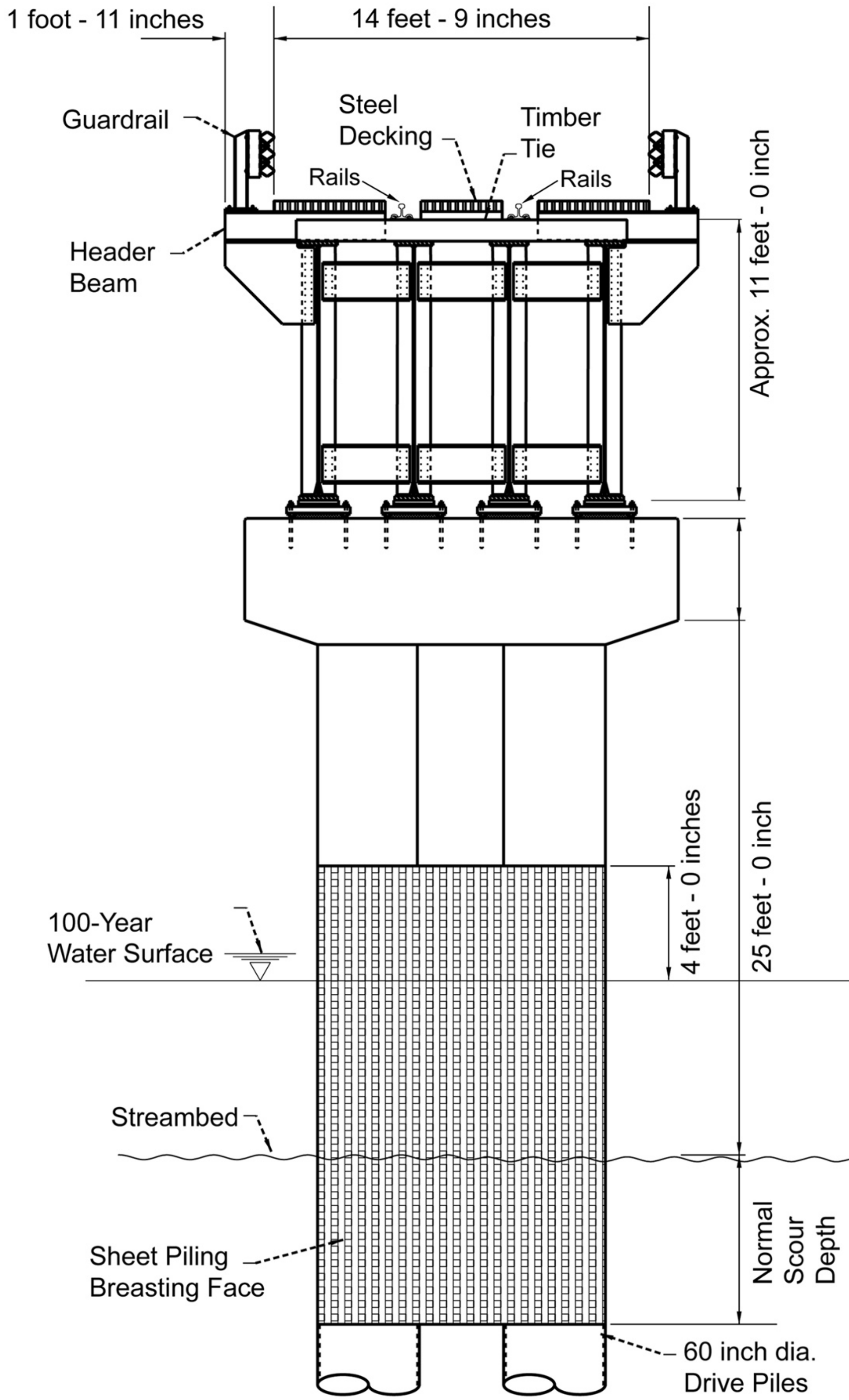

Figure 2-18 – Typical Cross Section of the Tanana River Bridge

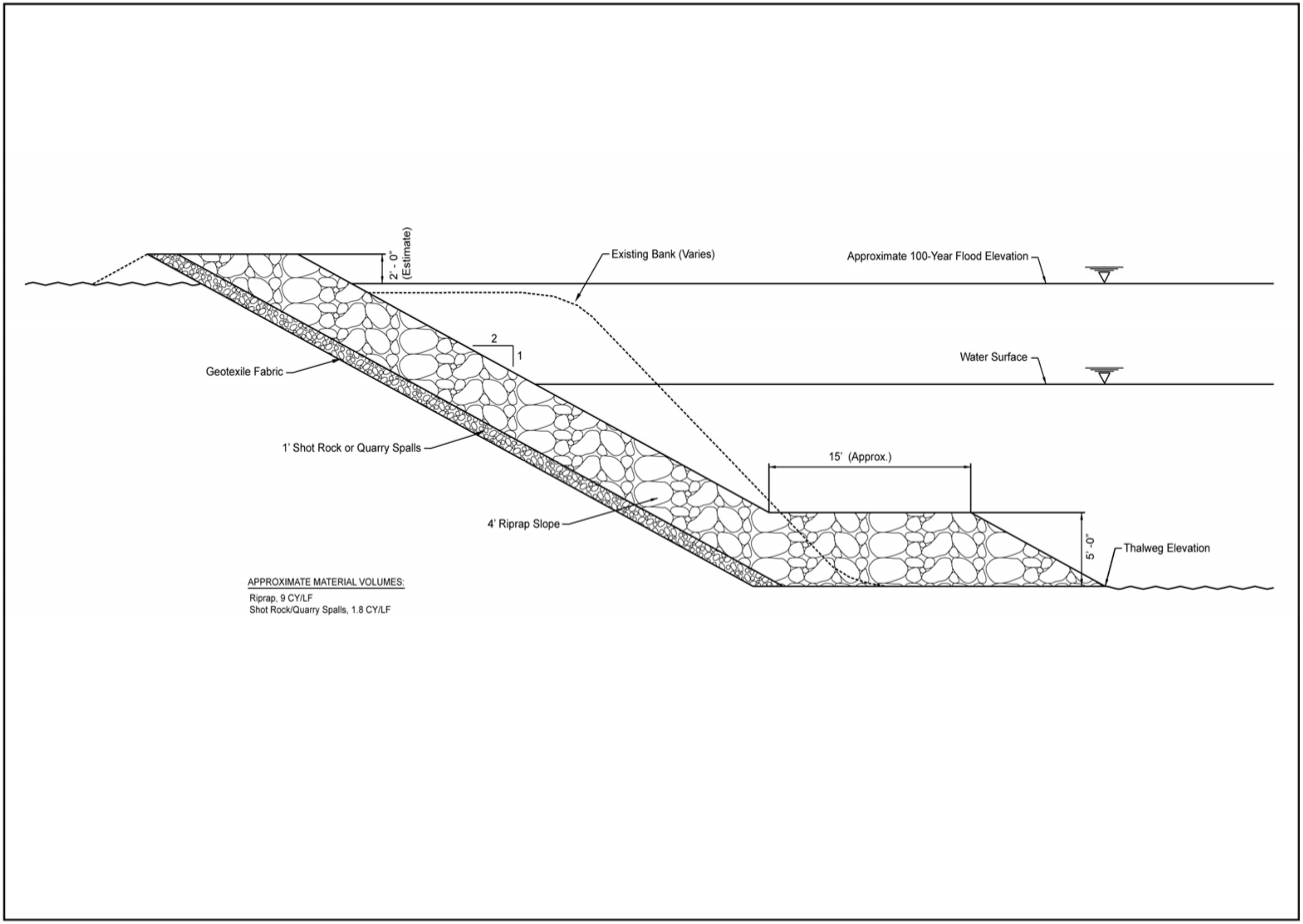

Figure 2-19 – Typical Cross Section of a Revetment

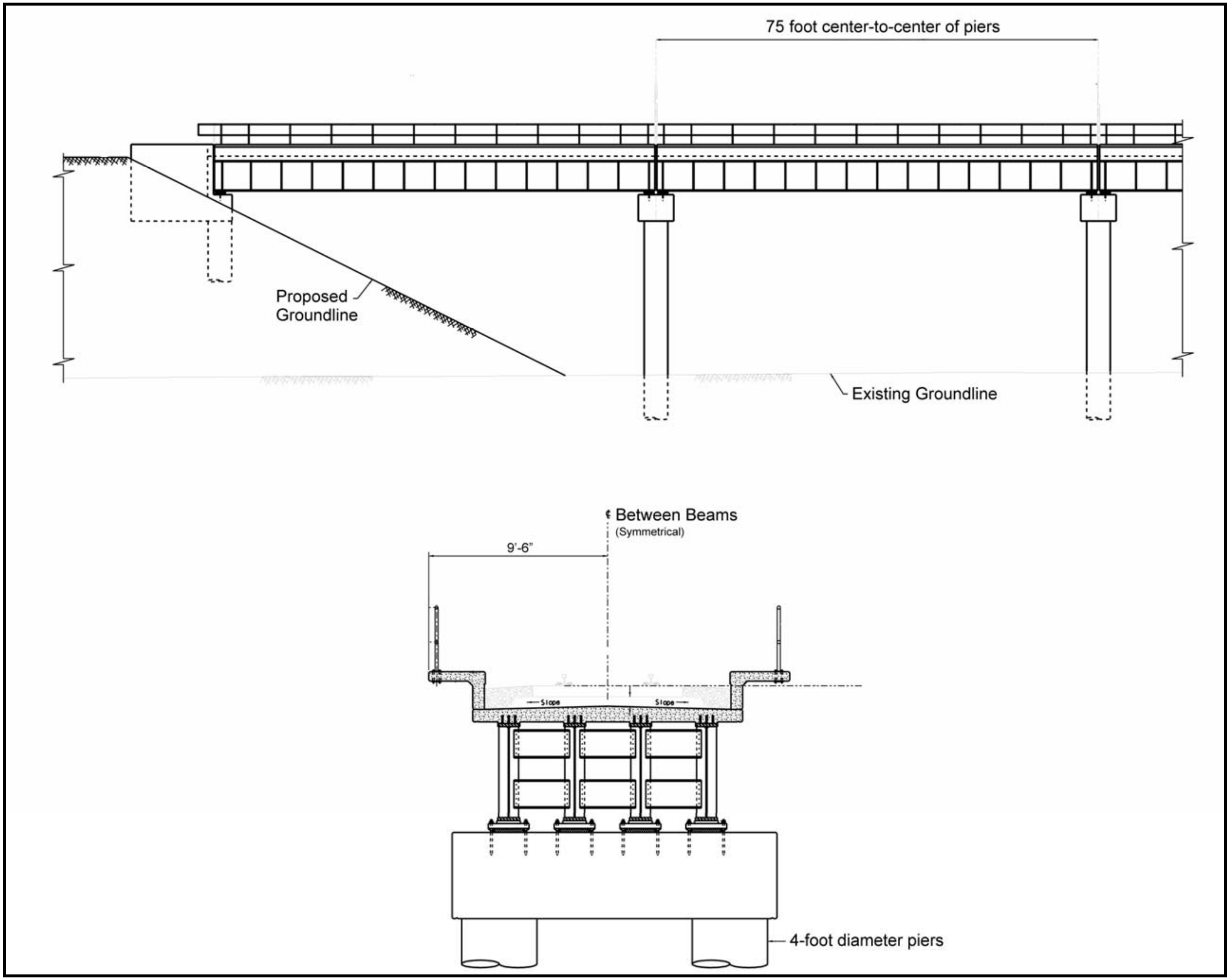

Figure 2-20 – Typical Profile (top) and Cross Section (bottom) of a 75-foot-span Bridge

manufacturers would supply the bridge sections, additional steel, and concrete required for bridge construction.

ARRC would start constructing bridges and large culverts before other infrastructure because they would take longer to construct and would be needed for construction activity. Most bridge foundation work likely would take place during the winter, when frozen conditions would facilitate access across rivers and avoid the need for temporary construction bridges.

Each bridge would require a bridge staging area. Most bridge staging areas would require approximately 1 acre along the closest alternative segment and would likely be in the 200-foot ROW. The staging areas for the Salcha Alternative Segment 1 and Salcha Alternative Segment 2 Tanana River crossings would cover approximately 43 acres and 84 acres, respectively, and would extend outside of the 200-foot ROW. Crossings of the Delta River, Little Delta River, Delta Creek, and the Salcha River could require bridge staging areas up to 5.7 acres.

Construction Schedule

The timeframe for construction would depend on funding, which could lead to one of three construction scenarios—a full construction scenario; a phased construction scenario with the Tanana River bridge constructed before railroad construction; or a phased construction scenario with the Tanana River bridge constructed after the first 13 or 18 miles of rail line from the Eielson Branch to the Tanana River.

Under a full construction scenario, construction would begin at both ends of the alignment from North Pole and Delta Junction and meet near the Little Delta River or Delta Creek crossing. ARRC anticipates that the project would be finished in 3 to 4 years under this scenario.

With a phased scenario, construction of the Tanana River bridge could start prior to railroad construction due to the long lead time associated with the bridge spans and a logistical need to complete the bridge early in the project to facilitate construction of the rail line on the southwest side of the Tanana River. Under this scenario, the Tanana River bridge could be constructed several months or years before the rail line is constructed. This scenario would require an interim rail-to-truck transload and staging site for materials and equipment shipped to the Fairbanks area via the existing Alaska Railroad system. Two potential locations have been identified for this staging site and are described in more detail previously in the Construction Staging Areas section.

Alternatively, another phased construction approach could involve the first 13 or 18 miles of the rail line from the Eielson Branch to the Tanana River, depending on which alternative segment was selected. Under this scenario, there would be no need for the rail-to-truck transload and staging site.

Because the Tanana River bridge would be dual-modal, military vehicles could use the bridge to access TAs on the southwest side of the Tanana River prior to completion of the rail line. Access over the dual-modal bridge to the west side of the Tanana River would be controlled by the military before and after the rail line was completed in accordance with a Memorandum of Agreement between ALCOM and ARRC.

With either approach, construction would be conducted throughout the year, although severe weather would limit winter-time construction to land clearing activities, material and equipment staging, most bridge construction, and interior work associated with facility buildings. The specific timeframe and sequence of construction would depend on funding, final design, and permit conditions, such as requirements to avoid sensitive breeding periods for migratory birds and raptors and when salmon redds are present.

Grade Crossings

To maintain access to existing public and private roads and trails across the rail line, ARRC would install grade crossings where the rail line would cross a roadway. In places where the rail line would cross the Alaska or Richardson Highway, ARRC proposes to grade separate the crossings. Where the rail line would cross paved, public roadways, the routes would cross at grade and active warning devices, such as flashing lights and gates, would be installed. Where the rail line would cross unpaved roads and private crossings, the routes would cross at grade and ARRC would install passive warning devices such as crossbucks and stop signs. Where the rail line would cross legally authorized trails and FNSB trail easements, ARRC has indicated that the crossings would likely be grade separated.

In locations where ARRC would construct grade-separated crossings for the Alaska and Richardson Highways, additional staging work spaces outside the 200-foot ROW likely would be required.

2.3.4 Rail Line Operations Support Facilities

The proposed action includes the construction and operation of several rail line support facilities that would be required for proper operation of the proposed rail line. These permanent facilities would include:

- A passenger facility;
- Section facilities;
- Communications towers; and
- Track sidings.

These facilities would be constructed at the same time as the rail line. Shippers might want to construct offloading facilities along the proposed rail line; however, no offloading facilities are being proposed at this time.

Passenger Facility

The proposed action includes a passenger depot in Delta Junction. ARRC would construct the depot according to U.S. Department of Transportation (USDOT) and Federal Transit Administration (FTA) regulations and guidance regarding passenger accommodation and platform height. This facility would likely be collocated with the end-of-track facilities, such as a maintenance facility and a loading dock. The passenger station would be approximately 1 acre, including an access road and parking area; provide protection from the weather; and possibly accommodate automated ticketing.

The passenger depot associated with Delta Alternative Segment 1 would be located off the Alaska Highway (see Figure 2-21) and would be partially on Fort Greely property.[2] The passenger depot associated with Delta Alternative Segment 2 would be located off Emmaus Road. The rail line approach and the location of the passenger terminal for Delta Alternative Segment 2 would interfere with the intersection of Emmaus and Nestler Roads and block access to a subdivision off Emmaus Road. ARRC is proposing to reroute the intersection and construct a new access road to the subdivision from Nestler Road (see Figure 2-22).

[2] A security evaluation would be required in conjunction with development of facility details during final design.

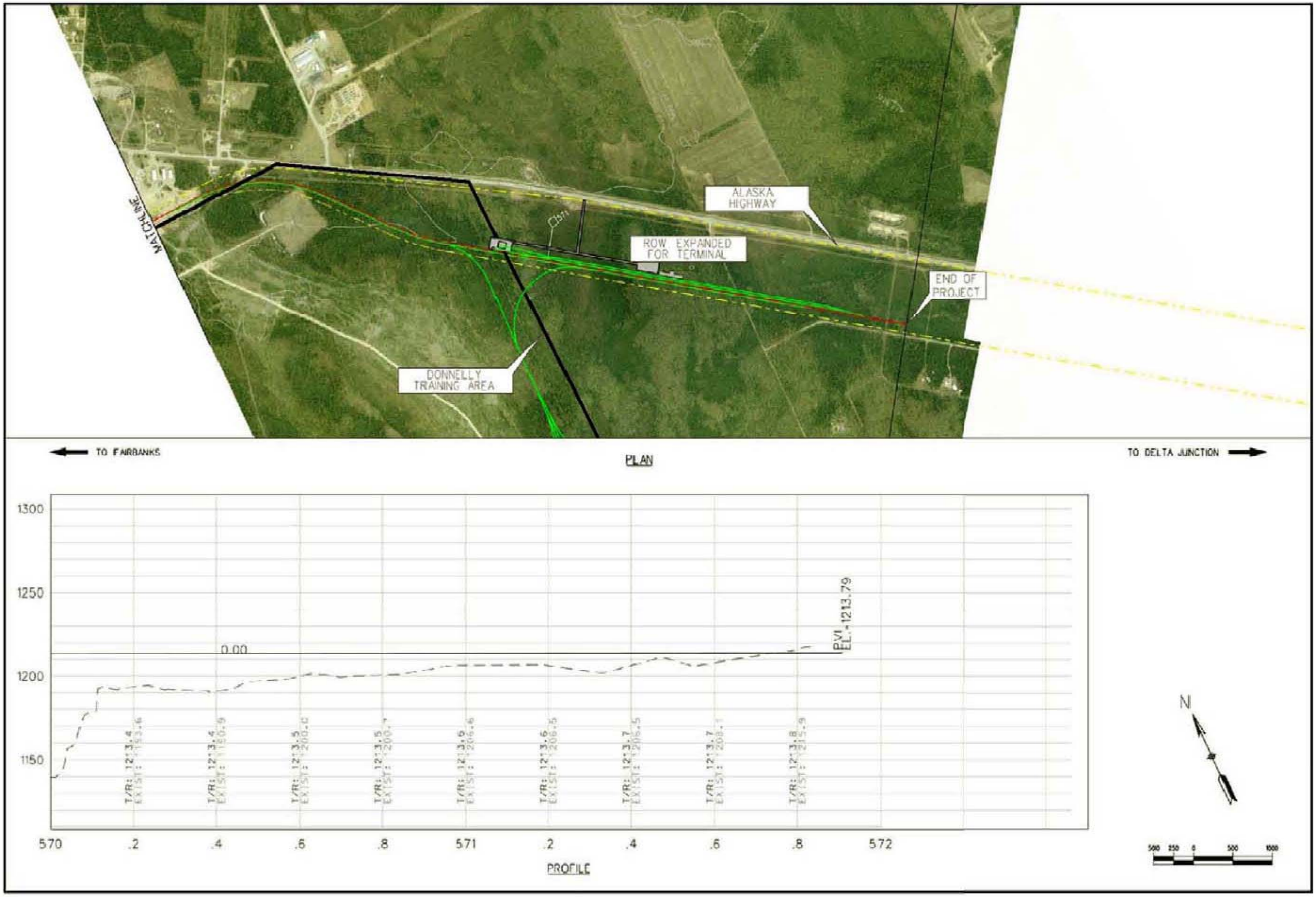

Figure 2-21 - Delta Alternative Segment 1 Passenger Facility

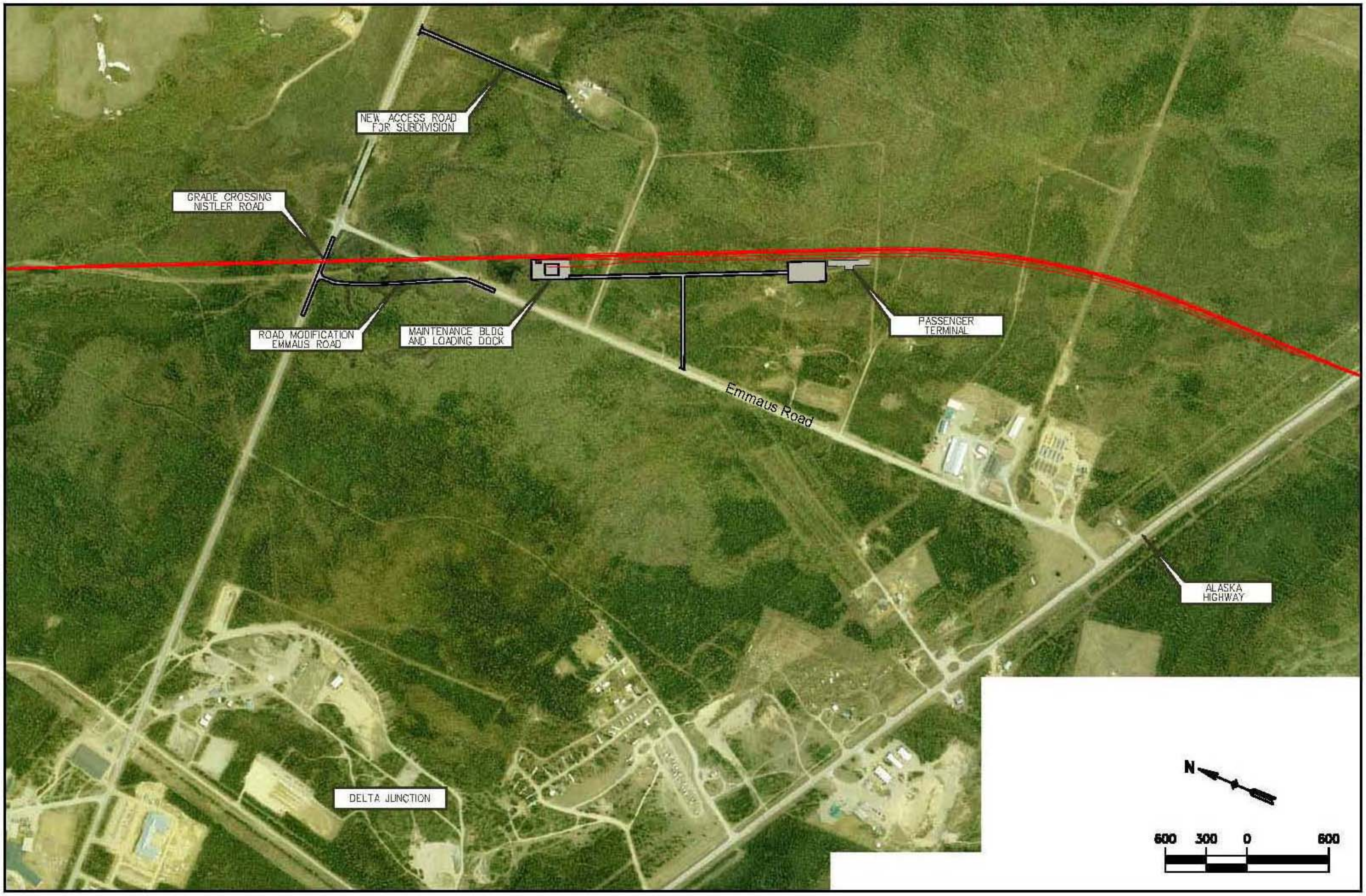

Figure 2-22 – Delta Alternative Segment 2 Passenger Facility

Section Facilities

ARRC would construct facilities at Delta Junction and at the bridge on the north side of the Tanana River. The Delta Junction facility would include the capability to spot a locomotive or rolling stock within the building for storage/light repair. The facility adjacent to the Tanana River bridge would be south of Piledriver Slough along Bradbury Road if Salcha Alternative Segment 1 were selected. If Salcha Alternative Segment 2 were selected, the facility would be in the vicinity of the staging area shown in Figure 2-17.

Communications Towers

Communications towers would be situated at six locations along the proposed rail line to provide for communications with the train crew. ARRC would construct three new tower sites along Moose Creek bluff, Site A, and Site B. Each new tower site would cover approximately 0.2 acre. Towers would be lit if required by the Federal Aviation Administration and would have a maximum height of 180 feet. The sites would require creation of access roads if they are not accessible by existing roads, except for remote sites, which would have helicopter access rather than road access for construction and operation.

ARRC also proposes to use existing State of Alaska towers at three locations—Harding Lake, Canyon Creek, and Delta Junction.

- **Moose Creek Bluff Communication Tower** would be a new tower located near North Common Segment, collocated with the Eielson Construction Staging Area. This site would require a permanent new access road within the Eielson Construction Staging Area.

- **Site A Communication Tower** would be a new tower located near Salcha Alternative Segment 1 in the Tanana Flats TA (or on ADNR land). This site would require a permanent access road.

- **Harding Lake Communication Tower** is an existing tower located on Flag Hill, near Salcha Alternative Segment 2. This site would use existing access roads.

- **Canyon Creek Communication Tower** is an existing tower along Richardson Highway between the Salcha and Big Delta communities. This site would use existing access roads.

- **Site B Communication Tower** would be a new tower located near South Common Segment, situated on high ground south of Delta Creek. This tower would have an access road connecting from an ADNR winter trail.

- **Delta Junction Communication Tower** is an existing tower located near Delta Alternative Segment 2, on high ground northeast of the terminus. This site would use existing access roads.

Track Sidings

ARRC would construct up to seven 6,200-foot ("in clear" length) sidings to allow train passage and/or access to rail services. The ARRC design and operation criteria indicate that sidings should be provided at every 20 minutes of running time along the route. Sidings would be placed, where possible, on tangent sections of the alignment. All sidings would be in the 200-

foot ROW. Two of the seven sidings might be located in conjunction with potential offloading facilities for the military at the Tanana Flats TA and Donnelly West TA.

Offloading Facilities

ARRC anticipates that the military might need offloading facilities along the NRE. These facilities could be located near the rail line terminus in Delta Junction, on the west side of the Tanana River just past the Tanana River bridge, and near the Donnelly TA along Donnelly Alternative Segment 1 or 2. Because the need for offloading facilities is uncertain, construction of such facilities for military use is not part of the proposed action.

Rail Line Operations and Traffic

After construction of the rail line, trains could transport commercial freight, military equipment and supplies, and passengers. Transport of military equipment, supplies, and personnel could support the operations of the U.S. Army at the Tanana Flats and Donnelly TAs. Commercial freight could include aggregate, agricultural products, building supplies, fertilizer, forest products, and petroleum products. Military shipments could include building supplies, equipment, fuel, munitions, troop food supplies, personnel, and vehicles

Train frequency would vary, but ARRC anticipates an average of approximately four round-trip passenger trains per day and one round-trip freight train per day, with approximately 13,000 loaded freight cars per year. Table 2-4 shows the annual frequency based on type of service the train would provide. Passenger service would involve four round trips per day (two in the morning and two in the evening) between the Fairbanks Intermodal Center and Delta Junction. Military train traffic for training activities, if requested, is assumed to originate at Fort Wainwright's offloading facility and travel to the Tanana Flats and Donnelly TAs. Train traffic between the Port of Anchorage and Fort Wainwright for DoD forces outside of Alaska could increase as a result of construction and operation of the NRE.

Table 2-4
Train Frequency

Type of Service	Round Trips Per Year
Freight Service	365
Passenger Service	1,460
Total Trains	1,825

Source: ARRC, 2007f

Some military traffic might elect not to access the Tanana Flats or Donnelly TAs by rail and instead access the TAs on the west side of the Tanana River using the vehicular portion of the dual-modal Tanana River bridge. In these instances, the military traffic would travel southward on Richardson Highway from the Fort Wainwright Main Post or Eielson AFB to the access road for the Tanana River bridge. The distance traveled on Richardson Highway would depend on which Salcha alternative segment was selected. Once on the west side of the Tanana River, the military could use existing trails or the access road parallel to the rail line to access the TAs.

Train lengths would vary depending on whether ARRC was transporting passengers or commercial and military freight. ARRC estimates that passenger train lengths would be 260 feet or less, depending on the type of equipment used. For passenger service, ARRC may use a diesel motorized unit or a locomotive with two coach cars, which could have a total capacity of approximately 185 passengers. Freight trains would be approximately 2,200 feet long.

Train speeds would be a maximum 79 miles per hour miles per hour for passenger trains and 60 miles per hour for freight trains.

Rail Line Maintenance

ARRC would conduct periodic maintenance and inspections to ensure operation of a safe and reliable rail line. The primary maintenance activities would include signal testing and inspection; minor rail, tie, and turnout replacement; and routine ballasting and surfacing tasks. Additional activities would be performed on an as-needed basis and would include vegetation control, snow removal, and vehicle and equipment maintenance.

2.4 Comparison of Environmental Impacts

Council on Environmental Quality NEPA implementing regulations require a comparison of the environmental impacts of the proposed action and alternatives to the proposed action, in order to sharply define the issues and provide a clear basis for choice among options (see 40 CFR 1502.14). This section compares the environmental impacts of the proposed action alternatives based on the information and analysis presented in the resource chapters. Sections 2.4.1 through 2.4.14 summarize potential impacts identified in the resource chapters. For more detailed impacts information, refer to each resource chapter.

2.4.1 Topography, Geology, and Soils

Impacts on soil from construction of the proposed rail line would mostly be associated with excavation and fill activities to provide the desired elevation and grade of the railbed, or with removal of compressible soils that are unsuitable for construction. The existing soil profile would be eliminated in areas subject to excavation or filling. Salcha Alternative Segment 2, Donnelly Alternative Segments 1 and 2, and Delta Alternative Segment 1 would require grading and fill to meet the design standard of no more than a 1-percent grade for the rail line. Construction of the railbed would cause some thawing of the permafrost, potentially leading to irregular subsidence of the surrounding soil. The predicted amount of permafrost encountered by each segment would range from 5 to 90 percent of total segment ROW area, and overburden would range from 2 feet to 14 feet. Among the sets of alternative segments, Salcha Alternative Segment 2 (75 to 90 percent, 2 to 7 feet overburden), Central Alternative Segment 1 (2 to 75 percent, 7 to 14 feet overburden), and Donnelly Alternative Segment 1 (5 to 90 percent, 2 to 14 feet overburden) would encounter substantially larger areas of permafrost than their counterparts (see Table 2-5 at the end of this chapter for area and overburden for all segments). Seismic activity in the area could affect any location on the proposed NRE. Both Salcha Alternative Segments 1 and 2 would cross the Salcha seismic zone, but mass wasting events such as landslides, rockslides, or slump would be more likely to affect Salcha Alternative Segment 2.

2.4.2 Water Resources

Impacts to water resources from construction of the proposed NRE could result from the building of unpaved access roads, excavation of gravel for use in construction, construction of bridges and culverts, use of ice roads and ice bridges, water supply withdrawals, transportation, and staging areas. The relevant effects of these activities on surface water, water quality, groundwater, wetlands, and floodplains are discussed below; Table 2-5 at the end of this chapter highlights the distinguishing impacts by segment.

Surface Water and Water Quality

Bridges and culverts would be used to convey water under the rail line and on the west side of the Tanana River, under the access road. Bridges would either completely or partially span (or clear) the stream channel and would require that construction occur along the streambanks (*i.e.*, to construct abutments) and/or in the channel (*i.e.*, to construct piers and footings). Culverts would require work to be completed in the channel and along streambanks. Impacts from bridges could include changes to natural drainage, sloughing and erosion of the streambank, impacts to permafrost, increased stages and velocities of floodwater, and increased channel scour or bank erosion. The construction of single or multiple culverts in waterbodies could result in localized disturbance of waterway banks to gain access to the channel and disturbance of the channel bed when installing the culverts. The installation of bridges and culverts would result in temporary impacts to water quality from increased sediment transport, increased sediment load, and increased turbidity due to bank and waterbody bed disruption.

Table 2-5 at the end of this chapter lists the numbers and types of crossings for each common and alternative segment. Generally, the more bridges or culverts along a given segment, the greater the occurrence of these impacts; however, the magnitude of effects at individual crossings would also depend on site- specific factors. Eielson Alternative Segment 3 would have more culverts than Eielson Alternative Segment 1 or 2 (14 versus 13 and 10, respectively), but Eielson Alternative Segments 2 and 3 would have more small bridge crossings than Eielson Alternative Segment 1 (3 each versus 1). Both Salcha Alternative Segment 1 and 2 would have a bridge crossing of the Tanana River. However, the anticipated impacts would differ, primarily due to differences in the location and extent of revetments and channel alterations and fill. Salcha Alternative Segment 2 would have more bridge crossings than Salcha Alternative Segment 1 (2 versus none for small bridges, and 4 versus 1 for large bridges). In addition, Salcha Alternative Segment 2 would require a bridge over the Salcha River. Central Alternative Segment 2 would have more small bridge crossings than Central Alternative Segment 1 (2 versus 1). Among the connector segments, E and C would have the most culvert crossings (5 and 4, respectively), and C and D would have the most small bridge crossings (3 versus 1 for all other connector segments). Both Donnelly Alternative Segments 1 and 2 would have bridge crossings of the Little Delta River and Delta Creek. Donnelly Alternative Segment 2 would have many more culverts than Donnelly Alternative Segment 1 (44 versus 31), but Donnelly Alternative Segment 1 would have two additional small bridge crossings (4 versus 2). Both Delta Alternative Segments 1 and 2 would have a bridge crossing of the Delta River. Delta Alternative Segment 1 would have a single culvert crossing, the only culvert crossing along either Delta alternative segment. Large bridge crossings along the Salcha, Donnelly, and Delta alternative segments would all likely result in impacts to surface waters due to altered flood hydraulics, increased scour surrounding the piers and downstream aggradation, and could increase the potential for overbank flooding and/or ice/debris jams.

Groundwater

Impacts to groundwater could include effects to infiltration, increased groundwater discharge through ponds created by borrow areas, permanent changes to permafrost thickness and vertical location of the active thaw zone, and temporary groundwater elevation declines from pumping. The extraction of materials from the borrow areas along all common and alternative segments, except Delta Alternative Segment 2, would likely affect groundwater due to the changes in local hydrogeologic regime resulting from the removal of saturated materials and the creation of new ponds that would serve as sources of groundwater discharge through evaporation during the summer and sources of groundwater recharge during the break-up and major rainstorms.

Wetlands

A total of 33 percent of the area within 500 feet of the proposed alternative segments is wetlands. Assuming that the amount of wetlands on the sites of proposed ancillary facilities is the same as the area in general, 203.3 acres of wetlands would be affected by the facilities. In addition, construction in the ROW of each of the proposed alternative segments would affect wetlands. The ROW of the Applicant's preferred route includes 1,046.3 acres of wetlands and other waters. The minimum area alternative would include 884 acres of wetlands and other waters, while the maximum area alternative would include 1,111 acres. Among the sets of alternatives, Eielson Alternative Segment 3 (100.3 acres), Salcha Alternative Segment 2 (262.3 acres), Connector Segment A (56.2 acres), Central Alternative Segment 1 (51.0 acres), Donnelly Alternative Segment 1 (397.0 acres), and Delta Alternative Segment 1 (94.9 acres) would affect substantially greater areas of wetlands and other waters than their counterpart alternative segments (see Table 2-5 at the end of this chapter for wetland acreages by wetland type for all segments).

Floodplains

Portions of the proposed NRE would be constructed within the floodplain of the Tanana and Delta Rivers and some of their tributaries. Portions of the rail line, access road, staging areas and construction camps would likely be placed within the 100-year flood zone. The affected areas would be small compared to the total floodplain storage available; thus, effects on floodplain storage would be minimal. Borrow areas in the floodplain could alter the hydraulics and conveyance of the watercourse during flood stage, leading to a short-term increase in flood storage and/or the development of meander cutoffs and a change in sinuosity of the affected reaches. Effects would be more likely in streams crossing broad shallow floodplains and less likely for entrenched streams. At the sites of the Tanana River bridges on Salcha Alternative Segments 1 and 2, rock revetments (and a levee, in the case of Option 1 for Salcha Alternative Segment 1) would control surface flow and reduce the width of the floodplain near the bridge, but would not prevent flooding from groundwater upwelling on the upland side of the revetments. There are a number of differences among alternative segment groups in terms of floodplain impacts. Central Alternative Segment 2 would lie within the 100-year floodplain, while Central Alternative Segment 1 would lie outside it. Connector Segment A would lie within the 100-year floodplain, E and C would lie in the 100-year floodplain along half their routes, and B and D would be outside the 100-year floodplain.

2.4.3 Biological Resources

Vegetation Resources

Impacts on vegetation would occur through direct clearing for construction of the rail line, access roads, and other support facilities, and through the introduction and spread of noxious and invasive plants. Estimated vegetation clearing for common support facilities would be 721.6 acres. The Applicant's preferred route would result in the clearing or filling of a maximum of approximately 2,818.6 acres of vegetation. The minimum area alternative would affect approximately 2,791.3 acres, while the maximum area alternative would affect 2,885 acres of vegetation. See Table 2-5 at the end of this chapter for cleared vegetation acreage by segment. Vegetation clearing would be a long-term impact for forest communities due to the length of recovery time and the need to maintain cleared areas adjacent to the rail line and access road.

There are no threatened, endangered, or candidate plants protected by Federal or State of Alaska government agencies within the project area; 27 rare plants are known to occur in the vicinity of the project area and one rare willow was identified within the project area during field investigations for wetlands..

Fisheries Resources

Construction of the rail line would result in short-term disturbance and long-term habitat modification to fisheries. Construction- and operations-related impacts would include the loss or alteration of instream and riparian habitats, mortality from instream construction, possible blockage of fish movement during in-stream construction activities, and degradation of water quality. All alternative segments would cross streams or waterbodies with fish resources and would potentially cause the impacts discussed above. The proposed NRE would cross 27 fish-bearing streams. Among the sets of alternatives, the following segments would result in substantially greater numbers of fish stream crossings than their counterpart alternative segments: Eielson Alternative Segment 3 (7 crossings), Salcha Alternative Segment 2 (9 crossings), Connector Segments C and D (6 and 4 crossings, respectively), and Donnelly Alternative Segment 2 (8 crossings). Table 2-5 at the end of this chapter provides the total number of fish stream crossings and the number of anadromous and spawning stream crossings for each segment. Construction and operation of the Tanana River bridge and in-river revetments and channel plugs associated with Salcha Alternative Segments 1 and 2 would have direct adverse impacts on aquatic habitat in the vicinity. Regarding the proposed Salcha Alternative Segment 2 crossing of the Tanana River, ADNR has stated that flow through the side channel, which would be blocked and redirected by the proposed bridge design, is critical for anadromous fish use of the area.

Wildlife Resources

The environmental consequences of construction and operation of the proposed NRE on game mammals (particularly, bears, caribou, moose, wolves, bison, and furbearers) would be influenced by the animal's dependence on specific habitats, the availability of preferred and used habitats, the amount of preferred habitat affected by the project, ecology and life history, and past and current population trends. Common construction-related impacts would include habitat loss and fragmentation, direct mortality from construction, reduced winter survival and lowered breeding success from exposure to construction noise/human activity, and reduced survival or mortality from exposure to spills and leaks of fuels and lubricants. The Eielson alternative segments would have the highest moose and furbearers occurrence. Salcha Alternative Segment 1 and Donnelly Alternative Segment 2 would have higher densities of certain wildlife species than Salcha Alternative Segment 2 and Donnelly Alternative Segment 1. Central Alternative Segment 2 and Connector Segments B, C, and D would contribute to the fragmentation of large areas of closed needleleaf forest core habitats, resulting in mixed effects to wildlife. All game mammals except bison would be expected to be more common along Delta Alternative Segment 1 than Delta Alternative Segment 2. Among the sets of alternatives, the following segments would result in substantially greater losses of habitat for most game mammals than their counterpart alternative segments: Salcha Alternative Segment 2, Connector Segment A, and Central Alternative Segment 1 (see Table 2-5 at the end of this chapter for habitat acreages by species for all segments).

Bird Resources

In general, the proposed NRE would affect a small proportion of the available habitat and the total avian population within the project area, with the greatest potential for impacts to forest nesting raptors, owls, and landbirds. The proposed NRE would reduce the amount of available habitat for nesting and migratory birds within the Tanana River Valley. Segments constructed through late-succession forest habitats would have the greatest impact on forest nesting landbirds. Power lines and communications towers built to support the rail line would increase collision mortality for all birds, especially when placed near raptor nests and foraging sites or between wetland or agricultural foraging habitats and riverine roosting habitats used by sandhill cranes, geese, swans, and ducks during migration. Twenty-five bird species of conservation concern and seven bird species listed as BLM Alaska Special Status Species have been documented using the project area and would be affected by reduced habitat availability and suitability. Table 2-5 at the end of this table describes relevant owl and raptor effects for each segment; a general overview of the notable differences among segments in alternative segment sets is presented below. Construction of Eielson Alternative Segments 1 and 2 and Central Alternative Segment 2 would result in impacts to identified bald eagle and other large-raptor nests, while Eielson Alternative Segment 3 and Central Alternative Segment 1 would not. Construction of Salcha Alternative Segment 2 would have a notably larger effect on nesting raptors than Salcha Alternative Segment 1. Construction of Connector Segments A and B would affect one nesting pair of owls, while Connector Segments B, C, and D would contribute to the fragmentation of raptor habitat. Construction of Donnelly Alternative Segment 2 would affect two raptors or their nests, while Donnelly Alternative Segment 1 would affect one raptor nest.

2.4.4 Cultural Resources

Surface and subsurface disturbances from construction activities generally would be the source of potential direct effects to historic properties and archaeological sites; indirect project effects could result from increased erosion and watershed changes. Impacts to these resources could include direct disturbance or destruction, contamination of organic residues of a site, exposure of archaeological resources, impacts to the aesthetics and visual site setting (depending on proximity), and changes to groundwater that affect soil pH level and harm the preservation of buried artifacts.

Negligible impacts to prehistoric and historic resources are expected from North Common Segment, the Eielson alternative segments, Salcha Alternative Segment 1, the Central alternative segments, and Connector Alternative Segments A, B, C, and D because they would lie in areas with relatively low archeological sensitivity for prehistoric sites, low or moderate sensitivity for historic sites, and have no known cultural resources within the Area of Potential Effect (APE). Salcha Alternative Segment 2 is in an area that has high potential for both prehistoric and historic sites. A prehistoric site and an historic site lie within or near the APE and are associated with Salchaket Village. The Donnelly alternative segments are located in areas with relatively high potential for prehistoric resources. Donnelly Alternative Segment 1 contains more identified archeological sites than Donnelly Alternative Segment 2. Eight buried prehistoric sites are located within the APE of Donnelly Alternative Segment 1. Seventeen additional cultural resources were identified within 1,312 feet of the APE boundary for Donnelly Alternative Segment 1. Radiocarbon dating indicated that one of the sites is approximately 13,000 years old (after date calibration), which would make it one of the earliest human habitation sites in North America. Four prehistoric archeological sites were recorded along Donnelly Alternative Segment 2, and 11 archaeological sites were identified within 1,312 feet of the APE boundary. Prehistoric sites were also identified within the APE for South Common Segment (low potential for historic and prehistoric resources), and Delta Alternative Segment 2 (moderate potential for prehistoric and high potential for historic resources). No cultural resources were identified within the APE for Delta Alternative Segment 1 (moderate potential for historic and prehistoric resources). Table 2-5 at the end of this chapter identifies the potential impacts to prehistoric and historic resources within the APE by segment.

2.4.5 Subsistence

Subsistence impacts associated with the proposed NRE would result from restrictions on user access to use areas and resource availability in those areas. The project area lies within ADF&G's Fairbanks nonsubsistence designated area, meaning harvests of wildlife and fish in the area do not qualify as subsistence activities and are instead managed under general sport hunting regulations, or by personal use or sport fishing regulations. Potential impacts to subsistence were evaluated by examining changes in use areas, user access, resource availability, and competition. Subsistence resource uses in and near the project area would be affected similarly by the proposed rail line, regardless of the alternative segment selected. Restricted access along the proposed rail line would create a linear barrier preventing free range of hunters across the area. The proposed rail line could limit the prevalence and movement of wildlife in the immediate vicinity, especially west of the Tanana River, which subsistence users from the east generally access by traveling across the river. Moose mortality due to train-moose collisions could affect moose availability and hunting success in the area. More limited access and hunting and trapping success in the area could cause harvesters to utilize use areas of other communities, increasing the number of harvesters competing for resources in those areas. Such effects would be most likely to occur in Delta Junction, Healy Lake, Nenana, Salcha, and Tok. Impacts to resident and anadromous fish resources resulting from construction, including loss of riparian and stream habitat and potential blockage of fish movements, could decrease the availability of these fish species to harvesters. Construction activities would affect harvest activities, depending on construction timing, access points to the use area, and availability of alternative harvest locations.

2.4.6 Climate and Air Quality

SEA evaluated the potential impacts of increased emissions of National Ambient Air Quality Standards air pollutants by developing emissions estimates for construction and operation of the proposed rail line. The estimated emissions for all of the alternative segments would be similar because the length of new rail line would be similar regardless of alternative segment selected. Construction-related and estimated annual average operations emissions would be expected to be small fractions of the Fairbanks North Star Borough (FNSB) total annual emissions and would be minimal in the context of existing conditions. Construction-related emissions of nitrogen oxides (NO_x), particulate matter less than 10 microns (PM_{10}), and particulate matter less than 2.5 microns ($PM_{2.5}$) would range from 0.6 to 0.9 percent of FNSB total emissions for each pollutant. These emissions would be spread over the length of the new rail line and approximately half of the rail line would be outside FNSB. None of the construction would occur in the Fairbanks and North Pole carbon monoxide (CO) maintenance areas, and estimated emissions would be well below the *de minimus* conformity thresholds (100 tons per year for each pollutant). Operations emissions of NO_x would represent the largest increase in comparison with the existing area transportation conditions (highway vehicle emissions), but would still be relatively low. The proposed action would represent a 6.3 percent increase in carbon dioxide (CO_2) emissions by rail operations in Alaska, but the overall effect would be less than an 0.02-percent increase for the state as a whole (ADEC, 2008b).

2.4.7 Noise and Vibration

SEA evaluated whether the alternatives would result in vibration impacts or rail line noise levels (attributable to wayside noise and the locomotive warning horn) that would equal or exceed a 65 decibel day-night average noise level (DNL) and/or result in an increase of 3 a-weighted decibels (dBA) or greater. An estimated 32 noise receptors near the Salcha Alternative Segment 2, and an estimated four receptors near the Eielson Alternative Segment 3 would be exposed to adverse noise effects at greater than 65 DNL and an increase in noise level of 15 to 30 dBA. An estimated 446 receptors along the existing Eielson Branch between Fairbanks Depot and the connection point for the proposed NRE would experience an adverse noise impact at greater than 65 DNL with an increase of 4 to 10 dBA as a result of the increased rail traffic for the proposed NRE. An estimated four receptors along Salcha Alternative Segment 2 would experience vibration levels exceeding the 80 vibration decibels (VdB) criterion for human annoyance. Additional temporary construction noise would be generated from the proposed rock storage and transfer facility adjacent to the Eielson Branch near Eielson AFB. Table 2-5 at the end of this chapter identifies potential noise and vibration impacts by segment.

2.4.8 Energy Resources

The overall potential effects from the proposed rail line on electrical transmission lines, pipelines, recyclable commodities, and demand for energy resources would be negligible. Any change in energy consumption (fuel usage) as a result of the proposed project would be small.

2.4.9 Transportation Safety and Delay

Safety

Using available statistics on accidents per train mile, SEA estimated that the proposed NRE would result in an increase of 0.59 predicted train accidents per year. The increase would be essentially the same for all routes from North Pole to Delta Junction because the difference in the length of the routes is comparatively small. Similarly, the potential consequences of moving 63 hazardous material-containing railcars annually would be the same for all routes. The potential impacts of the NRE on road safety would be small during construction and minimal to potentially positive during operations, which would be equal for all routes. SEA’s analysis of highway-rail grade crossing safety indicates that, during operations, accident frequency at each of the existing public at-grade crossings that would be used by proposed NRE rail traffic would range between a minimum rate per year of 0.0093 and a maximum of 0.413 (*i.e.*, one predicted accident every 2.4 to 108 years). The total estimated increase in predicted accident frequency of 0.54 accident per year (from 1.18 to 1.72) for all existing crossings that would be used by proposed NRE traffic is independent of the route of the rail line extension because the same existing crossings would be used for all routes. For new at-grade crossings, predicted accident frequency would be much lower than for the existing grade crossings because total estimated vehicle traffic at the new crossings would be less than 2 percent of that for the existing crossings for any of the alternative routes from North Pole to Delta Junction.

Delay

SEA does not expect that trains on the existing rail line would experience noticeable delays as a result of the projected additional construction or operations rail traffic. Construction activities would generate vehicle trips, and construction transportation could cause increased road delays. Temporary delays would occur where existing roads are widened to access the Tanana River bridge location on Salcha Alternative Segments 1 and 2, and for traffic on Richardson Highway in the Salcha area during relocation of the highway for construction of Salcha Alternative Segment 2. Construction of grade-separated and highway/rail at-grade crossings could also cause temporary delays. SEA anticipates that the impacts of road transportation delay from drivers' commutes to rail stations would be minimal. Vehicle trips on Richardson Highway could decrease slightly during operations. SEA estimates that the number of vehicles delayed by rail traffic would increase as a result of the proposed NRE from approximately 1 percent of all vehicles using the highway/rail at-grade crossings to approximately 1.6 percent, and that the average delay experienced by each delayed vehicle would decrease from approximately 1.67 minutes per vehicle to 1.34 minutes per vehicle (because the average train length would decrease). Operations impacts on emergency-vehicle response time would be small.

2.4.10 Navigation

SEA evaluated whether the proposed project would affect navigation on U.S. Coast Guard- and ADNR-designated navigable waterways. It was determined that the proposed NRE would have a negligible effect on these waterways because the proposed crossing structures would be designed to allow the continued passage of watercraft. For bridges that do not clear-span the waterway, piers would be placed at appropriate locations in the channel based on design considerations that include navigation. ARRC would design these bridges to comply with Coast Guard, ADNR, and ADF&W permit conditions regarding bridge construction over designated navigable waters. Any temporary, construction-related impacts on commercial or personal navigation in these waterways would depend on the types of crafts using the waterway and the timing of bridge construction.

2.4.11 Land Use

Most of the land that would be directly affected by the rail line is owned by the Federal Government, the State of Alaska, and private entities. Two native allotments are in the vicinity of the proposed NRE near Salcha, but no tribal lands or native allotments have been identified in the ROW of any of the proposed common or alternative segments. Federal and state lands are used primarily for military training, recreation, hunting, fishing, mining, and timber harvest. Privately owned lands are primarily in agricultural and residential use or in a natural state. Existing land use in the ROW would be permanently changed. Any non-rail associated activities within the ROW would require a permit from ARRC, and any permissions required by the agency, corporation, or individual that owns the property. Permanent support facilities that would be constructed outside of the ROW include permanent access roads, communications towers, and facilities to support operations, including a passenger terminal. Existing land ownership or control and use in these areas would be permanently changed. Lands that would be affected by the project are generally undeveloped and away from residences and businesses, with several exceptions (see Table 2-5 at the end of this chapter for private property and structure impacts by segment). Temporary indirect effects to residences and business would occur during construction, primarily from noise and changes to the visual landscape, but these effects would generally be minor.

Recreation Resources

Because recreation activities within the project area are generally dispersed over a large area, most potential impacts to recreation would be common to all alternative segments. Impacts during the construction period would include temporary closure of some trails, and limited access to some navigable rivers and other access routes. Where culverts would be used to convey water under the rail line, they would typically limit access for winter and summer use of the waterway. Main river access routes to areas west of the Tanana River via larger rivers and streams (Fivemile Clearwater Creek, Little Delta River, Delta Creek) would be maintained through use of bridges with ample clearance. During construction and operations, restricted access to the proposed rail line ROW would create a linear barrier, preventing free range of recreational users within the ROW and across the area. See Table 2-5 at the end of this chapter for the types of recreational activities affected and the number of recreation access route intersections by segment.

Unserialized trails (legally established trails on state lands that do not have recorded trail easements or ROWs) are quite common on state lands along many of the proposed alternative segments. Individuals are not required to report the use or location of these trails to the ADNR. The Alaska Division of Mining, Land and Water has indicated that it would consider closure of these generally allowed trails to be an impact, and would require further investigations to determine their location and use, and would require accommodation of these legal features (Proulx, 2008).

Section 4(f) Resources

SEA identified potential 4(f) resources that would be affected by the proposed NRE. Most of these properties are recreational trails used for dog-sledding, snowmachining, and skiing, but two are cultural resource sites (see Section 6.3). Ten alternative segments would require use of Section 4(f) resources, based on preliminary determination (see Appendix M).

By the criteria of Section 4(f) evaluation, the alignment that minimizes effects to 4(f) properties would include the following combination of segments: North Common Segment, Eielson Alternative Segment 3, Salcha Alternative Segment 1, any of the connector segments, either of the Central alternative segments, Donnelly Alternative Segment 2, South Common Segment, and either Delta alternative segment.

There may be opportunities to minimize or mitigate impacts to Section 4(f) resources, including timing construction to avoid times of heavy trail use, and minimization of dust and noise emissions. Coordination is ongoing with appropriate agencies to determine the significance of resources that are protected under Section 4(f) that would be affected by the proposed NRE.

Hazardous Materials/Waste Sites

Environmental effects could occur as a result of excavating contaminated sites during construction of roadbeds and railbeds, hill cuts, grade separations, and retaining walls. Borrow areas developed for fill materials could disturb or move contaminated materials. Eleven sites identified in the project area present potential risks due to site contamination if excavation were to occur at these locations. Potential sites in the project area include former highway construction camp sites and a petroleum pipeline ROW.

2.4.12 Visual (Aesthetic) Resources

The visual effects of the proposed NRE were measured using the BLM visual resource management (VRM) methodology, which establishes a set of management criteria for landscapes and a related level of acceptable visual alteration to those landscapes. The proposed action and alternative segments would meet VRM objectives with several exceptions. Salcha Alternative Segment 2 would not meet VRM objectives due to a hill cut, crossings of the Tanana and Salcha rivers, and its proximity to the Salcha community, and Salcha Alternative Segment 1 would not meet VRM objectives at its crossing of the Tanana River. SEA anticipates that the Donnelly alternative segments would not meet VRM objectives at their crossings of Delta Creek and Little Delta River, and that Delta Alternative Segments 1 and 2 would not meet VRM objectives at their crossings of the Delta River and at highway crossings. Visual impacts from temporary facilities would be strong during construction; however, these facilities would be removed and the sites restored after construction was completed, and SEA believes they would likely meet VRM objectives in the long term. Depending on their location, some of the permanent communications towers may have a moderate to strong contrast with the surrounding landscape due to the elevation of the terrain and areas permanently cleared of vegetation surrounding the towers.

2.4.13 Socioeconomics

Most potential socioeconomic effects would be independent of the specific alternative segments that would be constructed if the STB granted a license for construction and operation of the proposed NRE. However, there are some socioeconomic effects that would differ across alternative segments, including effects on communities and neighborhoods. Salcha Alternative Segment 2 would require that ARRC relocate the Salcha Elementary School. The effects of all alternatives on community cohesion would be minimal. Eielson Alternative Segment 1 would result in the loss of approximately 2 acres of farming surface area from the Eielson Farm Community, but would have negligible effects on existing travel patterns and social interaction and agricultural output within the community. The effects of the proposed NRE on public services and housing in the project area would also be minimal. SEA estimates that NRE operations would result in the creation of between 10 and 17 ARRC full-time direct and secondary jobs. The number of new full-time ARRC employment positions that would be created for operation of the proposed NRE would be small, and the effects on housing and public facilities and services would be negligible.

2.4.14 Environmental Justice

SEA identified no potential high and adverse impacts to human populations in the project area. Therefore, there would be no high and adverse impacts to environmental justice populations as a result of the proposed NRE.

Table 2-5 summarizes and compares potential impacts for resource areas and topics for which are noteworthy differences among the alternatives. Table 2-5 does not include resource areas for which the potential impacts would be essentially the same for all the alternatives. Similarly, the table does not include the No-Action Alternative because, under that alternative, existing conditions would remain the same and there would be no impacts.

Table 2-5
Summary and Comparison of Potential Impacts

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Eielson Branch (existing)	Not applicable	Not applicable	Not applicable	Not applicable	Adversely affected noise receptors: 446	Not applicable	Not applicable
North Common Segment	Minimal grading/filling 25% permafrost, 5 feet overburden	Crossings would include 1 bridge and 1 culvert.[b] Impacts to wetlands and other waters (acres): 3.5 (forested 0, scrub/shrub 2.6, emergent 0.3, other waters 0.6)	Total vegetation cleared (acres): 61.6 Fish-bearing stream crossings: 2 (2 spawning, 1 anadromous habitat) Direct habitat loss (acres): Bears, 60.5 Caribou, 21.7 Moose, 60.5 Wolves, 61.6 Furbearers, 42.0	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	Federal/state land ownership Impacts to fishing 4(f) resource present Potential hazardous material/waste sites	Consistent with VRM objectives
Eielson Alternative Segment 1	Minimal grading/filling 25% permafrost, 5 feet overburden	Crossings would include 13 culverts and 1 small bridge.[b] Impacts to wetlands and other waters (acres): 16.8 (forested 6.9, scrub/shrub 7.1, emergent 1.5, other waters 1.3)	Total vegetation cleared (acres): 246.4 Fish-bearing stream crossings: 2 (2 spawning, 2 anadromous habitat) Direct habitat loss (acres): Bears, 246.4 Caribou, 123.8 Moose, 246.4 Wolves, 247.3 Furbearers, 237.2 1 bald eagle and 1 red-tailed hawk nest affected	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	52 acres private land; 2 acres in agricultural use 2 to 3 residences directly affected 11 recreation access route intersections 4(f) resource present	Consistent with VRM objectives

Table 2-5
Summary and Comparison of Potential Impacts (continued)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Eielson Alternative Segment 2	Minimal grading/filling 25% permafrost, 5 feet overburden	Crossings would include 10 culverts and 3 small bridges.[b] Impacts to wetlands and other waters (acres): 70.8 (forested 23.3, scrub/shrub 43.1, emergent 3.5, other waters 0.9)	Total vegetation cleared (acres): 241.0 Fish-bearing stream crossings: 3 (2 spawning, 2 anadromous habitat) Direct habitat loss (acres): Bears, 241.0 Caribou, 146.4 Moose, 241.0 Wolves, 241.2 Furbearers, 222.9 1 bald eagle and 1 red-tailed hawk nest affected	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	78 acres private land; 2 acres in agricultural use 8 recreation access route intersections 4(f) resource present	Consistent with VRM objectives
Eielson Alternative Segment 3	Minimal grading/filling 25% permafrost, 5 feet overburden	Crossings would include 14 culverts and 3 small bridges.[b] Impacts to wetlands and other waters (acres): 100.3 (forested 36.7, scrub/shrub 48.6, emergent 5.7, other waters 9.3)	Total vegetation cleared (acres): 238.5 Fish-bearing stream crossings: 7 (1 spawning, 1 anadromous habitat) Direct habitat loss (acres): Bears, 238.5 Caribou, 124.5 Moose, 238.5 Wolves, 239.3 Furbearers, 222.0	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	Adversely affected noise receptors: 4	55 acres private land 6 recreation access route intersections 4(f) resource present	Consistent with VRM objectives

Table 2-5
Summary and Comparison of Potential Impacts (continued)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Salcha Alternative Segment 1	Minimal grading/filling 5 to 25% permafrost, 2 to 5 feet overburden Potential for seismic events	Crossings would include 12 culverts and 1 large bridge[b]; large bridge crossing of the Tanana River would result in high impacts due to altered flood hydraulics, increased scour, and downstream aggradation. Impacts to wetlands and other waters (acres): 179.9 (forested 32.2, scrub/shrub 56.7, emergent 0.2, other waters 90.8)	Total vegetation cleared (acres): 434.9 Fish-bearing stream crossings: 3 (2 spawning, 1 anadromous habitat); adverse impact from bridge Higher density of game mammals (particularly bears, wolves, furbearers) than Salcha 2; potential impact to prime moose calving area Direct habitat loss (acres): Bears, 434.9 Caribou, 175.2 Moose, 434.9 Wolves, 447.6 Furbearers, 426.4 1 pair bald eagles, 1 pair great horned owls affected	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	14 acres private land 25 to 30 residences directly or indirectly affected Impacts to fishing 1 recreation access route intersection	Inconsistent with VRM objectives: bridge crossing

Table 2-5
Summary and Comparison of Potential Impacts (continued)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Salcha Alternative Segment 2	Substantial grading/filling 5 to 75% permafrost, 2 to 7 feet overburden Potential for seismic events and mass wasting	Crossings would include 12 culverts, 2 small bridges and 4 large bridges[b]; large bridge crossing of the Tanana River would result in high impacts due to altered flood hydraulics, increased scour, and downstream aggradation. Impacts to wetlands and other waters (acres): 262.3 (forested 58.5, scrub/shrub 120.1, emergent 3.0, other waters 80.7)	Total vegetation cleared (acres): 536.8 Fish-bearing stream crossings: 9 (7 spawning, 7 anadromous habitat); adverse impact from bridge Direct habitat loss (acres): Bears, 535.1 Caribou, 299.1 Moose, 536.2 Wolves, 580.4 Furbearers, 506.0 2 pair bald eagles and 3 nest structures; 3 pair peregrine falcon affected	High potential for impacts to historic and prehistoric resources Identified sites within APE: 2	Adversely affected noise receptors: 32 Adversely affected vibration receptors: 4	92 acres private land; 150 homes or businesses temporarily or permanently affected, including the Salcha School 3 recreation access route intersections; impacts to fishing and hunting Potential hazardous material/waste sites 4(f) resource present	Inconsistent with VRM objectives: hill cut, bridge crossing, community
Central Alternative Segment 1	Minimal grading/filling 75 to 90% permafrost, 7 to 14 feet overburden	Crossings would include 9 culverts and 1 small bridge.[b] Impacts to wetlands and other waters (acres): 51.0 (forested 22.5, scrub/shrub 24.1, emergent 4.2, other waters 0.2) Would lie outside 100-year floodplain	Total vegetation cleared (acres): 122.6 Fish-bearing stream crossings: 1 (1 spawning habitat) Direct habitat loss (acres): Bears, 122.6 Caribou, 65.9 Moose, 122.6 Wolves:, 22.8 Furbearers, 88.9	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	Impacts to hunting	Consistent with VRM objectives

Table 2-5
Summary and Comparison of Potential Impacts (continued)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Central Alternative Segment 2	Minimal grading/filling 25% permafrost, 5 feet overburden	Crossings would include 9 culverts and 2 small bridges.[b] Impacts to wetlands and other waters (acres): 6.5 (forested 0, scrub/shrub 6.5, emergent 0) Would lie within 100-year floodplain of the Tanana River	Total vegetation cleared (acres): 84.9 Fish-bearing stream crossings: 2 (no spawning or anadromous habitat) Fragmentation of closed needleleaf habitat (benefit to moose, mixed adverse impact to furbearers) Direct habitat loss (acres): Bears, 84.9 Caribou, 72.5 Moose, 84.9 Wolves, 86.9 Furbearers, 84.3 1 pair bald eagles affected	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	Impacts to hunting	Consistent with VRM objectives
Connector Segment A	Minimal grading/filling 25% permafrost, 5 feet overburden	Crossings would include 3 culverts and 1 small bridge.[b] Impacts to wetlands and other waters (acres): 56.2 (forested 31.9 , scrub/shrub 23.0, emergent 1.1, other waters 0.2) Would lie within 100-year floodplain	Total vegetation cleared (acres): 105.7 Fish-bearing stream crossings: 1 (1 anadromous habitat) Direct habitat loss (acres): Bears, 105.7 Caribou, 64.1 Moose, 105.7 Wolves, 105.7 Furbearers, 91.0 1 pair great horned owls affected	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	Federal/state land ownership 1 recreation access route intersection; impacts to hunting and fishing	Consistent with VRM objectives

Table 2-5
Summary and Comparison of Potential Impacts (continued)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Connector Segment B	Minimal grading/filling 25% permafrost, 5 feet overburden	Crossings would include 2 culverts and 1 small bridge.[b] Impacts to wetlands and other waters (acres): 1.6 (forested 0.3, scrub/shrub 0.4, emergent 0.2, other waters 0.7) Would lie outside 100-year floodplain	Total vegetation cleared (acres): 78.5 Fish-bearing stream crossings: 2 (1 spawning, 2 anadromous habitat) Fragmentation of closed needleleaf habitat (benefit to moose, mixed adverse impact to furbearers) Direct habitat loss (acres): Bears, 78.5 Caribou, 68.9 Moose, 78.5 Wolves, 78.5 Furbearers, 78.5 1 pair great horned owls affected	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	Federal/state land ownership 1 recreation access route intersection; impacts to hunting and fishing	Consistent with VRM objectives
Connector Segment C	Minimal grading/filling 25% permafrost, 5 feet overburden	Crossings would include 4 culverts and 3 small bridges.[b] Impacts to wetlands and other waters (acres): 26.3 (forested 10.4, scrub/shrub 13.2, emergent 1.3, other waters 1.4) Half of segment would lie within 100-year floodplain	Total vegetation cleared (acres): 55.6 Fish-bearing stream crossings: 6 (1 spawning, 5 anadromous habitat) Fragmentation of closed needleleaf habitat (benefit to moose, mixed adverse impact to furbearers) Direct habitat loss (acres): Bears, 55.6 Caribou, 41.4 Moose, 55.6 Wolves, 55.6 Furbearers, 45.3	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	Federal/state land ownership Impacts to hunting	Consistent with VRM objectives

Table 2-5
Summary and Comparison of Potential Impacts (continued)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Connector Segment D	Minimal grading/filling 25% permafrost, 5 feet overburden	Crossings would include 1 culvert and 3 small bridges.[b] Impacts to wetlands and other waters (acres): 2.9 (forested 0, scrub/shrub 1.5, emergent 0.2, other waters 1.2) Would lies outside 100-year floodplain	Total vegetation cleared (acres): 21.2 Fish-bearing stream crossings: 4 (4 anadromous habitat) Fragmentation of closed needleleaf habitat (benefit to moose, mixed adverse impact to furbearers) Direct habitat loss (acres): Bears, 21.2 Caribou, 19.7 Moose, 21.2 Wolves, 21.2 Furbearers, 21.2	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	Federal/state land ownership Impacts to hunting	Consistent with VRM objectives
Connector Segment E	Minimal grading/filling 25% permafrost, 5 feet overburden	Crossings would include 5 culverts and 1 small bridge.[b] Impacts to wetlands and other waters (acres): 3.5 (forested 0.7, scrub/shrub 2.1, emergent 0.3, other waters 0.4) Half of segment would lie within 100-year floodplain	Total vegetation cleared (acres): 58.2 Fish-bearing stream crossings: 1 (1 spawning, 1 anadromous habitat) Direct habitat loss (acres): Bears, 58.2 Caribou, 16.3 Moose, 58.2 Wolves, 58.4 Furbearers, 24.5	Negligible potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	6 acres private land Impacts to hunting and fishing	Consistent with VRM objectives

Table 2-5
Summary and Comparison of Potential Impacts (continued)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Donnelly Alternative Segment 1	Substantial grading/filling 5 to 90% permafrost, 2 to 14 feet overburden	Crossings would include 31 culverts, 4 small bridges, and 2 large bridges[b]; large bridge crossing of Delta Creek and Little Delta River would result in high impacts due to altered flood hydraulics, increased scour, downstream aggradation, and increased potential for overbank flooding and/or debris jams. Impacts to wetlands and other waters (acres): 397.0 (forested 125.8, scrub/shrub 214.0, emergent 2.2, other waters 55)	Total vegetation cleared (acres): 627.5 Fish-bearing stream crossings: 6 (no spawning or anadromous habitat) Fragmentation of closed needleleaf habitat (benefit to moose, mixed adverse impact to furbearers) Direct habitat loss (acres): Bears, 626.9 Caribou, 475.3 Moose, 626.9 Wolves, 658.8 Furbearers, 549.8 1 northern goshawk nest affected	High potential for impacts to historic and prehistoric resources Identified sites within APE: 8	No adversely affected noise/vibration receptors	Federal/state land ownership 6 recreation access route intersections; impacts to hunting 4(f) resource present	Consistent with VRM objectives

Table 2-5
Summary and Comparison of Potential Impacts (continued)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Donnelly Alternative Segment 2	Substantial grading/filling 4 to 12% permafrost, 4 to 12 feet overburden	Crossings would include 44 culverts, 2 small bridges, and 2 large bridges[b]; large bridge crossing of Delta Creek and Little Delta River would result in high impacts due to altered flood hydraulics, increased scour, downstream aggradation, and increased potential for overbank flooding and/or debris jams. Impacts to wetlands and other waters (acres): 302.5 (forested 144.1, scrub/shrub 99.0, emergent 4.2, other waters 55.2)	Total vegetation cleared (acres): 636.4 Fish-bearing stream crossings: 8 (3 spawning, 3 anadromous habitat) Fragmentation of open and closed needleleaf (benefit to moose, mixed adverse impact to furbearers) and closed broadleaf habitat; higher occurrence of furbearers than Donnelly 1 Direct habitat loss (acres): Bears, 636.4 Caribou, 370.2 Moose, 636.4 Wolves, 669.7 Furbearers, 564.9 1 pair peregrine falcons, 1 bald eagle nest affected	High potential for impacts to historic and prehistoric resources Identified sites within APE: 4	No adversely affected noise/vibration receptors	4 acres private land 3 recreation access route intersections; impacts to hunting Potential hazardous material/waste sites 4(f) resource present	Consistent with VRM objectives
South Common Segment	Minimal grading/filling 50 to 85% permafrost, 3 to 4 feet overburden	Crossings would include 11 culverts and 3 small bridges.[b] Impacts to wetlands and other waters (acres): 55.5 (forested 11.3, scrub/shrub 43.4, emergent 0.8, other waters 0.3)	Total vegetation cleared (acres): 251.2 Fish-bearing stream crossings: 3 (2 spawning, 2 anadromous habitat) Direct habitat loss (acres): Bears, 251.2 Caribou, 166.3 Moose, 251.2 Wolves, 251.2 Furbearers, 244.2 2 red-tailed hawk, 2 great gray owl, and 1 great horned owl nest affected	Low potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	Federal/state land ownership 2 recreation access route intersections; impacts to fishing 4(f) resource present	Consistent with VRM objectives

Table 2-5
Summary and Comparison of Potential Impacts (continued)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources
Delta Alternative Segment 1	Substantial grading/filling 5 to 85% permafrost, 3 to 7 feet overburden	Crossings would include 1 culvert and 1 large bridge[b]; large bridge crossing of the Delta River would result in high impacts due to increased scour, bank erosion and/or downstream aggradation. Impacts to wetlands and other waters (acres): 94.9 (forested 14.0, scrub/shrub 34.0, emergent 0.1, other waters 46.8)	Total vegetation cleared (acres): 261.7 Fish-bearing stream crossings: 1 (no spawning or anadromous habitat) All game animals except bison more common than Delta 2; fragmentation of closed needleleaf habitat (benefit to moose, mixed adverse impact to furbearers) Direct habitat loss (acres): Bison, 14.6 Bears, 256.4 Caribou, 198.2 Moose, 256.4 Wolves, 311.2 Furbearers, 247.5	Moderate potential for impacts to historic and prehistoric resources Identified sites within APE: 0	No adversely affected noise/vibration receptors	3 acres private land Federal/state land ownership No recreation access route intersections; numerous legal, informal trails Potential hazardous material/waste sites 4(f) resource present	Inconsistent with VRM objectives: highway crossing
Delta Alternative Segment 2	Minimal grading/filling 5 to 85% permafrost, 2 to 7 feet overburden	Crossings would include 1 large bridge[b]; large bridge crossing of the Delta River would result in high impacts due to increased scour, bank erosion and/or downstream aggradation. Impacts to wetlands and other waters (acres): 60 (forested 4.2, scrub/shrub 19.6, emergent 1.1, other waters 35)	Total vegetation cleared (acres): 281.1; one rare willow identified. Fish-bearing stream crossings: 1 (no spawning or anadromous habitat) Greater disturbance of potential bison habitat than Delta 1; negligible impact to bison Direct habitat loss (acres): Bison, 74.2 Bears, 211.4 Caribou, 104.6 Moose, 211.4 Wolves, 304.0 Furbearers, 209.0	Moderate potential for impacts to historic and prehistoric resources; greater direct impacts on historic resources than Delta 1 Identified sites within APE: 1	No adversely affected noise/vibration receptors	59 acres of private land in agricultural and residential use 1 recreation access route intersection; numerous legal, informal trails Potential hazardous material/waste sites 4(f) resource present	Inconsistent with VRM objectives: highway crossing

Table 2-5
Summary and Comparison of Potential Impacts (continued)

Alternative Segments	Topography, Geology, Soils	Water Resources	Biological Resources	Cultural Resources	Noise and Vibration	Land Use[a]	Visual (Aesthetic) Resources

[a] Known trails and streams not including all trapping trails and other small winter trails.
[b] Generally, the more bridges or culverts, the greater the potential for the following environmental consequences: bridge construction impacts could include changes to natural drainage, sloughing, and erosion of the streambank, impacts to permafrost, increased stages and velocities of floodwater, and increased channel scour or bank erosion; impacts from construction of single or multiple culverts would likely include localized disturbance of the streambank to gain access to the channel and disturbance of the channel bed when installing the culverts.

3. TOPOGRAPHY, GEOLOGY, AND SOILS

This chapter identifies topography, geology, and soils expected to be encountered during construction and operation of the approximately 80-mile proposed rail line through largely undeveloped areas in the Tanana River valley. This chapter describes the applicable regulations, existing environmental conditions, and potential environmental consequences related to topography, geology, and soils in the project area. This chapter also addresses permafrost and seismic hazards.

The proposed Northern Rail Extension (NRE) lies primarily in a western section of a broad depression between the Yukon-Tanana Uplands and the Alaska Range known as the Tanana Lowlands. Coalescing outwash fans from the Alaska Range are featured in the lowlands with rivers flowing in broad, terraced valleys near the heads of the fans, which can be up to several hundred feet deep. Glacial moraines lie on the upper end of some fans (Wahrhaftig, 1965). Thermokarst lakes are well developed on the terraces and the low-lying areas away from the heads of the fans. The Delta and Tanana Rivers are two major rivers that drain the province (U.S. Geological Survey [USGS], 2007).

The foothills of the Alaska Range south of the project area consist of a belt of flat-topped, east-trending hills that are separated by lowlands composed of moraines or outwash fans deposited by the glaciers from the Alaska Range. The hills are largely unglaciated. Thermokarst lakes develop in the lowlands. Delta River, Delta Creek, and Little Delta River are three glacier-fed streams that drain the Alaska Range into the Tanana River. The Alaska Range south of the project area is characterized by rugged glaciated terrain, with peaks over 12,000 feet. Landforms associated with alpine glaciers are common, including cirques, U-shaped valleys, moraines, outwash fans, and alluvial fans.

Immediately north of the project area, the Yukon-Tanana Uplands rise up to 2,000 feet above adjacent valley floors. Rounded, even-topped, unglaciated ridges with gentle side slopes and valley floors up to a half-mile wide are common.

3.1 Applicable Regulations

The Farmland Protection Policy Act (FPPA) was enacted in 1981 in reaction to the substantial decrease in the amount of open farmland resulting from high conversion rates in the late 1970s. The FPPA’s statement of purpose states that Federal programs that contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses will be minimized. The Act addresses prime, unique, and farmland of statewide or local importance (7 U.S.C. 4201(c)(1)(A), (B), and (C)).

There are no prime farmlands in Alaska because soil temperatures do not meet the prime farmland threshold established by Congress. No unique farmlands have been designated in Alaska. No farmlands of statewide importance have been designated in Alaska.

3.2 Topography

3.2.1 Affected Environment

Many northern sections of the Tanana River are bordered by the Yukon-Tanana Uplands. The uplands north of the river can rise up to 700 feet above the elevation of the river. Along the project route, hills rise in elevation from 580 feet above sea level near Eielson Air Force Base

(AFB) to 1,200 feet above sea level at Delta Junction. The Tanana River is bordered to the south by the Tanana Lowlands and little elevation change occurs south of the river.

3.2.2 Environmental Consequences

Methodology

The objective of topographic analysis is to identify areas of the proposed rail line where modifications to the current topography would be required for the rail line to meet design goals. Track geometry and design objectives for the proposed NRE are maintenance of grades no greater than 1 percent, based on Federal Railroad Association (FRA) Class 5 track standards (49 CFR Part 213). Spatial analysis of topography was completed using the 25-foot contours identified by Alaska Railroad Corporation (ARRC) through analysis of 2005 site imagery with digital elevation modeling software. Contours were converted to a 500-foot raster grid using a Geographic Information System (GIS) and ArcGIS Spatial Analyst (software tool designed to manipulate and analyze raster data). Slope was then calculated for the grid and a slope layer was created for visual analysis. Because the geometric design goals include grades limited to 1 percent, visual analysis of the slope layer identified areas along the alignment with slopes greater than 1 percent. Distances between the 25-foot contours for each route alignment segment were estimated using ArcGIS to calculate the slope of each particular segment. See Table 3-1 and Figure 3-1. Chapter 20 of the EIS described proposed mitigation for impacts to topography.

Construction Impacts

The proposed approximately 80-mile rail line would generally follow the Tanana River from North Pole to Delta Junction, predominantly on the southwestern side of the river. Track geometry and design objectives to support proposed passenger services and reduce long-term maintenance costs use geometric design criteria that would allow FRA Class 5 track standards to be easily maintained. Geometric design goals include grades limited to 1 percent. Where these design criteria could not be met, grading and filling that would alter the natural topography would be required.

Most of the rail line alternative segments avoid sudden topographic changes, such as hills or knobs, in the vicinity of the alternative segments.

Table 3-1
Slope Analysis of Route Alignment

Route Segment	Percent Slope	Linear Feet Affected
North Common Segment	*No slope contours greater than 1%*	
Eielson Alternative Segment 1	*No slope contours greater than 1%*	
Eielson Alternative Segment 2	*No slope contours greater than 1%*	
Eielson Alternative Segment 3[a]	*No slope contours greater than 1%*	
Salcha Alternative Segment 1[a]	*No slope contours greater than 1%*	
Salcha Alternative Segment 2	5	500
	17.5 average	600
	5	500
	12.5 average	1,000
	6.3 average	1,500
Central Segments 1 and 2 Central Connector Segments	*No slope contours greater than 1%*	

Table 3-1
Slope Analysis of Route Alignment (continued)

Route Segment	Percent Slope	Linear Feet Affected
Donnelly Alternative Segment 1[a]	4	650
	2	1,500
	2.5	1,000
	2.5	1,000
	2.5	1,000
	2	2,500
Donnelly Alternative Segment 2	2	1,500
	2	2,500
	2.5	1,000
	7.5 average	1,000
	2	1,500
South Common Segment	*No slope contours greater than 1%*	
Delta Alternative Segment 1[a]	4 average	1,750
Delta Alternative Segment 2	*No slope contours greater than 1%*	

[a] Components of the proposed action.

Construction Impacts by Alternative Segment

The paragraphs below describe the topographical analysis for each alternative segment listed in Table 3-1 with slope contours greater than 1 percent.

Salcha Alternative Segment 2

Salcha Alternative Segment 2 runs adjacent to three knobs or hills. There are areas along these sections with slopes greater than 1 percent (see Table 3-1 and Figure 3-1), which would require grading and fill to meet the design objectives.

Donnelly Alternative Segment 1

Donnelly Alternative Segment 1 does not encounter knobs or hills; however, the route would traverse several areas with slopes greater than 1 percent (see Table 3-1 and Figure 3-1), which would require grading and fill to meet the design objectives.

Donnelly Alternative Segment 2

Donnelly Alternative Segment 2 does not encounter knobs or hills; however, the route would traverse several areas with slopes greater than 1 percent (see Table 3-1 and Figure 3-1), which would require grading and fill to meet design objectives.

Delta Alternative Segment 1

Delta Alternative Segment 1 does not encounter knobs or hills; however, the route would traverse one area of topography with a slope greater than 1 percent (see Table 3-1 and Figure 3-1), which would require grading and fill to meet the design objectives.

Operations Impacts

Operation and maintenance of the 80-mile rail line would not have an impact on topography.

No-Action Alternative

The only impact on topography under the No-Action Alternative would be from natural processes.

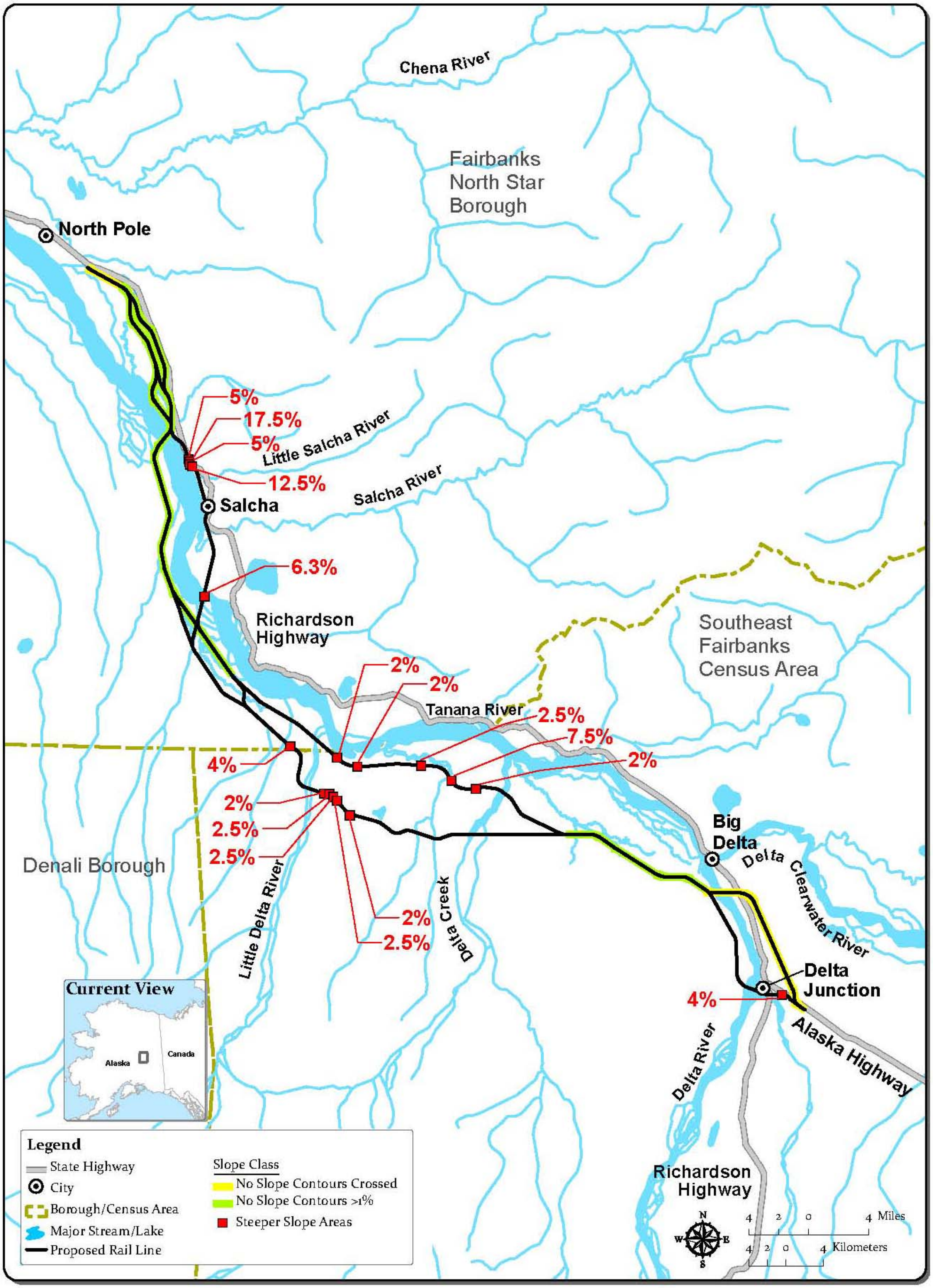

Figure 3-1 – Slope Classes

3.3 Geology

3.3.1 Affected Environment

Four types of bedrock have been identified along the proposed rail line. The four rock types and their value for use in rail line construction are as follows (Miller, 2007):

- **Rd –** dioritic igneous rock from the Flag Hill area. This relatively massive rock could be suitable for riprap and ballast.

- **Rg –** gneissic rock, occasionally interbedded with or incorporated into the large schistose deposits. This harder rock could provide a source of ballast, but the dominant bedding and parting planes would probably preclude its use as armor stone.

- **Rq –** locally, quartzite layers interbedded with the schist deposits. This material crushes well but is very limited in volume. Crushed quartzite is often used as rail line ballast.

- **Rs –** schistose rock, the most common rock type in the project area. Because of thin bedding and moderate to severe weathering, it is generally suitable for use only as unclassified fill.

3.3.2 Environmental Consequences

Methodology

The objective of geology analysis is to identify areas of the proposed rail line where bedrock needs to be removed to construct the rail line or service roads, and where nearby bedrock units could be mined for construction material. The areas of rail alternative segments that potentially encounter bedrock are identified in the project geotechnical report (Miller, 2007).

This analysis of environmental consequences briefly describes common impacts and then identifies site-specific impacts in more detail as applicable. Chapter 20 of the EIS describes proposed mitigation for impacts to geology.

Common Impacts

Throughout most of the project area, bedrock is not exposed at the surface and there would be no impacts on geology.

Construction Impacts

Construction-related impacts on geology would occur in two situations — where bedrock needs to be removed to construct the rail line or service roads, and where nearby bedrock units would be mined for construction material. These situations specific to each alternative segment are listed separately below.

Construction Impacts by Alternative Segment

Salcha Alternative Segment 2

Salcha Alternative Segment 2 would encounter schistose units at approximately mile 2.5, mile 12, and mile 21 (and approximately 0.25 north of the rail line at mile 16). Diorite, a massive igneous rock, was identified along Salcha Alternative Segment 2 at approximately mile 21 (Flag

Hill). This unit is a potential source of ballast rock. During construction, it might be necessary to remove bedrock along Salcha Alternative Segment 2 to maintain the grade of the rail line.

Donnelly Alternative Segment 2

Donnelly Alternative Segment 2 would pass through or be adjacent to a schistose-gneissic unit at approximately mile 23. During construction, it might be necessary to remove bedrock along Donnelly Alternative Segment 2 to maintain the grade of the rail line.

Other Segments/Alternatives

There would be no construction-related impact on geology for alternative segments that do not pass through bedrock deposits. These include the North Common Segment, Eielson Alternative Segment 1, Eielson Alternative Segment 2, Eielson Alternative Segment 3, Salcha Alternative Segment 1, Central Alternative Segments 1 and 2, Central Connector Segments A through E, Donnelly Alternative Segment 1, South Common Segment and Delta Alternative Segment 1 discussed above.

Operations Impacts

Because of the generally resilient characteristics of bedrock geology, the impact on geology as a result of rail operations and maintenance would be negligible.

No-Action Alternative

The only impact on geology under the No-Action Alternative would be from natural processes.

3.4 Soils

3.4.1 Affected Environment

Soil units along the proposed rail line were identified during a 2006 geophysical investigation (Miller, 2007). Table 3-2 lists and describes the soil units.

Table 3-2
Mapped Soil Series in Project Area

Soil Unit	Description
Aa	Active floodplain deposits. Gray stratified gravel, sand and silt, often with cobbles and boulders
Ab	Abandoned floodplain deposits. Similar material to active floodplains, except more likely to be frozen with a thick silt cover
Ac	Active channel deposits. Gray stratified gravel, sand and silt, often with cobbles and boulders
Af	Alluvial fan deposits. Gray to brown stratified material that accumulates from draining streams
Afw	Alluvial fan Wisconsin Age. Outwash deposits from most recent (Wisconsin Age) glacial retreat
Afi	Alluvial fan Illinoisan Age. Outwash deposits from Healy and Donnelly (late Illinoisan Age) glacial retreat
Aft	Alluvial fan torrent. Deposits from torrential stream flow and rapid melt associated with end of Healy glaciation
Cu	Reworked loess and undifferentiated frozen silt. Dark brown organic rich silt from colluvial mixing
EL	Loess. Light brown eolian (windblown) silt
Es	Dune sand. Light brown eolian sand

Table 3-2
Mapped Soil Series in Project Area (continued)

Soil Unit	Description
G	Glacial deposits. Yellowish gray to brown moraine deposits
Gw	Glacial Wisconsin. Glacial deposits from Wisconsin glaciation
Gi	Glacial Illinoisan. Glacial deposits from Illinoisan glaciations
O	Glacial outwash deposits. Outwash laid down by melt water from retreating glaciers
Ow	Outwash Wisconsin. Outwash deposits from Wisconsin glaciation
Oi	Outwash Illinoisan. Outwash deposits from Illinoisan glaciation
S	Swamp deposits. Dark brown to black peat and organic silt more than four feet deep and poorly drained

In general, the soil units closer to the Tanana River have depositional origins related to the river or its tributaries. The units farther from the river were commonly deposited by glaciation or other alluvial processes. The units are sometimes intermixed and might overlie each other.

3.4.2 Environmental Consequences

Methodology

The general engineering properties of each soil unit were considered in the context of the proposed project to identify impacts to soils and constraints presented by soil engineering properties.

This analysis of environmental consequences briefly reviews common impacts and then identifies site-specific impacts in more detail as applicable. Chapter 20 of the EIS describes proposed mitigation for impacts to soil.

Construction Impacts

Impacts on soil during rail line construction would mostly be associated with excavation and fill of soils to maintain the grade of the railbed or with removal of unsuitable construction material. The existing soil profile would be eliminated in areas subject to excavation or filling. In addition, some soil units with high sand and gravel content could be suitable for use as borrow material to construct the railbed. Active floodplain deposits are the most likely source of borrow material along the rail line (Miller, 2007). Use of these deposits as borrow material would require Federal and state permits. Therefore, availability of these deposits for borrow areas could be limited by regulations. Soils would also be affected by the construction of service roads. Like the railbed, some sections of service roads could be in areas unsuitable to support a road. In these cases, the unsuitable soil would be removed and replaced with gravel from another source. In a few locations along the proposed rail line, a proposed segment could encounter hills or slopes where soils would need to be cut away, potentially affecting the stability of the slope. Table 3-1 and Figure 3-1 list and show these locations specific to each alternative segment.

Construction Impacts by Alternative Segment

North Common Segment

North Common Segment would traverse active floodplain deposits (Aa). This segment would not encounter significant hills or slopes.

Eielson Alternative Segments 1, 2, and 3

Eielson Alternative Segment 1, Eielson Alternative Segment 2, and Eielson Alternative Segment 3 would traverse active floodplain deposits (Aa). These segments would not encounter significant hills or slopes.

Salcha Alternative Segment 1

Salcha Alternative Segment 1 would traverse active floodplain deposits (Aa) and active channel deposits (Ac). This segment would not encounter significant hills or slopes.

Salcha Alternative Segment 2

The soils Salcha Alternative Segment 2 would traverse include active floodplain deposits (Aa), abandoned floodplain deposits (Ab), and loess (El). Abandoned floodplains could also provide borrow material, but overburden depths are generally greater than active floodplain deposits and abandoned floodplains are more likely to be frozen (Miller, 2007). This segment would encounter several areas of slope where excavation of soils would be required to accomplish design grades.

Central Segment 1

Central Segment 1 would traverse abandoned floodplains deposits (Ab) and alluvial fan deposits (Afw). This segment would not encounter significant hills or slopes.

Central Segment 2

Central Segment 2 would traverse active floodplain deposits (Aa). This segment would not encounter significant hills or slopes.

Connector Segments A through E

Connector Segments A through E would traverse active floodplain deposits (Aa). These segments would not encounter significant hills or slopes.

Donnelly Alternative Segment 1

Donnelly Alternative Segment 1 would traverse dune sand (Es), active floodplain deposits (Aa), abandoned floodplain deposits (Ab), active channel deposits (Ac), glacial outwash of Wisconsin age (Ow), glacial outwash of Illinoisan age (Oi), and alluvial fan deposits (Af). Active channel deposits are also a potential source of borrow material, but permitting concerns could limit availability (Miller, 2007). This segment would encounter several areas of slope where excavation of soils would be required to accomplish design grades.

Donnelly Alternative Segment 2

Donnelly Alternative Segment 2 would traverse active floodplain deposits (Aa), abandoned floodplain deposits (Ab), active channel deposits (Ac), reworked loess, and undifferentiated frozen silt (Cu), loess, and glacial outwash of both Wisconsin age (Ow) and Illinoisan age (Oi). This segment would encounter several areas of slope where excavation of soils would be required to accomplish design grades.

South Common Segment

South Common Segment would traverse glacial outwash of Illinoisan age (Oi) and dune sand (Es). This segment would not encounter significant hills or slopes.

Delta Alternative Segment 1

Delta Alternative Segment 1 would traverse dune sands (Es), active floodplain deposits, abandoned floodplain deposits (Ab), active channel deposits (Ac), and glacial outwash of Illinoisan age (Oi). This segment would encounter several areas of slope where excavation of soils would be required to accomplish design grades.

Delta Alternative Segment 2

Delta Alternative Segment 2 would traverse dune sands (Es), abandoned floodplain deposits (Ab), active channel deposits (Ac), and glacial outwash of Illinoisan age (Oi). This segment would not encounter significant hills or slopes.

Operations Impacts

Impacts on soils during rail line operations and maintenance would include excavation of soils from borrow sites used for maintenance of the railbed and service roads. Also, use of service roads during maintenance would cause dust and other fine-grained sediments to become airborne and deposited downwind of the road.

No-Action Alternative

The only impact on soils under the No-Action Alternative would be from natural processes.

3.5 Permafrost

3.5.1 Affected Environment

Permafrost is defined as soil, silt, and rock that remain frozen year-round. It is characterized as a thermal condition in which the temperature of the ground remains below 32 degrees Fahrenheit (°F) (0 degrees Celsius [°C]) for 2 or more years. Areas underlain by permafrost are classified as belonging to either the continuous zone or the discontinuous zone. Continuous permafrost refers to areas that have a constant layer of permafrost. Discontinuous permafrost occurs in patches. Discontinuous permafrost exists at various depths throughout the project alignment, ranging from less than 1.6 to more than 66 feet to its upper surface, with the base commonly ranging from as little as 39 to more than 148 feet below the ground surface (Williams, 1970).

Permafrost is a major factor influencing human activities and the distribution of flora in Alaska. Permafrost is an important contributor to soil processes including cryoturbation, rapid runoff, subsidence, and restriction to drainage. Cryoturbation is the mixing of soil by freezing and thawing, resulting in broken soil horizons. Runoff occurs on slopes with permafrost because the frozen ground prevents water infiltration. Subsidence of the ground surface can occur if permafrost melts. The impermeable surface of the permafrost table can create a barrier to water flow and often causes permafrost to remain very wet or saturated during the summer season.

The presence and maintenance of permafrost depends strongly on climate and disturbance activities. The weather stations at Fairbanks and Big Delta both show a warming trend since the 1940s. The recorded increase in the mean annual seasonal temperature is between 5 °F and 7 °F per 100 years for the two stations.

3.5.2 Environmental Consequences

Methodology

Permafrost along the proposed rail line was analyzed through soil borings and collecting core samples during the geotechnical investigation. The results indicate that permafrost is present throughout the project area, but its distribution varies depending on soil type, moisture content, slope aspect, surface cover, and other factors. Where permafrost was encountered, the depth of thaw was generally less than 2 feet below ground surface. Slightly deeper thaw was found at some locations with drier soil conditions (Miller, 2007).

Table 3-3 lists the amount of permanently frozen ground expected to be present in each mapped soil unit as a percentage. The range of thickness of overburden (organic silt and silt overlying a soil unit) is also tabulated. Overburden is the primary source of thaw settlement if the permafrost thaws (Miller, 2007).

Table 3-3
Estimated Permafrost Percentages and Overburden Thickness[a]

Soil Unit	Percent Frozen	Overburden in Feet		
		Minimum	Most Common	Maximum
Aa	25	2.0	5.0	10.0
Ab	75	2.5	7.0	12.0
Ac	5	0.0	2.0	4.0
Af	90	3.0	14.0	26.0
Cu	85	4.0	12.0	30.0
EL	15	2.0	6.0	15.0
Es	50	0.5	3.0	5.0
Gw	80	1.0	3.0	8.0
Oi	85	0.5	4.0	10.0
Ow	75	0.0	4.0	8.0
S	5	4.0	8.0	12.0

[a] Source: Miller, 2007.

This analysis of environmental consequences reviews common impacts briefly, and then identifies segment-specific impacts in more detail as applicable. Chapter 20 describes proposed mitigation for impacts to permafrost.

Construction Impacts

Construction-related impacts on permafrost potentially include any removal of surface vegetation for construction of the railbed and service roads, construction of the railbed embankment, and excavation of sources that contain permafrost.

Any activity that removes the insulating vegetation mat above the permafrost layer allows the ice mass to melt and irregular subsidence to occur. Thermokarst is the process and range of features that form from irregular subsidence. These features can include hummocks and mounds, water-filled depressions, flooded forests, mudflows on sloping ground, or other land forms. The thawing process is difficult to control, and after it has begun, thermokarst features persist (Berger and Iams, 1996).

As a standard rail line construction practice, the railbed would be built above grade. Construction of an embankment would reduce the surface albedo (reflectance of solar energy) and increase the ground surface temperature in the summer. This would result in a deeper thaw depth. For a gravel embankment 5 feet thick, the depth of thaw would extend into the frozen soils below the natural depth of thaw. Under the shoulders of the embankment, the depth of thaw would be even greater. If the soils are thaw-unstable (high silt content), the embankment and its shoulders would settle. If railbed construction occurred on permafrost with a high potential for subsidence, the rate of thaw could be slowed by the use of insulating mats and gravel embankments of appropriate thickness to keep frozen substrates frozen, and therefore able to bear loads.

Specific construction methods that would be employed in areas of permafrost would depend highly on site conditions. Minor shifts of the alignment to avoid or minimize impacts to permafrost could be possible in some areas. In other areas, the depth and thickness of the permafrost layer might allow total excavation down to unfrozen substrate and backfilling with gravel. Above-grade insulating mats or gravel embankments could also be utilized in areas where the required above-grade embankment thickness would not conflict with rail grade requirements.

The known permafrost characteristics specific to each alternative segment are listed separately below and in Table 3-4. Additional detailed analysis of permafrost characteristics would be conducted prior to construction to determine appropriate construction methods designed to minimize permafrost thaw and subsidence.

Table 3-4
Estimated Permafrost Percentages and Overburden Thickness for Alternative Segments[a]

	Permafrost (based on soil unit characteristics)	
Alternative Segment	**Percentage of Frozen Ground**	**Depth (in feet) of Overburden (ice content)**
North Common Segment	25	5
Eielson Alternative Segment 1	25	5
Eielson Alternative Segment 2	25	5
Eielson Alternative Segment 3[b]	25	5
Salcha Alternative Segment 1[b]	5 to 25	2 to 5
Salcha Alternative Segment 2	5 to 75	2 to 7
Central Alternative Segment 1	75 to 90	7 to 14
Central Alternative Segment 2	25	5
Central Connector Alternative Segments A through E	25	5
Donnelly Alternative Segment 1[b]	5 to 90	2 to14
Donnelly Alternative Segment 2	4 to 12	4 to 12
South Common Segment	50 to 85	3 to 4
Delta Alternative Segment 1[b]	5 to 85	3 to 7
Delta Alternative Segment 2	5 to 85	2 to 7

[a] Source: Miller, 2007.
[b] Components of the proposed action.

Construction Impacts by Alternative Segment

North Common Segment

North Common Segment would be wholly within an active floodplain. On average, the active floodplain is likely to contain 25 percent permafrost and, where permafrost exists, 5 feet unfrozen overburden.

Eielson Alternative Segments 1, 2, and 3

Eielson Alternative Segments 1, 2, and 3 would be wholly contained within an active floodplain (Aa, 25 percent permafrost and 5 feet overburden). The eastern section of Eielson Alternative Segment 1 would approach the active channel deposits of the Tanana River, where permafrost percentage and overburden would decrease.

Salcha Alternative Segment 1

Salcha Alternative Segment 1 would immediately cross the active channel deposits (Ac, 5 percent permafrost and an average of 2 feet overburden) of the Tanana River. Salcha Alternative Segment 1 would then continue east within the active floodplain (Aa, 25 percent permafrost and 5 feet overburden) south of the river.

Salcha Alternative Segment 2

Salcha Alternative Segment 2 would cross active floodplains (Aa, 25 percent permafrost and 5 feet average overburden), active channel deposits (Ac, 5 percent permafrost and 2 feet overburden), and abandoned floodplain deposits (Ab, 75 percent permafrost and 7 feet overburden). The segment would also cross the corner of a loess deposit, characterized by permafrost at 15 percent and overburden of 6 feet.

Central Alternative Segment 1

Central Alternative Segment 1 would cross abandoned floodplain deposits (Ab, 75 percent permafrost and 7 feet overburden), and alluvial fan deposits (Afw, 90 percent permafrost and 14 feet overburden).

Central Alternative Segment 2

Central Alternative Segment 2 would be wholly contained within the active floodplain (Aa, 25 percent permafrost and 5 feet overburden) south of the Tanana River.

Connector Segments A through E

Central Connector Segments A through E would cross active floodplains (Aa, 25 percent permafrost and 5 feet overburden) south of the Tanana River. Connector A exhibits permafrost at a depth of approximately 1 foot to 2 feet below the soil surface (Miller, 2007).

Donnelly Alternative Segment 1

Donnelly Alternative Segment 1 would begin in the active floodplain south of the Tanana River, where it would break south and west through dune sand (Es, 50 percent permafrost and 3 feet average overburden), active floodplain (Aa), active channel deposit (Ac), and abandoned floodplain (Ab), until it crossed the Little Delta River. As Donnelly Alternative Segment 1 ran farther south of the Tanana river, it would traverse glacial outwash deposits of Illinoisan and Wisconsin age (Oi, 85 percent permafrost and 4 feet overburden; Ow, 75 percent permafrost and 4 feet overburden), then an alluvial fan deposit (Af, 90 percent permafrost and 14 feet overburden). Donnelly Alternative Segment 1 would cross more Wisconsin glacial outwash before crossing Delta Creek and into Illinoisan glacial outwash, where the segment would meet Delta Alternative Segment 2 and form South Common Segment.

Donnelly Alternative Segment 2

Donnelly Alternative Segment 2 would be contained within the active and abandoned floodplains (Aa, Ab) of the Tanana River until it crossed the Little Delta River and traversed a deposit of reworked loess and undifferentiated frozen silt (Cu, 85 percent permafrost and 12 feet overburden) and Wisconsin age glacial outwash (Ow) before crossing Delta Creek into glacial outwash of Illinoisan age (Oi) and connecting with Donnelly Alternative Segment 1 to form the South Common Segment.

South Common Segment

South Common Segment would continue to traverse Illinoisan age glacial deposits (Oi, 85 percent permafrost and an average 4 feet overburden) west of the Tanana River. The segment would enter a sand dune unit (Es, 50 percent permafrost and 3 feet overburden) as it approached the Delta River and divided into Delta Alternative Segment 1 and Delta Alternative Segment 2.

Delta Alternative Segment 1

Delta Alternative Segment 1 would begin at the margin of the dune sand unit (Es, 50 percent permafrost and an average 3 feet overburden) before crossing into the abandoned floodplain (Ab, 75 percent permafrost and 7 feet overburden) of the Delta River. The segment would parallel the Delta River south until it cut east across a small active floodplain (Aa, 25 percent permafrost and 5 feet overburden) before crossing the river and its active floodplain deposits (Ac, 5 percent permafrost and 5 feet overburden). On the east side of the Delta River, the segment would cross an abandoned floodplain (Ab) before terminating in an Illinoisan age glacial outwash plain (Oi, 85 percent permafrost and 4 feet overburden).

Delta Alternative Segment 2

Delta Alternative Segment 2 would begin at the margin of the dune sand unit (Es, 50 percent permafrost and an average 3 feet overburden), then run east, crossing the thin, abandoned floodplain unit (Ab, 75 percent permafrost and 7 feet overburden) before crossing the Delta River and its active channel deposits (Ac, 5 percent permafrost and 2 feet overburden). On the east side of the river, the segment would traverse south across a glacial outwash deposit of Illinoisan age (Oi, 85 percent permafrost and 4 feet overburden) before terminating.

Operations Impacts

Operations impacts on permafrost would result from temperature changes in the sub-base related to compaction and friction produced by trains and other equipment utilized for rail line ROW maintenance. These operations impacts to permafrost would be expected to be nominal.

No-Action Alternative

The only impact on permafrost under the No-Action Alternative would be from natural processes.

3.6 Seismic Hazards

3.6.1 Affected Environment

Assessments of seismic potential, along with information on surface geology, can be used to determine the seismic hazard in a particular area and to design and build structures accordingly. A seismic hazard can be evaluated to estimate the probabilities that various levels of earthquake ground motion would be exceeded at a site in a period of time. The evaluation uses three inputs—seismic source, seismicity, and a ground motion attenuation function (a function of earthquake magnitude and distance) (U.S. Department of the Interior [USDOI], 2002).

The tectonic framework of Alaska is dominated by subduction of the Pacific plate underneath the North American plate. Stresses resulting from plate convergence are transmitted across great distances (more than 300 miles) into Interior Alaska, where the deformation causes substantial crustal seismicity. While some of the earthquakes in the project area are clearly associated with the large-scale, strike-slip fault systems of Denali in the south and Kaltag and Tintina in the north, most of the shocks are located in a zone of distributed shear deformation between the two fault systems. These earthquakes are aligned in three major north-northeast-trending zones, one of which (the Salcha seismic zone) crosses both Salcha Alternative Segment 1 and Salcha Alternative Segment 2 (Page *et al.*, 1991).

Little is known about geological structures that produce this broadly distributed seismicity. The area between the Tintina and Denali fault systems is occupied by the Yukon-Tanana terrain, an assemblage of Paleozoic and older metasedimentary, metavolcanic, and metaplutonic rocks that are multiply deformed and regionally metamorphosed (Foster *et al.*, 1994). These rocks are cut by a suite of Cenozoic northeast-striking lineaments and sinistral-slip faults. Several of these faults show evidence suggestive of late Cenozoic displacement. Suggestive, but not definitive, evidence from trenching studies and geomorphic features suggests late Pleistocene displacements (Page *et al.*, 1995; Hansen *et al.*, 2001).

The 1937 Salcha magnitude 7.3 earthquake was one of the largest ever recorded in Interior Alaska. Its epicenter was less than 10 miles from Salcha Alternative Segment 2.

3.6.2 Environmental Consequences

Methodology

Probabilistic seismic hazard maps of Alaska were prepared in 1999. An effort was begun in 2005 to revise and extend the previous maps, taking into account new and improved information about the earthquake hazard in the region and improvements in methodology. The most significant development since preparation of the 1999 maps was the occurrence of the November 3, 2002, Denali earthquake (Moment Magnitude 7.9), with the epicenter about 50 miles south of Donnelly Alternative Segment 1. Ground motion was felt most strongly north of the Alaska Range. This was the largest earthquake recorded in Interior Alaska (USGS Earthquake Hazards Program, 2006; Trans-Alaska Pipeline System [TAPS] Owners 2001). Because of the high seismic activity in the area, all segments in the project area could be affected by seismic events. Salcha Alternative Segment 1 and Salcha Alternative Segment 2 would cross the Salcha seismic zone, which increases the potential for impacts. Chapter 20 of the EIS describes proposed mitigation for impacts to the proposed rail line from seismic activity.

Common Impacts

Seismic impacts on the project area would likely be common to all the segments. Seismic impacts would be the same during rail line operations and maintenance, and proportionally less during construction, depending on when a seismic event occurred. The most likely impact on the rail line from seismic activity would be misalignment or damage to the tracks, railbed, or service roads. This could be caused by ground shaking, offset lateral movement or soil subsidence. Mass wasting events such as landslides, rockslides, or slump are possible impacts on Salcha Alternative Segment 2, which would within the Salcha seismic zone and pass through and adjacent to significant relief. If strong enough, ground shaking could also cause derailment of a train. Salcha Alternative Segment 1 and Salcha Alternative Segment 2 would cross the Salcha seismic zone, and would therefore have the potential for train derailment resulting from a seismic event.

Soil liquefaction that could result from earthquakes is an additional risk to the stability and integrity of the proposed rail line. Soil liquefaction describes the behavior of loose, saturated, unconsolidated soils that go from solid state to the heavy liquid as a consequence of increasing porewater pressures, decreasing in volume when subject to earthquake loading (Yould *et al.*, 2001). Subsidence and movement of subsurface deposits beneath the railbed could result. Liquefaction is most likely to occur in loose to moderate granular soils with poor drainage, such as silty sands or sands and gravels capped or containing seams of impermeable sediments. Deposits of sands and silts along riverbeds are known to be susceptible to liquefaction.

When the Trans-Alaska Pipeline was designed, the 800-mile route was divided into five seismic zones on the basis of the expected Richter magnitude of a design contingency earthquake in that zone. The division was based on the findings of a USGS study (Alyeska Pipeline Service Company [APSC], 2001). The proposed NRE falls within Zone B (pipeline Milepost 258 to 560), with an expected Richter magnitude of 7.5 (U.S. Department of the Interior [USDOI], 2002, Table 3.4-1).

No-Action Alternative

The only seismic impacts under the No-Action Alternative would be from natural processes.

4. WATER RESOURCES

This chapter analyzes potential direct and indirect impacts to water resources due proposed Northern Rail Extension (NRE) construction and operations. The NRE would be in predominately undeveloped areas within the Tanana River Valley. This chapter describes applicable regulations (Section 4.1), and the affected environment and potential environmental consequences to surface water (Section 4.2), groundwater (Section 4.3), water quality (Section 4.4), wetlands (Section 4.5), and floodplains (Section 4.6).

4.1 Applicable Regulations

Various Federal and State of Alaska agencies regulate project construction activities that could impact water resources, as described in Sections 4.1.1 and 4.1.2.

4.1.1 Federal Agency Regulations

U.S. Environmental Protection Agency (USEPA):

- Section 402 of the Clean Water Act (CWA) (33 U.S.C. [United States Code] 1251 *et seq.*) – National Pollutant Discharge Elimination System (NPDES): Point Source and Stormwater Discharges.

- Section 404 of the CWA – Discharge of Fill Material to Waters of the U.S. USEPA reviews and comments on U.S. Army Corps of Engineers (USACE) Section 404 permit applications for compliance with the Section 404(b)(1) guidelines and other statutes and authorities within its jurisdiction (40 Code of Federal Regulations [CFR] Part 230).

U.S. Army Corps of Engineers:

- Section 10 of the Rivers and Harbors Act (33 U.S.C. 403) – Navigable Waters of U.S. Dredge and Fill Permit.

- Section 404 of the CWA – Discharge of Fill Material to Waters of the U.S.

- Executive Order 11990, *Protection of Wetlands* (24 May 1977).

- Executive Order 11988, *Floodplain Management* (24 May 1977).

4.1.2 State Agency Regulations

Alaska Department of Natural Resources (ADNR):

- Alaska Statute (AS) 46.15, Alaska Water Use Act, and 11 Alaska Administrative Code (AAC) 93 – Under the Alaska Constitution, all surface and subsurface waters reserved for common use, except mineral and medicinal waters, are subject to appropriation under state law. Any withdrawal, diversion (including dewatering of an area or gravel pit) or impoundment of a significant volume of water requires a permit or certificate under state law. ADNR is the exclusive regulatory authority to approve water withdrawals from surface and subsurface waterbodies in Alaska. This authority is based on the common law doctrine of Public Trust, which is embedded in the Alaska Constitution, Article VIII, Section 3, and entitled Common Use. A significant amount of water is defined in 11 AAC 93.970 (14) as:

> The use of more than 5,000 gallons of water in a single day from a single water source; or, The regular daily or recurring seasonal use of more than 500 gallons of water per day for ten days or more per year from a single water source; or The non-consumptive use of more than 30,000 gallons of water per day from a single water source; or, Any water use that might adversely affect the water rights of other appropriators or the public interest.

- Division of Forestry, Alaska Forest Resources Practices Act (FRPA, AS 41.17) – Protect fish habitat, water quality, reforestation, timber health, fire protection.

Alaska Department of Environmental Conservation:

- Section 401 of the CWA – Section 401 Certification.
- Sections 402 and 404 of the CWA – Certificate of Reasonable Assurance for 402 and 404 Permits.
- Section 402 of the CWA – NPDES: Point Source and Stormwater Discharges.

Alaska Department of Fish and Game (ADF&G):

- Title 16, AS 16.05.020(2) – Fish, Game, Aquatic Plant Resources (management, protection, maintenance, improvement, and extension).
- AS 16.05.841 (Fishway Act) and AS 16.05.871 (Anadromous Fish Act) Fish Habitat Permits issued by ADF&G Division of Habitat.

4.1.3 Local Regulations/Plans

- Fairbanks North Star Borough (FNSB) – Title 21, Stormwater Management Ordinance, requires a site development permit for any land-disturbing activity of 1 acre or more that has potential for eroded soil to enter waters of the United States.

4.2 Surface Water

This section describes existing surface-water conditions of the Tanana River Valley in proximity to the proposed NRE (Figure 4-1). SEA collected data in the project area during field investigations in 2005, 2006, and 2007. Appendix E describes the methodologies employed and data collected. Appendix E also describes and summarizes data the U.S. Geological Survey and the State of Alaska collected in the project area.

4.2.1 Affected Environment

The Tanana River Basin occupies approximately 44,000 square miles extending from the river's headwaters in Canada to its confluence with the Yukon River (Brabets *et al.*, 2000). The Tanana

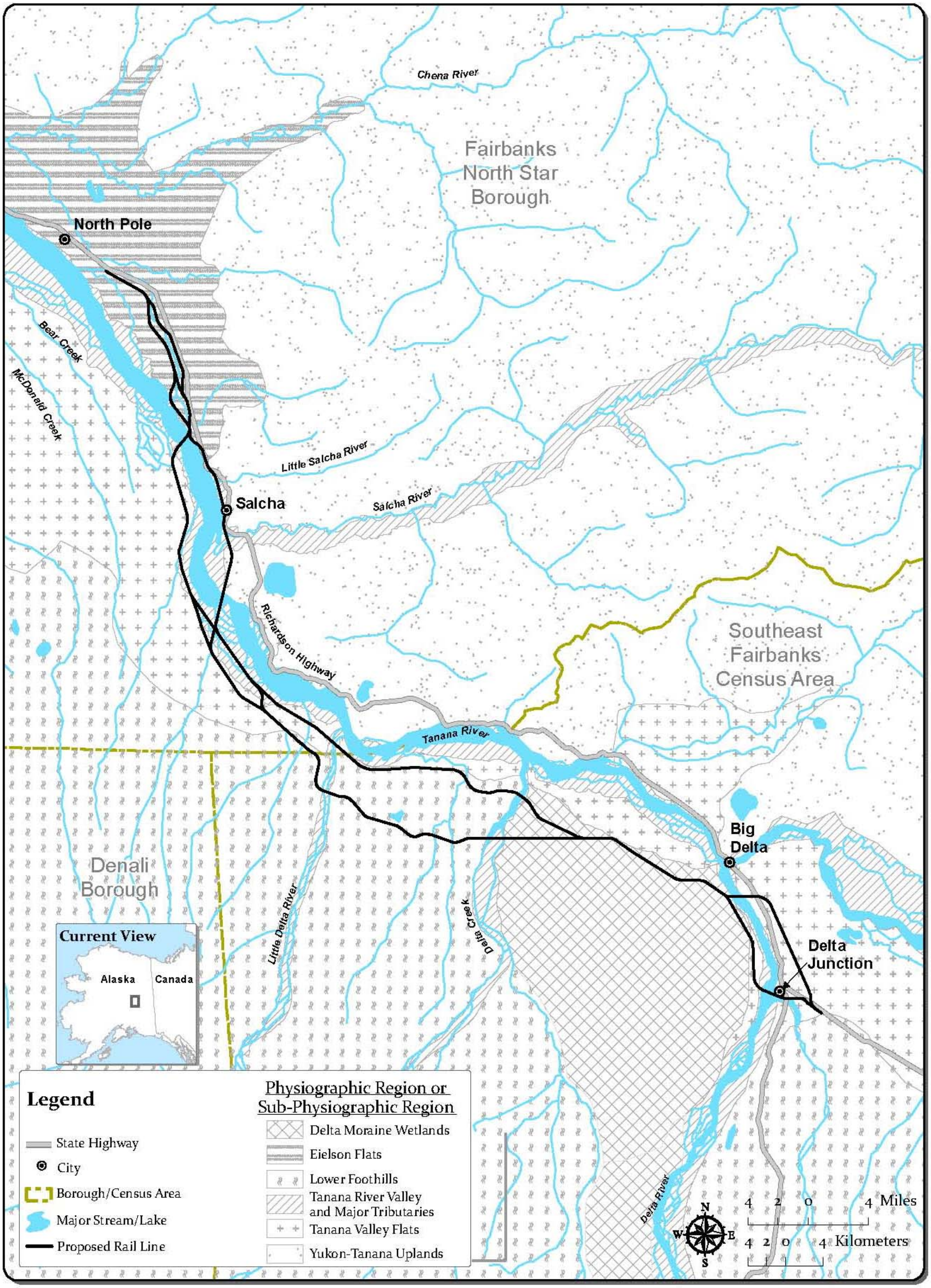

Figure 4-1 – Physiographic and Sub-Physiographic Regions

River is part of the larger Yukon River Basin, and is the largest tributary of the Yukon River. The Tanana River flows north-northeast from the base of the Alaska Range and through several physiographic regions (Wahrhaftig, 1965). A physiographic region is an area that has similar features or land forms that differ significantly from that of adjacent areas. Often, there are sub-areas within a region. These sub-areas are referred to as sub-physiographic regions. Table 4-1 summarizes the characteristics of major streams and rivers in the NRE project area. The project area lies along the border of the Yukon-Tanana Uplands and Tanana Lowlands physiographic regions, but mostly within the Tanana Lowlands region following the path of the river. The Tanana Lowlands are further divided into sub-physiographic regions that have distinct hydrologic and geomorphic characteristics, including Eielson Flats, Delta Moraine Wetlands, Lower Foothills, Tanana Valley Flats, and the Tanana River Valley and Major Tributaries.

Table 4-1
Summary Characteristics of Major Streams and Rivers in the NRE Project Area

Major Streams and Rivers	Drainage Area (square miles)[a]	Sub-Physiographic Region	Dominant Discharge Regime[b]
Tanana Lowlands Physiographic Region			
Tanana River	19,850	Tanana River Valley and Major Tributaries	Glacier
Piledriver Slough	ND[c]	Eielson Flats	Groundwater Breakup-
Moose Creek	ND	Eielson Flats	Groundwater
Twentythreemile Slough	ND	Eielson Flats	Breakup-Rainfall-Groundwater
Fivemile Clearwater River	188	Tanana Valley Flats	Groundwater
Little Delta River	691	Lower Foothills	Glacier
Kiana Creek	115	Lower Foothills	Breakup-Rainfall-Groundwater
Delta Creek	641	Lower Foothills	Glacier
Richardson Clearwater River	182	Tanana Valley Flats	Groundwater
Providence Creek	ND	Tanana Valley Flats	Groundwater
Delta River	1,642	Tanana Valley Flats - Delta Moraine Wetlands - Lower Foothills	Glacier
Jarvis Creek	ND	Tanana Valley Flats - Lower Foothills	Glacier-Rainfall
Yukon-Tanana Uplands Physiographic Region			
Little Salcha River	65[a]	N/A [d]	Rainfall-Groundwater
Salcha River at Richardson Highway	2,170	N/A	Breakup-Rainfall

[a] Drainage areas computed at proposed crossing location.
[b] Discharge regimes are described in Appendix E.
[c] ND = no data available.
[d] N/A = no sub-physiographic regions were identified in the project area.

There are 11 major watercourses that discharge to the Tanana River within the project area. Three of the larger rivers (Delta River, Delta Creek, and Little Delta River) have headwaters in glaciated regions of the Alaska Range and flow northward toward the Tanana River. Two rivers on the northern side of the Tanana River (Salcha River and Little Salcha River) flow south-southwest from the Yukon-Tanana Uplands. Five streams that are primarily groundwater-fed (Richardson Clearwater, Fivemile Clearwater, Providence Creek, Twentythreemile Slough, and Piledriver Slough) flow parallel to the Tanana River along the south and north sides of the river before discharging to the river. Kiana Creek flows north and drains a large area in the Lower Foothills between Delta Creek and Little Delta River, until it reaches the Tanana Valley Flats, where it turns westward and is fed by a major groundwater upwelling complex. Kiana Creek joins the Tanana River approximately 4.5 miles upstream of the Little Delta River. In addition to the 11 major drainages within the project area, numerous smaller drainages in the valley are derived from local groundwater seeps or small side branches of the Tanana River, or are snowmelt/runoff drainage pathways.

In the project area, lakes were either formed naturally or excavated by humans. Naturally formed lakes and ponds are a result of floodplain processes, spring discharge, natural depressions below the groundwater table, relic moraine features associated with rapid downwasting of the 'Delta' Glaciers, or are located at the base of closed basins. Lakes and ponds are found throughout the study area, but in general have not been used for to supply water. Excavated lakes have been created to supply water for construction, development, or agriculture, or resulted from gravel mining and borrow areas dug below the groundwater table. Excavated lakes are common in the rural populated areas of Eielson Flatlands.

The Tanana River floodplain (Figure 4-2) exhibits many small pond-like features with a relatively permanent water supply that sustains them for most of the year. These smaller ponds are lenticularly shaped oxbows (*e.g.*, ponds formed within old river meander scars or channels) once occupied by the Tanana River. The ponded water is lower in elevation or is located in small depressions that fill with water when the underlying water table is high. Over time, these depressions fill in with organics and sediment and no longer contain standing water. These features are common throughout the Tanana River floodplain, and less so within the Eielson Flatlands and Tanana Valley Flats.

4.2.2 Environmental Consequences

This section describes potential impacts to surface water as a result of the proposed NRE. Appendix E describes in detail the methodology for assessing impacts. Appendix E also provides detailed water-resource tables, which list specific water resources and their characteristics. This section first describes common impacts associated with the proposed rail line, and then describes specific impacts associated with each alternative segment. The impacts descriptions include both proposed rail line construction and operations. In some cases, there would be no operations impacts. Chapter 20 describes proposed mitigation measures for impacts to surface water.

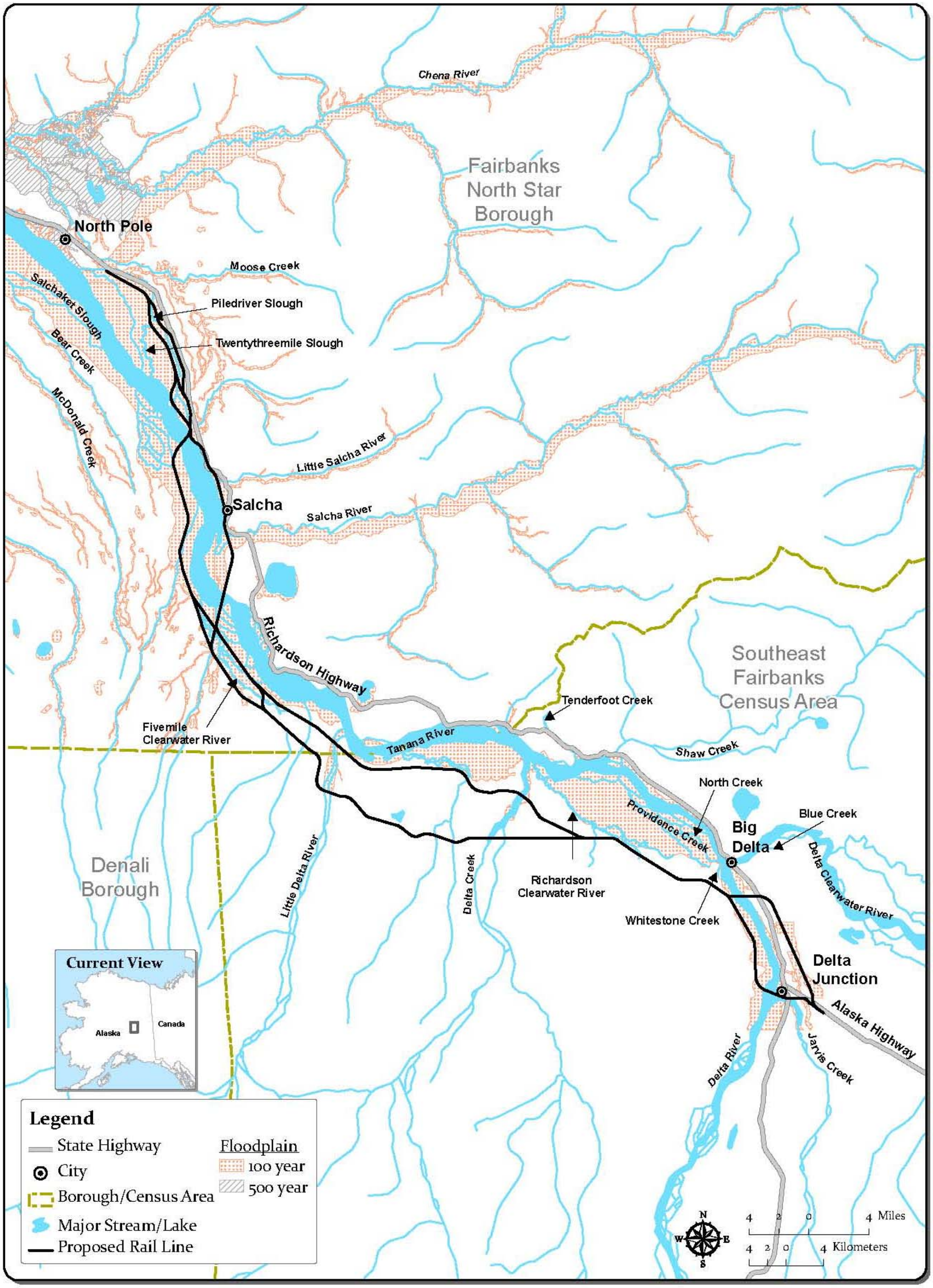

Figure 4-2 – Floodplain Area

Methodology

As part of this analysis, impacts are defined as low, moderate, high, or no impact (see Table 4-2). These impact descriptions provide a general guideline for understanding the effects of the proposed NRE, because the location and/or design characteristics of some temporary construction facilities and rail line structures would only be developed during the final design and permitting process. See Chapter 2 for a description of this process. The impact determinations for these preliminary facilities and structures represent the Surface Transportation Board Section of Environmental Analysis (SEA) conservative best estimates of the potential effects that could result from these types of facilities and structures in the project area.

Table 4-2
Impact Assessment Definitions

Description	Definition
No Impact	The activity/structure would not come in contact with the listed resource.
Low Impact	The activity/structure could have contact, but has little to no effect.
Moderate Impact	The activity/structure could cause negative impacts, but typically only under adverse or extreme conditions (*i.e.*, extreme flooding or weather events).
High Impact	The activity/structure would most likely cause negative impacts under normal construction or operational activities (*e.g.*, when fill is placed and occupies approximately half or more of a channel width).

Common Impacts to Surface Water

Common impacts are construction and operations-related impacts that could occur throughout the project area. These potential impacts are not associated with any specific alternative segment.

Common Construction Impacts to Surface Water

Construction-related impacts could result from the construction of unpaved access roads, construction of the rail line foundation, excavation of borrow areas, construction of bridges and culverts, use of ice roads and ice bridges, water supply extraction, and staging areas.

Unpaved Access Roads

In general, the construction of access roads would have low impacts to rivers and streams, except in areas where the road would be near or adjacent to waterbodies and wetland flow-way areas. In these cases, flood and/or wetland flow-way hydraulics could be altered, potentially creating new wetland areas or causing the loss of wetland areas by cutting off water sources. In addition, unpaved access roads could increase sediment availability, which could lead to sediment loading and turbidity in nearby streams. The construction of access roads (or the railbed) could affect sheet surface water flow if adequate cross drainage is not provided or if fill materials capture surface or subsurface flows and redirect them. In porous floodplain systems, there is the potential for fills associated with access roads to alter subsurface flows and upwellings important for fish habitat. The impacts from access road-related bridges and culverts are discussed below.

Excavation of Borrow Areas

Large man-made reservoirs could result from the excavation of materials used to supply subballast. In addition, borrow areas in discontinuous permafrost terrain could lead to thermal erosion (the erosion of permafrost by the combined thermal and mechanical action of moving water) and subsequent transport of fine-grained sediments during flooding or ice breakup to nearby waterbodies. Thermal erosion can occur anywhere ice-rich permafrost thaws, not just near streams. Section 4.4 provides more information about erosion and sedimentation.

There would also be several large (approximately 20 acres each) borrow areas in the active channels of the large braided glacial streams (Tanana River, Little Delta River, Delta Creek, and Delta River). The exact location of these borrow areas within the active channels has not been identified, and the timing and duration of borrow activity has not been described, so it is plausible that without knowledge of annual and seasonal variation of flood stage and hydraulics of these rivers at the borrow areas, there could be adverse consequences. These consequences could include flooding and subsequent erosion and/or aggradation of the borrow area and loss of equipment and work days.

Excavation of materials from wetlands could cause loss of aquatic habitat, loss of the ability to slow surface water flow, and decreased filtration capacity, as described in Section 4.5. Local shallow water areas (former borrow areas) could be targeted areas for further gravel extraction. The excavation of borrow areas could affect sheet surface water flow by capturing surface or subsurface flows. In some cases, these man-made reservoirs have established recreational or habitat value, which could be disrupted by the removal of material from the gravel pits, including sediment disturbance, an increase in turbidity, and an overall degradation of water quality within the pit pond. Also, large man-made reservoirs (approximately 17 acres each) would be left as a result of the material excavations.

Construction and Installation of Bridges and Culverts

Bridges would be constructed as single- or multiple-span segments that would either completely or only partially span (or clear) the channel. Depending on design and the need to work in the channel (*i.e.*, geotechnical drilling for design work, constructing piers and footings) or along the stream banks (*i.e.*, constructing abutments), filling or excavating materials from streams and/or wetlands, impacts could be low to high, and could include:

- Blockage, convergence, or changes to the natural drainage during and after (short and long-term) constructing/working in the channel;
- Sloughing and erosion of the streambank;
- Thermal erosion of cuts made into permafrost soils;
- Geotechnical boreholes providing direct communication between surface water and groundwater;
- Increased stages and velocities of floodwater (due to temporary constrictions) possibly concurrent with increased backwater flooding; and
- increased channel scour, bank erosion and downstream sedimentation.

The installation of bridge piers or abutments could result in the exposure of supra-permafrost (the layer of ground above permafrost) layers. Alteration of these areas could also affect the stability of the piers if thawing was not abated.

The construction of single culverts and battery culverts (multiple culverts at one crossing), however, would likely result in localized disturbance of the streambank to gain access to the channel, and disturbance of the channel bed during culvert installation. Culvert installation would likely have a low impact to supra-permafrost locations. The placement of culverts would typically be within existing channel beds and banks, limiting the extent of permafrost disturbances.

Construction and Use of Ice Roads and Ice Bridges

Although the Alaska Railroad Corporation (ARRC or the Application) has not proposed specific ice roads or bridges, wintertime construction might require ice roads and ice bridges to cross rivers and streams. In some cases, the building of an ice bridge would entail thickening of ice at the crossing. Thickening ice at a crossing could increase freeze-depth in the stream bed and banks, leading to increased overflow or icing in the channel, and diverting flows from downstream reaches. In spring, the thicker zone of ice could take longer to thaw/melt during breakup and cause local flooding (similar to an ice jam). Disturbance along these areas from construction activities could lead to river or stream bank collapse and erosion. Ice bridges can also cause effects during winter, because under-ice flows are restricted and overflow icing increases due to restriction of the channel cross section by thickening ice.

Water Supply Extraction for Potable Water and Construction Use

Rivers, streams, lakes, and ponds could supply fresh water for the construction of ice bridges and ice roads during winter construction seasons and for potable and construction water at construction camps and staging facilities. The Applicant has not estimated proposed project water needs (rates and volumes), but SEA anticipates that these activities could have low short-term (seasonal) impacts on the stage (water level) of smaller streams but would have a lesser effect on larger watercourses.

Major rivers, lakes, and ponds could be used to supply fresh water for the construction of ice bridges and ice roads during the winter construction season and for potable and construction water at construction camps and staging facilities. Impacts to rivers, lakes, and ponds would depend on the total cumulative water withdrawal by all users from a single source. The ADNR would manage water withdrawal to ensure that water appropriation would not impact fish or fish overwintering habitats or prior appropriators.

If the cumulative withdrawal rate by all users exceeded the natural recharge rate for that aquifer (during intermittent or sustained periods), water extractions from wells could (1) temporarily reduce local groundwater levels and (2) affect the rate and volume of groundwater discharge to rivers and streams. This effect would be greater in certain areas where there is a reasonably high level of hydraulic connectivity between the surface water and groundwater systems.

ADNR would authorize the withdrawal, impoundment, or diversion of water only if the withdrawal, impoundment, or diversion would be in the public interest and would not adversely affect the supply of water to lawful appropriators of record. Public interest criteria include the effect of water withdrawal, diversion, or impoundment on fish and game resources and on public recreational opportunities.

Use of River Channels or Floodplains as Transport and Staging Areas

Although construction staging areas and camps are not typically allowed on floodplains due to the inherent flooding risks and the associated difficulty in containing hazardous materials spills, there might not be feasible alternatives. Because locations have not been finalized (regarding proximity to waterbodies and floodplains), SEA has conservatively assumed that there is a possibility staging areas and camps could be located on floodplains.

The use of floodplains as staging areas or camps could affect sheet surface water flow if adequate cross drainage was not provided or if fill materials captured surface or subsurface flows and redirected them. In porous floodplain systems, there is the potential for fills associated with access roads to alter subsurface flows and upwellings important for fish habitat.

Natural drainage patterns could be disrupted if construction activities (*e.g.*, in staging areas) occur during flooding episodes of major streams, during high runoff periods along seasonal drainages, or along shallow overland flow paths. Blockages or diversions to areas with insufficient flow capacity could result in seasonal or semi-permanent impoundments. Also, redirected surface flows could increase stream velocities at isolated locations, where increased bank scour or overbanking could occur.

There is discontinuous permafrost throughout the project area and compaction or ground disturbance to the area adjacent to streambanks would likely occur as a result of the construction and use of staging areas and camps. As a result of the potentially large areas that would be occupied, there would be a possibility of affecting areas of permafrost, which could catalyze thermal erosion near streambanks. In addition, removal or compaction of shallow surface soils could enlarge or eliminate supra-permafrost areas. Construction pads could temporarily affect shallow surface water zones and could temporarily change the thickness and vertical location of the active thaw zone. This could lead to entrainment and transport of fine-grained sediments to nearby waterbodies during rainstorms or subsequent breakups.

Common Operations Impacts to Surface Water

Section 4.4 describes operations impacts to surface water.

Impacts to Surface Water by Alternative Segment

Construction Impacts

North Common Segment

There are two potential crossings along this segment—one bridge and one culvert. The 140-acre Eielson Construction Camp and Staging Area and one 17-acre borrow area would be part of this segment. Figure 4-3 shows the proposed stream crossings and Table 4-3 provides additional details on the two crossings. Appendix E provides information on controlling factors and other crossing characteristics, and summarizes potential impacts for North Common Segment (see Tables E-15 through E-16b).

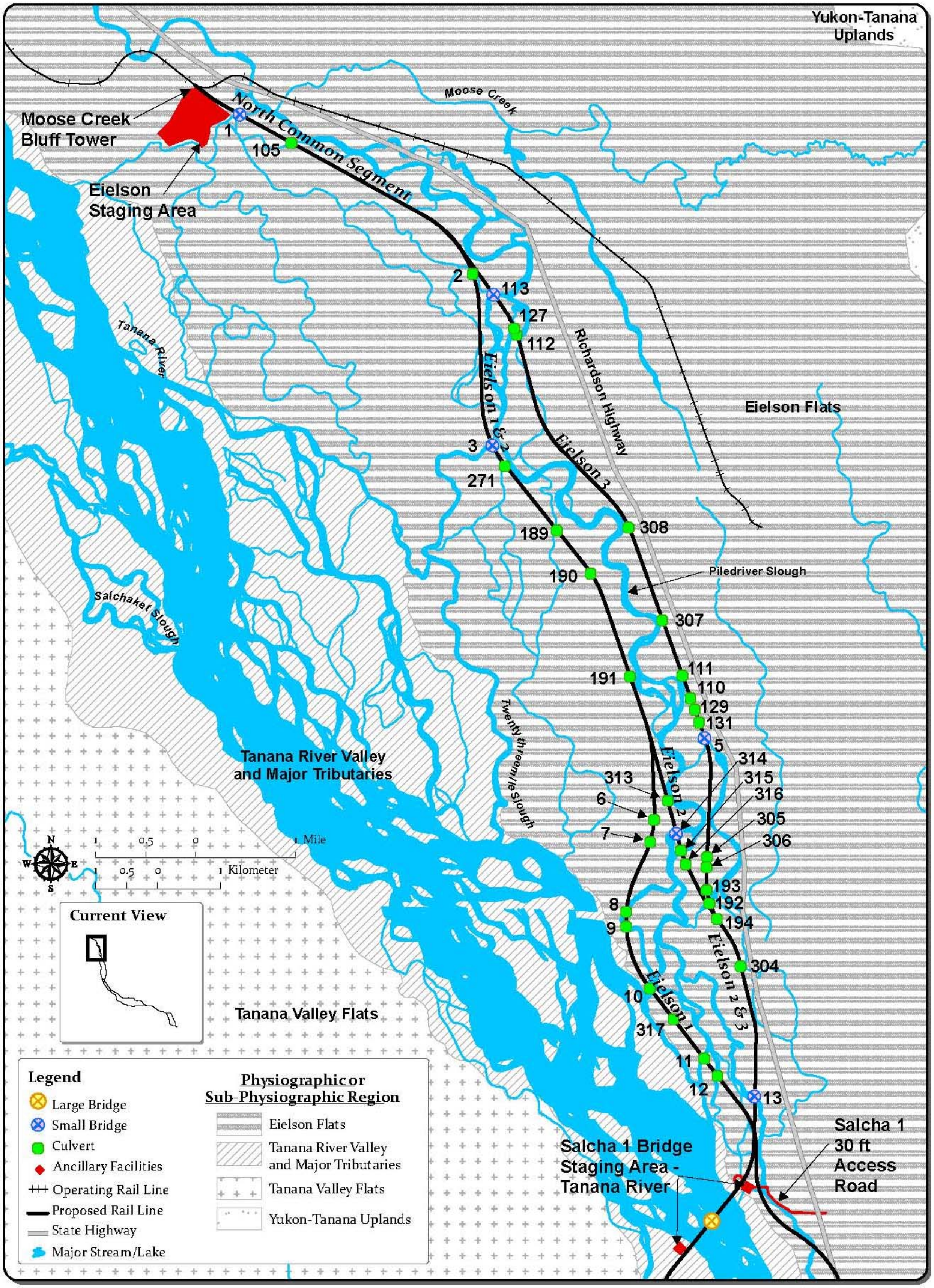

Figure 4-3 – North Common and Eielson Alternative Segments Stream Crossings

Table 4-3
Summary of Crossing Environment for North Common Segment

Number of Crossings	
	2
Type of Waterbody	
Drainageway	–
Floodplain Slough	1
Overflow Channel	–
Seep	–
Stream	1
Wetland Flow-way[a]	–
Physiographic Division	
Eielson Flats	2
Delta Moraine Wetlands	–
Lower Foothills	–
Tanana River Valley and Major Tributaries	–
Tanana Valley Flats	–
Yukon-Tanana Uplands	–
Type of Crossing	
Small Bridge	1
Culvert	1
Channel Stability	
High	–
Moderate	2
Low	–
Within 100-Year Floodplain	
Yes	2
No	–

[a] Not defined as wetlands per the National Wetlands Inventory.

The relevant activities or structures that would be placed along the 2.7-mile-long North Common Segment would result in low impacts. Most of the activities would not be located along the margins of any waterbodies along this reach and would not affect the rivers and streams.

The approximately 100-foot-long proposed bridge across the Piledriver Slough would be a single-span bridge and no structures would be placed directly in the channel, resulting in minimal disturbance to the river channel. There would be low to moderate disturbances to the streambanks during construction of the bridge approaches and abutments. Impacts associated with potential bridge construction over Piledriver Slough would be low.

Construction of the culvert crossing (two 10-foot-diameter culverts) would likely result in localized disturbance of the streambank when gaining access to the channel and disturbance of the channel bed when installing the culvert. Impacts associated with potential culvert battery construction would be moderate.

The 140-acre Eielson Construction Camp and Construction Staging Area would likely be located along this segment, but its relative proximity to waterbodies is not known. Compaction and/or ground disturbance adjacent to streambanks in areas of permafrost could occur as a result of constructing the staging area and camp in proximity to streams. As a result of the potentially large area being occupied, there would likely be a moderate impact to local areas of permafrost, which could catalyze thermal erosion near streambanks.

Well-water extraction would also be required for potable water use in the camp and for construction water in the staging area. The estimated water use (rates and volumes) would be determined during final design and permitting. Based on the following general effects that could result from water use, there could be impacts on natural water balances in the local area. Water extractions from wells could reduce local groundwater levels and, due to a reasonably high level of hydraulic connectivity between the surface water and groundwater systems, the rate and volume of groundwater discharge to waterbodies could be reduced intermittently during sustained pumping periods (*i.e.*, the withdrawal rate could exceed the natural recharge rate). The level of impact would depend on site conditions and water withdrawal rates.

The construction of gravel access roads near adjacent waterbodies would result in low impacts because there would be a number of existing roads in the area that could be used when feasible. Therefore, the construction of new roads would be minimal.

One approximately 17-acre borrow area to supply subballast material would likely be located along this segment. While there is discontinuous permafrost throughout this area, borrow areas would not likely be situated in permafrost (because the finer-grained nature of these soils would be less desirable), which would minimize the potential for thermal erosion and reduced gravel pond quality. Therefore, it is anticipated that this borrow area would result in a low impact.

Further, due to the shallow groundwater in the area it could be difficult to reach the assumed excavation depth of 20 feet, even with the use of a dragline, as described in Section 2.3.3. Thus, the borrow area might need to be larger than the assumed 17 acres. A large groundwater-fed pond would be left as a result of the subballast excavation.

The bridge across Piledriver Slough would span the entire width of the channel and would be designed to pass the 100-year flood and provide passage for navigation of small boats. These design criteria would also make the potential for ice and debris jams low. Thus, the proposed bridge across Piledriver Slough would result in a low impact.

The proposed battery culvert would cause some constriction at the crossing site because the bankfull width of the channel would be reduced from 35 feet to less than 20 feet by the use of two 10-foot-diameter culverts (see Table E-15 in Appendix E). During high flows, this constriction could cause backwaters to form upstream, which would increase the potential for flooding and sediment deposition upstream, and/or channel scour downstream. The culvert also would increase the potential for debris to become trapped, which could result in overbank flooding. The installation of the culvert would result in high impacts, because it could (1) alter flood hydraulics upstream and downstream of the crossing, (2) increase the potential for overbank flooding and ice and debris jams upstream of the culverts, (3) increase scour and bank erosion downstream of the culverts, and (4) increase channel aggradation in certain reaches both upstream and downstream of the culverts.

The remainder of activities or structures along North Common Segment would likely result in low impacts.

Eielson Alternative Segments

There are three proposed Eielson alternative segments, though the segments have common routes over part of the project area. Depending upon the alternative, four or five 17-acre borrow areas are proposed at 3 to 5-mile intervals. Staging areas surrounding the bridge crossings are only proposed for Eielson Alternative Segments 2 and 3.

Table 4-4 lists and Figure 4-3 shows the types of waterbodies and proposed stream crossings along these alternative segments. Appendix E provides information on controlling factors and other stream crossing characteristics for the Eielson alternative segments (see Tables E-17 through E-22c).

Table 4-4
Summary of Crossing Environment for Eielson Alternative Segments

	Eielson 1	Eielson 2	Eielson 3
Number of Crossings			
	14	13	17
Type of Waterbody			
Drainageway	–	–	1
Floodplain Slough	1	3	7
Overflow Channel	6	4	2
Seep	–	–	–
Stream	–	1	–
Wetland Flow-way[a]	7	5	7
Physiographic Division			
Eielson Flats	14	13	17
Delta Moraine Wetlands	–	–	–
Lower Foothills	–	–	–
Tanana River Valley and Major Tributaries	–	–	–
Tanana Valley Flats	–	–	–
Yukon-Tanana Uplands	–	–	–
Type of Crossing			
Small Bridges	1	3	3
Rail Large Bridges	–	–	–
Culvert	13	10	14
Channel Stability			
High	6	3	10
Moderate	7	9	6
Low	1	1	1
100 Year Floodplain			
Yes	14	13	17
No	–	–	–

[a] Not defined as wetlands per the National Wetlands Inventory.

Eielson Alternative Segment 1

This segment would be 10.3 miles long and would include 14 total crossings (13 culverts and 1 bridge), 6 of them common with Eielson Alternative Segment 2. The approximately 100-foot-long proposed bridge across Twentythreemile Slough would likely be a single-span bridge similar to the one across Piledriver Slough as part of North Common Segment. The bridge would be designed to pass the 100-year flood and provide passage for navigation of small boats.

These design criteria would also make the potential for ice and debris jams low. Thus, the proposed bridge over Twentythreemile Slough would result in a low impact.

Seven of the culverts would be used to maintain hydraulic continuity in a wetland flow-way and would be 4 or 10 feet in diameter. Fill would be used across most of the cross-sectional width of the wetland flow-ways. Culvert batteries (multiple culverts at a single crossing) sized to convey flows up to the 100-year flood would be used at four other culvert crossings. The remaining two culverts would also be sized to convey the 100-year flood flow. In all but two of the cases, fill would be required to cross at least half the width of the channels, resulting in disturbance of the streambanks and a narrow strip (but sufficiently wide to build the rail line) across the channels. These local activities would result in high impacts during construction. The timeframe for construction would depend on funding, and construction would likely be staged. However, under a full construction scenario, ARRC anticipates that the project would be completed within 3 to 4 years. Most of the other activities or structures along Eielson Alternative Segment 1 would not be located along the margins of any waterbodies. Therefore, they would not affect the rivers and streams and would result In low impacts. Refer to the Common Impacts and North Common Segment discussions above for activities relating to culverts, gravel access roads and borrow extraction.

Culvert batteries and single culverts would be used in the overflow crossings for the purpose of conveying 100-year flood flows. Although some of these culverts would be relatively large, the overflow channels would still be substantially constricted, thereby potentially increasing flow velocities during high flows through this section. These crossings (both single and battery culverts) would result in high impacts for (1) altered flood hydraulics, (2) increased potential for overbank flooding and ice or debris jams, and (3) increased scour, bank erosion, and channel aggradation. Refer to the section entitled Common Impacts to Surface Water for discussions of these potential impacts.

The remainder of the activities or structures proposed along Eielson Alternative Segment 1 would likely result in low impacts.

Eielson Alternative Segment 2

This segment would be 10.0 miles long and would include 13 total crossings (3 bridges and 10 culverts), 6 of them common along 5.7 miles of Eielson Alternative Segment 1 and 3 crossings common with the last 2.2 miles of the Eielson Alternative Segment 3.

The approximately 100-foot-long proposed bridge across Twentythreemile Slough would likely be a single-span bridge similar to the one across Piledriver Slough as part of North Common Segment. The bridge would be designed to pass the 100-year flood and provide passage for navigation of small boats. These design criteria would also make the potential for ice and debris jams low. Thus, the proposed bridge over Twentythreemile Slough would result in a low impact.

The Piledriver Slough bridge crossing (#314 on Figure 4-3) would be approximately 330 feet long and would likely have at least two mid-channel piers to accommodate three bridge sections. The third bridge would be shorter (60 feet) and would cross an 80-foot-wide channel. Construction activities for these two bridges would have a greater chance of disturbing the channel and banks, so potential impacts would be moderate.

Five of the culverts would be used to maintain hydraulic continuity in a wetland flow-way; three would be 4 feet in diameter and two would be 10 feet in diameter. In all cases, the culvert diameters would be a small proportion of the crossing width, so fill would be used across most of the cross-sectional width of the wetland flow-way. Culverts would be used at the other five crossings to convey flows up to the 100-year flood, and in one case to convey a small stream. Two of the five culverts used to maintain hydraulic conductivity would be 4 feet in diameter; only one of these would be a culvert battery (four 10-foot-diameter culverts). In all but two cases (#190 and #191 on Figure 4-3), fill would be used in more than half of the channel width. These crossings (both single and battery culverts) would result in high impacts for (1) altered flood hydraulics, (2) increased potential for overbank flooding and ice or debris jams, and (3) increased scour, bank erosion, and channel aggradation. Refer to the section entitled Common Impacts to Surface Water for discussions of these potential impacts.

The other activities or structures proposed along Eielson Alternative Segment 3 would likely result in low impacts.

Eielson Alternative Segment 3

This alternative segment would be 10.1 miles long, with the last 2.2 miles the same as Eielson Alternative Segment 2. There are 17 proposed crossings that include 3 bridges, 6 culvert batteries, and 8 single culverts. Two of the bridge crossings, one across Piledriver Slough and the other across an unnamed slough, would likely be multiple span bridges, which would require mid-channel piers; the third would be a 60-foot crossing in an 80-foot-wide channel. Potential impacts associated with these bridge crossings would be moderate due to the required work in the channel and along the banks. Refer to the section entitled Common Impacts to Surface Water for a discussion of these impacts. The same high impacts listed above for Eielson Alternative Segment 1 would apply to the culvert placements.

Most of the activities proposed along Eielson Alternative Segment 3 would likely result in low impacts. Refer to the Common Impacts and North Common Segment subsections for discussions of the construction of culverts and gravel access roads, and material extraction from borrow areas.

Salcha Alternative Segments

Both Salcha alternative segments would include Tanana River crossings, and one would cross both the Tanana and Salcha Rivers. Depending on the alternative segment, there would be three to five 17-acre borrow areas at 3- to 5-mile intervals. Staging areas surrounding the bridge crossings are proposed along both segments. Ice roads and bridges would be used along these segments to cross the Tanana River during winter to transport material and equipment to the west side of the Tanana River.

Figure 4-4 shows and Table 4-5 lists the types of waterbodies these alternative segments would cross and the proposed stream crossings. Appendix E provides information on controlling factors and other stream crossing characteristics (see Tables E-23 through E-26d).

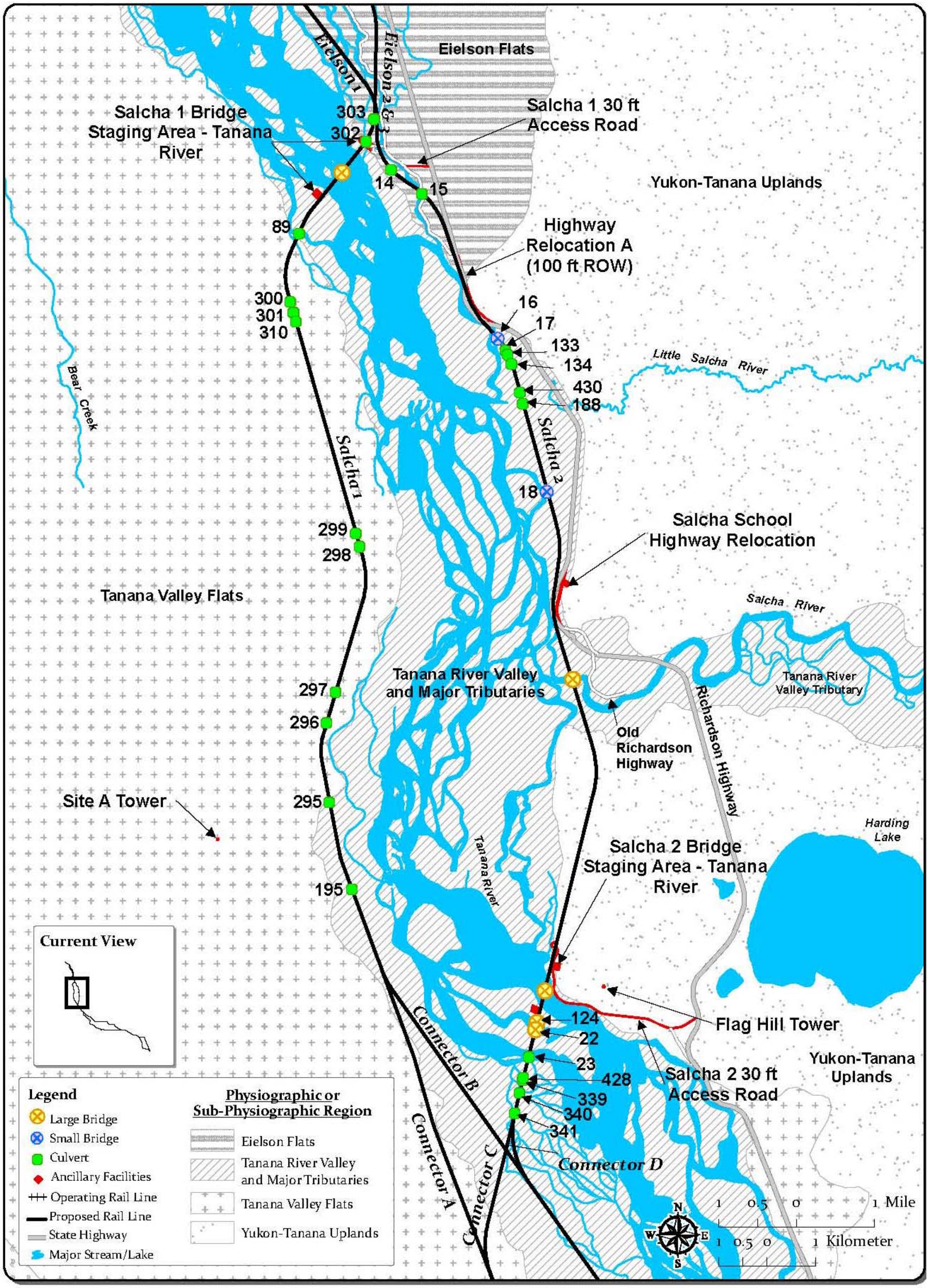

Figure 4-4 – Salcha and Connector Alternative Segments Stream Crossings

Table 4-5
Summary of Crossing Environment for Salcha Alternative Segments

	Salcha 1	Salcha 2
Number of Crossings		
	13	18
Type of Waterbody		
Drainageway	4	–
Floodplain Slough	1	8
Overflow Channel	–	3
Seep	–	–
Stream	2	5
Wetland Flow-way[a]	6	2
Physiographic Division		
Eielson Flats	2	2
Delta Moraine Wetlands	–	–
Lower Foothills	–	–
Tanana River Valley and Major Tributaries	4	16
Tanana Valley Flats	7	–
Yukon-Tanana Uplands	–	–
Type of Crossing		
Small Bridges	-	2
Rail Large Bridges	1	4
Culvert	12	12
Channel Stability		
High	11	3
Moderate	2	15
Low	–	–
Within 100-Year Floodplain		
Yes	13	18
No	–	–

[a] Not defined as wetlands per the National Wetlands Inventory.

Salcha Alternative Segment 1

This segment would be approximately 11.8 miles long and would run primarily along the west side of the Tanana River. Thirteen crossings are proposed along this segment, including one major crossing of the Tanana River (approximately 3,000 feet wide), and 12 culvert crossings. The bridge crossing of the Tanana River would require a dual-modal bridge ranging from 2,400 to 3,600 feet in length. Due to the size of the crossing, there would be construction activities in the middle of the channel to place the bridge piers. Construction activities could cause increased scour or bank erosion while accessing the channel. This impact would be moderate.

The large-bridge crossing at the Tanana River would be designed to pass the 100-year flood and be navigable for a maximum boat size (depending on U.S. Guard [USCG] criteria). Further, the piers placed within the channel would alter flood hydraulics, causing increased scour surrounding the piers, which would result in downstream aggradation and increase the potential for overbank flooding and ice or debris jams. Detailed analyses of the Tanana River crossing has been conducted on only a preliminary level and effects to flood hydraulics during high-flow events are unknown. Thus, conservatively, this structure could result in high impacts.

The Applicant would need to construct gravel roads along the west side of the Tanana River, and has proposed a 24-foot-wide road. Road crossings of streams would be adjacent to the rail line and have the same type of bridge and culvert crossings as the railbed and would have similar impacts as the railbed crossings. While localized disturbances to the stream banks would likely occur during construction, impacts would be low.

Ice roads and bridges would be constructed to cross the Tanana River in winter for transport of people and construction material. Ice roads and bridges would result in moderate impacts, as follows: (1) altered flood hydraulics, (2) increased potential for overbank flooding and ice or debris jams, and (3) stresses on natural water balances. These effects would occur during spring breakup when the ice roads and bridges began to melt. The ice roads and bridges would be the last to break up because of the increased thickness of the ice in the river and could cause ice jams, which could back up the river and cause flooding upstream.

Most of the other activities or structures along Salcha Alternative Segment 1 would be located away from major waterbodies; therefore, impacts would likely be low. Refer to the Common Impacts to Surface Water and North Common Segment subsections for discussions of activities relating to staging areas, culverts, and borrow extraction.

Salcha Alternative Segment 2

This segment would be approximately 13.8 miles long and would run primarily along the east side of the Tanana River. Eighteen crossings are proposed along this segment, including two major river crossings of the Salcha and Tanana rivers (one Tanana River bridge crossing the main and two side channels), two additional smaller bridge crossings, and 12 culvert crossings (including six culvert batteries).

The bridge crossing at the Tanana River is near Flag Hill and would require a dual-modal bridge approximately 4,000 feet long. Due to the size of the crossing, there would be construction activities along the banks while building the abutments, and in the middle of the channel while placing the bridge piers. The bridge would cross the main channel of the Tanana River and two side channels approximately 280 and 150 feet wide. This crossing would also include placement of a natural bottom culvert in an additional side channel.

The large bridge crossing of the Salcha River would also require multiple spans. Construction activities for all these bridges could cause increased bank erosion when accessing the channel and while the bridge approaches and abutments were constructed. This impact would be moderate.

The large bridge crossing at the Tanana River would be designed to pass the 100-year flood and be navigable for a maximum boat size (depending on USCG criteria). Further, the piers placed within the channel would alter flood hydraulics, would cause increased scour surrounding the piers, resulting in downstream aggradation, and increase the potential for overbank flooding and ice or debris jams. Detailed analyses of the Tanana River crossing has been conducted on only a preliminary level and effects to flood hydraulics during high-flow events are unknown. Thus, conservatively, this structure could result in high impacts.

Six culvert batteries (three batteries with two 10-foot-diameter culverts and three batteries with three 10-foot-diameter culverts) are proposed for three overflow channels (one of which includes flow from the Little Salcha River), one small stream, and two small sloughs. In all but one case, the combined width of the proposed culvert batteries and single culverts would be small compared to the total crossing widths. Thus, considerable fill would be required, and much of the channel and banks would be disturbed. Overall, there would be minimal to moderate disturbances to the streambanks and channels due to the short construction window. Impacts associated with culvert construction would be high.

Ice roads and bridges would result in moderate impacts, as follows: (1) altered flood hydraulics, (2) increased potential for overbank flooding and ice or debris jams, and (3) stresses on natural water balances. These effects would occur during spring breakup when the ice roads and bridges began to melt. The ice roads and bridges would be the last to break up because of the increased thickness of the ice in the river and could cause ice jams, which could back up the river and cause flooding upstream.

Most of the other activities or structures along this segment would be located away from major waterbodies; therefore, the impacts would likely be low. Refer to the section entitled Common Impacts to Surface Water and the section entitled North Common Segment for discussions of activities relating to staging areas, small culverts, and borrow extraction.

Central Alternative Segments

The two Central alternative segments would include crossings of wetland flow-ways, streams, seeps, overflow channels, and a drainageway (Figure 4-5). Both alternative segments would require unpaved access roads, borrow areas, a construction camp, water-supply extraction, and transportation and staging areas. Ice roads and bridges might be used along Central Alternative Segment 2 to cross waterbodies during winter to transport material and equipment. Appendix E provides information on controlling factors and other crossing characteristics for the two Central alternative segments (see Tables E-27 through E-29d).

Central Alternative Segment 1

The Applicant proposes ten stream crossings along Central Alternative Segment 1—one bridge crossing and nine culvert crossings. In addition, a 40-acre Tanana/Donnelly Construction Camp and one or two borrow areas are proposed for this segment. Ice roads and bridges would not likely be used for this segment. Table 4-6 lists the types of waterbodies and proposed stream crossings for Central Alternative Segment 1.

The bridge would cross a relatively small tributary stream of the Tanana River and would likely be a single-span bridge; therefore, no structures would be placed in the channel. There would be minimal to moderate disturbances to the streambanks if the bridge approach and abutments were constructed. Impacts associated with bridge construction would be low.

All nine culvert crossings would require relatively small single culverts (*i.e.*, 4 feet or 10 feet in diameter) that would provide conveyance for a stream, a drainageway, seeps, or hydraulic continuity for wetland flow-ways. Most of these single culverts would occupy only a small portion of the channel, with the remaining width covered in fill. Short-term streambank and channel disturbance during construction would result in high impacts.

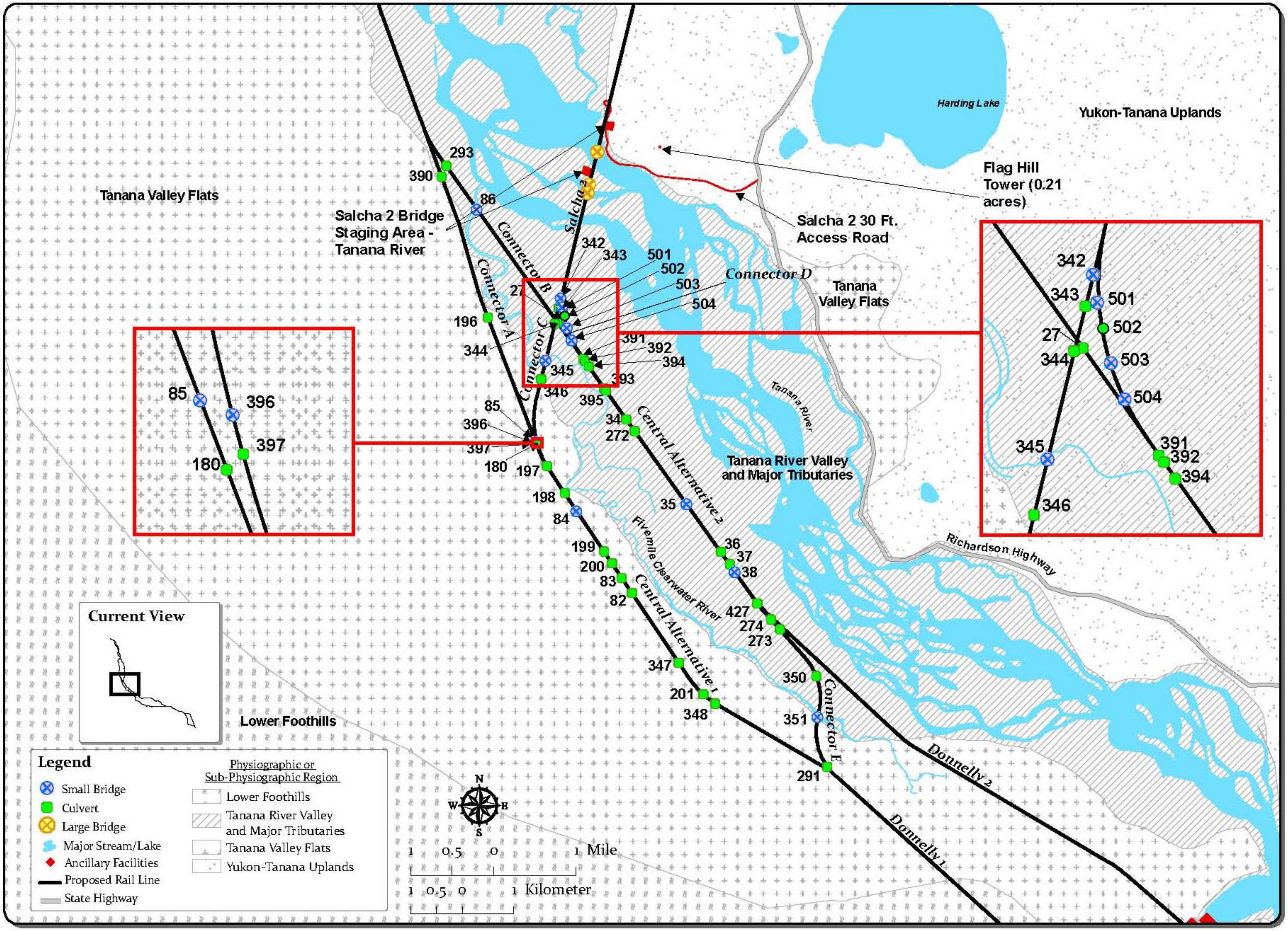

Figure 4-5 – Central Alternative Segments and Connectors Stream Crossings

Table 4-6
Summary of Crossing Environment for Central Alternative Segments 1 and 2

	Central Alternative 1	Central Alternative 2
Number of Crossings		
	10	11
Type of Waterbody		
Drainageway	1	–
Floodplain Slough	–	–
Overflow Channel	–	9
Seep	3	–
Stream	2	–
Wetland Flow-way[a]	4	2
Physiographic Division		
Eielson Flats	–	–
Delta Moraine Wetlands	–	–
Lower Foothills	–	–
Tanana River Valley and Major Tributaries	–	11
Tanana Valley Flats	10	–
Yukon-Tanana Uplands	–	–
Type of Crossing		
Small Bridges	1	2
Rail Large Bridges	–	–
Culvert	9	9
Channel Stability		
High	9	9
Moderate	1	2
Low	–	–
Within 100-Year Floodplain		
Yes	–	11
No	10	–

[a] Not defined as wetlands per the National Wetlands Inventory.

Other activities or structures placed along the 5.1-mile-long Central Alternative Segment 1 would result in low impacts. Similar to the other segments, most of the construction activities would not be along the margins of any waterbodies and, therefore would not affect the rivers and streams.

The 40-acre Tanana/Donnelly Construction Camp could be located along this segment, but its relative proximity to waterbodies is not known. There is discontinuous permafrost throughout this area and compaction and ground disturbance to the area adjacent to the streambanks could occur as a result of the staging area and camp. As a result of the potentially large area that would be occupied, and its unknown location, the potential impacts could be moderate to areas of permafrost, which could catalyze thermal erosion near streambanks.

Well-water extraction would also be required for potable water use in the camp and construction water in the staging area. The estimated water use (rates and volumes) would be determined during final design and permitting. Based on the following general effects that could result from water use, there could be impacts on natural water balances in the local area. Water extractions from wells could reduce local groundwater levels and, due to a reasonably high level of hydraulic connectivity between the surface water and groundwater systems, the rate and volume of groundwater discharge to waterbodies could be reduced intermittently during sustained pumping periods (*i.e.*, the withdrawal rate could exceed the natural recharge rate). The level of impact would depend on site conditions and water withdrawal rates.

Central Alternative Segment 2

The Applicant proposes 11 stream crossings along Central Alternative Segment 2—two bridge crossings and nine culvert crossings. In addition, a 40-acre Tanana/Donnelly Construction Camp and one or two borrow areas are planned for this segment. Ice roads and bridges would not likely be used for this segment. Table 4-6 lists the types of waterbodies and proposed stream crossings for Central Alternative Segment 2.

The two bridges would cross relatively small overflow channels of the Tanana River and would likely be single-span bridges; therefore, no structures would be placed in the channel. There would be minimal to moderate disturbances to the streambanks if the bridge approaches and abutments were constructed. Impacts associated with bridge construction along Central Alternative Segment 2 would be low.

The nine culvert crossings would be relatively small, single culverts (*i.e.*, 4 feet or 10 feet in diameter) that would provide conveyance for flows up to the 100-year flood or hydraulic continuity for wetland flow-ways. Most of these single culverts would occupy only a small portion of the channel, with the remaining width covered in fill. Short-term streambank and channel disturbance during construction would result in high impacts.

Other activities or structures placed along Central Alternative Segment 2 would result in low impacts. Similar to other segments, most of the activities or structures would not be located along the margins of any waterbodies, and therefore would not affect the rivers and streams.

The 40-acre Tanana/Donnelly Construction Camp could be located along this segment, but its relative proximity to waterbodies is not known. There is discontinuous permafrost throughout this area and there could be compaction and ground disturbance to the area adjacent to the streambanks as a result of the staging area and camp. Because of the potentially large area the camp would occupy and its unknown location, potential impacts could be moderate to areas of permafrost, which could catalyze thermal erosion near streambanks.

Well-water extraction would also be required for potable water use in the camp and construction water in the staging area. The estimated water use (rates and volumes) would be determined during final design and permitting. Based on the following general effects that could result from water use, there could be impacts on natural water balances in the local area. Water extractions from wells could reduce local groundwater levels and, due to a reasonably high level of hydraulic connectivity between the surface water and groundwater systems, the rate and volume of groundwater discharge to waterbodies could be reduced intermittently during sustained pumping periods (*i.e.*, the withdrawal rate could exceed the natural recharge rate). The level of impact would depend on site conditions and water withdrawal rates.

Connector Segments A through E

There would be 24 stream crossings along the proposed connector segments—nine small bridge crossings and 15 culvert crossings (Figure 4-5). There would likely be one or two borrow areas along the connectors; ice roads and bridges would not be likely. Table 4-7 lists the types of waterbodies and proposed stream crossings along the connector segments. Appendix E provides information on controlling factors and other crossing characteristics for the connector segments (see Tables E-30 through E-39b).

Table 4-7
Summary of Crossing Environment for Connector Segments A through E

	Connector A	Connector B	Connector C	Connector D	Connector E
Number of Crossings					
	4	3	7	4	6
Type of Waterbody					
Drainageway	1	1	–	–	1
Floodplain Slough	–	1	1	–	–
Overflow Channel	–	–	1	–	–
Seep	–	–	–	–	–
Stream	1	1	4	4	1
Wetland Flow-way[a]	2	–	1	–	4
Physiographic Division					
Eielson Flats	–	–	–	–	–
Delta Moraine Wetlands	–	–	–	–	–
Lower Foothills	–	–	–	–	–
Tanana River Valley and Major Tributaries	1	3	5	4	5
Tanana Valley Flats	3	–	2	–	1
Yukon-Tanana Uplands	–	–	–	–	–
Type of Crossing					
Small Bridges	1	1	3	3	1
Rail Large Bridges	–	–	–	–	–
Culvert	3	2	4	1	5
Channel Stability					
High	4	2	4	1	5
Moderate	–	1	3	3	1
Low	–	–	–	–	–
Within 100-Year Floodplain					
Yes	–	3	7	4	3
No	4	–	–	–	3

[a] Not defined as wetlands per the National Wetlands Inventory.

The nine bridge crossings would include relatively small streams and would likely be single-span bridges; therefore, no structures would be placed in the channel. Connector Segments B, C, and E would cross Fivemile Clearwater River. There would be low to moderate disturbances to the streambanks if the bridge approaches and abutments were constructed. Impacts associated with bridge construction along the connector segments would be low.

Five culvert batteries (four batteries with two and one with three 10-foot-diameter culverts) and ten single culverts (six 4 feet and four 10 feet in diameter) would provide conveyance for flows up to the 100-year flood, or hydraulic continuity for wetland flow-ways. Most of these culverts would occupy only a small portion of the channel, with the remaining width covered in fill. Short-term streambank and channel disturbance during construction would result in high impacts.

Other activities or structures placed along the connector segments would likely result in low impacts. Similar to the other segments, most of the activities would not be located along the margins of any waterbodies, and therefore would not affect the rivers and streams.

Donnelly Alternative Segments

There are two proposed Donnelly alternative segments. The 28-mile-long Donnelly Alternative Segment 1 would have 37 total crossings, including four small bridges, two large bridges, four culvert batteries, and 27 single culverts. The 26.2-mile-long Donnelly Alternative Segment 2 would have 48 total crossings with four bridges (two large and two small), two culvert batteries, and 42 single culverts (Figure 4-6). Both segments would require relatively large multiple-span bridges to cross the wide glacially fed and braided Little Delta River and Delta Creek. Smaller full-span bridges would be necessary to cross two unnamed streams (one for each Donnelly alternative segment), and small full-span bridge is proposed for Kiana Creek (40 feet long for Donnelly Alternative Segment 1 or 80 feet long for Donnelly Alternative Segment 2).

Donnelly Alternative Segment 1 would require culverts and culvert batteries to maintain flow for 17 small streams and drainageways, and hydraulic continuity for 14 wetland flow-ways. Donnelly Alternative Segment 2 would pass along the boundary of the Lower Foothills and Tanana Valley Flats, where there are numerous seeps and springs. Thirteen culvert crossings would be required to maintain flow for 13 seeps, 7 wetland flow-way crossings, 24 small streams, drainageways, and overflow channels.

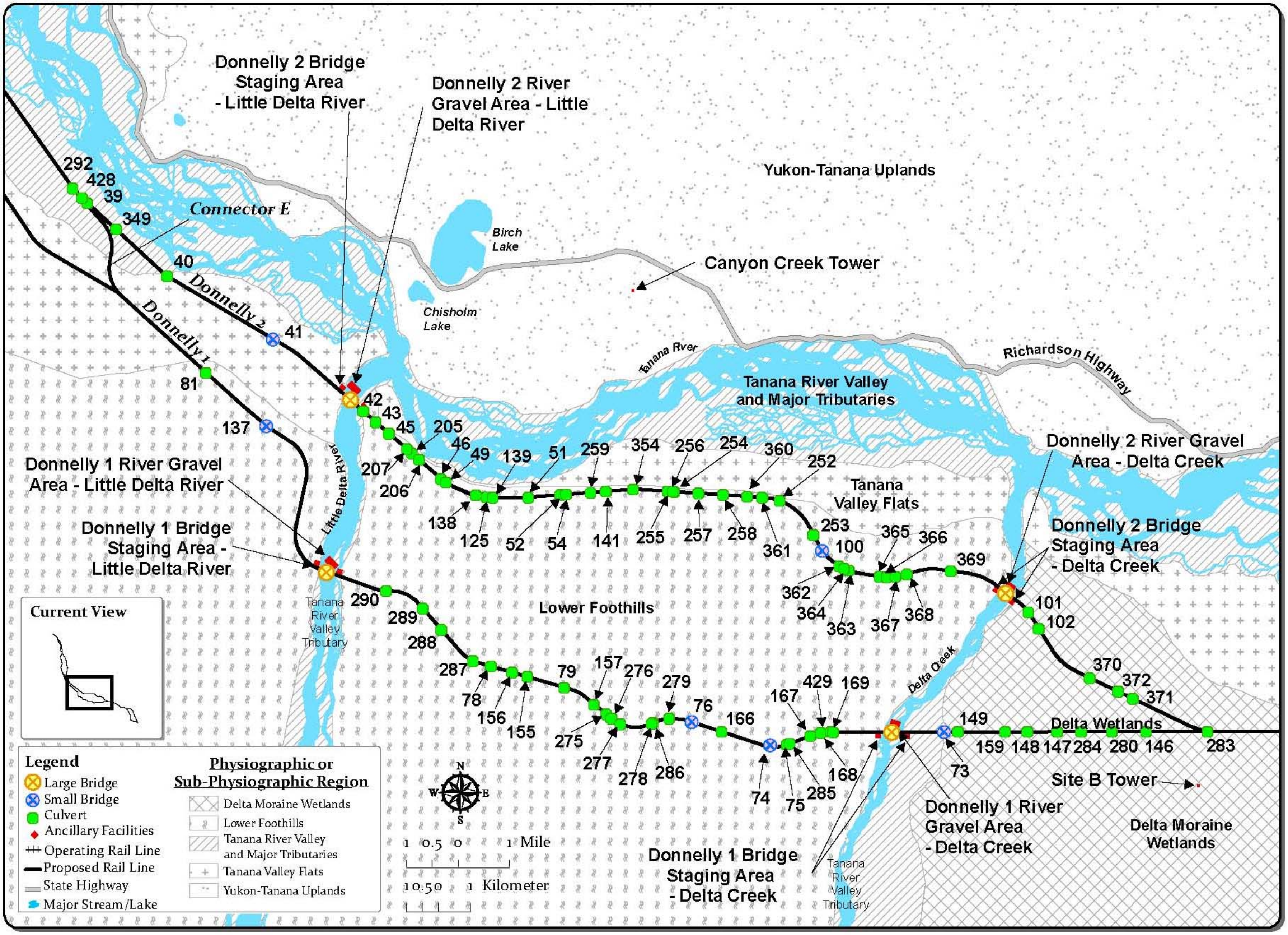

Figure 4-6 – Donnelly Alternative Segments Stream Crossings

Depending on segment, there could be up to eight 17-acre borrow areas planned at 3- to 5-mile intervals. Staging areas surrounding the bridge crossings are proposed along both segments. Ice roads and bridges would be used along these segments to cross the larger rivers during winter to transport material and equipment along the selected segment. The Tanana/Donnelly Construction Camp could also be used for either segment. Table 4-8 lists the types of waterbodies and proposed stream crossings proposed for each Donnelly alternative segment. Appendix E provides information on controlling factors and other stream crossing characteristics (see Tables E-40 through 43f).

Table 4-8
Summary of Crossing Environment for Donnelly Alternative Segments

	Donnelly 1	Donnelly 2
Number of Crossings		
	37	48
Type of Waterbody		
Drainageway	14	14
Floodplain Slough	–	–
Overflow Channel	1	4
Seep	–	13
Stream	8	10
Wetland Flow-way[a]	14	7
Physiographic Division		
Eielson Flats	–	–
Delta Moraine Wetlands	8	5
Lower Foothills	26	34
Tanana River Valley and Major Tributaries	3	7
Tanana Valley Flats	–	2
Yukon-Tanana Uplands	–	–
Type of Crossing		
Small Bridges	4	2
Rail Large Bridges	2	2
Culvert	31	44
Channel Stability		
High	27	37
Moderate	10	8
Low	–	3
Within 100-Year Floodplain		
Yes	4	7
No	33	41

[a] Not defined as wetlands per the National Wetlands Inventory.

Donnelly Alternative Segment 1

There are 37 proposed crossings that encompass three physiographic regions along this segment that would require bridges or culverts. The larger crossings would be associated with the Little Delta River, Delta Creek, West Kiana Creek, Kiana Creek, and two unnamed streams. The smaller crossings would include drainageways, wetland flow-ways, and streams.

The bridge crossings over one of the unnamed streams, West Kiana Creek, and Kiana Creek would all be relatively short, single-span bridges. The proposed crossings of West Kiana Creek and Kiana Creek would likely have minimal impact on the channel; the bridge over the unnamed stream would only partially span the waterway (40 feet to 50 feet). Bank disturbance would occur with all three of these crossings. In particular, field observations of Kiana Creek noted over-steepened channel banks and active bank erosion. Construction of bridge abutments along the channel banks could cause additional disturbance of the bank sediments, thus increasing bank erosion. Due to the sensitive nature of these streams, construction activities associated with these proposed crossings would result in high impacts because of the potential to increase bank erosion and cause channel aggradation downstream.

Long, multiple-pier, partial-span bridges are proposed to cross over Delta Creek and the Little Delta River. Due to the size of these crossings, there would be construction activities along the banks and in the middle of the channels while building the abutments and the bridge approaches. Construction activities for these bridges could cause increased bank erosion when accessing the channel and while the bridge approaches and abutments were constructed. This impact would be moderate.

The large bridge crossings of the Little Delta River and Delta Creek would be designed to pass the 100-year flood and be navigable for a maximum boat size (depending on USCG criteria). Further, the piers placed within the channel would alter flood hydraulics, cause increased scour surrounding the piers (resulting in downstream aggradation), and increase the potential for overbank flooding and debris jams. Analyses of the Little Delta River and Delta Creek crossings have been conducted on only a very preliminary level, and the effects to flood hydraulics during high-flow events are unknown. Thus, conservatively, it is expected that these structures could result in high impacts.

The sixth Donnelly Alternative Segment 1 bridge, a partial-span, multiple-pier structure, is proposed to cross a 1,050-foot overflow channel of the Tanana River. There would be significant work in the channel, which could lead to increased erosion and downstream sediment transport. This impact would be moderate.

Twenty seven of the culvert crossings would be relatively small single culverts (*i.e.*, 4 feet or 10 feet in diameter), three would be small culvert batteries (two 4-foot-diameter culverts), and one would be larger (three 10-foot-diameter culverts). These structures would provide conveyance for streams and drainageways, or hydraulic continuity for wetland flow-ways. Most of these single culverts would occupy only a small portion of the channels, with the remaining width covered in fill. Short-term and localized streambank and channel disturbance during construction would result in high impacts.

Ice roads and bridges across the Little Delta River and Delta Creek could be required during construction. However, these streams are relatively shallow, especially in winter where most of the channel is not occupied by river ice. Due to the natural high sediment transport of these streams, the effect of ice roads and bridges would not likely be detectable; therefore, impacts from the ice bridges would be low.

The 40-acre Tanana/Donnelly Construction Camp could be located along this segment, but its relative proximity to waterbodies is not known. There is discontinuous permafrost throughout this area and there could be compaction and ground disturbance to the area adjacent to the streambanks as a result of the staging area and camp. Because of the potentially large area the camp would occupy and its unknown location, potential impacts could be moderate to areas of permafrost, which could catalyze thermal erosion near streambanks.

Well-water extraction would also be required for potable water use in the camp and construction water in the staging area. The estimated water use (rates and volumes) would be determined during final design and permitting. Based on the following general effects that could result from water use, there could be impacts on natural water balances in the local area. Water extractions from wells could reduce local groundwater levels and, due to a reasonably high level of hydraulic connectivity between the surface water and groundwater systems, the rate and volume of groundwater discharge to waterbodies could be reduced intermittently during sustained pumping periods (*i.e.*, the withdrawal rate could exceed the natural recharge rate). The level of impact would depend on site conditions and water withdrawal rates.

Most other activities or structures placed along the 28-mile long Donnelly Alternative Segment 1 would likely result in low impacts. Similar to North Common Segment, Salcha Alternative Segment 1, and the Central alternative segments, most of the activities would not be located along the margins of any waterbodies and would not affect the rivers and streams.

Donnelly Alternative Segment 2

There would be 48 crossings encompassing four physiographic regions along this segment. The Little Delta River and Delta Creek would require larger crossings; drainageways, wetland flow-ways, streams, overflow channels, and seeps would require smaller crossings.

Crossings over an unnamed stream and Kiana Creek would require relatively short, single, full-span bridges; therefore, minimal impacts to either channel would be expected. There would be bank disturbance with both of these crossings. In particular, field observations of Kiana Creek noted over-steepened channel banks and active bank erosion. Construction of the bridge abutments along the channel banks could disturb the bank sediments, thus increasing bank erosion. Due to the sensitive nature of these streams, construction activities associated with these potential crossings would result in moderate impacts because of the potential to increase bank erosion.

The Applicant proposes long, multiple-pier, partial-span bridges to cross over Delta Creek and the Little Delta River. Due to the size of these crossings, there would be construction activities along the banks and in the middle of the channels while building the abutments and the bridge approaches. Construction activities for these bridges could cause increased bank erosion when accessing the channel and while the bridge approaches and abutments were constructed. This impact would be moderate.

The large bridge crossings of the Little Delta River and Delta Creek would be designed to pass the 100-year flood and be navigable for a maximum boat size (depending on USCG criteria). Further, the piers placed within the channel would alter flood hydraulics, cause increased scour surrounding the piers (resulting in downstream aggradation), and increase the potential for overbank flooding and debris jams. Analyses of the Little Delta River and Delta Creek crossings have been conducted on only a very preliminary level, and the effects to flood hydraulics during high-flow events are unknown. Thus, conservatively, these structures could result in high impacts.

Forty-two of the culvert crossings would be relatively small single culverts (*i.e.*, 4 feet or 10 feet in diameter); two would be culvert batteries (one battery with three 10-foot-diameter culverts and one with two 10-foot-diameter culverts). These structures would provide conveyance for high 100-year flood flows in drainageways, seeps, and streams, or hydraulic continuity for wetland flow-ways. Most of these single culverts would occupy only a small portion of the channels, with the remaining width covered in fill. Short-term and localized streambank and channel disturbance during construction would result in high impacts.

Ice roads and bridges across the Little Delta River and Delta Creek could be required during construction. However, these streams are relatively shallow, especially in winter where most of the channel is not occupied by river ice. Due to the natural high sediment transport of these streams, the effect of ice roads and bridges would not likely be detectable; therefore, impacts from the ice bridges would be low.

The 40-acre Tanana/Donnelly Construction Camp could be located along this segment, but its relative proximity to waterbodies is not known. There is discontinuous permafrost throughout this area and there could be compaction and ground disturbance to the area adjacent to the streambanks as a result of the staging area and camp. Because of the potentially large area the camp would occupy and its unknown location, potential impacts could be moderate to areas of permafrost, which could catalyze thermal erosion near streambanks.

Well-water extraction would also be required for potable water use in the camp and construction water in the staging area. The estimated water use (rates and volumes) would be determined during final design and permitting. Based on the following general effects that could result from water use, there could be impacts on natural water balances in the local area. Water extractions from wells could reduce local groundwater levels and, due to a reasonably high level of hydraulic connectivity between the surface water and groundwater systems, the rate and volume of groundwater discharge to waterbodies could be reduced intermittently during sustained pumping periods (*i.e.*, the withdrawal rate could exceed the natural recharge rate). The level of impact would depend on site conditions and water withdrawal rates.

Most activities or structures placed along the proposed 26.2-mile-long Donnelly Alternative Segment 2 would likely result in low impacts. Similar to the North Common Segment, Salcha Alternative Segment 1, and Central alternative segments, most of the activities would not be located along the margins of any waterbodies and would not impact the rivers and streams.

South Common Segment

There would be 14 crossings along South Common Segment (Figure 4-7). In addition, the 40-acre Big Delta Construction Camp and Staging Area and two or three 17-acre borrow areas are proposed for this segment. Ice roads and bridges are not proposed for this segment. Table 4-9 lists the types of waterbody and stream crossings along this segment. Appendix E provides information on controlling factors and other crossing characteristics (see Tables E-44 though E-45c).

Crossings along this 10.5-mile segment would include three bridges over headwaters of the Richardson Clearwater River and several smaller drainages, and would include culverts to cross drainageways and wetland flow-ways.

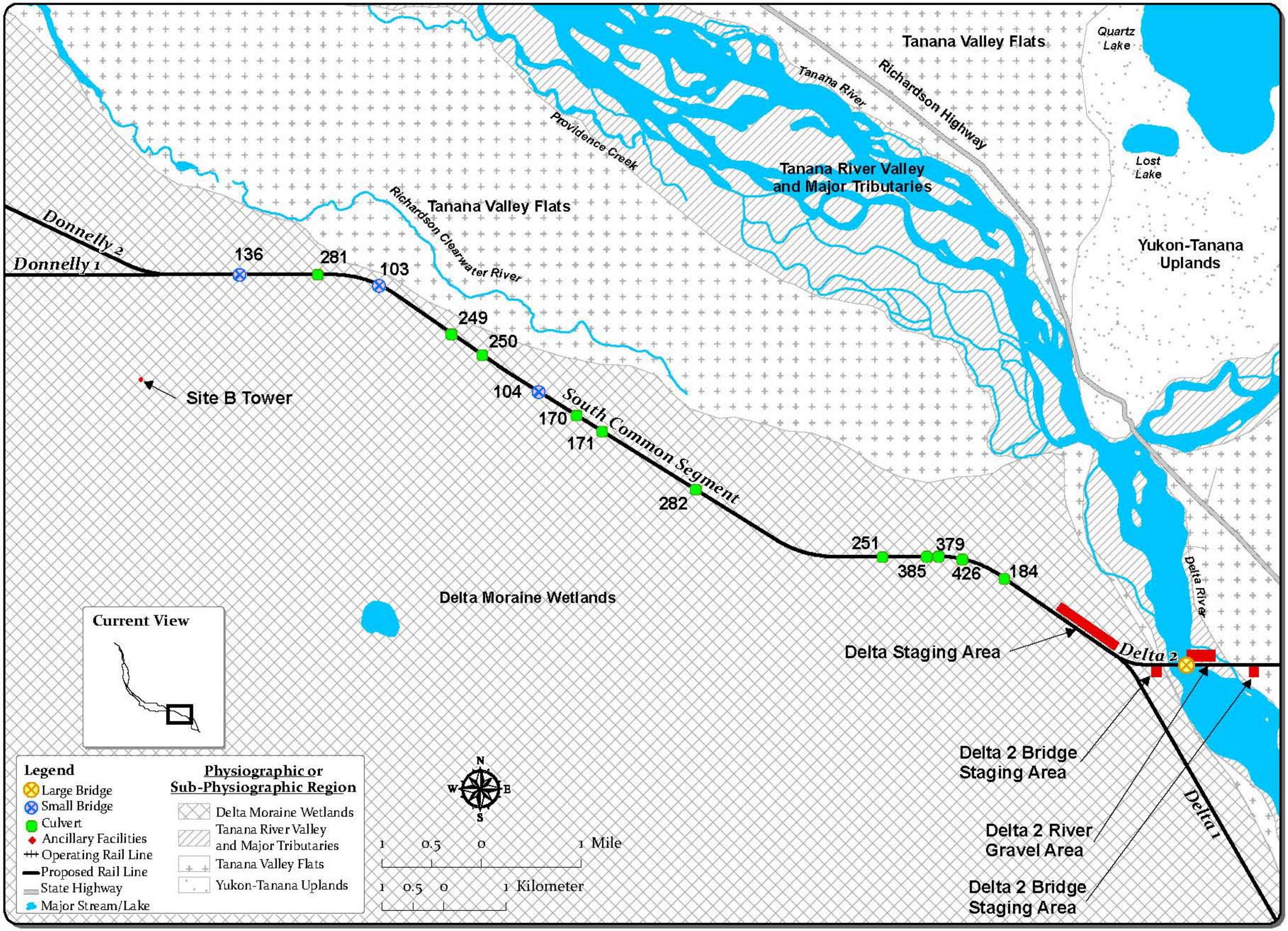

Figure 4-7 – South Common Segment Stream Crossings

Table 4-9
Summary of Crossing Environment for the South Common Segment

Number of Crossings	
	14
Type of Waterbody	
Drainageway	2
Floodplain Slough	–
Overflow Channel	–
Seep	–
Stream	3
Wetland Flow-way[a]	9
Physiographic Division	
Eielson Flats	–
Delta Moraine Wetlands	14
Lower Foothills	–
Tanana River Valley and Major Tributaries	–
Tanana Valley Flats	–
Yukon-Tanana Uplands	–
Type of Crossing	
Small Bridges	3
Rail Large Bridges	–
Culvert	11
Channel Stability	
High	14
Moderate	–
Low	–
Within 100-Year Floodplain	
Yes	–
No	14

[a] Not defined as wetlands per the National Wetlands Inventory.

Most of the other activities or structures proposed along this segment would not be located along the margins of waterbodies, thereby minimizing potential impacts to rivers and streams. Therefore, impacts would likely be low.

The three proposed bridge crossings at headwaters of the Richardson Clearwater River include single-span bridges ranging from 40 to 65 feet in length. In two cases, the spans would be longer than the channel width. Bridges longer than the channel width would minimize opportunities to affect the bank areas. There would be minimal disturbances to the streambanks while the bridge approaches and abutments were constructed. Impacts associated with construction of these bridges would be low.

Construction and installation of the culverts (4-foot and 10-foot diameter single culverts) would require moderate disturbances to facilitate access to the channels. Fill would be necessary to cross a portion of these channels. The slower velocity flows associated with the wetland flow-ways and low-flow or possible dry drainageway channels would minimize impacts to the channel bed and banks during operations. Impacts associated with culvert installation would be high.

The large Big Delta Construction Camp and Staging Area would be located along this segment. Impacts to discontinuous permafrost and water-well extraction would be similar to those described in the section entitled Common Impacts to Surface Water for large camps and staging areas. This activity would likely result in moderate impacts for the reasons previously discussed.

In addition, the construction and installation of wide gravel roads would have impacts similar to those described for Salcha Alternative Segments 1 and 2 along the west side of the Tanana River.

Delta Alternative Segments

Delta Alternative Segments 1 and 2 would have different crossing locations for the Delta River (Figure 4-8). Depending on the alternative segment, there would be one or two 17-acre borrow areas at 3- to 5-mile intervals, in addition to gravel extraction within the Delta River. There would be staging areas surrounding the bridge crossing along either alternative segment. Ice roads and bridges would also be used to cross the Delta River during winter months.

Table 4-10 lists the types of waterbody and proposed stream crossings. Appendix E provides information on controlling factors and other stream crossing characteristics (see Tables E-46 through E-49b).

Delta Alternative Segment 1

There are only two proposed waterbody crossings along this segment—a larger bridge crossing associated with the Delta River and a smaller crossing for a drainageway. Impacts associated with the proposed crossing of the Delta River would be similar to those of the large crossings of the Salcha alternative segments (Tanana River) and the Donnelly alternative segments (Delta Creek and Little Delta River); refer to those sections for descriptions of impacts.

Most construction activities would likely result in low impacts to rivers and streams due to the small number of proposed crossings. Refer to the section entitled Common Impacts to Surface Water for a description of those impacts.

The location of the proposed bridge crossing along the east side of the Delta River is near the confluence of Jarvis Creek and Delta River. Field observations indicate that the downstream end of the confluence has steepened banks, and active erosion of the river bank is occurring. Impacts associated with this bridge construction would include blockages or changes to the channel's shape, which would result in moderate impacts, and the potential for increased scour, bank erosion, and channel aggradation. Overall, the impacts would be high.

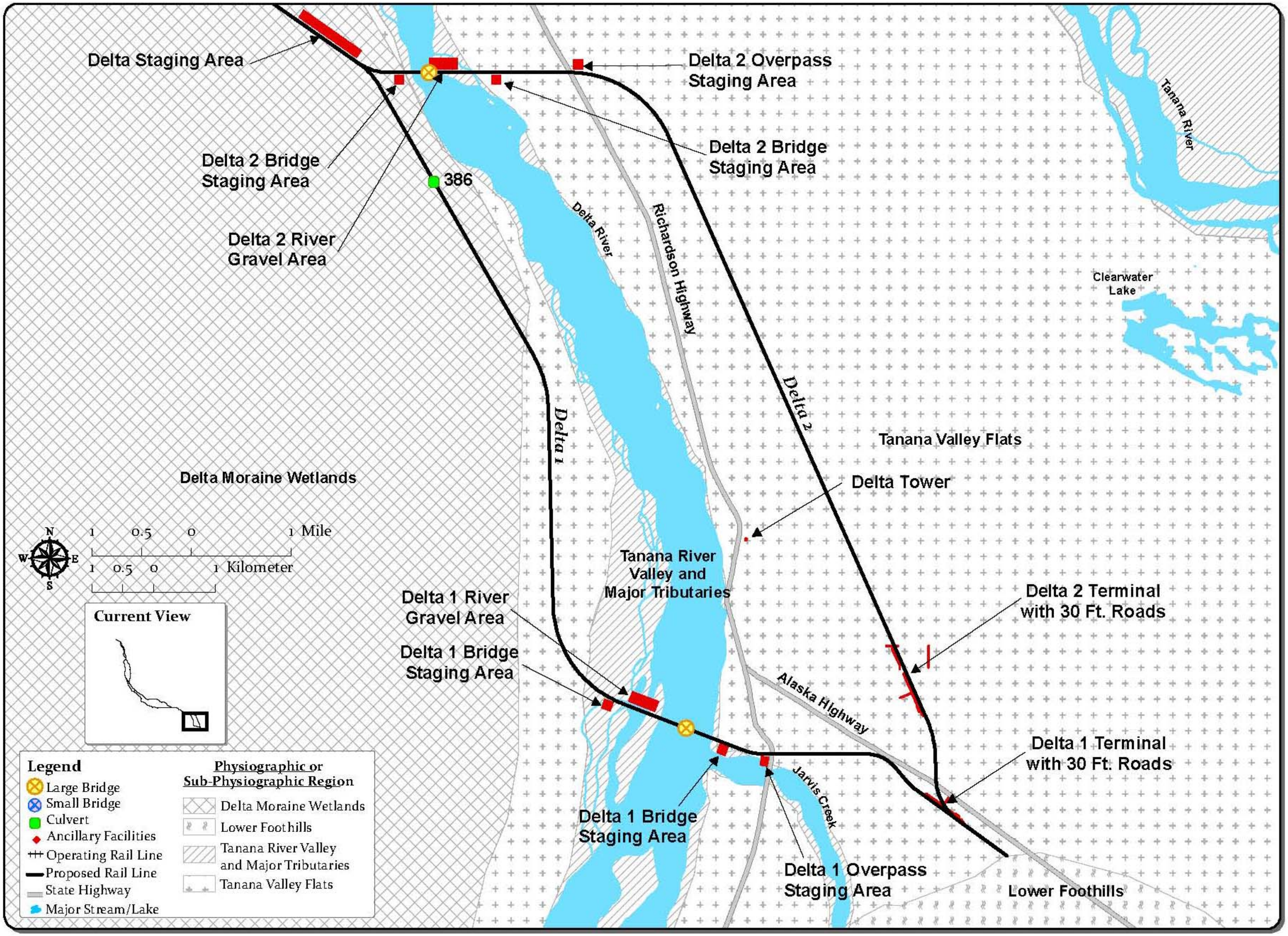

Figure 4-8 – Delta Alternative Segments Stream Crossings

Table 4-10
Summary of Crossing Environment for Delta Alternative Segments

	Delta 1	Delta 2
Number of Crossings		
	2	1
Type of Waterbody		
Drainageway	1	–
Floodplain Slough	–	–
Overflow Channel	–	–
Seep	–	–
Stream	1	1
Wetland Flow-way[a]	–	–
Physiographic Division		
Eielson Flats	–	–
Delta Moraine Wetlands	1	–
Lower Foothills	–	–
Tanana River Valley and Major Tributaries	1	1
Tanana Valley Flats	–	–
Yukon-Tanana Uplands	–	–
Type of Crossing		
Small Bridges	–	–
Rail Large Bridges	1	1
Culvert	1	–
Channel Stability		
High	1	–
Moderate	–	–
Low	1	1
Within 100-Year Floodplain		
Yes	2	1
No	–	–

[a] Not defined as wetlands per the National Wetlands Inventory.

Ice roads and bridges across the Delta River would be constructed in winter. Ice roads and bridges would result in low impacts, similar to the impacts described for Donnelly Alternative Segments 1 and 2. Borrow and gravel extraction is proposed at several locations along Delta Alternative Segment 1 and within the Delta River. Gravel extraction activities within the Delta River could cause blockage of the low-flow channels where gravel or spill piles were placed within the river. Also, blockages from construction activities would likely occur. Extraction impacts would likely be moderate.

Delta Alternative Segment 2

The only crossing along Delta Alternative Segment 2 would be a bridge over the Delta River. The impacts associated with this crossing are described above for Delta Alternative Segment 1 and the Salcha and Donnelly alternative segments.

Construction of gravel access roads near waterbodies would result in low impacts because most of the segment would be located adjacent to a number of existing roads in the area. The impacts associated with construction of new roads would be minimal. Impacts associated with borrow and gravel extraction would be the same as described above for Delta Alternative Segment 1. These impacts would likely be moderate.

Operations Impacts to Surface Water

Section 4.4 describes operations impacts to surface water.

No-Action Alternative

Under the No-Action Alternative the proposed rail line would not be built and there would be no impacts to surface water.

4.3 Groundwater

This section describes the current groundwater conditions of the Tanana River Valley in the vicinity of the proposed NRE. Data were collected in the project area during field investigations conducted in 2005, 2006, and 2007. Appendix E describes the methodologies employed and data collected. Appendix E also describes and summarizes data the USGS and the State of Alaska collected in the project area.

4.3.1 Affected Environment

Groundwater in the Tanana River Basin occurs under artesian or unconfined conditions. Artesian conditions are found in the lower slopes where permeable beds are confined by less permeable sediments, sedimentary rocks, or permafrost. Artesian conditions are common within the Tanana Valley Flats and along the northern border of the Lower Foothills, especially from the flatlands east of the Delta River to west of the Little Delta River, and provide the headwater sources for the Richardson Clearwater River, Providence and Whitestone Creeks, the Fivemile Clearwater River, and other smaller unnamed creeks. Unconfined conditions prevail in unconsolidated alluvium throughout the study area and form significant aquifers in Eielson Flats and Tanana Valley Flats.

Seepage from streams provides an important source of groundwater for much of the study area south of the Tanana River, especially the large braided streams flowing north across alluvial fans from the Alaska Range. These streams provide a steady source of recharge throughout each year. Direct infiltration of precipitation, especially snowmelt, is also significant in many areas; however, this input is minimal in areas underlain by permafrost or bedrock, which are prone to quick runoff.

Regional groundwater generally flows parallel to surface drainage. The water table slope has less relief and is generally less than the land-surface slope; however, groundwater mounds can form under stream channels. Fluctuations in groundwater level are related mainly to seasonal changes in recharge and discharge and range from a few inches per year to more than 50 feet per year, depending on location and proximity to recharge and discharge zones. Shallow groundwater areas, such as floodplains and low terraces, fluctuate with stream stage as the stream alternates between gaining and losing flow. Fluctuations in water levels in bedrock respond to snowmelt and precipitation recharge, but typically the changes are smaller than in the floodplains and terraces.

Permafrost affects both surface water and groundwater flow because its relative impermeability restricts recharge, discharge, groundwater movement, storage capacity, and confining pressures that might lead to artesian conditions. The impermeable permafrost prevents infiltration from runoff and creates ponds and swamps. Permafrost also holds a significant amount of water in storage as ice.

4.3.2 Environmental Consequences

This section describes potential impacts to groundwater as a result of the proposed project. Section 4.2.2 describes the methodology for assessing impacts. Appendix E includes detailed water-resource tables, which list the specific water resources and their characteristics.

Common impacts associated with the proposed project are presented first, followed by discussion of specific impacts associated with each alternative segment where appropriate. Construction and operation impacts are presented, except where these types of impacts are not expected. Proposed mitigation measures for impacts to groundwater are addressed in Chapter 20.

Common Impacts to Groundwater

Common construction and operations impacts are those that could occur throughout the project area. Common impacts are not associated with any specific alternative segment.

Common Construction Impacts to Groundwater

Construction-related impacts could result from the construction of unpaved access roads, excavation of borrow areas, construction of bridges and culverts, use of ice roads and ice bridges, water supply extraction, and transportation and staging areas.

Construction of Unpaved Access Roads, Staging Areas, and Camps

Construction of access roads, staging areas, and camps would alter infiltration and recharge characteristics and, in most cases, permanently reduce or impede infiltration due to surface-soil compaction and the creation of impenetrable surfaces (*e.g.*, buildings, tanks, and other structures). These effects would be limited to the footprint of the access roads, areas, and facilities.

Presence of Bridges and Culverts

The presence of culverts, bridge pilings, or other permanent maintenance structures would have minimal to no effect on groundwater infiltration because activities would not remove large volumes of surface soils or have an impact on infiltration processes. The location of bridges or culverts near or over springs and seeps could disrupt groundwater discharge processes and create instability concerns that would need to be addressed in structure design. However, during the investigation and design phase, geotechnical boreholes would be necessary to characterize the subsurface. These boreholes could provide direct communication between surface water and groundwater, and between shallow and deep aquifers; therefore, they would have to be properly abandoned following state regulations.

Excavation of Borrow Areas

Extraction of gravel from borrow areas could affect the local hydrogeologic regime (and water balance) by the removal of saturated materials and the creation of large man-made reservoirs. Depending on the hydraulic transmissivity of the soils in the borrow areas, over time, the man-made reservoirs would likely become groundwater fed. The water levels in the man-made reservoirs would fluctuate with the water table, and would be a source of groundwater discharge through evaporation during summer and changing to a source of groundwater recharge during ice breakup and major rainstorms.

There could be dewatering of aquifers or reservoirs of local, shallow, thawed, water-bearing zones during construction and operation of any borrow area. However, dewatering of a shallow aquifer would not be permitted if it would adversely affect the right of a prior water-rights appropriator or would not be in the public interest. In some cases, borrow areas could be in supra-permafrost zones, which could be enlarged or eliminated by the removal of shallow surface soils, blasting, and excavation of gravel. In general, construction of the rail line could temporarily affect shallow subsurface saturated zones that exist as thaw bulbs around lakes and streams and could temporarily change the thickness and vertical location of the active thaw zone.

Water-Supply Extraction for Potable Water and Construction Use

Water demands during construction could temporarily affect local water balances if the cumulative withdrawal rate by all users exceeded the natural recharge rate for that aquifer. Withdrawal of water from groundwater sources or surface water could deplete groundwater recharge of the surrounding aquifer, thereby lowering water tables and reducing discharge to streams. Further, to allow a dry work environment, temporary dewatering of a shallow groundwater aquifer could be required. The level of impact would depend on site conditions and water withdrawal rates. The ADNR would only authorize withdrawal of water if the withdrawal would be in the public interest and would not adversely affect the supply of water to lawful appropriators of record. Public interest criteria include the effect of water withdrawal, the effect of diversion or impoundment on fish and game resources, and the effect on public recreational opportunities.

Groundwater could supply fresh water for the construction of ice roads during winter construction seasons and for potable water at temporary construction camps and staging facilities. Although water-use demands have not been estimated, these activities would likely have minor short-term (seasonal) impacts on groundwater levels. Long-term effects on groundwater levels are not expected because natural annual recharge processes are sufficient to recharge to pre-pumping levels following the construction year.

Common Operations Impacts to Groundwater

Section 4.4 describes operations impacts to groundwater.

Impacts to Groundwater by Alternative Segment

Construction Impacts

North Common Segment

The extraction of gravel from the 17-acre borrow area along this segment would result in moderate impacts to the local hydrogeologic regime and water balance through the removal of saturated materials and the creation of a large pond. Due to the anticipated relatively high hydraulic transmissivity of the soils in Eielson Flats, the pond would become a groundwater pond over a relatively short period. Water levels in the pond would fluctuate with the water table, being a source of groundwater discharge through evaporation during the summer and changing to a source of groundwater recharge during snowmelt or rainstorms.

The 140-acre Eielson Construction Camp and Staging Area along this segment would impede groundwater infiltration due to surface soil compaction and impenetrable surfaces such as buildings and other structures. Also, staging areas for bridge construction would compact the ground surface and could locally alter surface infiltration. These activities would result in moderate impacts.

Construction and installation of the proposed bridge across Piledriver Slough and the culvert along this segment would have a low impact on groundwater because construction would not require the removal of large volumes of surface soils or affect infiltration processes.

Construction of gravel access roads would have a low impact because existing roads would be used when feasible and the construction of new roads would be minimal, resulting in few changes to existing conditions.

Long-term impacts to the hydrogeologic regime would include changes in recharge potential (infiltration rates) in the camp and staging area and the changed hydrologic balance of the newly created pond. Both these impacts would likely be low due to the minimal sizes of the affected areas. The remainder of activities or structures would likely result in low impacts for reasons described above.

Eielson Alternative Segments

Groundwater impacts would be the same for all Eielson alternative segments.

The extraction of subballast from the borrow area on the selected Eielson alternative segment would have a moderate impact on the local hydrogeologic regime. Refer to the section entitled Common Impacts to Groundwater for a detailed description of the potential impacts to groundwater from proposed subballast extraction.

The remainder of activities or structures would likely result in low impacts. Refer to the section entitled Common Impacts to Groundwater and the section entitled North Common Segment for a description of these impacts.

The borrow areas proposed along these segments could have long-term impacts to local hydrogeologic regimes and include changes in the recharge potential and hydrologic water balance. The borrow area along any of the Eielson alternative segments would result in a low impact, provided the impacts were mitigated as described in Chapter 20.

Salcha Alternative Segments

Groundwater impacts would be the same for both Salcha alternative segments.

The extraction of subballast from borrow areas along these segments would likely have a moderate impact to the local hydrogeologic regime. Refer to the section entitled Common Impacts to Groundwater and the section entitled North Common Segment for a detailed description of potential impacts.

Disruption and change in surface material (from natural soils to gravels) as a result of road construction could lead to compaction of underlying soils and result in localized changes in groundwater infiltration and recharge surrounding the road. This would likely result in a low impact.

The borrow areas proposed along the Salcha alternative segments could have long-term impacts to local hydrogeologic regime and could include changes in the recharge potential and hydrologic water balance. The borrow areas would result in a low impact, provided the impacts were mitigated as described in Chapter 20.

Central Alternative Segments

Groundwater impacts would be the same for both Central alternative segments.

Construction impacts to groundwater would generally be the same as described in the section entitled Common Impacts to Groundwater and the section entitled North Common Segment. The following activities or structures would result in moderate impacts:

- During extraction of materials from the borrow areas, there could be changes in local hydrogeologic regime due to the removal of saturated materials and the creation of a large pond.
- The Tanana/Donnelly Construction Camp would impede groundwater infiltration due to surface soil compaction and impenetrable surfaces such as buildings and other structures.

The remainder of activities or structures would have low impacts for the reasons described in the section entitled North Common Segment.

Gravel roads along these segments would need to be constructed. Disruption and change in surface material (natural soils to gravels) and compaction of underlying soils could result in localized changes in groundwater infiltration and recharge surrounding the road, but would likely result in low impacts.

Long-term impacts to the hydrogeologic regime would include changes in recharge potential (infiltration rates) of the staging/camp area and the changed hydrologic balance of the newly created gravel pond. These impacts would be low, provided the impacts are mitigated as described in Chapter 20.

The remainder of activities or structures was determined to have low impacts for the reasons described above.

Connector Segments A through E

Groundwater impacts would be the same for all the connector segments.

Construction impacts to groundwater would generally be the same as described in the section entitled Common Impacts to Groundwater and the section entitled North Common Segment. The following activities or structures would likely result in moderate impacts:

- During the extraction of materials from the borrow areas, changes in local hydrogeologic regime could occur due to the removal or saturated materials and the creation of a large pond.

The remainder of activities or structures would likely result in low impacts for the reasons described in the section entitled North Common Segment.

Gravel roads along these segments would need to be constructed. Disruption and change in surface material (natural soils to gravels) and compaction of underlying soils could result in localized changes in groundwater infiltration and recharge surrounding the roads, but would likely result in low impacts.

Long-term impacts to the hydrogeologic regime would include the changed hydrologic balance of any newly created pond. The borrow areas would result in a low impact, provided the impacts are mitigated as described in Chapter 20.

The remainder of activities or structures would likely result in low impacts for the reasons described above.

Donnelly Alternative Segments

Groundwater impacts would be the same for both Donnelly alternative segments.

Construction impacts to groundwater would be the same as those described in the section entitled Common Impacts to Groundwater. The following activities or structures would likely result in moderate impacts:

- During the extraction of materials from the borrow areas, changes in local hydrogeologic regime could occur due to the removal or saturated materials and the creation of a large pond.
- The Tanana/Donnelly Construction Camp would impede groundwater infiltration due to surface soil compaction and impenetrable surfaces such as buildings and other structures.

The remainder of activities or structures would likely result in low impacts for the reasons described in the Common Impacts subsection.

Gravel roads along these segments would need to be constructed. Disruption and change in surface material (natural soils to gravels) and compaction of underlying soils could result in localized changes in groundwater infiltration and recharge surrounding the road, but would likely result in low impacts.

Long-term impacts to the hydrogeologic regime would include changes in recharge potential (infiltration rates) of the construction camp area and the changed hydrologic balance of the newly created gravel pond. Both of these impacts would be low because of the minimal sizes of the affected areas.

The remainder of activities or structures would likely result in low impacts for the reasons described in the section entitled Common Impacts to Groundwater.

South Common Segment

Construction impacts to groundwater would be the same as described in the section entitled Common Impacts to Groundwater. The following activities or structures would likely result in moderate impacts**:**

- During the extraction of materials from the borrow areas, changes in local hydrogeologic regime could occur due to the removal of saturated materials and the creation of a large pond.
- The Big Delta Construction Camp and Staging Area would impede groundwater infiltration due to surface soil compaction and impenetrable surfaces such as buildings and other structures.

The remainder of activities or structures would likely result in low impacts for the reasons described in the section entitled Common Impacts to Groundwater.

Gravel roads along these segments would need to be constructed. Disruption and change in surface material (natural soils to gravels) and compaction of underlying soils could result in localized changes in groundwater infiltration and recharge surrounding the road, but would likely result in low impacts.

Long-term impacts to the hydrogeologic regime would include changes in recharge potential (infiltration rates) of the construction camp and staging area and the changed hydrologic balance of the newly created gravel pond. These impacts would likely be low because of the minimal sizes of the affected areas.

The remainder of activities or structures would likely result in low impacts for the reasons described in the section entitled Common Impacts to Groundwater.

Delta Alternative Segments

Delta Alternative Segment 1

Construction impacts to groundwater would be the same as described in the section entitled Common Impacts to Groundwater and the section entitled Donnelly Alternative Segments. The following activities or structures would likely result in moderate impacts:

- During the extraction of materials from the borrow areas, changes in local hydrogeologic regime could occur due to the removal of saturated materials and the creation of a large pond.

The remainder of activities or structures would likely result in low impacts for the reasons described in the section entitled Common Impacts to Groundwater.

Gravel roads along these segments would need to be constructed. Disruption and change in surface material (natural soils to gravels) and compaction of underlying soils could result in localized changes in groundwater infiltration and recharge surrounding the road, but would likely result in low impacts.

The long-term impact to the hydrogeologic regime would be the changed hydrologic balance of the newly created gravel pond. The impact would likely be low because of the minimal size of the affected area.

Operations Impacts to Groundwater

Section 4.4 describes operations impacts to groundwater.

No-Action Alternative

Under the No-Action Alternative, the proposed rail line would not be built and there would be no impacts to groundwater.

4.4 Water Quality

This section describes the current water quality conditions of the Tanana River Valley in the vicinity of the proposed NRE. SEA collected data in the project area during field investigations in 2005, 2006, and 2007. Appendix E describes the methodologies employed and data collected. Appendix E also describes and summarizes data the USGS and the State of Alaska collected in the project area.

4.4.1 Affected Environment

Except for several large streams, data on surface water quality is generally unavailable for most streams within the project area. From 1949 to 1981, the USGS collected data on surface water quality for some of the larger streams, including the Tanana River at Big Delta, near Harding Lake, and near Fairbanks; the Salcha River near Salchaket; the Delta River; and Jarvis Creek. Samples were collected from these stations at intervals varying from monthly to annually; there were also single-event samples. In most cases, the samples were analyzed for a full chemical suite of parameters. Appendix E summarizes the sampling data. Burrows and Harrold (1983) conducted a detailed sediment load (total suspended and bed loads) study of the Tanana River in 1980 and 1981. In 1983, the State of Alaska conducted a water quality study on Richardson Clearwater Creek and its tributaries (Maurer, 1999). There is no current water quality information available from established USGS sites within the project area. The most current water quality information was acquired at 68 potential stream crossing locations throughout the project area in 2005, 2006, and 2007 by SEA. The information collected was limited to *in-situ* sampling procedures using a Horiba U22 series hand-held water quality meter. No laboratory analyses were conducted. Appendix E summarizes this field data.

In general, the available water quality data indicate that the chemical composition of surface water within the project area is highly variable due to spatial differences in geology, soils, the extent of permafrost, and specific watershed processes such as glaciated basins.

4.4.2 Environmental Consequences

This section describes potential impacts to water quality as a result of the proposed project. Section 4.2.2 describes the methodology for assessing impacts. Appendix E provides detailed water-resource tables, which list specific water resources and their characteristics.

This section first describes common impacts to water quality for the entire project area, and follows with specific impacts associated with each alternative segment. Chapter 20 provides proposed mitigation measures for potential impacts to water quality.

Common Impacts to Water Quality

Common construction and operations impacts are those that could occur throughout the project area. Common impacts are not associated with any specific alternative segment.

Common Construction Impacts to Water Quality

Construction-related impacts could result from the construction of unpaved access roads, excavation of borrow areas, construction of bridges and culverts, use of ice roads and ice bridges, water supply extraction, and transportation and staging areas.

Construction of Unpaved Access Roads

Unpaved access roads would, in most cases, follow the rail line, except where necessary to gain access to borrow areas, staging areas, and camps or to gain access to a nearby established road. If access roads were required to be near or adjacent to rivers or streams (*i.e.*, roads would need to cross watercourses), the potential consequences to water quality could include:

- Increased sediment transport to watercourses during ice breakup, snowmelt or rainstorms.
- Nutrient loading associated with sediments could contribute to water quality changes.
- Disturbance and degradation of permafrost, leading to increased sediment load to watercourses.

In general, construction of access roads would have negligible impacts to rivers and streams except in those areas where the road would be near or adjacent to waterbodies.

Excavation of Borrow Areas

Local shallow water areas could be affected during the construction and operation of borrow areas. Disruption and movement of material from the borrow areas would stir up sediment and degrade water quality within the pond.

While there is discontinuous permafrost throughout the project area, it is assumed that borrow extraction would not be situated in permafrost (because the finer-grained nature of these soils would be less desirable), thus minimizing the potential for thermal erosion and reduced gravel pond quality. If sediment were disturbed and entrained, the effect would likely be short term and would last only during the construction and extraction period. Turbidity levels would return to background conditions once the fine material settled. No long-term impacts would be expected.

Construction and Installation of Bridges and Culverts

During construction activities, surface disturbance of the banks and riparian areas in the immediate vicinity of waterbodies being crossed could lead to localized sloughing, erosion, and sheet rilling. This could lead to increased erosion rates and sediment loads to the channel during high-water events or runoff from snow melt and rainstorms. In addition, disturbed banks along water crossings could increase sediment loads and turbidity during construction periods, even during low-water periods.

Construction and installation of culverts could cause increases in turbidity and sediment loads associated with disturbances of the streambank and channel bottom. Bed and bank disruption could lead to increased sediment load downstream of the crossing. This impact, however, would generally be short in duration and conditions would return to background levels once construction finished.

Construction and installation of the proposed bridges could have negligible to moderate effects on water quality, depending on whether the proposed bridge is a full or partial span and on the amount of in-channel work necessary for construction of piers and abutments. Depending on the direction (direct or oblique) and type of bridge construction (single partial span, single clear span, multiple pier partial span, multiple pier clear span), abutments, and/or in-channel piers, the length of affected streambank and channel width could be quite large. Therefore, the degree of bank and channel disturbances could vary substantially and could effectively alter bank erosion and sedimentation processes.

Construction and Use of Ice Roads and Ice Bridges

The construction and use of ice roads and bridges would leave a residual effect (*i.e.*, disturbed surface and exposed soils) that would be observed after breakup. In some cases, these disturbed areas would be point sources of increased sediment loads and/or turbidity levels.

Use of Rail Line and Unpaved Access Roads

In general, the use of the rail line and unpaved access roads would have negligible impacts to rivers and streams except in those areas where they would be in proximity to waterbodies. When near or adjacent to waterbodies, consequences to water quality could include:

- Increased transport of fine-grained sediments to watercourses during ice breakup, snowmelt, or rainstorms, and
- Unmitigated thermal degradation of permafrost, leading to increased sediment load to watercourses.

The relative degree of water quality degradation associated with increased turbidity and/or sediment loads would vary dependent on stream type, location and habitat value. In general, the clearwater streams (*i.e.*, many of those fed by groundwater) would have the greatest risk due to their low existing turbidities and sediment loads.

Use of Bridges and Culverts

With the changes in channel hydraulics due to a culvert or bridge, channel scour and erosion processes (*i.e.*, lateral migration, avulsion [the sudden change in the course of a stream], bank undercutting) can increase, which could lead to an increase in sediment transfer loads and downstream sedimentation. Unmitigated thermal erosion of fine-grained permafrost along streambanks would also contribute to an increase in sediment load and turbidity.

The presence of bridges could have negligible to moderate effects on water quality, depending on the number of in-channel piers used to support the bridge and on whether the proposed bridge is a full or partial span. The approach direction (direct or oblique), type of bridge construction (single partial span, single clear span, multiple pier partial span, multiple pier clear span), placement of abutments and/or in-channel piers, and the length of affected streambank and channel width would vary by structure. Therefore, the degree of bank and channel infringement could also vary substantially, as would the extent of erosion and sedimentation.

Common Operations Impacts to Water Quality

The use of gravel roads could result in a moderate impact. The presence of gravel roads would provide a constant source of sediment to the river if the sediment was transported by surface runoff.

Impacts to Water Quality by Alternative Segment

Construction Impacts to Water Quality

North Common Segment

Construction and installation of the only proposed culvert on this segment could cause increases in turbidity and sediment loads associated with disturbances of the streambank and channel bottom. This activity would result in a moderate impact. Bed and bank disruption could lead to increased sediment load downstream of the crossing. However, this impact would be short in duration and conditions would return to background levels once construction was completed and any disturbed areas reclaimed.

During extraction of materials from the borrow areas, surface water runoff could transport fines and petroleum-hydrocarbons from disturbed ground surfaces into nearby waterbodies. This would likely result in a low impact to water quality in local areas.

The proposed location of the Eielson Construction Camp and Staging Area is along this segment. Surface water runoff could transport metals and other miscellaneous chemicals used and stored at the camp to the surface waters, resulting in a moderate impact.

Construction and installation of the only proposed bridge along this segment would result in a low impact to water quality because the bridge would span the entire width of Piledriver Slough and construction activities would not occur in the channel. Activities that could affect water quality (*i.e.*, bridge abutment and foundation work) would likely be isolated by temporary berms or dams, so impacts would be low.

Impacts from the construction of gravel roads would also likely result in a low impact because existing roads would be used when feasible and the construction of new roads would be minimal, resulting in few changes to existing conditions.

Eielson Alternative Segments

Water quality impacts would be the same for all Eielson alternative segments.

Construction and installation of culverts along all three segments could cause increases in turbidity and sediment loads associated with disturbances of the streambank and channel bottom. These activities would result in moderate impacts**.** Bed and bank disruption could lead to increased sediment load downstream of the crossings. However, this impact would be short in duration, and conditions would return to background levels once construction was completed.

During extraction of materials from the borrow areas, surface water runoff could transport fines from disturbed ground surfaces into nearby waterbodies. This would likely result in low impacts to water quality.

The remaining impacts to water quality would likely be **low**, as described under the section entitled Common Impacts to Water Quality.

Salcha Alternative Segments

Water quality impacts would be the same for both Salcha alternative segments.

The construction of new and wide gravel roads along these segments would have a moderate potential to increase sediment and turbidity loads in surface waters because some of the roads would be in proximity to watercourses. This would likely result in a moderate impact. In some cases, existing roads would be utilized along the eastern edge of the Tanana River, thereby minimizing the need to construct new gravel roads. In these instances, there would likely be low impacts along this segment.

The substantial amount of channel and bank work that would occur from either of the Tanana River crossings would likely disturb sediments and create increased sediment loads and downstream sedimentation. However, the effects might not be discernible due to the already high sediment loads carried during ice breakup and during peak summer flow season. Thus, the impacts would likely be low.

Ice roads and bridges would result in moderate impacts due to increases in turbidity. Sediment could be trapped in the ice, and when the sediment was released during breakup, turbidity levels in the water would increase immediately downstream. This would be less detectable for the glacial-type streams, and more problematic for the clearer streams (for example, at proposed crossings #340 and #341), where extra precautions would be necessary.

Construction and installation of the culverts along either of these two segments could cause increases in turbidity and sediment loads associated with disturbances of the streambank and channel bottom. Bed and bank disruption could lead to increased sediment load downstream of crossings. Although this activity would be short in duration and conditions would return to background levels once construction is finished, these activities would result in moderate impacts**.**

During extraction of materials from the borrow areas, surface water runoff could transport fines from disturbed ground surfaces into nearby waterbodies. Following best management practices would likely minimize this impact. This activity would likely have a low impact on water quality.

The remaining potential impacts to water quality would likely be low, as described in the section entitled Common Impacts to Water Quality.

The permanent gravel roads would likely result in a moderate impact when they were located in proximity to watercourses. These roads would provide a constant source of sediment to the river when it is transported by surface runoff.

The remaining activities or structures would likely result in low impacts to water quality the long-term. Refer to the section entitled Common Impacts to Water Quality for more detailed discussions.

Central Alternative Segments

Water quality impacts would be the same for both Central alternative segments.

Construction impacts to water quality would generally be the same as described in the section entitled Common Impacts to Water Quality and the section entitled North Common Segment. The following activities or structures would likely result in moderate impacts:

- Increases in turbidity and sediment loads associated with disturbances of the streambank and channel bottom.
- Gravel roads along these segments would need to be constructed. Surface runoff could transport the gravel to surrounding waterbodies.
- During the extraction of materials from the borrow areas, surface water runoff could transport fines from disturbed ground surfaces into nearby waterbodies.
- Surface water runoff from the proposed Tanana/Donnelly Construction Camp could transport metals and/or other miscellaneous chemicals being used and stored at the camp to the surface waters.

The remainder of activities or structures would likely result in low impacts for the reasons described in the section entitled North Common Segment.

The permanent gravel roads could result in moderate impacts. These roads would provide a constant source of sediment to the river when transported by surface runoff.

Connector Segments A through E

Water quality impacts would be the same for all connector segments.

Construction impacts to water quality would generally be the same as described in the section entitled Common Impacts to Water Quality and the section entitled North Common Segment. The following activities or structures would likely result in moderate impacts:

- Increases in turbidity and sediment loads associated with disturbances of the streambank and channel bottom.

- Gravel roads along these segments would need to be constructed. Surface runoff could transport the gravel to surrounding waterbodies.

- During the extraction of materials from the borrow area, surface water runoff could transport fines from disturbed ground surfaces into nearby waterbodies.

The remainder of activities or structures would likely result in low impacts for the reasons described in the section entitled North Common Segment.

The permanent gravel roads could result in moderate impacts. These roads would provide a constant source of sediment to the river when the sediment was transported by surface runoff.

Donnelly Alternative Segments

Water quality impacts would be the same for both Donnelly alternative segments.

The substantial amount of channel and bank work that would occur for the Little Delta River and Delta Creek crossings would likely disturb sediments and create increased sediment loads and downstream sedimentation. However, the effects would not be discernible due to the already high sediment loads carried during ice breakup and during the peak summer flow season. Thus, there would be low impacts.

Construction impacts are generally the same as described in the section entitled Common Impacts to Water Quality and sections addressing other segments. The following impacts would likely be moderate:

- Increases in turbidity and sediment loads associated with disturbances of the streambank and channel bottom during culvert installation. It is assumed that culvert installation would occur during ice-free periods and during low-flow periods. During low-flow periods, some waterbodies might have little or no flow at crossings (drainageways or overflow channels), reducing impacts to low.

- Gravel roads along these segments would need to be constructed. Due to the high abundance of waterbody crossings, surface runoff could transport gravel to nearby waterbodies.

- Sediment could be trapped within ice roads and bridges, and when the sediment was released during ice breakup, turbidity levels in the water would increase immediately downstream.

- Surface water runoff from the proposed Tanana/Donnelly Construction Camp could transport metals and other miscellaneous chemicals being used and stored at the camp to the surface waters.

During the extraction of materials from the borrow areas, surface water runoff could transport fines from disturbed ground surfaces into nearby waterbodies. In addition, gravel from the Little Delta River and Delta Creek would be extracted for construction material. Disruption of the channel bed would increase downstream turbidity, resulting in moderate impacts.

The remainder of activities or structures would likely result in low impacts for the reasons described in the section entitled North Common Segment.

The permanent gravel roads would likely result in a moderate impact. These roads would provide a constant source of sediment to the river when the sediment was transported by surface runoff.

South Common Segment

Construction impacts would be the same as described in the entitled Common Impacts to Water Quality. The following would likely result in moderate impacts**:**

- Increases in turbidity and sediment loads associated with disturbances of the streambank and channel bottom during culvert installation. It is assumed that culvert installation would occur during ice-free periods and during low-flow periods.

- During the extraction of materials from the borrow areas, surface water runoff could transport fines from disturbed ground surfaces into nearby waterbodies.

- Gravel roads along this segment would need to be constructed. Due to the wide road, surface runoff could transport gravel to nearby waterbodies.

- Surface water runoff from the Big Delta Construction Camp and Staging Area could transport metals and other miscellaneous chemicals being used and stored at the camp to the surface waters.

The remainder of activities or structures would likely result in low impacts for the reasons described in the section entitled North Common Segment.

The permanent gravel roads would result in a moderate impact**.** The gravel roads would provide a constant source of sediment to the river when the sediment was transported by surface runoff.

Delta Alternative Segments

Water quality impacts would be the same for the both Delta alternative segments.

Construction impacts would be the same as described for the Donnelly alternative segments. The following would likely result in moderate impacts**:**

- Increases in turbidity and sediment loads associated with disturbances of the streambank and channel bottom during culvert installation. It is assumed that culvert installation would occur during ice-free periods and during low-flow periods (Delta Alternative Segment 1 only).

- During the extraction of materials from the borrow areas, surface water runoff could transport fines from disturbed ground surfaces into nearby waterbodies. Gravel extraction is also proposed within the main channel of the Delta River, and the disturbance of the channel bed would release fine sediments downstream.

- Gravel roads along these segments would need to be constructed. Due to the wide road, surface runoff could transport gravel to nearby waterbodies (Delta Alternative Segment 1 only).

The remainder of activities or structures would likely result in low impacts **f**or reasons described in the section entitled Common Impacts to Water Quality.

Operations Impacts to Water Quality

The section entitled Common Operations Impacts to Water Quality describes impacts to water quality from rail line operations.

No-Action Alternative

Under the No-Action Alternative, there would be no impacts to water quality from proposed rail line construction and operations.

4.5 Wetlands

This section describes the current wetlands conditions of the Tanana River Valley in the vicinity of the proposed NRE. SEA collected data in the project area during field investigations in 2005, 2006, and 2007. Appendix E describes the methodologies employed and data collected. Appendix E also describes and summarizes data the USGS and the State of Alaska collected in the project area.

4.5.1 Affected Environment

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions (33 CFR Part 328.3(b)). By regulatory definition, wetlands must support hydrophytic vegetation, show signs of wetland hydrology, and contain hydric soils. Wetlands and other waters of the United States are subject to the USACE jurisdiction under authority of Section 404 of Clean Water Act of 1972 or Section 10 of the Rivers and Harbors Act of 1899. To comply with these laws, it is necessary to avoid project impacts to wetlands wherever practicable, minimize impact where impact is unavoidable, and compensate for the impact in some cases. An estimated 5 percent of the wetlands in the project area did not appear to have surface connections to waterways or other wetlands. These wetlands could be isolated and might not fall under USACE jurisdiction.

Wetlands improve water quality, recharge water supplies, reduce flood risks, and provide fish and wildlife habitat. Wetlands act as natural sponges by trapping and slowly releasing surface water, rain, snowmelt, groundwater, and floodwaters. Trees, root mats, and other wetland vegetation slow floodwaters and distribute water over the floodplain. These combined water storage and braking functions can lower floodwater elevations and reduce erosion (USEPA, 1995). Wetlands also provide recreational opportunities, aesthetic benefits, sites for research and education, and habitats for sport and commercial fishery species and other wildlife (USEPA, 2001a).

Appendix E describes wetland communities within 500 feet of the proposed alternative segments or project area (HDR, 2007a). The description of wetlands within the project area was based on field investigations and interpretations of aerial photographs (HDR, 2007a). Two wetland types predominate in the project area, forested wetlands and scrub/shrub wetlands; emergent wetlands are less common (Table 4-11). Forested wetlands include broadleaf, needleleaf, and mixed broadleaf/needleleaf forest communities. Scrub/shrub wetlands include broadleaf, needleleaf, and mixed shrub communities. Emergent wetlands are dominated by graminoid species—sedges and grasses with scattered willow shrubs. Other waters and riverine habitats in the project area include ponds (with and without aquatic bed vegetation such as lilypads, horsetails, and pondweed), and perennial and intermittent streams.

Table 4-11
Summary of Wetland Types Within 500 Feet of the Proposed Alternative Segments[a]

Proportion (percent) of Wetland Area by Category[b]	Wetland Type (NWI Code[c])	Number of Wetland Regions[d]	Wetland Area (acres)
1	Broadleaf Forest Wetlands (PFO1)	28	18.1
96	Needleleaf Forest Wetlands (PFO4)	576	2,061.7
3	Mixed Forest Wetlands (PFO#/#)	27	66.2
30	**Subtotal Forest Wetlands (PFO)**	**631**	**2,145.9**
26	Broadleaf Scrub/Shrub Wetlands (PSS1)	584	779.9
24	Needleleaf Scrub/Shrub Wetlands (PSS4)	274	729.7
50	Mixed and Other Scrub/Shrub Wetlands (PSS#/#)	343	1,532.4
43	**Subtotal Scrub/Shrub Wetlands (PSS)**	**1,201**	**3,042.0**
9	Emergent Wetlands (PEM)	430	160.9
3	Palustrine Waters (P)	60	63.6
42	Riverine Waters (R)	435	787.9
46	Other Waters	495	851.5
27	**Subtotal All Other Wetlands and Waters**	**1,420**	**1,863.9**
	All Wetlands and Waters	**3,252**	**7,051.8**

[a] Source: HDR, 2007a.
[b] Proportion of wetland area for broader wetland types (PFO, PSS, and Other Wetlands and Waters) are in bold. Proportion of wetland areas within each wetland type are listed for Forested Wetlands (PFO1,PFO4, PFO#/#), Scrub/Shrub Wetlands (PSS1, PSS4, PSS#/#), and Other Wetlands and Waters (PEM, P, R, Other Waters).
[c] National Wetland Inventory (NWI) Codes as defined by Classification of Wetlands and Deepwater Habitats (Cowardin *et al.*, 1979):
PFO – Palustrine Forested
PSS – Palustrine Scrub/Shrub
PEM – Palustrine Emergent
R – Riverine
[d] Regions are individual contiguous wetland areas as mapped by HDR (2007a).

Unique or Sensitive Wetlands

There are large areas of herbaceous floating mat wetlands, or fens, between the Alaska Range and the Tanana River at the northwestern corner of the Tanana Flats (Racine and Walters, 1994). Fen systems play an important role in regulating hydrology, nutrient availability, thermal stability, water table levels, and succession (Hogg and Wein, 1988). This habitat type is rare because it is not found on the edges of ponds and lakes as are most fens; the absence of mosses; physiographic position; presumed origin (groundwater discharge); and because of its large extent (Racine and Walters, 1994). A field investigation in 1997 discovered the presence of floating mat fens in the northern range of the Tanana Flats, although no fens appear to be present within the project area (Racine *et al.*, 1998; HDR, 2007a).

Wetland Functions and Values

Wetlands provide multiple benefits to the environment that are unique and vital to ecological resources. Benefits are defined as functions and values where the wetlands serve specific functions for the environment, such as controlling erosion, or supply humans a benefit, such as providing recreation areas. Wetland functions (and values) for project area wetlands that were identified and evaluated include surface-water storage (flood control), stream-flow maintenance (maintaining aquatic habitat and aesthetic appreciation opportunities), groundwater recharge/discharge (replenishing water supplies), sediment removal and nutrient cycling (water quality protection and nutrient export), and contributions to the abundance and diversity of wetland vegetation and wildlife (maintaining aquatic habitat and fish and wildlife harvest opportunities) (USEPA, 2001a; HDR, 2007b).

An assessment of the functional capacity of wetlands in the project area indicates (Magee and Holland, 1998; HDR, 2007b):

- Wetlands in the study area have a high functional capacity to modify water quality, contribute to the abundance and diversity of wetland vegetation, and contribute to the abundance and diversity of wetland fauna.
- Permanently and semi-permanently flooded emergent wetlands have a high functional capacity to perform groundwater discharge.
- Wetlands with an outlet have a high functional capacity to export detritus and a moderate functional capacity to store stormwaters and floodwaters and modify stream flow.
- Wetlands without an outlet have a high functional capacity to store stormwaters and floodwaters and a low functional capacity to modify stream flow and export detritus.

4.5.2 Environmental Consequences

This section describes potential impacts to wetlands as a result of the proposed project. Appendix E provides detailed wetland tables that list the individual wetland classes and their characteristics. Chapter 20 describes proposed mitigation measures for impacts to wetlands.

Wetland types and areas within 500 feet of the proposed segments were identified through implementation of the USACE wetlands jurisdictional determination methodology from August 23 through 31, 2005; July 20 through 27, 2006; and August 14 through 20, 2006 (HDR, 2007a; HDR, 2007b). The methodology for establishing wetland boundaries and types is contained in the USACE Wetlands Delineation Manual (Environmental Laboratory, 1987) and the Interim Regional Supplement to the USACE Wetland Delineation Manual Alaska Region (USACE, 2007a). The aerial extent of wetlands that would be directly affected by the proposed rail line was calculated using geographic information system (GIS) analysis of delineated wetland areas within the 200-foot-wide rail line right-of-way (ROW). Areas outside the 200-foot ROW, which have been proposed for staging areas, communications towers, access roads, highway relocations, river gravel areas, and passenger terminals, were also analyzed. Wetland types and areas for these ancillary facilities were estimated from National Wetland Inventory data in instances where their locations were not included within the areas delineated.

Functions and values of wetlands in the vicinity of the proposed project were analyzed through application of *A Rapid Procedure for Assessing Wetland Functional Capacity* (Magee and Hollands, 1998; HDR, 2007b). The wetlands functional assessment was the basis for describing qualitative wetland impacts that would result from proposed rail line construction and operations. Appendix E includes a summary of wetland functional values by wetland class.

Wetland Analysis

In compliance with Executive Order 11990, *Protection of Wetlands and Floodplains*, this section provides the results of an impact analysis on those areas within 500 feet of the alternative segments that are considered to be wetlands, as described above. Approximately 33 percent of the area within 500 feet of the proposed alternative segments would be considered wetlands, according to the USACE established criteria for determining wetlands (Environmental Laboratory, 1987; USACE, 2007a). Construction of the rail line project would directly affect wetlands that are situated within the 200-foot rail line ROW and could indirectly affect wetlands that are within 500 feet of the construction footprint. Construction of the proposed project would require the placement of fill material in wetlands. The placement of fill would cause a permanent loss of wetland functions within the fill areas and could result in additional indirect impacts to adjacent wetland areas. Appendix F provides detailed wetlands data for each alternative segment.

Common Impacts to Wetlands

Common Construction Impacts to Wetlands

Construction activities would affect wetland functions or values, either short term or long term, including:

- Fish, wildlife, and plant habitats—Fill placed in wetlands would result in permanent direct loss of habitat. Hydrophilic plants would lose available habitat area, although some wetland types, such as black spruce wetlands are ubiquitous throughout the project area (Post, 1996).

- Water quality improvement—Reduction in total wetland area and alteration of wetland hydrology would reduce the capacity of regional wetlands to provide the function of water quality improvement.

- Flood storage—Removal of wetland vegetation would destroy the wetlands' capacity to impede and redistribute floodwaters (USEPA, 2001a).

- Shoreline erosion protection—Removal of riparian vegetation with roots and root wads that reinforce soil structure by increasing its shear strength would decrease bank stability and result in increased bank erosion (Gray and MacDonald, 1989).

- Aesthetic appreciation—Loss and interruption of wetlands due to construction of the rail line would diminish the undeveloped character of the project area, which is parallel to the scenic Richardson Highway.

Construction of the rail line would require that the 200-foot ROW be cleared of surface vegetation. Wetlands would be both excavated and filled within the railbed and access road footprints. Construction activities resulting in the direct loss of wetlands, through excavation or fill placement, would affect predominantly the most common wetland types within the area: forested and scrub/shrub wetlands. Loss or alteration of wetlands would eliminate or minimize wetland function. Fill or drainage of wetlands prevents surface water storage and reduces wetland water quality enhancement functions, while accelerating the flow of water downstream and potentially causing increased flood damage. Wetlands act as natural sponges by trapping and slowly releasing surface water, rain, snow melt, groundwater, and floodwaters. Trees, root mats, and other wetland vegetation slow floodwaters and redistribute waters over the floodplain. These combined water storage and braking functions can lower floodwater elevations and reduce erosion (USEPA, 1995).

The direct loss of wetland vegetation due to construction activities would also affect adjacent riparian vegetation. Riparian habitats are located adjacent to waterbodies and provide a mechanism through which energy, materials, and water passes. They are the transition areas between terrestrial and aquatic ecosystems (NRC, 2002) and are significant in ecology, environmental management, and civil engineering because of their role in soil conservation, their biodiversity, and their influence on aquatic ecosystems. Riparian zones act as natural filters, protecting aquatic environments from excessive sedimentation, polluted surface runoff, and erosion (Nakasone *et al.*, 2003). They supply shelter and food for many aquatic animals and shade that is an important part of stream temperature regulation. Research shows riparian zones are instrumental in water quality improvement for both surface runoff and water flowing into streams through subsurface or groundwater flow (Mengis *et al.*, 1999).

Impacts to wetland soils would result from filling, excavating, or clearing for construction of the railbed and associated facilities, resulting in the permanent loss of some hydric soils that sustain wetlands. Soil stability depends on vegetative cover, and when vegetation is disturbed, soil can become unstable. The peat cover common in many black spruce wetlands insulates the wetland from summer heating and encourages permafrost aggradation, creating a feedback that results in a shallow frost table. This shallow active layer (the layer above permafrost that seasonally melts) reduces the wetlands moisture storage capacity and is easily saturated (Woo and Young, 2005; Post, 1996). Black spruce lowland wetlands (generally falling under the needleleaf forested and scrub-shrub wetland types) are abundant in the project area (Hall *et al.*, 1994).

Rail line and bridge construction activities would cause increased sediment loading to wetlands (Childers and Gosselink, 1990) by exposing mineral soils to erosion from the removal of wetland and riparian vegetation. Channelization caused by culverts and bridges would change wetland hydrology by increasing the velocity of water moving into and through wetlands. Patterns of sediment deposition would be changed and wetland functions and values that depend on low velocity flows through the wetland would be reduced. High sediment loads entering wetlands through channels and drainage ditches can smother aquatic vegetation and benthic invertebrates, fill in riffles and pools, and increase water turbidity (USEPA, 1993). Channel modifications would change instream water temperatures and could diminish habitat suitability for fish and wildlife (USEPA, 1993). Borrow areas next to wetlands would also degrade water quality through sedimentation and increased turbidity in the wetland (Irwin, 1992). Silts and fines precipitate from still waters, leading to sedimentation, which reduces water storage capacity, smothers vegetation, reduces light penetration, and reduces oxygen concentrations, which ultimately affects wetland richness, diversity, and productivity.

Disturbances in wetland hydrology, such as interruption of surface flow or creation of outlets, could create surface impoundments or increase outflow. When the water table of a wetland drops because of decreased inflow or increased outflow, changes in vegetation and degradation of the peat layer can occur; these changes can ultimately result in degradation of the wetland and reduction or elimination of its functions. Normal sheet flow through wetlands is inhibited by road embankments, leading to the creation of surface impoundments that decrease water circulation and lead to water stagnation. Decreased water circulation also results in increased water temperature, lower dissolved oxygen levels, changes in salinity and potential of hydrogen (pH), the prevention of nutrient outflow, and increased sedimentation (USEPA, 1993).

Railbeds and roadbeds could create impoundments even with installation of properly placed and maintained culverts. Once installed, culverts can become ice traps because of a culvert's location within an embankment exposes the culvert to maximum cooling conditions. Metal culverts have very high thermal conductivity. Culverts are usually designed to have an air space at the top. As cold air circulates through the pipe, cooling it and the surrounding embankment, small culverts often freeze solid as over-ice melt waters flow into the culvert and freeze during spring break up (Freitag and McFadden, 1997). Such inadvertent impoundment and hydrologic alteration can change the functions of the wetland (Winter, 1981).

During construction, fugitive dust generated by excavation and grading would cause short-term, local increases in levels of air-borne particulates. Fugitive dust would also be generated by loose soil blowing from haul truck beds and by traffic in vehicle access and construction staging areas. Dust deposited in wetlands would affect plant growth by changing soil productivity and permeability and reducing water quality, which could result in reduced wetland plant diversity next to the roadways.

Common Impacts of Facilities

Two construction staging areas and a rock staging area have been proposed that would likely be used regardless of which segment might be authorized for construction. These staging areas are near the beginning of the project (Eielson Construction Staging Area; see Chapter 2) and near the end of the project (Delta Construction Staging Area; see Chapter 2) and would affect about 19 acres of wetlands, primarily scrub/shrub and mixed forest wetlands (Table 4-12). Three new communications towers would also be constructed for the rail line. These towers would affect approximately 0.2 acre each and would likely occur within forested upland habitats and would not affect wetlands. New access roads to these tower locations would cross wetlands, contributing additional minor affects to wetlands similar to those described for the rail line.

Table 4-12
Wetlands within the Eielson and Delta Construction Staging Areas and Rock Staging Area[a]

NWI[b] Code	Description	Area (acres)	Wetland Proportion (percent)
PFO#/#	Mixed Forest Wetlands	5.6	30
PSS1	Broadleaf Scrub/Shrub Wetlands	12.9	70
Wetland Total		**18.5**	
Upland		173.5	

[a] Source: HDR, 2007a.
[b] NWI = National Wetland Inventory.

Approximately 560 acres would be required for borrow areas, with an approximate spacing of one 17-acre pit every 2.5 miles and a total of 33 borrow areas. A total of 33 percent of the project area is wetlands, and avoidance of all wetland impacts in the excavation of borrow areas would be unlikely. With no avoidance of wetlands, an estimated 185 acres of wetlands would be affected by borrow area excavation based on the 33 percent wetland proportion (see Table 4-13) (HDR, 2007a). Specific borrow area locations have not yet been finalized, but would presumably be sited to minimize impacts to wetland, making the 185-acre figure an estimate of the maximum impact.

Table 4-13
Estimated Borrow Area Wetlands for 33 Borrow Areas at 2.5-Mile Intervals Based on the Proportional Distribution of Wetland Types in the Project Area[a]

NWI Code[b]	Definition	Estimated Area (acres)	Wetland Proportion (percent)
PFO1	Broadleaf Forest Wetlands	-	-
PFO4	Needleleaf Forest Wetlands	60.4	33
PFO#/#	Mixed Forest Wetlands	1.9	1
PFO	**Subtotal Forest Wetlands**	**62.3**	**34**
PSS1	Broadleaf Scrub/Shrub Wetlands	18.5	10
PSS4	Needleleaf Scrub/Shrub Wetlands	23.7	13
PSS#/#	Mixed and Other Scrub/Shrub Wetlands	48.0	26
PSS	**Subtotal Scrub/Shrub Wetlands**	**90.2**	**49**
PEM	Emergent Wetlands	4.0	2
P/RA	Aquatic Bed	-	-
P/R	Other Waters	28.3	15
	All Wetlands and Waters	**184.8**	**33**
Upland		375.2	67

[a] Source: HDR, 2007a.
[b] NWI = National Wetland Inventory.

Operations Impacts to Wetlands

Most direct effects to wetlands within the ROW would occur during construction, while many indirect effects would occur during rail line operations. Railroad maintenance would include repairing the tracks and associated structures (maintenance roads, ditches, bridges, and culverts) and cleaning out ditches and culverts. These activities would be infrequent and of short duration. The maintenance and use of access roads could include the use of rock salt for deicing or sand for increasing traction that could damage or kill vegetation and aquatic life (Campbell *et al.*, 1994). Herbicides, soil stabilizers, and dust palliatives used along roadways could damage wetland plants (USEPA, 1993). Bridge maintenance activities could cause deposition of lead, iron (rust), and toxins from paint, solvents, abrasives, and cleaners directly into the wetlands below, resulting in injury to wetland plants and contamination of wetland soils. Toxic substances adhering to sediments could accumulate in impoundments as a result of decreased water circulation, leading to bioaccumulation of contaminants by wetland biota. Bioaccumulation of toxins occurs at higher trophic levels, which could ultimately cause toxicity.

Stormwater discharges from railbed drainage ditches would convey stormwater and low concentrations of pollutants to wetlands along the receiving waterways and drainage channels, potentially altering soil chemistry and soil pH and affecting vegetation adjacent to the rail line. Runoff from bridges could increase loadings of hydrocarbons, heavy metals, toxic substances, and deicing chemicals directly into wetlands (USEPA, 1993). Moreover, precipitation runoff could have a similar affect on the pH of wetlands, depending on the parent materials for the railbed. The primary pollutants that would cause degradation are sediment, nutrients, pesticides, salt, heavy metals, and selenium. Other factors could include low dissolved oxygen and pH (NCSU, 2008; USEPA, 1993).

Fugitive dust generated by vehicles using gravel access and maintenance roads could affect wetlands next to the access roads by covering vegetation with fine dust particles, inhibiting photosynthesis. Train operations could produce insignificant amounts of fugitive dust. Fugitive dust settling in wetlands along the rail line ROW could affect soil pH, surface hydrology, and sheet flow (DNRP, 2004).

Impacts to Wetlands by Alternative Segment

Construction Impacts to Wetlands

North Common Segment

Construction of North Common Segment would result in the loss of 3.5 acres of wetlands (Table 4-14) within the 200-foot ROW (Figure 4-9). Wetland impacts would result from excavation and filling associated with the construction of the rail line, access roads, and staging areas. Impacts from construction activities would be permanent and would eliminate or limit most wetland functions. Most affected wetlands would be broadleaf scrub/shrub communities that are not unique to the region (SWS, 2008). Broadleaf scrub/shrub wetlands have high functional capacities for water quality improvement, nutrient export, and contributions to the abundance and diversity of wetland flora and fauna (HDR, 2007b).

Table 4-14
Wetlands within 200-foot ROW for North Common Segment[a]

NWI[b] Code	Description	Area (acres)	Wetland Proportion (percent)
PFO1	Broadleaf Forest Wetlands	-	-
PFO4	Needleleaf Forest Wetlands	-	-
PFO#/#	Mixed Forest Wetlands	-	-
PFO	**Forest Wetlands**	**-**	-
PSS1	Broadleaf Scrub/Shrub Wetlands	2.6	75
PSS4	Needleleaf Scrub/Shrub Wetlands	-	-

Table 4-14
Wetlands within 200-foot ROW for North Common Segment[a] (continued)

NWI[b] Code	Description	Area (acres)	Wetland Proportion (percent)
PSS#/#	Mixed and Other Scrub/Shrub Wetlands	-	-
PSS	**Scrub/Shrub Wetlands**	**2.6**	
PEM	**Emergent Wetlands**	**0.3**	9
P/RA	**Aquatic Bed**	**-**	-
P/R	**Other Waters**	**0.6**	16
	All Wetlands and Waters	**3.5**	
Upland		60.3	

[a] Source: HDR, 2007a.
[b] NWI = National Wetland Inventory.

Eielson Alternative Segments

Wetland communities within the 200-foot ROW for the Eielson alternative segments would be directly affected through the loss of 17 to 100 acres (depending on alternative) of wetlands through excavation, filling, or other construction activities, including the development of access roads, staging areas, and support facilities necessary for rail line operations and maintenance (Figure 4-9 and Table 4-15). The affected wetland communities are not unique in the region. In some locations, the direct loss of wetlands to construction activities would eliminate adjacent riparian zones. Within the 200-foot rail line ROW, Eielson Alternative Segment 1 would affect about 17 acres of wetlands; Eielson Alternative Segment 2 would affect about 71 acres of wetlands; and Eielson Alternative Segment 3 would affect approximately 100 acres of wetlands. Affected wetlands differ in proportions with the various alternative segments but include predominantly scrub/shrub and forested wetland communities.

Eielson Alternative Segments 2 and 3 have the potential to affect the greatest wetland acreages near their southern terminus. Eielson Alternative Segments 2 and 3 would affect a higher proportion and acreage of scrub/shrub wetlands, predominately mixed needleleaf/broadleaf scrub/shrub and broadleaf scrub/shrub wetland communities (Table 4-15). These scrub/shrub wetland communities have high functional capacities for water quality improvement, nutrient export, and contributions to the abundance and diversity of wetland flora and fauna (HDR, 2007b). Eielson Alternative Segments 2 and 3 would also affect a lower proportion but higher total acreage of forested wetlands than Eielson Alternative Segment 1 (Table 4-15). Forested wetland communities affected by construction would be primarily needleleaf forested wetlands which have high functional capacities for water quality improvement, nutrient export and contributions to the abundance and diversity of wetland flora and fauna. Eielson Alternative Segment 1 would cross fewer wetland communities, although Eielson Alternative Segment 1 would come closest to the Tanana River (approximately 500 feet), which could affect water quality, not only of wetlands within the ROW, but within the riparian communities next to the Tanana River.

Table 4-15
Wetlands Within the 200-foot ROW for the Eielson Alternative Segments[a]

		Eielson 1		Eielson 2		Eielson 3	
NWI[b] Code	**Description**	**Area (acres)**	**Wetland Proportion (percent)**	**Area (acres)**	**Wetland Proportion (percent)**	**Area (acres)**	**Wetland Proportion (percent)**
PFO1	Broadleaf Forest Wetlands	-	-	-	-	-	-
PFO4	Needleleaf Forest Wetlands	6.9	41	23.3	33	36.6	36
PFO#/#	Mixed Forest Wetlands	-	-	-	-	0.1	-
PFO	**Forest Wetlands**	**6.9**	**41**	**23.3**	**33**	**36.7**	**36**
PSS1	Broadleaf Scrub/Shrub Wetlands	6.2	37	16.2	23	16.8	17
PSS4	Needleleaf Scrub/Shrub Wetlands	0.2	1	3.4	5	6.4	6
PSS#/#	Mixed and Other Scrub/Shrub Wetlands	0.7	4	23.5	33	25.4	25
PSS	**Scrub/Shrub Wetlands**	**7.1**	**42**	**43.1**	**61**	**48.6**	**48**
PEM	**Emergent Wetlands**	**1.5**	**9**	**3.5**	**5**	**5.7**	**6**
P/RA	**Aquatic Bed**	**-**	**-**	**-**	**-**	**0.7**	**1**
P/R	**Other Waters**	**1.3**	**8**	**0.9**	**1**	**8.6**	**9**
	All Wetlands and Waters	**16.8**		**70.8**		**100.3**	
Upland		230.5		170.6		143.1	

[a] Source: HDR, 2007a.
[b] NWI = National Wetland Inventory.

Salcha Alternative Segments

Construction of Salcha Alternative Segment 1 or Salcha Alternative Segment 2 would directly affect 180 acres and 262 acres of wetlands and waters, respectively (Tables 4-16 and 4-17). Wetlands that would be affected by construction in the Salcha Alternative Segment 1 ROW are dominated by scrub/shrub communities (Table 4-16); and construction within the Salcha Alternative Segment 2 ROW would affect predominately forested wetland communities (Figure 4-10 and Table 4-16). The wetlands communities that would be affected are common within the region (SWS, 2008). Scrub/shrub wetland communities within Salcha Alternative Segment 1 ROW are predominately mixed needleleaf/broadleaf and needleleaf communities, which have high functional capacities for water quality improvement, nutrient export, and contributions to the diversity and abundance of wetland flora and fauna (HDR, 2007b). Forested wetland communities along Salcha Alternative Segment 2 are predominately needleleaf communities, which have high functional capacities for water quality improvement, nutrient export, and contributions to the diversity and abundance of wetland flora and fauna (HDR, 2007b).

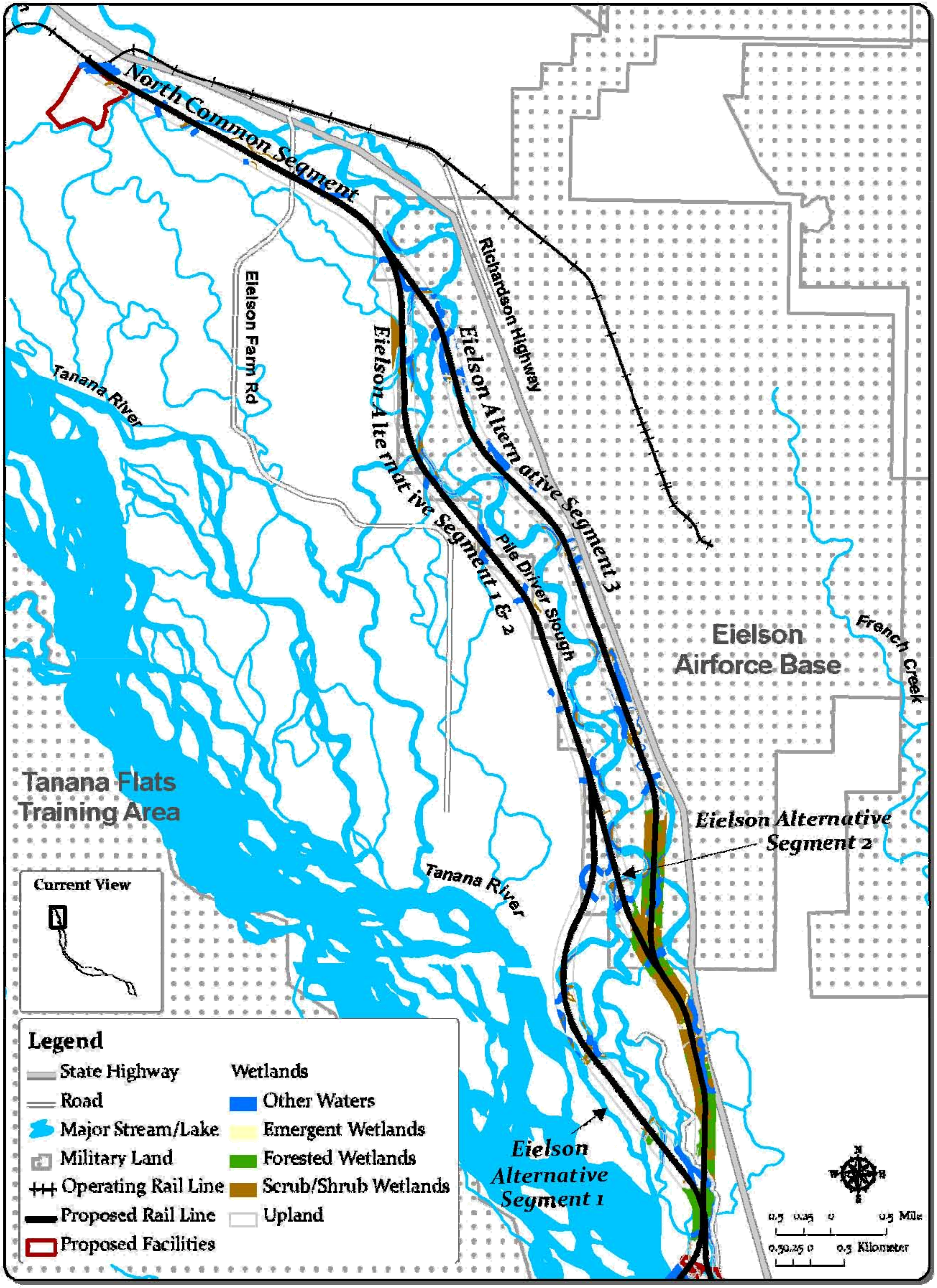

Figure 4-9 – Wetlands along North Common and the Eielson Alternative Segments (HDR, 2007a)

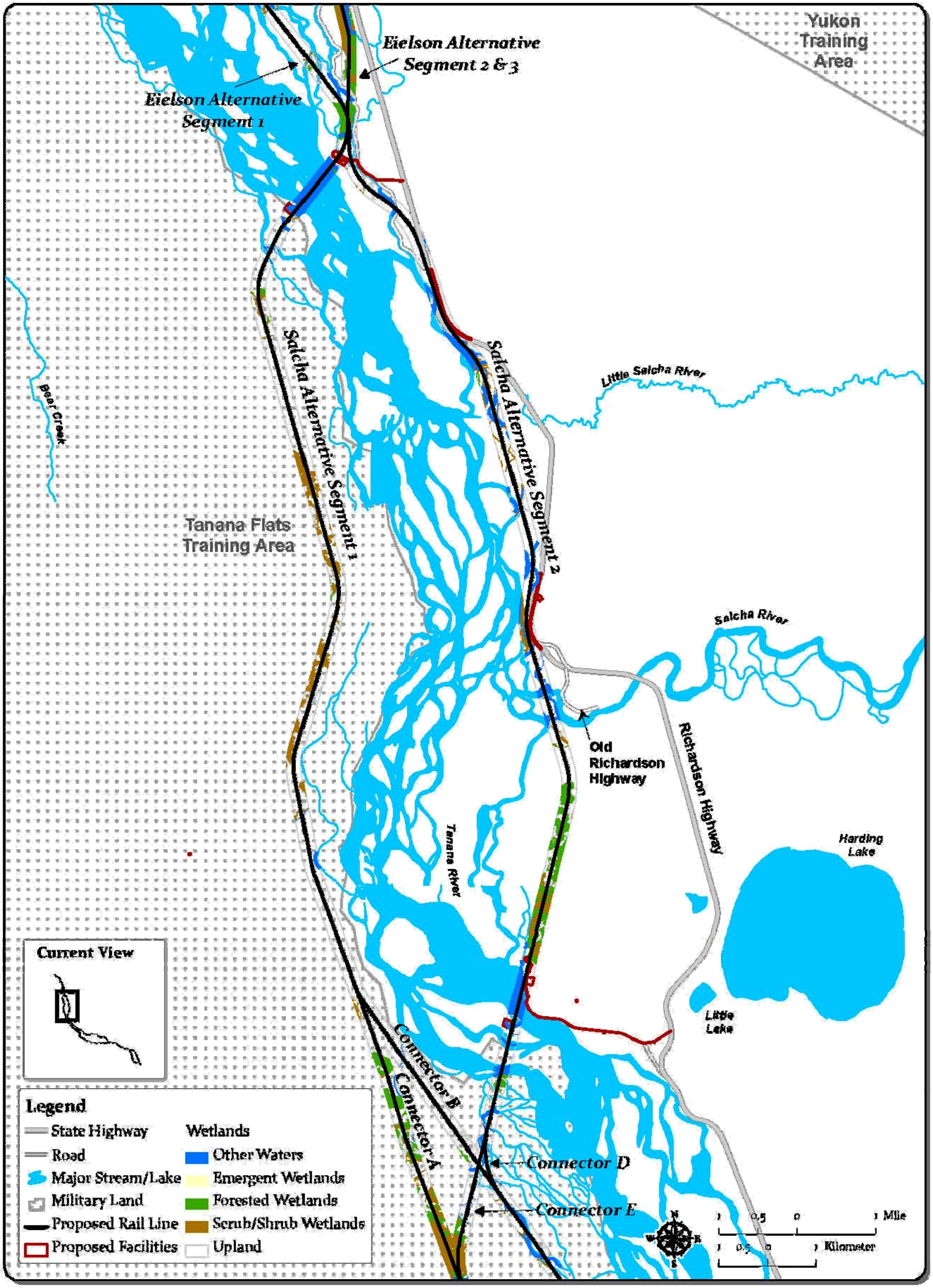

Figure 4-10 – Wetlands along the Salcha Alternative Segments (HDR, 2007a)

Table 4-16
Wetlands within 200-foot ROW for the Salcha Alternative Segments[a]

NWI[b] Code	Description	Salcha 1 Area (acres)	Salcha 1 Wetland Proportion (percent)	Salcha 2 Area (acres)	Salcha 2 Wetland Proportion (percent)
PFO1	Broadleaf Forest Wetlands	-	-	-	-
PFO4	Needleleaf Forest Wetlands	7.2	11	47.3	43
PFO#/#	Mixed Forest Wetlands	-	-	-	-
PFO	**Forest Wetlands**	**7.2**	**11**	**47.3**	**43**
PSS1	Broadleaf Scrub/Shrub Wetlands	2.8	4	18.9	17
PSS4	Needleleaf Scrub/Shrub Wetlands	12.4	18	8.1	7
PSS#/#	Mixed and Other Scrub/Shrub Wetlands	24.2	36	2.1	2
PSS	**Scrub/Shrub Wetlands**	**39.4**	**58**	**29.1**	**26**
PEM	**Emergent Wetlands**	**0.2**	**0**	**2.9**	**3**
P/RA	**Aquatic Bed**	**-**	**-**	**0.1**	**0**
P/R	**Other Waters**	**21.2**	**31**	**31.5**	**28**
	All Wetlands and Waters	**68.0**		**110.9**	
Upland		215.7		222.1	

[a] Source: HDR, 2007a.
[b] NWI = National Wetland Inventory.

Table 4-17
Wetlands within Salcha Alternative Segments 1 and 2 Bridge Staging Areas, Levees, Riprap Areas, Gravel Extraction Sites, Access Roads, and Highway Relocations[a]

NWI[b] Code	Description	Salcha 1 Area (acres)	Salcha 1 Wetland Proportion (percent)	Salcha 2 Area (acres)[c]	Salcha 2 Wetland Proportion (percent)
PFO1	Broadleaf Forest Wetlands	-	-	11.2	7
PFO4	Needleleaf Forest Wetlands	25.0	22	-	-
PFO#/#	Mixed Forest Wetlands	-	-	-	-
PFO	**Forest Wetlands**	**25.0**	**22**	**11.2**	**7**
PSS1	Broadleaf Scrub/Shrub Wetlands	17.3	16	34.2	23
PSS4	Needleleaf Scrub/Shrub Wetlands	-	-	<0.1	0
PSS#/#	Mixed and Other Scrub/Shrub Wetlands	-	-	56.8	38
PSS	**Scrub/Shrub Wetlands**	**17.3**	**16**	**91.0**	**61**
PEM	**Emergent Wetlands**	**-**	**-**	**-**	**-**
P/RA	**Aquatic Bed**	**-**	**-**	**-**	**-**
P/R	**Other Waters**	**69.6**	**62**	**49.2**	**32**
	All Wetlands and Waters	**111.9**		**151.4**	
Upland		136.9		155.8	

[a] Source: USFWS, 2005.
[b] NWI = National Wetland Inventory.
[c] < means less than.

Either alternative segment would include a crossing of the Tanana River and its adjacent wetlands and riparian zones. Table 4-17 lists wetlands within the Salcha alternative segments 1 and 2 bridge staging areas, levees, riprap areas, borrow sites, access roads, and highway relocation areas. Wetlands would be affected by construction of the river crossings through excavation, filling, or other construction activities, including the development of shoreline protection structures, flood protection structures, access roads, staging areas, and support facilities necessary for the rail line operations and maintenance (Table 4-17).

During construction, riprap would be added to the upstream side of the proposed Tanana River Bridge, resulting in affects on wetlands and riparian areas. Direct impacts would occur from placement of riprap material in wetlands. Riprap would also add substrate that is substantially different from the parent material of the shoreline, resulting in substantial changes to the habitat condition. In general, riprap would be placed on top of a barrier that would prevent the growth of riparian shrubs. Secondary habitat changes in riverine habitats would include changes in flow, sediment distribution, and vegetation, which would result in changes to the surrounding riparian wetlands.

Salcha Alternative Segment 1 would directly affect fewer wetland acres than Salcha Alternative Segment 2, and would not travel as close to the Tanana River as would Salcha Alternative Segment 2, potentially minimizing the impact of construction-related damages to water quality, wetlands, and riparian habitats adjacent to the Tanana River. Salcha Alternative Segment 2 would occupy the north bank of the Tanana River in several locations, potentially increasing the severity of the impacts to riverine wetlands, water quality, and riparian habitats due to proximity to the river channel.

Central Alternative Segments and Connectors

Construction of the Central alternative segments would affect 51 acres of wetland communities for Central Alternative Segment 1 and 6.5 acres for Central Alternative Segment 2 (Table 4-18). Impacts on wetland communities within the 200-foot ROW would include excavation and filling. Figure 4-11 shows wetlands the Central alternative segments and connector segments would cross. Wetlands affected by the Central Alternative Segment 1 are dominated by needleleaf forested wetlands and broadleaf scrub/shrub wetland communities, which comprise almost half of the wetland habitats within the project area. The dominant wetland community affected by Central Alternative Segment 2 would be scrub/shrub. Needleleaf forest wetlands have functional capacities for water quality improvement, nutrient export, and contribution to the abundance and diversity of wetland fauna. Needleleaf scrub/shrub and mixed needleleaf/broadleaf scrub/shrub wetland communities have functional capacities for water quality improvement, nutrient export, and contribution to the abundance and diversity of wetland fauna. The seasonally flooded needleleaf scrub/shrub communities have a lower functional capacity for contribution to the abundance and diversity of wetland flora than do the saturated mixed scrub/shrub wetland communities (HDR, 2007b).

Table 4-18
Wetlands within the 200-foot ROW for the Central Alternative Segments[a]

NWI[b] Code	Description	Central 1 Area (acres)	Central 1 Wetland Proportion (percent)	Central 2 Area (acres)[c]	Central 2 Wetland Proportion (percent)
PFO1	Broadleaf Forest Wetlands	-	-	-	-
PFO4	Needleleaf Forest Wetlands	22.5	44	-	0
PFO#/#	Mixed Forest Wetlands	-	-	-	-
PFO	**Forest Wetlands**	**22.5**	**44**	**-**	**-**
PSS1	Broadleaf Scrub/Shrub Wetlands	17.6	35	3.7	57
PSS4	Needleleaf Scrub/Shrub Wetlands	0.6	1	<0.1	0
PSS#/#	Mixed and Other Scrub/Shrub Wetlands	5.9	12	2.8	43
PSS	**Scrub/Shrub Wetlands**	**24.1**	**48**	**6.5**	**100**
PEM	**Emergent Wetlands**	**4.2**	**8**	**-**	**-**
P/RA	**Aquatic Bed**	**-**	**-**	**-**	**-**
P/R	**Other Waters**	**0.2**	**0**	**-**	**-**
	All Wetlands and Waters	**51.0**		**6.5**	
Upland		71.8		80.4	

[a] Source: HDR, 2007a.
[b] NWI = National Wetland Inventory.
[c] < means less than.

The five connector segments that could connect various alternative segments vary widely in length. Construction of the connector segments would affect between 1.6 and 56.2 acres of wetland communities (Figures 4-10 and 4-11, Table 4-19).

Donnelly Alternative Segments

Construction of the Donnelly alternative segments would affect 397 acres of wetland communities for Donnelly Alternative Segment 1 and 303 acres for Donnelly Alternative Segment 2 (Tables 4-20 and 4-21) by filling, excavation and construction, including large bridge staging areas, and river gravel sites. Within the 200-foot ROW, Donnelly Alternative Segment 1 would affect about 356 acres of wetlands and Donnelly Alternative Segment 2 would affect about 257 acres of wetlands. Wetlands affected would be predominantly scrub/shrub and forested wetland communities for Donnelly Alternative Segment 1 and predominately forested wetlands and scrub/shrub wetland communities for Donnelly Alternative Segment 2 (Figure 4-12). Wetland communities affected by the Donnelly alternative segments are common within the proposed project area (see Table 4-11) (SWS, 2008). The scrub/shrub wetlands affected by construction of the Donnelly alternative segments would include predominately mixed and other scrub/shrub wetland communities, while forested wetlands would include predominately needleleaf forests. Both alternatives would affect 55 to 60 acres of riverine habitats, which while not unique to the region, would generally be considered sensitive and highly susceptible to impacts on water quality or habitat (USEPA, 2001a). The glacial nature of the Little Delta River and Delta Creek, however, could negate most water quality or habitat impacts because of the higher turbidity and suspended sediment loads already present in the stream.

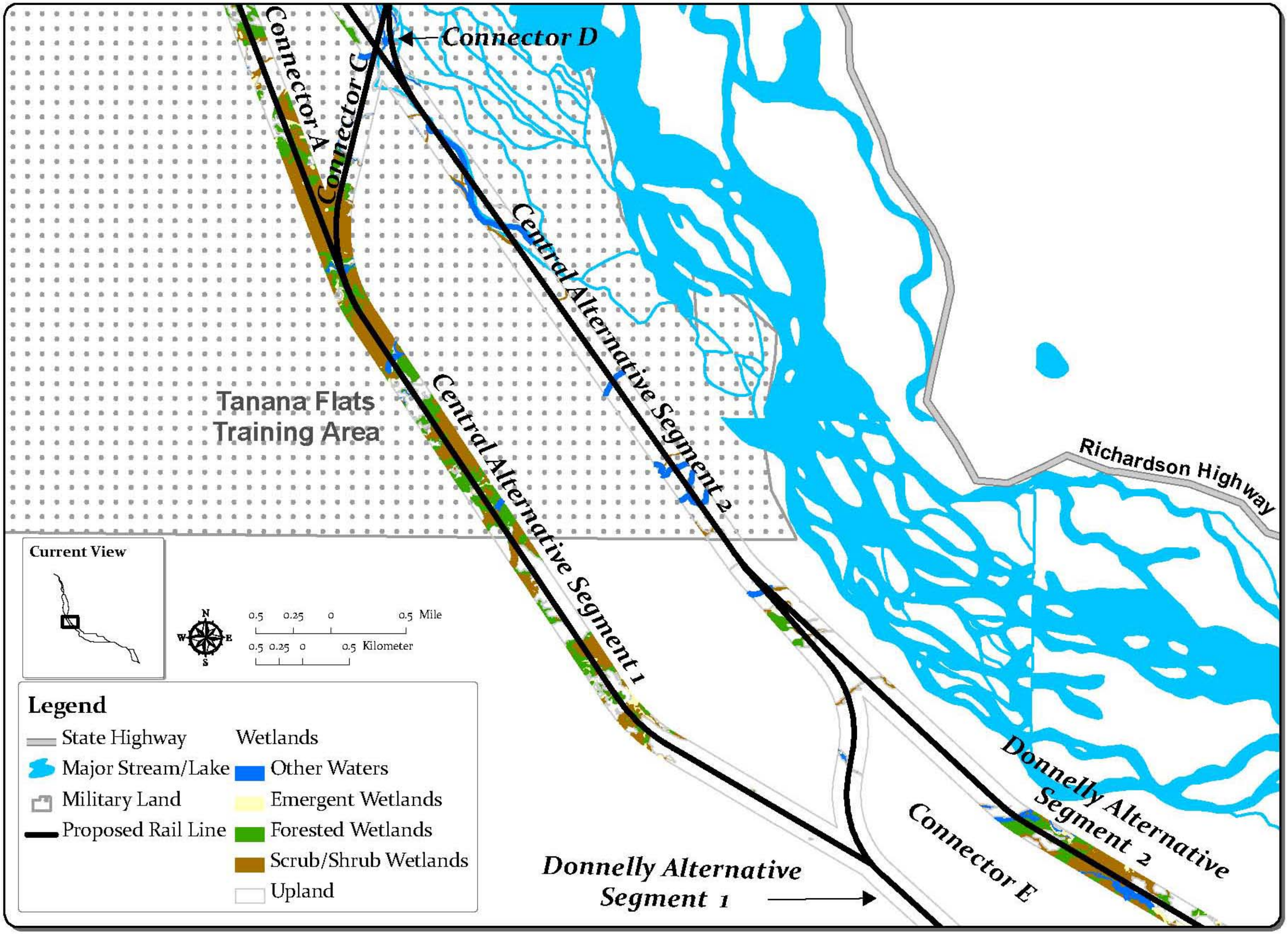

Figure 4-11 – Wetlands along the Central Alternative Segments (HDR, 2007a)

Table 4-19
Wetlands within the 200-foot ROW for the Connector Segments[a]

NWI[b] Code	Description	Connector A Area (acres)	Connector A Wetland Proportion (percent)	Connector B Area (acres)	Connector B Wetland Proportion (percent)	Connector C Area (acres)[c]	Connector C Wetland Proportion (percent)	Connector D Area (acres)	Connector D Wetland Proportion (percent)	Connector E Area (acres)	Connector E Wetland Proportion (percent)
PFO1	Broadleaf Forest Wetlands	0.1	0	-	-	-	-	-	-	-	-
PFO4	Needleleaf Forest Wetlands	30.3	54	0.3	18	10.4	40	-	-	0.7	22
PFO#/#	Mixed Forest Wetlands	1.5	3	-	-	-	-	-	-	-	-
PFO	**Forest Wetlands**	**31.9**	**57**	**0.3**	**18**	**10.4**	**40**	**-**	-	**0.7**	**22**
PSS1	Broadleaf Scrub/Shrub Wetlands	14.5	26	0.4	24	7.9	30	1.5	51	0.1	3
PSS4	Needleleaf Scrub/Shrub Wetlands	0.2	0	-	-	-	-	-	-	-	-
PSS#/#	Mixed and Other Scrub/Shrub Wetlands	8.3	15	-	-	5.3	20	-	-	2.0	56
PSS	**Scrub/Shrub Wetlands**	**23.0**	**41**	**0.4**	**24**	**13.2**	**50**	**1.5**	**51**	**2.1**	**59**
PEM	**Emergent Wetlands**	**1.1**	**2**	**0.2**	**13**	**1.3**	**5**	**0.2**	**6**	**0.3**	**7**
P/RA	**Aquatic Bed**	**-**	**-**	**-**	**-**	**<0.1**	**0**	**-**	**-**	**-**	**-**
P/R	**Other Waters**	**0.2**	**0**	**0.7**	**45**	**1.4**	**5**	**1.2**	**43**	**0.4**	**12**
	All Wetlands and Waters	**56.2**		**1.6**		**26.3**		**2.9**		**3.5**	
Upland		49.5		77.8		29.6		18.3		54.9	

[a] Source: HDR, 2007a.
[b] NWI = National Wetland Inventory.
[c] < means less than.

Table 4-20
Wetlands within 200-foot ROW for the Donnelly Alternative Segments[a]

		Donnelly 1		Donnelly 2	
NWI[b] Code	**Description**	**Area (acres)**	**Wetland Proportion (percent)**	**Area (acres)**	**Wetland Proportion (percent)**
PFO1	Broadleaf Forest Wetlands	0.2	0	1.5	1
PFO4	Needleleaf Forest Wetlands	123.1	35	128.0	50
PFO#/#	Mixed Forest Wetlands	0.4	0	10.6	4
PFO	**Forest Wetlands**	**123.7**	**35**	**140.1**	**55**
PSS1	Broadleaf Scrub/Shrub Wetlands	3.6	1	20.9	8
PSS4	Needleleaf Scrub/Shrub Wetlands	87.4	24	8.8	3
PSS#/#	Mixed and Other Scrub/Shrub Wetlands	117.9	33	67.6	26
PSS	**Scrub/Shrub Wetlands**	**208.9**	**58**	**97.3**	**37**
PEM	**Emergent Wetlands**	**2.0**	**1**	**4.2**	**2**
P/RA	**Aquatic Bed**	**0.2**	**0**	**-**	**-**
P/R	**Other Waters**	**21.3**	**6**	**15.4**	**6**
	All Wetlands and Waters	**356.1**		**257.0**	
Upland		264.8		373.3	

[a] Source: HDR, 2007a.
[b] NWI = National Wetland Inventory.

Table 4-21
Wetlands within the Donnelly Alternative Segments 1 and 2 Little Delta River and Delta Creek Large Bridge Staging Areas and Instream Gravel Sites[a]

		Donnelly 1		Donnelly 2	
NWI[b] Code	**Description**	**Area (acres)**	**Wetland Proportion (percent)**	**Area (acres)**	**Wetland Proportion (percent)**
PFO1	Broadleaf Forest Wetlands	2.1	5	4.0	9
PFO4	Needleleaf Forest Wetlands	-	-	-	-
PFO#/#	Mixed Forest Wetlands	-	-	-	-
PFO	**Forest Wetlands**	**2.1**	**5**	**4.0**	**9**
PSS1	Broadleaf Scrub/Shrub Wetlands	-	-	-	-
PSS4	Needleleaf Scrub/Shrub Wetlands	-	-	-	-
PSS#/#	Mixed and Other Scrub/Shrub Wetlands	5.1	13	1.7	4
PSS	**Scrub/Shrub Wetlands**	**5.1**	**13**	**1.7**	**4**
PEM	**Emergent Wetlands**	**-**	**-**	**-**	**-**
P/RA	**Aquatic Bed**	**-**	**-**	**-**	**-**
P/R	**Other Waters**	**33.7**	**82**	**39.8**	**87**
	All Wetlands and Waters	**40.9**		**45.5**	
Upland		21.9		17.3	

[a] Source: USFWS, 2005.
[b] NWI = National Wetland Inventory.

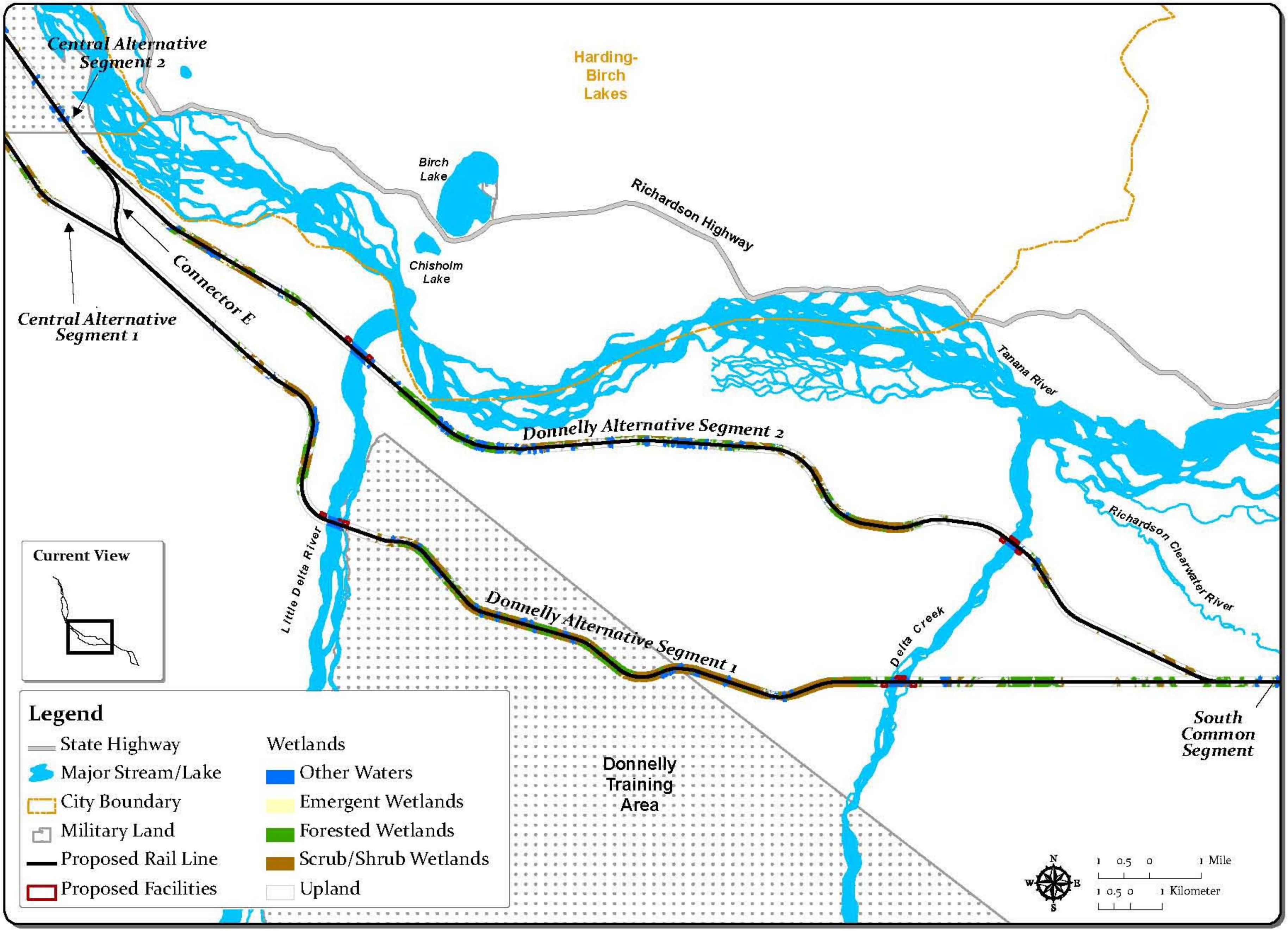

Figure 4-12 – Wetlands along the Donnelly Alternative Segments (HDR, 2007a)

The forested wetlands affected by construction of the Donnelly alternative segments would be primarily saturated needleleaf forests, which have a high functional capacity to improve water quality, export nutrients, and contribute to the abundance and diversity of wetland flora and fauna (HDR, 2007b). Donnelly Alternative Segment 2 would affect more broadleaf scrub/shrub habitats (21 acres) than Donnelly Alternative Segment 1 (4 acres). Broadleaf scrub/shrub habitats generally provide slightly higher functional capacities for contributions to the abundance and diversity of wetland flora and fauna than needleleaf scrub/shrub habitats (HDR, 2007b).

Donnelly Alternative Segment 1 and Donnelly Alternative Segment 2 would cross the Little Delta River and Delta Creek, tributaries of the Tanana River. Donnelly Alternative Segment 1 would be farther from the Tanana River than Donnelly Alternative Segment 2, which could reduce the impact of construction activities on water quality, wetlands, and the riparian zone next to the Tanana River. Donnelly Alternative Segment 2 would approach the southern bank of the Tanana River in several locations; potentially increasing the severity of impacts to wetlands, water quality, and the riparian zone (Figure 4-12). Construction of the large bridge crossings for the Little Delta River and Delta Creek would contribute to bank erosion that could be characterized as impacts to sensitive habitat (USEPA, 2001a).

South Common Segment

Construction within the 200-foot ROW of South Common Segment would result in the loss of about 56 acres of wetlands composed primarily of scrub/shrub wetland communities and forested communities (Table 4-22). The direct loss of wetlands would occur as a result of excavation, filling, or other construction activities. Figure 4-13 shows wetlands types. Most scrub/shrub wetlands affected would be seasonally flooded broadleaf communities (see Appendix E) with high functional capacities for water quality improvement, nutrient export, and contribution to the abundance and diversity of wetland flora and fauna (HDR, 2007b). Most affected forested wetlands would be saturated needleleaf forests (see Appendix E) with high functional capacities for water quality improvement, nutrient export, and contributions to abundance and diversity of wetland flora and fauna (HDR, 2007b).

Delta Alternative Segments

Construction of the Delta alternative segments would result in the loss of about 95 acres of wetlands for Delta Alternative Segment 1 and 60 acres of wetlands for Delta Alternative Segment 2 (Tables 4-23 and 4-24) through excavation, filling, or other construction activities, including the development of highway overpass staging areas, access roads, and a passenger terminal. Affected wetlands would be predominantly scrub/shrub and riverine communities within the Delta Alternative Segments 1 and 2 ROWs (Table 4-23; Appendix E). Riverine communities are considered sensitive habitats (SWS, 2008). Delta Alternative Segment 1 would affect more forested wetlands than Delta Alternative Segment 2 (Tables 4-23 and 4-24). Figure 4-14 shows wetland types for Delta Alternative Segments 1 and 2. Either alternative segment would require bridge crossings of the Delta River and adjacent riparian areas. Delta Alternative

Table 4-22
Wetlands within the 200-foot ROW for South Common Segment[a]

NWI[b] Code	Description	Area (acres)	Wetland Proportion (percent)
PFO1	Broadleaf Forest Wetlands	0.1	0
PFO4	Needleleaf Forest Wetlands	11.0	20
PFO#/#	Mixed Forest Wetlands	0.2	0
PFO	**Forest Wetlands**	**11.3**	**20**
PSS1	Broadleaf Scrub/Shrub Wetlands	32.7	59
PSS4	Needleleaf Scrub/Shrub Wetlands	6.9	12
PSS#/#	Mixed and Other Scrub/Shrub Wetlands	3.8	7
PSS	**Scrub/Shrub Wetlands**	**43.4**	**78**
PEM	**Emergent Wetlands**	**0.8**	**1**
P/RA	**Aquatic Bed**	–	–
P/R	**Other Waters**	**0.3**	**1**
	All Wetlands and Waters	**55.8**	
Upland		196.9	

[a] Source: HDR, 2007a.
[b] NWI = National Wetland Inventory.

Table 4-23
Wetlands within 200-foot ROW for the Delta Alternative Segments[a]

		Delta 1		Delta 2	
NWI[b] Code	Description	Area (acres)	Wetland Proportion (percent)	Area (acres)	Wetland Proportion (percent)
PFO1	Broadleaf Forest Wetlands	–	–	–	–
PFO4	Needleleaf Forest Wetlands	11.6	17	0.6	2
PFO#/#	Mixed Forest Wetlands	–	–	–	–
PFO	**Forest Wetlands**	**11.6**	**17**	**0.6**	**2**
PSS1	Broadleaf Scrub/Shrub Wetlands	0.9	1	6.3	18
PSS4	Needleleaf Scrub/Shrub Wetlands	0.7	1	0.7	2
PSS#/#	Mixed and Other Scrub/Shrub Wetlands	31.3	45	12.0	33
PSS	**Scrub/Shrub Wetlands**	**32.9**	**47**	**19.0**	**53**
PEM	**Emergent Wetlands**	**0.1**	**0**	**1.1**	**3**
P/RA	**Aquatic Bed**	–	–	–	–
P/R	**Other Waters**	**24.9**	**36**	**15.1**	**42**
	All Wetlands and Waters	**69.5**		**35.8**	
Upland		208.8		241.1	

[a] Source: HDR, 2007a.
[b] NWI = National Wetland Inventory.

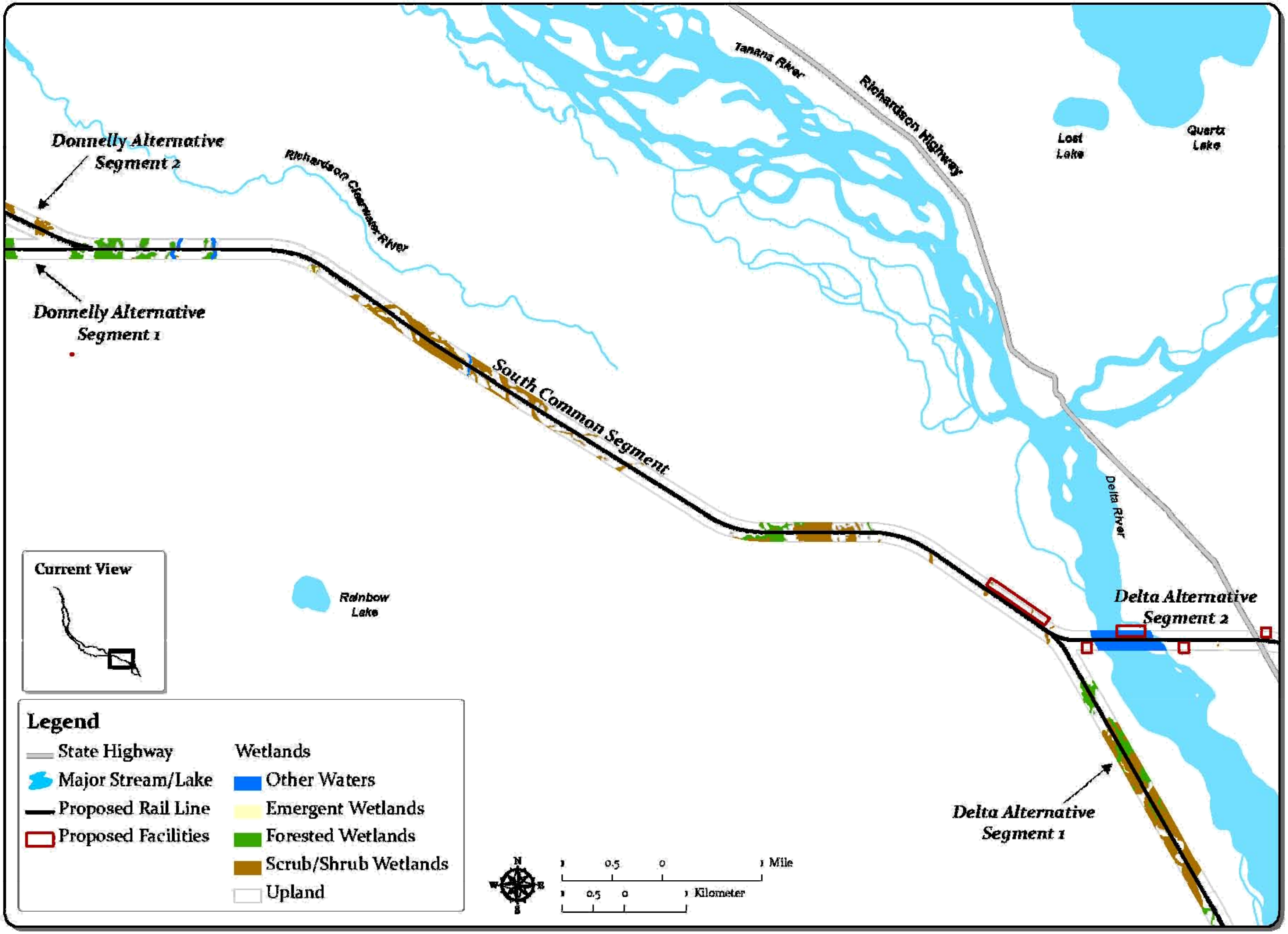

Figure 4-13 – Wetlands along South Common Segment (HDR, 2007a)

Table 4-24
Wetlands within Delta Alternative Segments 1 and 2 Large Bridge Staging areas, Instream Gravel Sites, Overpass Staging Areas, Access Roads, and Passenger Terminal[a]

		Delta 1		Delta 2	
NWI[b] Code	Description	Area (acres)	Wetland Proportion (percent)	Area (acres)	Wetland Proportion (percent)
PFO1	Broadleaf Forest Wetlands	2.4	9	–	–
PFO4	Needleleaf Forest Wetlands	–	–	–	–
PFO#/#	Mixed Forest Wetlands	–	–	3.6	15
PFO	**Forest Wetlands**	**2.4**	**9**	**3.6**	**15**
PSS1	Broadleaf Scrub/Shrub Wetlands	1.1	5	0.6	3
PSS4	Needleleaf Scrub/Shrub Wetlands	–	–	–	–
PSS#/#	Mixed and Other Scrub/Shrub Wetlands	–	–	–	–
PSS	**Scrub/Shrub Wetlands**	**1.1**	**5**	**0.6**	**3**
PEM	**Emergent Wetlands**	–	–	–	–
P/RA	**Aquatic Bed**	–	–	–	–
P/R	**Other Waters**	**21.9**	**86**	**19.9**	**82**
	All Wetlands and Waters	**25.4**		**24.1**	
Upland		15.2		18.5	

[a] Source: USFWS, 2005.
[b] NWI = National Wetland Inventory.

Segment 1 would cross riparian habitats next to Jarvis Creek, which would likely contribute to increased riverbank erosion in this actively eroding area.

Scrub/shrub wetlands that would be affected by construction of the Delta alternative segments would be primarily mixed needleleaf/broadleaf wetland communities, which have high functional capacities for water quality improvement, nutrient export, and contributions to the diversity and abundance of wetland flora and fauna. Needleleaf forested wetlands affected by construction of the Delta alternative segments have high functional capacities for water quality improvement, nutrient export, and contributions to the abundance and diversity of wetland flora and fauna.

Operations Impacts

Section 4.4 describes operations impacts to wetlands.

Summary of Impacts to Wetlands

The primary impacts to wetlands from Proposed NRE construction and operations would be loss of the existing wetland vegetation cover and alteration of wetland hydrology. Table 4-25 summarizes the results of the quantitative analysis of wetland impacts for the NRE alternative segments. Estimates are maximums based on clearing of the entire 200-foot ROW and no avoidance of wetlands for materials excavation sites. Construction of the proposed project would result in surface disturbance of an estimated 814 acres of wetlands including loss of 289 acres of forested wetlands, 511 acres of scrub/shrub wetlands, and 14 acres of emergent wetlands (Table 4-25). Construction of the minimum and maximum area projects would result in disturbance of an estimated 672 to 896 acres of wetlands including 283 to 377 acres of forested wetlands, 374 to 562 acres of scrub/shrub wetlands, and 14 to 17 acres of emergent wetlands (Table 4-25). Impacts to wetlands would represent 15 percent of the wetlands within 500 feet of

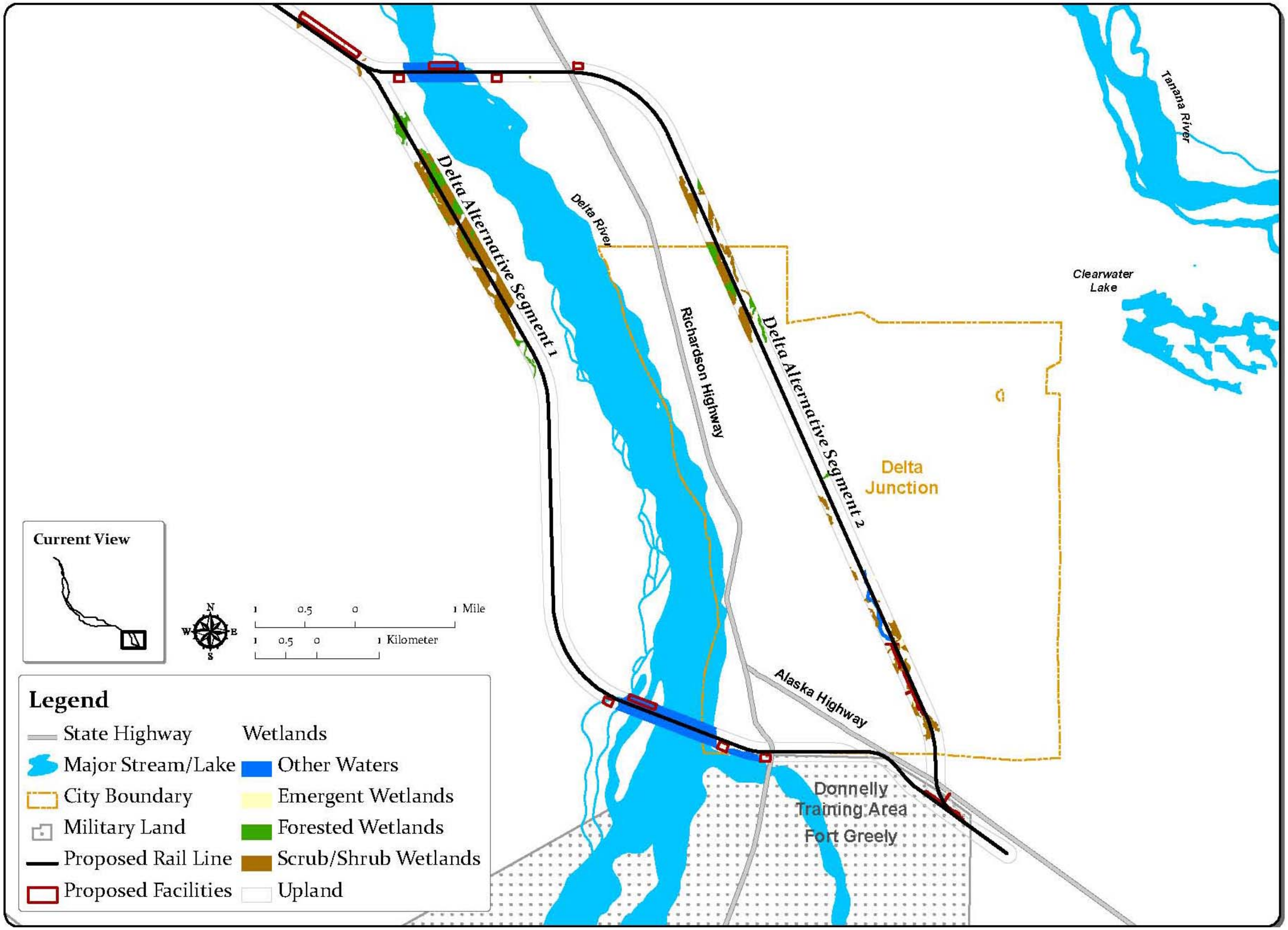

Figure 4-14 – Wetlands along the Delta Alternative Segments (HDR, 2007a)

Table 4-25
Summary of Impacts to Wetlands by Alternative Segment[a]

	Forested Wetlands (acres)	Scrub/Shrub Wetlands (acres)	Emergent and Aquatic Bed Wetlands (acres)	Total Wetlands (acres)	Other Waters (acres)	Total[b] Wetlands and Waters (acres)	Total[b] Uplands (acres)	Vegetated Wetland Proportion (percent)
Common Facilities	67.9	103.1	4.0	175.0	28.3	203.3	548.7	24
North Common	–	2.6	0.3	2.9	0.6	3.5	60.3	5
Eielson 1	6.9	7.1	1.5	15.5	1.3	16.8	230.5	6
Eielson 2	23.3	43.1	3.5	69.9	0.9	70.8	170.6	29
Eielson 3	36.7	48.6	5.7	91.0	9.3	100.3	143.1	37
Salcha 1 + Extra	32.2	56.7	0.2	89.1	90.8	179.9	352.6	17
Salcha 2 + Extra	58.5	120.1	3.0	181.6	80.7	262.3	377.8	28
Central 1	22.5	24.1	4.2	50.8	0.2	51.0	71.8	41
Central 2	–	6.5	–	6.5	–	6.5	80.4	7
Central Connector A	31.9	23.0	1.1	56.0	0.2	56.2	49.5	53
Central Connector B	0.3	0.4	0.2	0.9	0.7	1.6	77.8	1
Central Connector C	10.4	13.2	1.3	24.9	1.4	26.3	29.6	45
Central Connector D	–	1.5	0.2	1.7	1.2	2.9	18.3	8
Central Connector E	0.7	2.1	0.3	3.1	0.4	3.5	54.9	5
Donnelly 1 + Extra	125.8	214.0	2.2	342.0	55.0	397.0	286.7	50
Donnelly 2 + Extra	144.1	99.0	4.2	247.3	55.2	302.5	390.6	36
South Common	11.3	43.4	0.8	55.5	0.3	55.8	196.9	22
Delta 1 + Extra	14.0	34.0	0.1	48.1	46.8	94.9	224.0	15
Delta 2 + Extra	4.2	19.6	1.1	24.9	35.0	60.0	259.6	8

Table 4-25
Summary of Impacts to Wetlands by Alternative Segment[a] (continued)

	Forested Wetlands (acres)	Scrub/Shrub Wetlands (acres)	Emergent and Aquatic Bed Wetlands (acres)	Total Wetlands (acres)	Other Waters (acres)	Total[b] Wetlands and Waters (acres)	Total[b] Uplands (acres)	Vegetated Wetland Proportion (percent)
Proposed Action[b,c]	**288.9**	**511.4**	**13.8**	**814.1**	**232.2**	**1,046.3**	**2,025.4**	**26**
Minimum Area Alternative[b,d]	283.3	374.4	14.3	672.0	211.8	883.9	2,137.4	22
Maximum Area Alternative[b,e]	317.3	561.6	17.4	896.3	214.6	1,110.9	2,026.4	29

[a] Sources: HDR, 2007a; USFWS, 2005.
[b] column and row totals might not equal sums of values due to rounding.
[c] Proposed action (the Applicant's preferred segments) includes North Common, Eielson 3, Salcha 1, Connector B, Central 2, Connector E, Donnelly 1, South Common, and Delta 1.
[d] Minimum Project Area includes North Common, Eielson 2, Salcha 1, Connector B, Central 2, Donnelly 2, South Common, and Delta 2.
[e] Maximum Project Area includes North Common, Eielson 1, Salcha 2, Connector C, Central 1, Donnelly 1, South Common, and Delta 1.

the proposed project alternatives, ranging from 13 to 17 percent for the minimum and maximum project area alternatives (Tables 4-11 and 4-25). Loss of wetland vegetation, disturbance of hydric soils and alteration of wetland hydrology would contribute to the alteration or loss of wetland functions for affected wetlands. Within the project area most forested, scrub/shrub, and emergent wetlands have high functional capacities for water quality improvement, nutrient export, and contributions to the abundance and diversity of wetland flora and fauna. Some cleared areas would likely be restored after construction; other areas would be covered by fill. Clearing of wetland vegetation would be considered long-term or permanent impacts to forest wetlands, even with restoration, especially for late-succession riparian forests. Clearing of wetland vegetation would be considered a short-term impact on scrub/shrub and emergent communities, provided appropriate restoration was completed. Wetland habitats could be created with appropriate restoration of material sites.

No-Action Alternative

Under the No-Action Alternative, there would be no impacts to wetlands from proposed rail line construction and operations.

4.6 Floodplain Resources

This section describes the current floodplain conditions of the Tanana River Valley in the vicinity of the proposed NRE. SEA collected data in the project area during field investigations in 2005, 2006, and 2007. Appendix E describes the methodologies employed and data collected. Appendix E also describes and summarizes data the USGS and the State of Alaska collected in the project area.

4.6.1 Affected Environment

Flooding in the Tanana River Basin can be broken down into several categories, including rainfall runoff, snowmelt, groundwater, or ice jam/log jam floods. The largest floods on record resulted from ice jams or runoff following large rainfalls. The largest flood on record for Fairbanks occurred in mid-August 1967. It was the result of widespread rainfall totaling 10 inches on the middle and lower Tanana River near the City of Fairbanks. There was large-scale flooding on rivers in the area, including the Salcha River, where the maximum discharge was almost twice the peak for the 100-year recurrence interval flood. At the peak of the 1967 flood, approximately 95 percent of Fairbanks was under water. The flood was estimated as a 333-year recurrence interval flood (Collins, 1990).

Present damageable property in the study area consists of residences, scattered cabins, highways, bridges, and culverts. The Chena River Flood Control project has reduced the likelihood of a severe flood within the City of Fairbanks; however, those flood control measures are downstream of the study area and provide no flood protection for the Eielson Flatlands. Since 1969, the Fairbanks North Star Borough (FNSB) has participated in the National Flood Insurance Program, a pre-disaster flood mitigation and insurance program designed to reduce the exorbitant cost of disasters. The National Flood Insurance Program is a voluntary program and provides a *quid pro quo* approach to floodplain management. It makes federally backed flood insurance available to residents and business owners in communities that agree to adopt and adhere to sound flood mitigation measures that guide development in floodplains.

Within the project area, the Tanana River has the largest floodplain footprint, which extends up to 5 miles from the main channel. The Tanana River floodplain consists of flat, low-lying areas with several sloughs or overflow channels extending from the main stem of the river. Other larger rivers in the project area include the Little Delta River, Delta River, Delta Creek, Little Salcha River, and Salcha River. The 100-year floodplains of these rivers are smaller (approximately 0.5 to 2.0 miles wide) and can be defined by the extent of their valley walls or the presence of resistant bedrock outcrops.

FNSB and HDR, Inc., mapped floodplains were mapped for the project area. The FNSB floodplains are categorized in three ways—those within the 100-year floodplain, which has a 26 percent chance of flooding in 30 years; those within the 100- to 500-year floodplain; and those within the greater-than-500-year floodplain. Outside the FNSB, HDR, Inc., mapped the extent of the 100-year floodplain for the remainder of the project area. Figure 4-2 shows the composite 100-year floodplain for the study area. The project area and many of the proposed rail segments within the FNSB lie within the 100-year floodplain, while the proposed rail segments within the Southeast Fairbanks Borough are primarily outside the 100-year floodplain, except near Delta Junction.

4.6.2 Environmental Consequences

This section describes potential impacts to floodplains as a result of the proposed project. Section 4.2.2 describes the methodology for assessing impacts to floodplains. Appendix E provides detailed water-resource tables, which list specific water resources and their characteristics. Chapter 20 describes proposed mitigation measures to address impacts to floodplains.

In general, almost all of the crossing sites in the Eielson Flats and Tanana River Valley physiographic regions are within the 100-year floodplain, while crossing sites in the other regions are generally outside the 100-year floodplain. The railbed within the 100-year floodplain would be constructed above the 100-year flood elevation.

Common Impacts to Floodplains

Common Construction Impacts to Floodplains

This section describes potential construction impacts to floodplains that could occur throughout the project area if the proposed rail line was constructed.

Access roads, staging areas, and camps would likely be placed within the 100-year floodplain. The affected areas would be small compared to the total floodplain storage available; thus, effects on floodplain storage would be minimal. Nevertheless, access roads are linear features, and as such they can inhibit the flow of floodwaters to portions of the floodplain.

Borrow areas located in the floodplain and in proximity to the river or stream could alter the hydraulics and conveyance of the watercourse during flood stage, which could lead to a short-term increase in flood storage (*e.g.*, while the borrow area is filling with water during a flood) and/or the long-term change in channel planform (through the development of meander cutoffs) and a change in sinuosity of the affected reaches. This effect would be more likely in streams crossing broad shallow floodplains and not likely for entrenched streams. In any case, the short-and long-term effects would likely not be significant unless critical habitat was lost or changed, or the flooding dynamics affected the integrity of rural developments.

Common Operations Impacts to Floodplains

SEA does not anticipate impacts to floodplains from rail line operations.

Impacts by Alternative Segment

North Common Segment

The Eielson Construction Staging Area and Eielson Construction Camps would be located along this segment, which is entirely within the 100-year floodplain (Figure 4-2). Although the affected area would be approximately 140 acres, this area is small compared to the total floodplain storage available. This impact would likely be low.

All other activities or structures located along this segment would likely result in low impacts to floodplains.

Eielson Alternative Segments

All of the Eielson alternative segments would be within the 100-year floodplain, and the elevated rail line and access roads could inhibit the flow of floodwaters to portions of the floodplain. Depending on proximity and bed elevation of the rail line and access roads, these activities or structures could have a moderate impact. All other activities or structures would likely result in low impacts for reasons described in the section entitled Common Impacts to Floodplains

Salcha Alternative Segments

Most of Salcha alternative segments 1 and 2 would be with the 100-year floodplain. Proposed bridge crossings would include considerable lengths of river training works and channel plugs (in the overflow channels) to stabilize the river from lateral migrations and/or avulsions. River training works and channel plugs are structures placed in the river to direct the flow of water. Construction of the training works and plugs would require work in the active channel and would disturb banks and alter their physical conditions. Further, the bridge crossings would require staging areas on either side of the crossing. The approximate size of the staging areas would be 1 acre; however, the Tanana River staging areas would be approximately 5.7 acres. All of the proposed staging areas would be within the 100-year floodplain and the staging areas and associated construction facilities and structures could be inundated during an extreme flood event. While the affected areas would be large, the reduction in floodplain area would be small. This impact would likely be low due to the low risk of inundation and the relatively small area affected.

During spring breakup of ice, the ice roads and bridges could be the last to melt due to the increased thickness of the ice at these locations. As a result, ice jams or backups could occur, resulting in flooding upstream. This impact would be low.

Central Alternative Segments

Central Alternative Segment 1 would be outside the 100-year floodplain and, if constructed, would not impact floodplains. All of Central Alternative Segment 2 would be within the 100-year floodplain of the Tanana River.

The proposed location for the Tanana/Donnelly Construction Camp along Central Alternative Segment 2 would be entirely within the 100-year floodplain (Figure 4-2). Although the exact location of the camp is not known, the size of the camp in relation to the entire floodplain area would be small. Thus, the impact would be low.

Elevated rail lines and access roads along Central Alternative Segment 2 could inhibit the flow of floodwaters to portions of the floodplain, thereby reducing floodplain storage. Depending on proximity and bed elevation of the rail line and access roads, these activities or structures could have a moderate impact. All other activities or structures would result in low impacts for reasons described in the section entitled Common Impacts to Floodplains.

Connectors Segments A through E

All of Connector Segment A and half of Connector Segments C and E would be outside the 100-year floodplain, all of Connector Segments B and D would be within the 100-year floodplain, and about half the crossings for Connector Segment E would be within the 100-year floodplain. For segments in the 100-year floodplain, the elevated rail line and access roads could inhibit the flow of floodwaters to portions of the floodplain, thereby reducing floodplain storage. Depending on proximity and bed elevation of the rail line and access roads, these activities or structures could have a moderate impact. All other activities or structures would likely result in low impacts for the reasons described in the section entitled Common Impacts to Floodplains.

Donnelly Alternative Segments

Only a small portion (approximately less than 10 percent) of Donnelly Alternative Segments 1 and 2 would be within the 100-year floodplain. Thus, the built up roadbeds for the rail line and access road would have minimal effect on flood hydraulics and floodplain storage. These activities or structures would result in low impacts for the reasons described in the section entitled Common Impacts to Floodplains.

The proposed bridge crossings along these alternative segments would require staging areas on either side of the crossings. The approximate size of each staging area is 1 acre; however, the Little Delta River and Delta Creek staging areas would be approximately 5.7 acres. The proposed staging areas would be adjacent to or just inside the 100-year floodplain. While the affected areas would large, the reduction in floodplain area would be relatively small. This impact would likely be low.

South Common Segment

The entire footprint of South Common Segment would be outside the 100-year floodplain. The activities or structures located along this segment would result in low impacts to floodplains.

Delta Alternative Segments

Portions of Delta Alternative Segments 1 and 2 would be within the 100-year floodplain. The proposed bridge crossings along these segments would require staging areas on either side of the crossings. The approximate size of the staging areas would be 1 acre; however, the Delta River staging areas would be approximately 5.7 acres. While the affected areas would large, the reduction in floodplain area would be relatively small. This impact would likely be low.

Changes in floodplain hydraulics and floodplain storage would likely occur due to the bridge crossings and raised roadbeds for the rail line and access roads. Long-term operations activities or structures would result in moderate impacts.

No-Action Alternative

Under the No-Action Alternative, there would be no impacts to floodplains from proposed rail line construction and operations.

5. BIOLOGICAL RESOURCES

This chapter describes the biological environment and potential impacts due to construction and operation of the proposed Northern Rail Extension (NRE). The analysis focuses on four primary biological resources: (1) vegetation, (2) fisheries, (3) game mammals, and (4) game and protected birds. Analyses were focused on these resources because of their importance in providing habitat (vegetation cover), human use (fisheries, game mammals and birds), and regulatory compliance (protected migratory birds). During consultations with Federal and State of Alaska resource agencies, no Federal or state protected threatened, endangered or candidate plants or animals were identified as occurring within the project area (see Appendix B). Section 5.7 addresses Bureau of Land Management (BLM)-designated special status species identified as occurring within the project area. The analysis of wetlands impacts is presented in Chapter 4, Water Resources. Subsistence uses of biological resources are discussed in Chapter 7, Subsistence.

Appendix F describes the regional and site-specific conditions for biological resources, assessment methods, and the results of quantitative impact analyses for the proposed alternative segments based on spatial analyses, field surveys, and literature reviews. Appendix G presents the results of the Essential Fish Habitat (EFH) Assessment as specified by the National Marine Fisheries Service (NMFS).

5.1 Applicable Regulations

Project construction activities that have a potential to affect vegetation, fisheries, game animals, migratory birds, endangered species or their habitats are regulated by various Federal and state agencies. Table 5-1 lists and describes specific regulations for the protection of biological resources that are applicable to and must be complied with during construction of the NRE.

These Federal and State of Alaska regulations and associated permits provide the framework for agencies to review design, construction, and operation of the NRE to ensure that significant impacts on biological communities and resources within the project area are avoided, reduced, or mitigated.

5.2 Project Area Overview

The proposed NRE lies within the Tanana-Kuskokwim Lowlands eco-region, bordered to the north by the Yukon-Tanana Uplands and to the south by the Alaska Range eco-regions (Figure 5-1). A broad outwash plain slopes down from the Alaska Range, with numerous rivers radiating from the mountains of the Alaska Range to the south and the Yukon-Tanana Uplands to the north, which drain into the Tanana River (Nowacki *et al.*, 2001). The Yukon-Tanana Uplands are characterized by rounded mountains and hills between the Yukon and Tanana rivers. Rivers cut deep, narrow, V-shaped valleys into these uplands with small lakes occurring in valleys where drainage has been blocked (Nowacki *et al.*, 2001).

Table 5-1
Applicable Federal and State Permitting Activities

Permit/Activity	Authority	Description
FEDERAL		
National Oceanic & Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS)		
Essential Fish Habitat Consultation	Magnuson-Stevens Fishery Management and Conservation Act (M-SFMCA) (16 U.S.C. § 1801-1883)	Provides for the management of fish and other species in designated Exclusive Economic Zones (EEZ).
Fish & Wildlife Coordination Act Consultation	Fish and Wildlife Coordination Act (FWCA) (16 U.S.C. § 661 *et seq.*)	Requires evaluation of the impacts to fish and wildlife and development of mitigation for proposed development projects, including involvement of NMFS and state fish and wildlife management agencies.
U S Fish and Wildlife Service (USFWS)		
Bald and Golden Eagle Protection Act Clearance	Bald and Golden Eagle Protection Act (16 U.S.C. § 668)	Provides for the protection of bald and golden eagles, their nests, or their eggs from harm or disturbance.
Migratory Bird Protection Act Consultation	Migratory Bird Treaty Act (16 U.S.C. § 703)	Provides for protection of birds that migrate between the United States and Canada, Mexico, Japan, or Russia.
Fish & Wildlife Coordination Act Consultation	Fish and Wildlife Coordination Act (FWCA) (16 U.S.C. § 661 *et seq.*)	Requires evaluation of the impacts to fish and wildlife and development of mitigation for proposed development projects, including involvement of the U.S. Fish and Wildlife Service (USFWS) and state fish and wildlife management agencies.
Endangered Species Act Consultation	Endangered Species Act (ESA) (16 U.S.C. § 1531)	Provides for the protection of wildlife, fish, and plants that have been identified as in danger of becoming extinct including habitats that have been identified as critical to their survival. No federally protected wildlife fish or plants or designated critical habitats occur within the project area.
Department of Defense(DoD), U.S. Army Alaska (USARAK)		
Sikes Act Improvement Act	Sikes Act Improvement Act of 1997 (16 U.S.C. § 670a *et seq.*)	Promotes the planning, development, maintenance, and coordination of fish and game conservation and rehabilitation on military reservations.
Natural Resources – Land, Forest, and Wildlife Management	Natural Resources – Land, Forest, and Wildlife Management (Army Regulation (AR) 200-3)	Establishes the policy and procedures for management of natural resources to ensure the support of military mission and to ensure conservation, restoration, and appropriate use of renewable resources.
Enforcement of Hunting, Trapping and Fishing on Army Lands in Alaska	Enforcement of Hunting, Trapping and Fishing on Army Lands in Alaska (AR 190-13)	Requires civilians and DoD personnel to comply with fish and game laws established by the Alaska Department of Fish and Game (ADF&G) (*i.e.*, hunting seasons, bag limits, weapons restrictions, closed areas).
Environmental Conservation Program	Department of Defense (DoD) Directive 4715.3	Implements policy, assigns responsibilities, and prescribes procedures for the integrated management of natural and cultural resources on property under DoD control.

Table 5-1
Applicable Federal and State Permitting Activities (continued)

Permit/Activity	Authority	Description
STATE		
Alaska Department of Natural Resources (ADNR)		
Alaska Forest Resources Practice Act	Division of Forestry, Alaska Resources and Practice Act, Alaska Statute (AS) 41.17	Manages the state's forests, providing technical advice to the divisions of lands on sound forest practices necessary to ensure the continuous growing and harvesting of commercial forest species on other state land. Regulates the operations on private forest land and provides public information and assistance regarding forest practices and timber management.
Prohibited and restricted noxious weeds	Division of Agriculture, 11 Alaska Administrative Code (AAC) 34.020	Provides for the regulation and identification of prohibited noxious weeds and establishes the maximum allowable tolerances for restricted noxious weeds.
Alaska Department of Fish & Game (ADF&G)		
Fish Habitat (Title 16) Application	Habitat Division, AS 16.05.841 or 16.05.871	Requires environmental review for any activity conducted within fish-bearing waters, such as bridges, culvert installation, fords and crossings (both winter and summer), material sites, tailings facilities, and water-withdrawal structures.
Fish Passage Evaluation	Habitat Division, AS 16.05.841	Requires notification and authorization for activities within or across streams used by fish if such uses or activities may cause an impediment to passage of fish as determined by ADF&G. Culvert installation; stream realignment or diversions; dams; low-water crossings; and construction, placement, deposition, or removal of any material or structure below ordinary high water all require fish passage evaluation.
Anadromous Fish Evaluation	Habitat Division, AS 16.05.871	Requires notification and approval "to construct a hydraulic project or use, divert, obstruct, pollute, or change the natural flow or bed" or "to use wheeled, tracked, or excavating equipment or log-dragging equipment in the bed" of an anadromous waterbody from fish habitat biologists. All activities within or across streams and all instream activities including construction; road crossings; gravel removal; placer mining; water withdrawals; the use of vehicles or equipment in the waterway; stream realignment or diversion; bank stabilization; blasting; and the placement, excavation, deposition, disposal, or removal of any material potentially affecting an anadromous waterbody apply.
Conservation and Protection of Alaska Fish & Game	AS 16.20	Provides for the protection and preservation of the state's natural habitat and game populations.
Fish & Game (Title 5)	5 AAC 1 – 5 AAC 99	Establishes the framework for the regulation of subsistence/personal use, recreational, and commercial fishing.
Fish Resources Permit Application	Division of Sport Fish and the Division of Commercial Fisheries (5 AAC 41)	Provides for the regulation of the transportation, possession, or release of live fish for scientific or educational purposes.

Table 5-1
Applicable Federal and State Permitting Activities (continued)

Permit/Activity	Authority	Description
Fish, Game, Aquatic Plant Resources	Title 16, AS 16.05.020 (2)	Provides for the regulation of hunting and trapping and for the management of game populations within the state.
Determining Endangered Species	AS 16.20.190	Establishes the framework and criteria for determining endangered fish and wildlife species or subspecies in Alaska.
Regulation and Management of Game and Fish Resources	Alaska Statutes: Title 16, Chapter 5	Provides for the regulation of hunting and management of game populations within the state. Provides for the regulation of fishing and management of fisheries within the state.

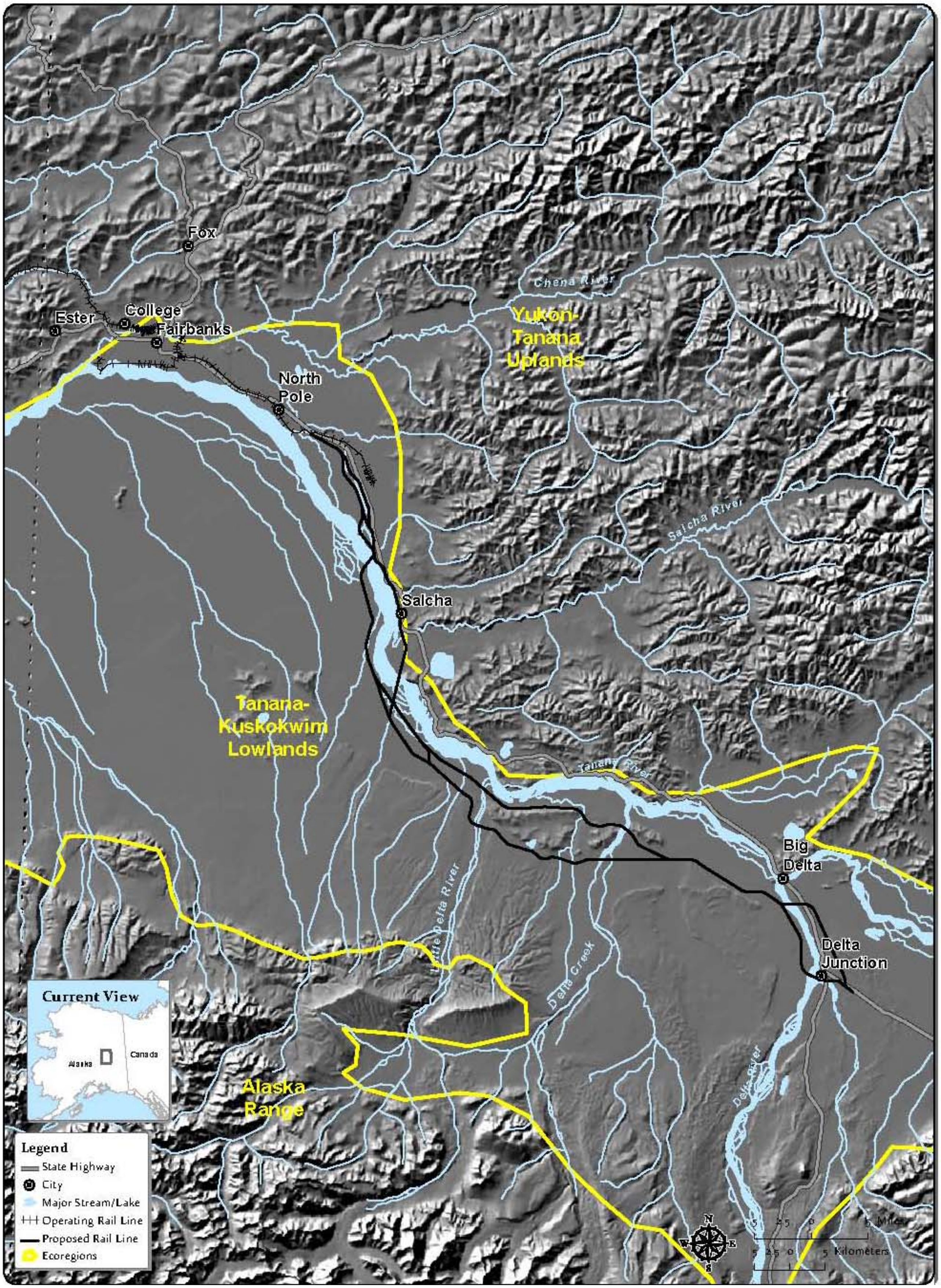

Figure 5-1 – Eco-Regions along the Proposed NRE (Nowacki et al., 2001)

This region provides prime habitat for animals using aquatic and riparian habitats such as mink, marten, muskrat, beaver, and river otter. Clear headwater streams are important spawning areas for Chinook (king), coho (silver), and chum salmon. Northern pike, whitefish, and burbot are common in the larger lakes and rivers, and arctic grayling are common in smaller streams (ADF&G, 2006). Groundwater-charged seeps and springs are common and support salmon and grayling eggs and developing embryos through the dark frozen winters.

Boreal forests dominate the landscape with black spruce in bogs, white spruce and balsam poplar along rivers; and tall willow, resin birch, and alder shrub communities scattered throughout (Nowacki *et al.*, 2001). The coldest, wettest areas of permafrost flats support birch-heath shrubs and sedge tussocks (Nowacki *et al.*, 2001). Black spruce favors the north-facing slopes underlain with permafrost; and black spruce also occurs with sedge tussocks. White spruce, birch, and aspen dominate south-facing slopes. Summer lightning storms are frequent in the foothills and mountains, so forest fires are common (ADF&G, 2006). This mosaic of boreal forest, riparian and aquatic habitats is home to moose, black bears, beavers, porcupines, red squirrels, grouse, ptarmigan, and ravens. Moose and caribou are the primary game mammals and their predators include wolves, black bears, and brown bears. Wolverine, marten, mink, short-tailed weasel, and lynx prey upon hares, red squirrels, and rodents throughout the forests. Open, mixed broadleaf-needleleaf forests support a large variety of resident birds, including black-capped and boreal chickadees, common redpolls, gray jays, common ravens, black-backed and three-toed woodpeckers, northern flickers, northern hawk owls, boreal owls and great horned owls, ptarmigan, and grouse.

Many migrant waterbirds and landbirds pass though this area on their way to and from nesting habitats to the north. Some waterbirds remain to nest; mallards, American wigeon, bufflehead, northern pintail, northern shoveler, scaup, and trumpeter swans breed on or near the lakes and wetlands (Platte, 2003). Mew gulls nest on river bars. Floodplain forests of large cottonwoods and white spruce combine with salmon runs to create bald eagle nesting habitat along the Tanana River (Ritchie and Prichard, 2007). Cliffs next to the river provide nesting habitats for peregrine falcons (Ritchie and Prichard, 2007). Common migratory landbirds nesting in the floodplain and boreal forests include savannah sparrow, dark-eyed junco, Wilson's warbler, Swainson's thrush, yellow-rumped warbler, white-crowned sparrow and orange-crowned warbler (Anderson *et al.*, 2000; Benson, 1999).

5.3 Vegetation Resources

This section describes the existing vegetation conditions in the project area and potential impacts resulting from the proposed NRE (Figure 5-2).

5.3.1 Affected Environment

Existing conditions for vegetation were based on Gallant *et al.* (1995); TAPSO, (2001); Magoun and Dean, (2000); Viereck *et al.*, (1992); and ANHP *et al.*, (2006). Quantification of vegetation and habitat types within the area were based on the Tanana Flats Land Cover Classification (BLM *et al.*, 2002) for an area within 5 miles of all proposed alternative segments. Table 5-2 indicates the relative abundance as a proportion of cover within the project area for vegetation

Table 5-2
Vegetation Cover Classes Within 5 Miles of the Proposed NRE[a]

Project Area Cover (%)[b]	Class Name	Project Area Cover (%)	Class Name
12	Closed Needleleaf Forest	<1	Aquatic Bed
28	Open Needleleaf Forest	2	Clear Water
8	Closed Broadleaf Forest	5	Turbid Water
5	Open Broadleaf Forest	<1	Ice
14	Closed Mixed Broadleaf/Needleleaf Forest	<1	Sparse Vegetation
3	Tall Shrub	1	Gravel/Rock
10	Low Shrub	3	Mud/Silt/Sand
<1	Dwarf Shrub	1	Urban
2	Graminoid[c]	3	Agriculture
<1	Bryoid/Lichen	3	Other

[a] Source: BLM *et al.*, 2002.
[b] < means less than.
[c] Grasses and grasslike plants.

cover classes. Figure 5-2 indicates the vegetation surrounding the area. Additional information on vegetation resources can be found in Appendix F.

Vegetation cover in the project area is primarily controlled by flooding and fire, although forestry, military activity, agriculture, gravel mining, urban development, insect infestations, moose browsing, and the spread of invasive and noxious plants have also affected vegetation within the project area. Development of vegetation communities is influenced by slope, aspect, elevation, parent material (the primary material from which soil is formed), and succession subsequent to flooding and fire. Frequent flooding across the active floodplains of the Tanana River, Little Delta River, Delta River, Delta Creek, and Jarvis Creek results in active erosion and the formation of new alluvial bars. Fires are common within the project area, ranging in size from less than 2 acres to 800,000 acres, and averaging about 5,600 acres. Fires occur naturally in Alaskan boreal forests at estimated periodicities of 50 to 200 years (VanCleve *et al.*, 1991). Fire season generally lasts from June through the beginning of August (Gallant *et al.*, 1995). See Appendix F for additional information about the fire history in the project area.

Riparian areas scoured by floodwater generally follow a sequence from bare alluvium, alluvium with scattered willows and herbs, open willow shrub, closed alder and willow shrub, open balsam poplar forest with a dense alder understory, closed balsam poplar forest with alder understory, mixed balsam poplar-white spruce forest, to closed white spruce forest (Viereck *et al.*, 1993). Development from the closed alder willow shrub to mature balsam poplar forest occurs over a period of 75 to 90 years, and the transition from mixed balsam poplar-white spruce forest to white spruce dominant forests occurs gradually over the span of nearly 100 years (Magoun and Dean, 2000).

Recently burned areas typically revegetate with herbaceous communities often dominated by fireweed, followed by graminoid communities dominated with bluejoint reedgrass and willow scrub. Broadleaf forests follow willow communities in uplands on south-facing slopes or on well-drained river terraces; while paper birch forests develop on east, west and some north-facing slopes and in flat areas. Mixed forests develop as spruce becomes established within the broadleaf forests; followed by spruce forests in some locations.

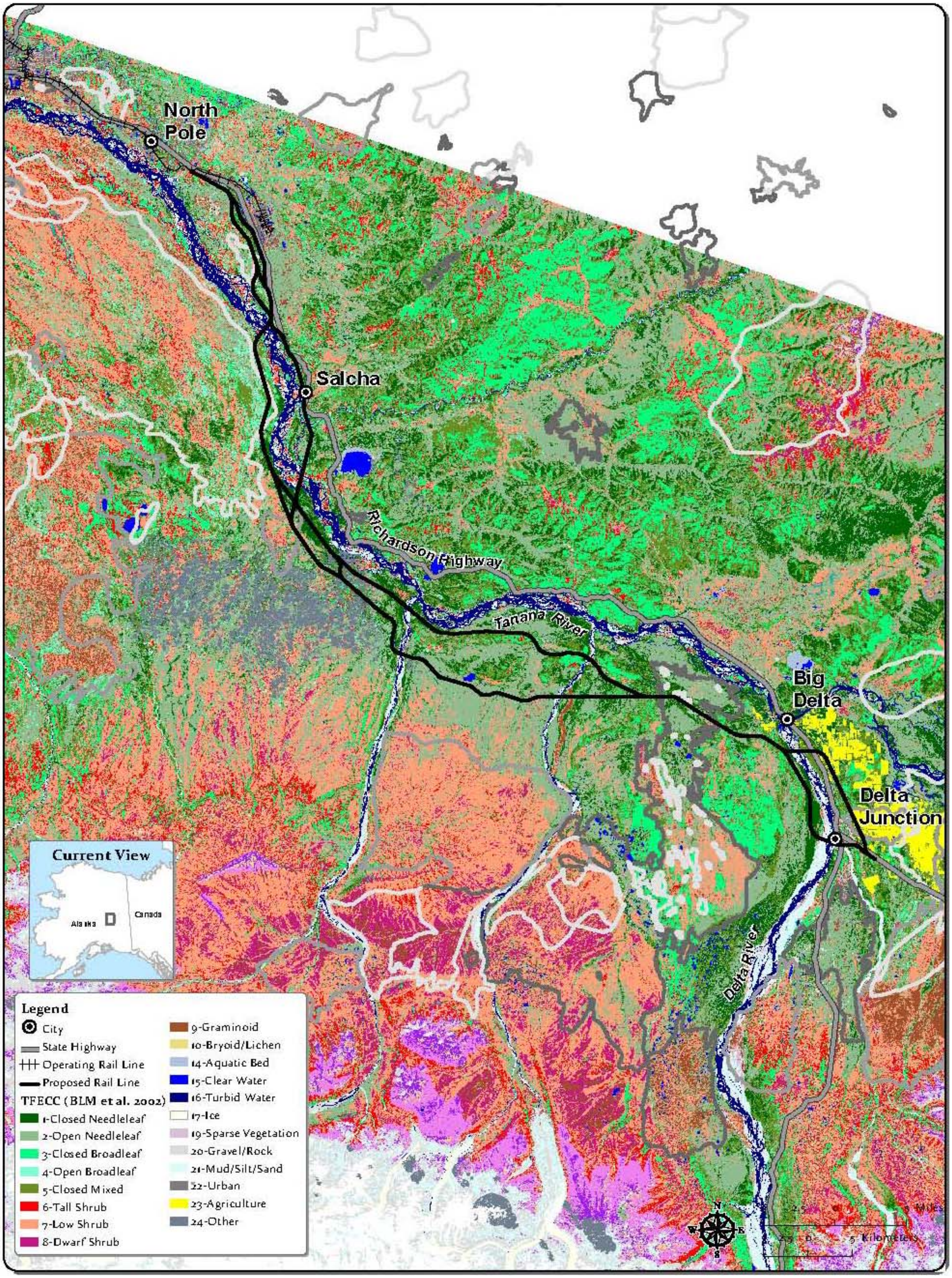

Figure 5-2 – Vegetation along the Proposed NRE

Forest communities cover two-thirds of the area. Needleleaf forests are dominated by white spruce, black spruce, or a combination of the two. Closed stands of white spruce occupy young river terraces where soil drainage is good, while closed stands of black spruce occur on poorly drained floodplain soils. Mixed closed stands with both white spruce and black spruce may have tall shrub understories of alder and willow. Colder, wetter soils support black spruce woodlands, where the tall shrub understory is a much more important component of the ecosystem than in the closed forest stands. Black spruce woodlands are part of the open needleleaf forest vegetation class, but are described as needleleaf scrub in wetland classifications (see Chapter 4). Broadleaf forests consist of open or closed stands of balsam poplar, paper birch or quaking aspen. Mixed forests consist of paper birch or quaking aspen with black spruce and/or white spruce, or where white spruce co-dominates with balsam poplar.

Tall shrub communities found on floodplains in the project area are typically dominated by willow or alder. Low shrub is characterized by open, low mixed shrubs and tussock-forming sedges. Resin birch, Labrador-tea, bog blueberry, low-bush cranberry, and sedge tussocks are common. Wetland communities, discussed in more detail in Chapter 4, are associated with the wettest locations, such as low and dwarf shrub bogs, graminoid meadows, and aquatic bed communities. Graminoid meadows are typically dominated by sedges or bluejoint reedgrass. Aquatic bed communities include herbaceous marshes with an open cover of emergent wetland plants. Horsetail typically dominates in aquatic bed communities, although buckbean and marsh fivefinger can be common; grasses and sedges may also be present as well as aquatic mosses.

Invasive and Noxious Plants

Alaska has remained relatively free from large-scale habitat changes resulting from non-native invasive plant species, primarily because Alaska has a small human population and relatively few areas of anthropogenic disturbance. Forty-four species of non-native plants occur within the project area (ANHP *et al.*, 2006). The most common non-native plants in the project area include common dandelion (*Taraxacum officinale*), foxtail barley (*Hordeum jubatum*), and annual hawksbeard (*Crepis tectorum*). These plants are considered to be highly invasive weeds. The Richardson Highway, from Delta Junction to Fairbanks, has some of the highest weed diversity of any transportation alignment in Interior Alaska (Lapina *et al.*, 2007). Seven to 19 different non-native plants were found at each of ten sites along this section of the Richardson Highway (Lapina *et al.*, 2007). Three weeds classified as prohibited noxious weeds and five weeds classified as restricted noxious weeds under Title 3 of the Alaska State Statute (11AAC 34.020) occur within the project area (Table 5-3, Figure 5-3; ANHP *et al.*, 2006).

Table 5-3
Occurrence of Prohibited and Restricted Noxious Weeds Within the Project Area[a]

Common Name	Species	Occurrence
Prohibited Noxious Weeds		
Field Bindweed	*Convolvulus arvensis*	2 sites
Hempnettle	*Galeopsis tetrahit*	8 sites
Perennial Sowthistle	*Sonchus arvensis*	29 sites
Restricted Noxious Weeds		
Yellow Toadflax	*Linaria vulgaris*	8 sites
Plantain	*Plantago* sp	34 sites
Annual Bluegrass	*Poa annua*	5 sites
Wild Buckwheat	*Polygonum convovulus*	4 sites
Tufted Vetch	*Vicia cracca*	32 sites

[a] Source: ANHP *et al.*, 2006.

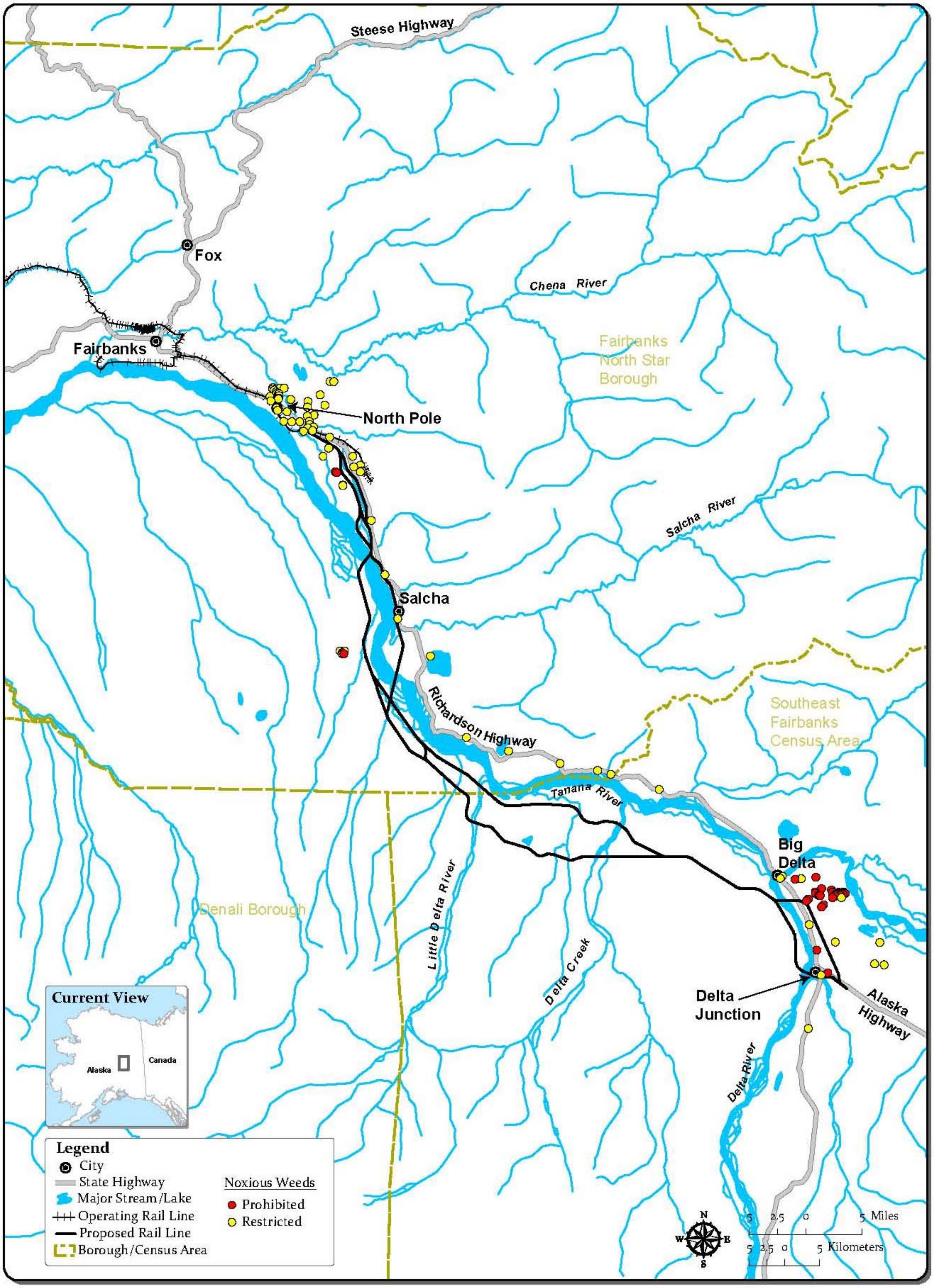

Figure 5-3 – Distribution of Prohibited and Restricted Noxious Weeds along the Proposed NRE (ANHP *et al.*, 2006)

5.3.2 Environmental Consequences

This section discusses the potential impacts on vegetation resulting from the proposed NRE. Chapter 20 identifies proposed mitigation for impacts to biology.

The effects of construction and operation of the proposed NRE on vegetation would be influenced by the vegetation type, soil conditions, and extent of topographic modification required for construction. The primary impacts from construction and operation of the project would be similar across vegetation types – vegetation would be removed and soil structures would be altered. No Federal or state protected threatened, endangered or candidate plants occur within the project area. Twenty-seven rare plants have been reported to occur within the Donnelly and Tanana Flats training areas near the NRE (Lipkin, 2007; Racine *et al.*, 2001; Tande *et al.*, 1996), and one rare willow, *Salix setchelliana*, was identified during field investigations for wetlands along Delta Alternative Segment 2 (HDR, 2007a).

Methodology

Analysis of effects to vegetation from the construction and operation of the proposed NRE was based on GIS analysis of the BLM *et al.* (2002) Tanana Flats Earth Cover Map. Analysis included a summary of vegetation cover within the 200-foot right-of-way (ROW) and ancillary facilities outside of the 200-foot ROW.

Construction Impacts

Impacts on vegetation would occur through direct clearing for construction of the rail line, access roads, and other support facilities. The following describes construction-related impacts that would be common to all the alternative segments.

- **Vegetation Clearing and Fill Placement**. Direct clearing of vegetation would result in plant death, adversely affecting plant community composition and structure. Some vegetation regrowth would be expected in the short term, although plant communities would be temporarily or permanently altered. Direct placement of fill to support the rail line and access roads would result in permanent vegetation loss. Vegetation loss would be short term in the areas at the edges of road and rail embankments which could be allowed to revegetate by natural succession. However, this natural process could be hindered by mechanical vegetation management in some locations. Some areas would be restored after construction. Forested areas stripped of vegetation would require from 70 to 200 years for regeneration and would be considered a long-term habitat loss, even with restoration. Restoration of graminoid or shrub habitats may occur within 5 to 20 years, and would be considered a short-term habitat loss. Forest communities would be replaced, in part, by either native early successional-stage vegetation or invasive plants.

- **Soil Compaction and Erosion**. Heavy equipment transiting areas within and outside the project footprint would affect plant communities by causing soil compaction. Compaction of soils inhibits germination of some seeds in the upper soil surface, inhibits infiltration of precipitation, inhibits root penetration, and could favor the development of bare soil areas or establishment of invasive plants. Removal of vegetation cover exacerbates erosion, and construction of the rail line would increase erosion rates throughout the project area. Soil erosion and sedimentation would occur in areas where a moderate amount of excavation or fill placement has been completed.

- **Spread of Invasive Plants.** Construction of the rail line, access roads, and other support facilities would likely increase the spread of invasive plants by allowing entry through the following pathways (1) construction equipment used on the site could carry seeds or propagative plant parts from other construction projects or infested portions of this construction project, (2) removal of overburden and cut materials to offsite locations could spread invasive species, and placement of fill from borrow sites may introduce invasive plants and (3) seed mixtures used in revegetation of slopes and exposed soils may contain invasive plant seeds. Native vegetation next to the rail line, access roads, and other areas cleared for the project would likely experience competition from invasive plants. The highest concentrations of invasive species within the project area are found in the more highly disturbed areas of North Pole and Delta Junction. Construction of alternative segments near these areas would have an increased potential to spread invasive plants.

- **Dust Deposition**. Wind-blown dust from gravel roads and railbeds could damage or eliminate plants by direct cover with mineral fines, which inhibit photosynthesis and respiration. More tolerant invasive species often replace native species in areas exposed to dust. The magnitude and duration of dust exposure would determine the intensity of the impact and vegetation response (Everett, 1980). Dust would have minimal to moderate impacts within approximately 1,000 feet (300 meters) from the ROW (Everett, 1980).

- **Fragmentation**. Fragmentation of vegetation communities from construction of the rail line would alter plant communities along the alignment edges and facilitate the spread and establishment of invasive non-native plants (Hansen and Clevenger, 2005). Permanent rail facilities would replace vegetation coverage resulting in the linear separation of the landscapes (Meffe *et al.*, 1997). Linear construction projects, such as a road or rail line, divide vegetation communities, converting interior communities into edge communities (Watson, 2005).

- **Wildland Fires**. Clearing of the ROW would fragment fuels, potentially creating a fire break such that a fire starting on one side of the ROW might be unable to cross the cleared alignment to the opposite side of the ROW. This would potentially change the natural cycle of fire, leading to decreased biodiversity from ecological succession. The separated vegetation communities could then experience different rates of ecological succession. A fuel break along the Tanana River Valley could also be beneficial in the protection of late-succession riparian forests and private property.

Operations Impacts

The following describes operations-related impacts that would be common to all the alternative segments.

- **Maintenance Clearing**. Continued vegetation and soil disturbance would include ongoing mechanical clearing and trimming of vegetation within the ROW to ensure the safety of the rail line (Appendix F). Other methods of vegetation maintenance may include thermal removal, steam or hot water removal, fire removal, smothering vegetation with impenetrable plastic layers along the base of the embankment; or manual removal with axes, machetes and chain saws (Torstensson, 2001). These activities would disturb successional vegetation cover, providing an opportunity for the introduction of invasive species. Any vegetation removal by burning could increase the risk of fire spreading beyond the vegetation management target area and could result in the unintentional destruction of forest resources (ARRC, 1984). The alteration of vegetation cover from ROW clearing and maintenance would be considered minor, but permanent.

- **Chemical Spills**. Vegetation remaining in the ROW after construction could be affected in the unlikely event of a release of hazardous materials from a train derailment or collision. The level of impact would depend on the type and quantity of spill. However, the likelihood of a release is low as ARRC anticipates few shipments of hazardous materials, and railcars used for transportation of hazardous materials are designed to withstand various types of impacts. The extent of degradation of vegetation would depend on factors such as the specific pollutant discharged, runoff type, and vegetation community affected. Chemical spills along the rail line are expected to be infrequent and, therefore, have minimal impact. A discussion of hazardous materials transportation safety is provided in Chapter 11 of the EIS.

- **Runoff and Sedimentation**. Precipitation runoff from road and rail embankments and across dust deposits during operation of the proposed NRE could result in changes in soil chemistry depending on the site-specific pH of the soil resulting in reduced nutrient levels, altered organic horizon depth, higher soil bulk density, and lower soil moisture. These changes could cause reduced vegetation biomass and diversity especially in areas with acidic soils, such as the needleleaf forest habitats (Auerbach *et al.*, 1997). Sedimentation of barren river bars and riverine willow communities could occur in slackwater areas behind erosion control structures constructed in floodplains. In most cases this sedimentation would lead to a decrease in plant species richness (Klinger *et al.*, 1983; Walker *et al.*, 1987).

- **Wildland Fire and Fire Management**. Sparks from rail operation could increase the potential for fires (DeWilde and Chapin, 2006). Wide-scale changes in fire management for the area surrounding the rail line would be unlikely. Fire management and fire history for the project area and alternatives are presented in Appendix F.

Impacts by Alternative Segment

Permanent vegetation removal would occur through direct clearing for the rail line and other support facilities. The level of impact is based on the size of the area to be cleared during construction and operation of the rail line. The following describes the vegetation types and areas of vegetation that would be removed within the 200-foot ROW and for support facilities associated with each alternative segment. The construction and operations impacts for alternative segments are presented and discussed when differences occur between alternative segments or when impacts are notable.

Common Support Facilities

Vegetation would be cleared for 33 borrow areas (17 acres each), two additional construction staging areas, one materials staging area, and three new communication towers. These common facilities are not dependent on the alternative segments selected. The exact locations for the borrow areas have not been determined. Borrow areas would occur at approximately two- to three-mile intervals along the ROW probably within non-aquatic habitats. Vegetation impacts are estimated based on the distribution of vegetation classes within the project area. Borrow areas would be converted to ponds. An estimated 534 acres of vegetation cover would be removed for construction of the borrow areas – 438 acres of forests, 84 acres of shrubs, 11 acres of graminoid vegetation, and 1 acre of bryoid/lichen (Table 5-4).

Table 5-4
Estimated Vegetation Clearing for Common Support Facilities[a]

Class Name	Borrow Pit Areas[b] (acres)	Extra Construction Staging Areas and Rock Staging[c] (acres)	Total[d] (acres)
Closed Needleleaf Forest	76.1	4.9	80.9
Open Needleleaf Forest	185.5	7.4	192.9
Closed Broadleaf Forest	54.2	21.5	75.8
Open Broadleaf Forest	30.1	5.0	35.1
Closed Mixed Needleaf/ Broadleaf Forest	92.2	34.6	126.8
Tall Shrub	15.9	62.2	78.1
Low Shrub	66.4	50.9	117.3
Dwarf Shrub	1.7	0.4	2.0
Graminoid	10.9	0.9	11.9
Bryoid/Lichen	0.9		0.9
Sparse Vegetation	2.5	0.0	2.5
Gravel/Rock	3.4		3.4
Mud/Silt/Sand	20.2	2.9	23.1
Urban	-	1.4	1.4
Total Area[d]	**560.0**	**192.1**	**752.0**

[a] Source: BLM *et al.*, 2002.
[b] Approximately 33 borrow areas at 17 acres per borrow area.
[c] Two construction staging areas (140 and 40 acres) and a rock staging area (12.1 acres).
[d] Column and row totals may not sum exactly due to rounding.

The two additional staging areas cleared for construction could be restored after construction has been completed. About 188 acres of vegetation would be removed for the construction staging areas – 73 acres of forests, 114 acres of shrubs, and 1 acre of graminoid vegetation. The final vegetation after restoration would depend on the type of vegetation cleared, soil conditions, and surrounding vegetation. Most restoration efforts would be initiated with establishment of an initial graminoid and herbaceous ground cover to prevent excess erosion and spread of invasive weeds. Shrubs would require 5 to 20 years to return to their original community composition and height (ADF&G, 2001a). Early succession forests would require up to 70 years to reach their original coverage and late succession forest would require up to 200 years to become established (ADF&G, 2001a).

Additional construction staging areas, access roads, Richardson Highway relocations, the Salcha School relocation, and passenger terminals are specific to the alternative segment selected for construction. These facilities would be constructed outside of the 200-foot ROW. The impacts to vegetation from these alternative segment-associated facilities are evaluated in conjunction with the ROW impacts for the alternative segments.

North Common Segment

Construction of the North Common Segment would clear about 62 acres of vegetation, including 36 acres of forests, 18 acres of shrubs, 7 acres of graminoid vegetation, and 1 acre of bryoid/lichen (Table 5-5). Most of the segment appears to be undisturbed forest and shrub communities (Figure 5-4). The highest concentrations of invasive species within the project area are found in the more highly disturbed areas of North Pole, and Delta Junction, but invasive plants are common along the Richardson Highway. Construction and operation of the North Common Segment would have a high potential to spread invasive plants.

Table 5-5
Vegetation Cover Within the 200-foot ROW for the North Common Segment[a]

Vegetation Class	Area (acres)	ROW Area (%)
Closed Needleleaf Forest	1.0	1
Open Needleleaf Forest	7.2	11
Closed Broadleaf Forest	7.5	12
Open Broadleaf Forest	6.1	10
Closed Mixed Needleleaf/ Broadleaf Forest	14.3	22
Tall Shrub	6.0	9
Low Shrub	11.8	18
Dwarf Shrub	0.4	1
Graminoid	6.7	10
Bryoid/Lichen	0.8	1
Urban	2.2	3
Total Area	**64.0**	

[a] Source: BLM *et al.*, 2002.

Eielson Alternative Segments

Construction of the Eielson alternative segments would clear about 246 acres of vegetation for Eielson Alternative Segment 1, 241 acres for Eielson Alternative Segment 2, and 238 acres for Eielson Alternative Segment 3 (Figure 5-4 and Table 5-6). The Eielson alternative segments cross predominantly open needleleaf and closed mixed forests. Construction of Eielson Alternative Segment 1 would clear 235 acres of forests, 10 acres of shrubs, and 1 acre of graminoid vegetation. Construction of Eielson Alternative Segment 2 would clear 221 acres of forests, 10 acres of shrubs, and 10 acres of graminoid vegetation. Construction of Eielson Alternative Segment 3 would clear 210 acres of forests, 17 acres of shrubs, and 11 acres of graminoid vegetation. The high proportions of closed-canopy forests crossed by the Eielson alternative segments indicate that this area has been undisturbed by extensive flooding or fire. The most extensive area of closed forest vegetation would be cleared for Eielson Alternative Segment 1 (133 acres), followed by Eielson Alternative Segment 3 (109 acres) and Eielson Alternative Segment 2 (98 acres).

All three Eielson alternative segments are located near sources of invasive plants, which could result in the spread of invasive plant species within the ROW. The three alternative segments

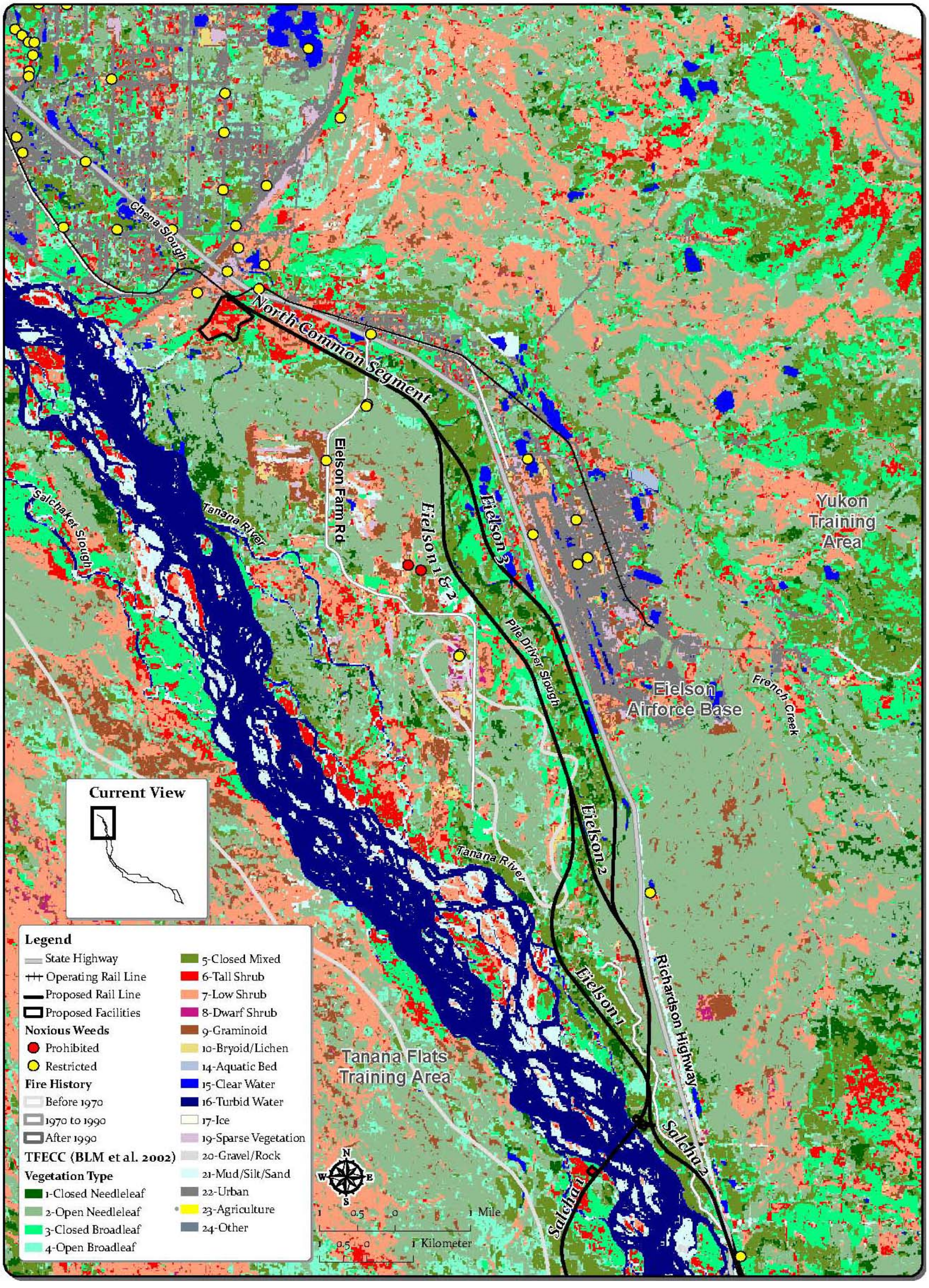

Figure 5-4 – Vegetation along the North Common and Eielson Alternative Segments

Table 5-6
Vegetation Cover Within the 200-foot ROW for Eielson Alternative Segments[a]

Vegetation Class	Eielson 1 Area (acres)	Eielson 1 ROW Area (%)	Eielson 2 Area (acres)	Eielson 2 ROW Area (%)	Eielson 3 Area (acres)	Eielson 3 ROW Area (%)
Closed Needleleaf Forest	20.6	8	13.7	6	11.8	5
Open Needleleaf Forest	72.0	29	104.9	43	91.4	38
Closed Broadleaf Forest	38.6	16	30.5	13	43.5	18
Open Broadleaf Forest	30.2	12	18.1	7	10.2	4
Closed Mixed Needleleaf/Broadleaf Forest	73.6	30	54.0	22	53.5	22
Tall Shrub	2.2	1	1.7	1	11.5	5
Low Shrub	8.2	3	8.3	3	5.5	2
Graminoid	1.0	0	9.7	4	11.0	5
Clear Water	-	0	0.1	0	2.8	1
Sparse Vegetation	-	0	-	0	0.5	0
Mud/Silt/Sand	0.8	0	0.2	0	0.2	0
Urban	-	0	-	0	1.3	1
Total Area	**247.2**		**241.2**		**243.2**	

[a] Source: BLM *et al.*, 2002.

parallel the Richardson Highway, and Eielson Alternative Segment 3 may contain previously disturbed vegetation communities within the urban area crossed by the segment. Alternative segments near previously disturbed areas with sources of invasive plants have a higher potential for spreading invasive plants.

Salcha Alternatives

Construction of the Salcha alternative segments would result in the clearing of about 435 acres of vegetation for Salcha Alternative Segment 1 and 537 for Salcha Alternative Segment 2 (Tables 5-7 and 5-8). The Salcha alternative segments cross predominately forest and riparian habitats (Figure 5-5). Construction of Salcha Alternative Segment 1 would clear 381 acres of forests, 53 acres of shrubs, and 1 acre of graminoid vegetation. Construction of Salcha Alternative Segment 2 would clear 471 acres of forests, 61 acres of shrubs, and 3 acres of graminoid vegetation.

Salcha Alternative Segment 1 crosses the Tanana River and continues along the west side of the Tanana River in a largely undisturbed landscape where few invasive plants would be expected and the potential to spread invasive plants would be low. The Salcha Alternative Segment 2 parallels portions of the Richardson Highway ROW, where existing sources of invasive plants would likely be spread throughout the rail ROW during construction. Salcha Alternative Segment 1 crosses 258 acres of closed forest and Salcha Alternative Segment 2 crosses 343 acres. Construction of Salcha Alternative Segment 1 and the eastern end of Salcha Alternative Segment 2 would fragment stands of closed needleleaf and closed mixed forests along the southern bank of the Tanana River.

Fire management differs between the Salcha alternative segments. Salcha Alternative Segment 2 approaches the Town of Salcha and runs along the Richardson Highway where fire protection is either critical or full; Salcha Alternative Segment 1 crosses primarily undeveloped lands where fire management is limited (See Appendix F for definitions of fire protection levels). About 4

Table 5-7
Vegetation Cover Within the 200-foot ROW for the Salcha Alternative Segments[a]

	Salcha 1		Salcha 2	
Vegetation Class	**Area (acres)**	**ROW Area (%)**	**Area (acres)**	**ROW Area (%)**
Closed Needleleaf Forest	40.7	14	67.7	25
Open Needleleaf Forest	23.6	8	48.1	14
Closed Broadleaf Forest	27.9	10	44.7	13
Open Broadleaf Forest	64.6	23	17.7	5
Closed Mixed Needleleaf/ Broadleaf Forest	94.4	33	84.4	25
Tall Shrub	8.1	3	11.9	4
Low Shrub	4.7	2	8.7	3
Graminoid	1.0	0	1.6	0
Bryoid/Lichen	-	-	0.4	0
Clear Water	0.8	0	5.7	2
Turbid Water	14.3	5	17.2	5
Ice	-	-	0.2	0
Sparse Vegetation	-	-	1.3	0
Gravel/Rock	-	-	0.3	0
Mud/Silt/Sand	3.9	1	23.1	7
Total Area	**284.0**		**333.0**	

[a] Source: BLM *et al.*, 2002.

Table 5-8
Vegetation Cover Within Access Roads, Bridge Staging Areas, Revetments, Levees, Richardson Highway Relocations and the Salcha School Relocation for Salcha Alternative Segments[a]

	Salcha 1		Salcha 2	
Vegetation Class	**Area (acres)**	**ROW Area (%)**	**Area (acres)**	**ROW Area (%)**
Closed Needleleaf Forest	9.3	4	99.2	32
Open Needleleaf Forest	17.6	7	52.5	17
Closed Broadleaf Forest	24.9	10	20.0	7
Open Broadleaf Forest	18.1	7	10.5	3
Closed Mixed Needleleaf/ Broadleaf Forest	60.3	24	26.5	9
Tall Shrub	36.8	15	22.7	7
Low Shrub	2.6	1	17.4	6
Dwarf Shrub	-	-	0.3	0
Graminoid	0.2	0	1.3	0
Bryoid/Lichen	-	-	1.1	0
Clear Water	12.9	5	10.5	3
Turbid Water	57.0	23	25.1	8
Sparse Vegetation	-	-	0.1	0
Gravel/Rock	0.4	0	2.2	1
Mud/Silt/Sand	8.4	3	17.6	6
Total Area	**248.5**		**307.0**	

[a] Source: BLM *et al.*, 2002.

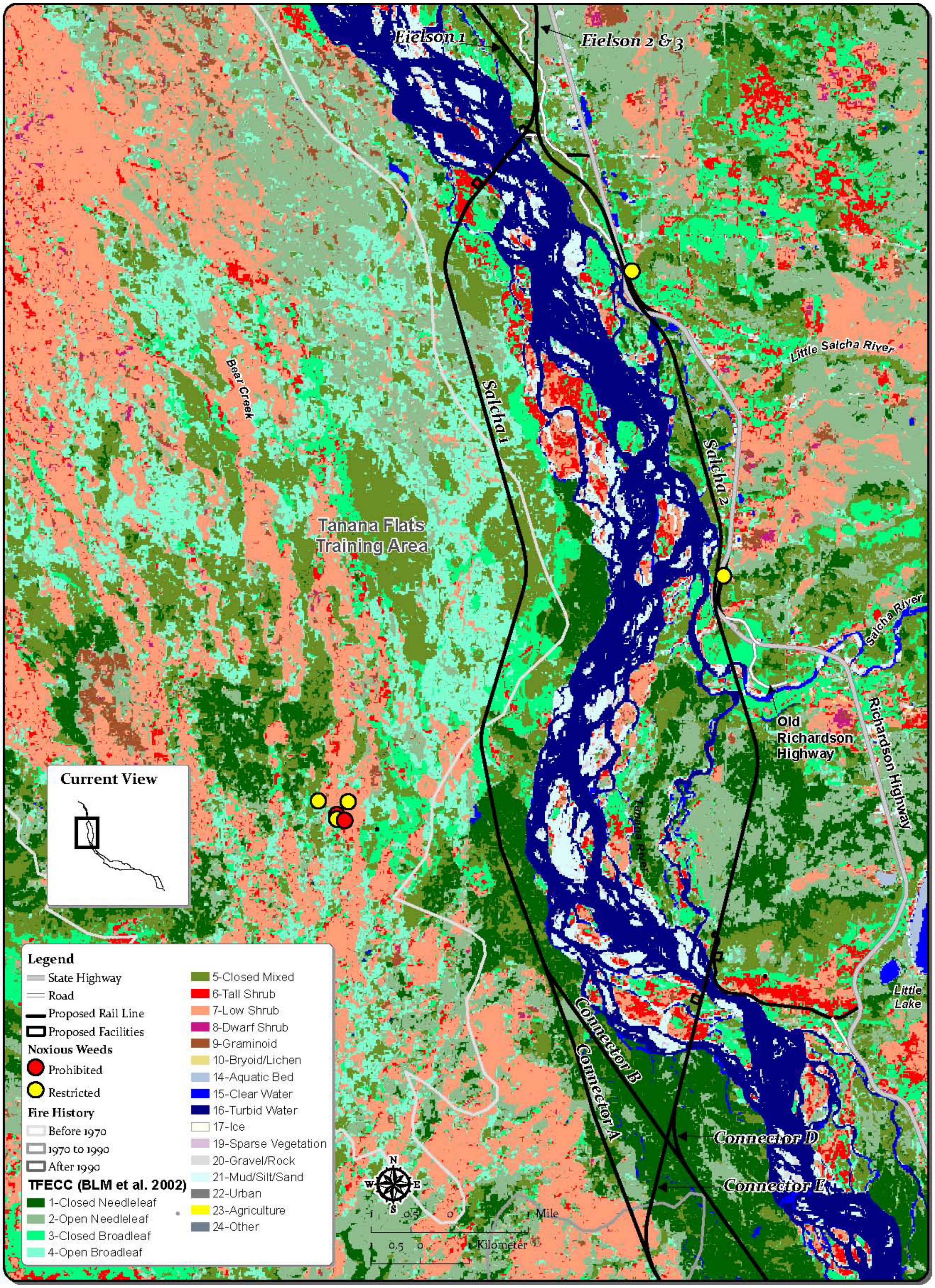

Figure 5-5 – Vegetation along the Salcha Alternative Segments

miles of Salcha Alternative Segment 1 was burned during 1957, while none of the Salcha Alternative Segment 2 has been burned since the 1950s.

Central Alternative Segments and Connectors

Construction of the Central alternative segments and connectors would result in the clearing of primarily forest and low shrub vegetation (Table 5-9 and Table 5-10). Much of Central Alternative Segment 1, Connector A, and Connector F cross open needleleaf forests, which appear to consist primarily of black spruce; while much of Central Alternative Segment 2, Connector B, Connector C, and Connector D cross closed needleleaf and mixed forests, which appear to consist primarily of white spruce and balsam poplar forests (Figure 5-6).

The Central alternative segments and Connectors extend along the west side of the Tanana River, where little disturbed vegetation exists and few invasive plants would be expected. The southern ends of Central Alternative Segment 1 and Central Alternative Segment 2 and all of Connector F fall within an area designated for full fire protection. The northern ends of Central Alternative Segment 1, Central Alternative Segment 2 and all of Connectors A, B, C, and D fall within an area designated for limited fire protection. Fire burned across about a mile of Central Alternative Segment 1, Connector A, and Connector C during 1981.

Table 5-9
Vegetation Cover Within 200-foot NRE ROW for Central Alternative Segments[a]

Vegetation Class	Central 1		Central 2	
	Area (acres)	ROW Area (%)	Area (acres)	ROW Area (%)
Closed Needleleaf Forest	16.5	13	64.7	74
Open Needleleaf Forest	40.0	33	7.8	9
Closed Broadleaf Forest	1.8	1	-	-
Open Broadleaf Forest	9.2	7	-	-
Closed Mixed Needleleaf/ Broadleaf Forest	21.1	17	11.8	14
Tall Shrub	0.4	0	-	-
Low Shrub	17.0	14	-	-
Graminoid	0.2	0	-	-
Clear Water	-	-	-	-
Mud/Silt/Sand	0.2	0	2.0	2
Other	16.5	13	0.6	1
Total Area	**122.9**		**86.9**	

[a] Source: BLM *et al.*, 2002.

Table 5-10
Vegetation Cover Within 200-foot NRE ROW for Central Connectors[a]

Vegetation Class	Connector A		Connector B		Connector C		Connector D		Connector E	
	Area (acres)	ROW Area (%)	Area (acres)	ROW Area (%)	Area (acres)	ROW Area (%)	Area (acres)	ROW Area (%)	Area (acres)	ROW Area (%)
Closed Needleleaf Forest	29.4	28	56.6	71	30.6	55	19.4	92	8.2	14
Open Needleleaf Forest	30.7	29	12.2	15	8.6	15	0.4	2	8.0	14
Closed Broadleaf Forest	0.4	0	-	-	0.1	0	-	-	1.3	2
Open Broadleaf Forest	3.6	3	0.2	0	2.0	4	-	-	0.1	0
Closed Mixed Forest	26.2	25	9.6	12	3.6	6	1.4	7	6.8	12
Tall Shrub	0.8	1	-	-	0.4	1	-	-	0.2	0
Low Shrub	14.2	13	-	-	10.1	18	-	-	-	-
Graminoid	0.5	0	-	-	0.2	0	-	-	-	-
Clear Water	-	-	0.8	1	0.4	1	-	-	-	-
Mud/Silt/Sand	-	-	-	-	-	-	-	-	0.3	0
Other	-	-	-	-	-	-	-	-	33.6	58
Total Area	**105.8**		**79.4**		**56.0**		**21.2**		**58.5**	

[a] Source: BLM *et al.*, 2002.

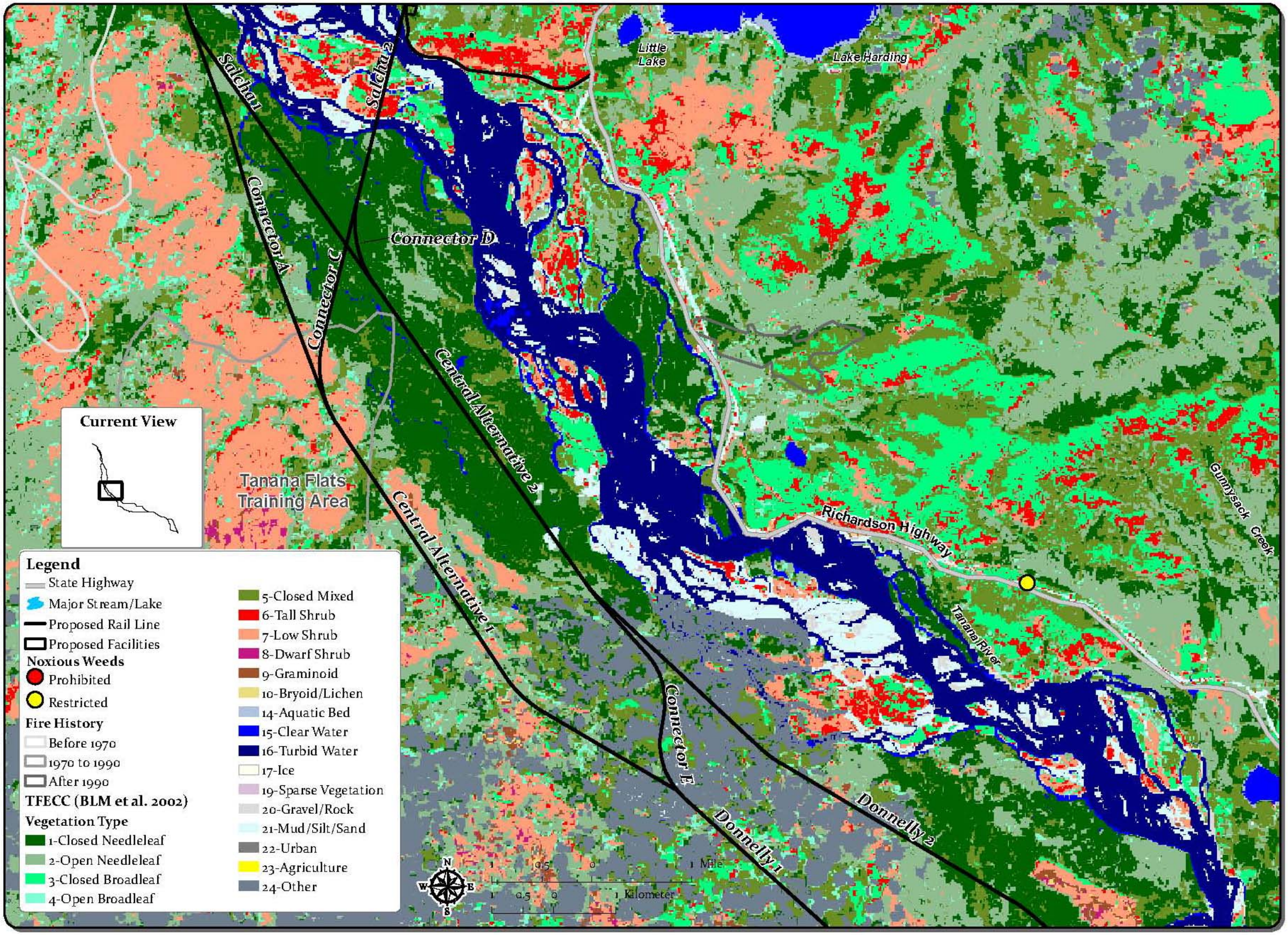

Figure 5-6 – Vegetation along the Central Alternative Segments and Connectors

Donnelly Alternative Segments

Construction of the Donnelly alternative segments would result in the clearing of primarily forest and low shrub vegetation (Table 5-11, Table 5-12, and Figure 5-7). Construction of the Donnelly alternative segments would clear about 628 acres for Donnelly Alternative Segment 1 and 636 acres for Donnelly Alternative Segment 2 (Table 5-11 and Table 5-12). Construction of Donnelly Alternative Segment 1 would clear 590 acres of forests, 27 acres of shrubs, and 11 acres of graminoid vegetation. Construction of Donnelly Alternative Segment 2 would clear 617 acres of forests, 16 acres of shrubs, and 3 acres of graminoid vegetation. The Donnelly Alternative Segment 2 crosses nearly twice the area of closed canopy white spruce, balsam poplar, paper birch and quaking aspen mixed forest (403 acres) as the Donnelly Alternative Segment 1 (206 acres), which primarily crosses open needleleaf black spruce forest.

Both alternative segments cross largely undisturbed boreal forest along the west side of the Tanana River, where few existing invasive plants would be expected. Fire management for both of the Donnelly alternative segments is primarily full suppression because of the cabins associated with the Richardson Clearwater River. Neither alternative segment area has been affected by fire since the 1950s. Construction of the rail- and roadbeds could increase the potential for interruption of the natural fire and succession pattern, especially for the Donnelly Alternative Segment 1, which crosses primarily black spruce forests.

Table 5-11
Vegetation Cover Within 200-foot NRE ROW for the Donnelly Alternative Segments[a]

Vegetation Class	Donnelly 1 Area (acres)	Donnelly 1 ROW Area (%)	Donnelly 2 Area (acres)	Donnelly 2 ROW Area (%)
Closed Needleleaf Forest	109.8	18	197.1	31
Open Needleleaf Forest	323.1	52	147.6	23
Closed Broadleaf Forest	6.9	1	35.7	6
Open Broadleaf Forest	16.9	3	7.7	1
Closed Mixed Needleleaf/ Broadleaf Forest	66.6	11	154.2	24
Tall Shrub	3.2	1	3.8	1
Low Shrub	22.6	4	9.8	2
Dwarf Shrub	0.6	0	-	0
Graminoid	11.0	2	2.7	0
Clear Water	2.0	0	2.1	0
Turbid Water	5.5	1	5.7	1
Gravel/Rock	2.3	0	3.5	1
Mud/Silt/Sand	7.4	1	4.4	1
Other[b]	43.0	7	56.1	9
Total Area	**620.9**		**630.4**	

[a] Source: BLM *et al.*, 2002.
[b] Portions of the areas crossed by these alternatives were obscured by clouds. These areas are primarily forest covered.

Table 5-12
Vegetation Cover Within Large Bridge Staging Areas and River Gravel Mine Sites for the Donnelly Alternative Segments[a]

	Donnelly 1		Donnelly 2	
Vegetation Class	Area (acres)	ROW Area (%)	Area (acres)	ROW Area (%)
Closed Needleleaf Forest	13.2	21	12.3	20
Open Needleleaf Forest	0.9	1	2.1	3
Closed Broadleaf Forest	0.3	0	0.4	1
Open Broadleaf Forest	0.1	0	0.7	1
Closed Mixed Needleleaf/ Broadleaf Forest	8.7	14	3.3	5
Low Shrub	0.4	1	2.9	5
Graminoid	0.2	0	-	-
Clear Water	0.9	1	-	-
Turbid Water	16.5	26	15.7	25
Sparse Vegetation	-	-	0.4	1
Gravel/Rock	6.8	11	8.2	13
Mud/Silt/Sand	14.8	24	16.6	27
Total Area	**62.8**		**62.6**	

[a] Source: BLM *et al.*, 2002.

South Common Segment

Construction of the South Common Segment would result in clearing of about 251 acres of vegetation (Table 5-13 and Figure 5-8). Vegetation within this alignment was 97 percent forest prior to a fire that occurred during 1998, as reflected in Table 5-13. Construction of the South Common Segment would clear 251 acres of vegetation including: 150 acres of forests, 91 acres of shrub, and 10 acres of graminoid vegetation (Table 5-13). The fire reset succession across 94 acres crossed by the segment, leaving 59 percent of the alignment in forest cover. Forested habitats within the burn area were replaced with low shrub/graminoid habitats, which are usually the first communities to regrow in burn areas. Due to the remoteness of the South Common Segment, few invasive plants would be expected to occur and the potential to spread invasive plants would be expected to be low.

Table 5-13
Pre- and Post-Fire Vegetation Cover Within 200-foot NRE ROW for the South Common Segment[a]

Vegetation Class	Pre-Fire Area (acres)	Post-Fire Area (acres)
Closed Needleleaf Forest	57.8	25.5
Open Needleleaf Forest	99.1	51.5
Closed Broadleaf Forest	18.7	18.2
Open Broadleaf Forest	8.5	3.8
Closed Mixed Needleaf/ Broadleaf Forest	60.1	51.3
Low Shrub	6.1	90.6
Graminoid	0.9	10.3
Clear Water	1.5	1.5
Totals	**252.7**	**252.7**

[a] Sources: BLM *et al.*, 2002; BLM AFS, 2007.

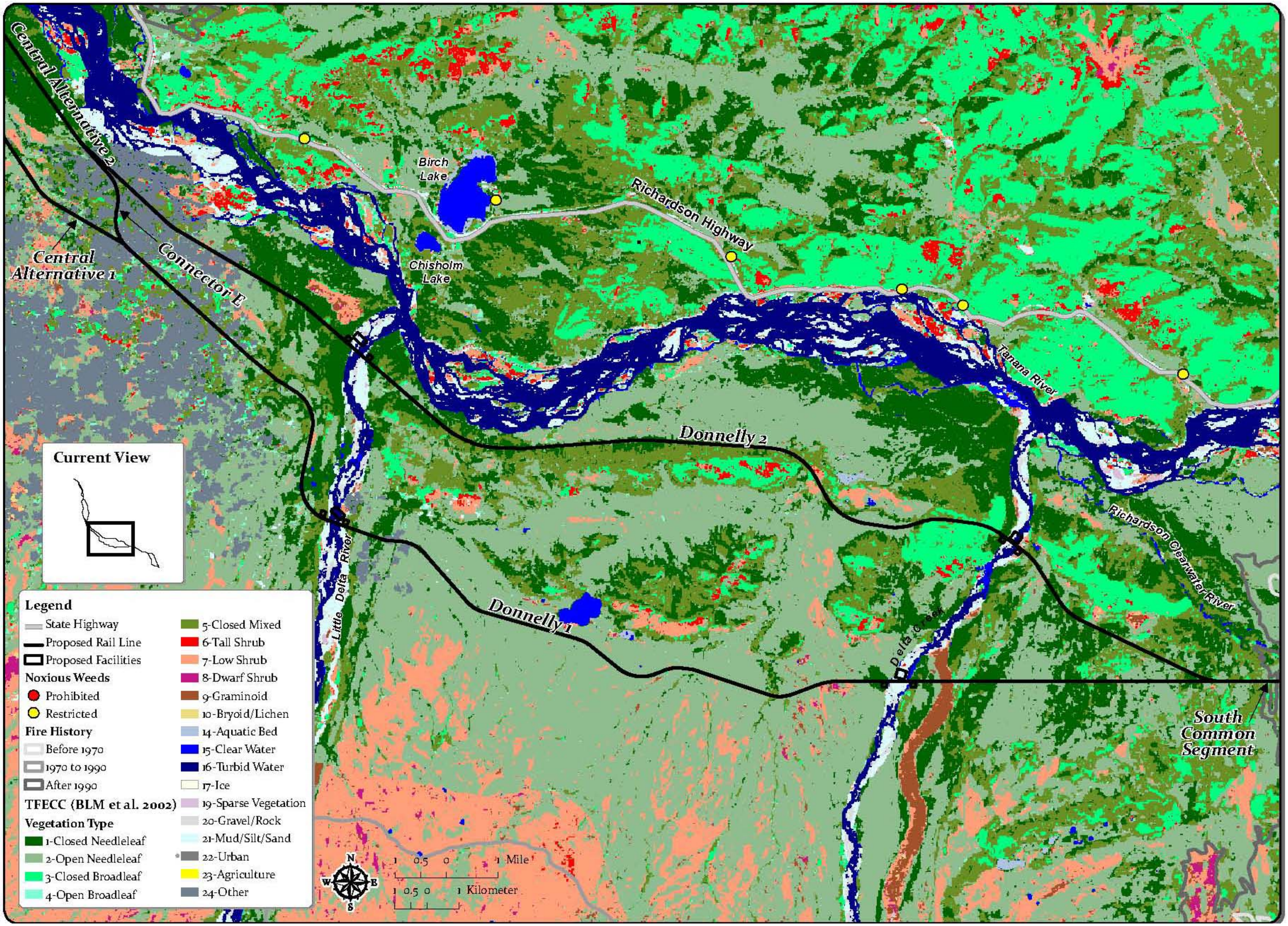

Figure 5-7 – Vegetation along the Donnelly Alternative Segments

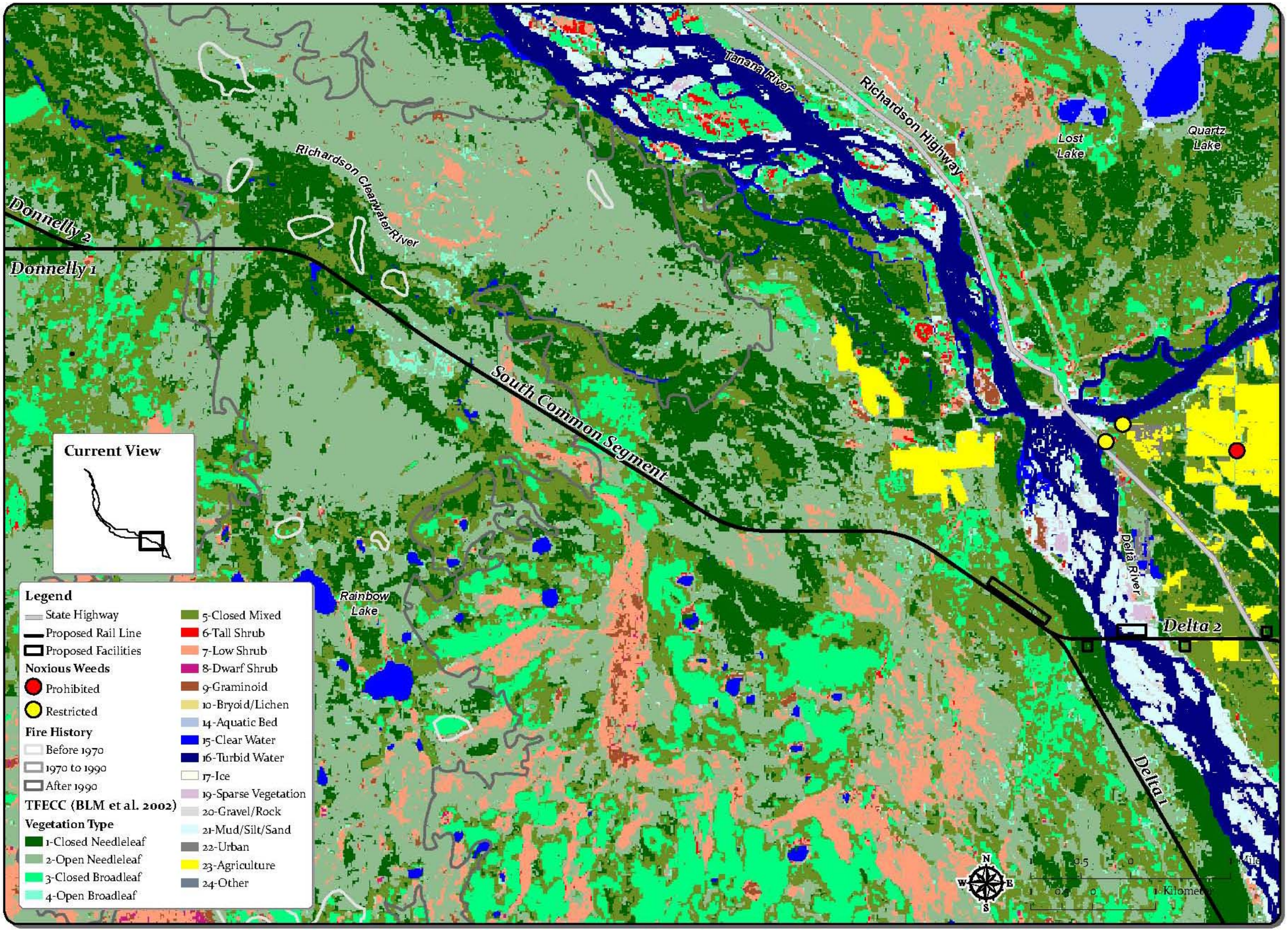

Figure 5-8 – Vegetation along the South Common Segment

Delta Alternative Segments

Construction of Delta Alternative Segment 1 would clear about 261 acres of vegetation, while Delta Alternative Segment 2 would clear about 281 acres (Table 5-14 and Table 5-15). Delta Alternative Segment 1 would result in clearing of primarily forest vegetation classes, while Delta Alternative Segment 2 would result in clearing of forests and agricultural vegetation (Figure 5-9). Delta Alternative Segment 2 would have a higher potential for invasive plant infestation because of its proximity to sources of invasive plants near the Richardson Highway and agricultural lands. A rare willow, *Salix setchelliana*, was reported to occur on Delta Alternative Segment 2 (HDR, 2007a). Delta Alternative Segment 1 would occupy primarily undeveloped and undisturbed boreal forests where a lower potential for invasive plants would be expected.

Table 5-14
Vegetation Cover Within 200-foot NRE ROW for the Delta Alternative Segments[a]

Vegetation Class	Delta 1		Delta 2	
	Area (acres)	ROW Area (%)	Area (acres)	ROW Area (%)
Closed Needleleaf	121.5	44	35.9	13
Open Needleleaf	60.6	22	52.1	19
Closed Broadleaf	9.0	3	20.5	7
Open Broadleaf	3.9	1	6.0	2
Closed Mixed	41.7	15	72.9	26
Tall Shrub	0.7	0	2.1	1
Low Shrub	3.1	1	2.3	1
Dwarf Shrub	0.0	0	-	-
Graminoid	2.3	1	-	-
Bryoid/Lichen	0.6	0	-	-
Clear Water	-	-	0.3	0
Turbid Water	6.0	2	8.1	3
Sparse Vegetation	3.6	1	1.2	0
Gravel/Rock	5.1	2	0.8	0
Mud/Silt/Sand	15.6	6	5.0	2
Urban	0.8	0	2.6	1
Agriculture	3.7	1	66.9	24
Totals	**278.2**		**276.7**	

[a] Source: BLM *et al.*, 2002.

Table 5-15
Vegetation Cover Within Bridge Staging, River Gravel Mine Sites, Overpass Staging, Passenger Terminal, and Access Roads for the Delta Alternative Segments[a]

Vegetation Class	Delta 1		Delta 2	
	Area (acres)	ROW Area (%)	Area (acres)	ROW Area (%)
Closed Needleleaf	2.8	7	8.9	21
Open Needleleaf	3.2	8	1.0	2
Closed Broadleaf	-	-	1.1	2
Open Broadleaf	1.4	4	0.6	1
Closed Mixed	2.3	6	8.0	19
Tall Shrub	0.4	1	-	-
Low Shrub	1.6	4	-	-
Graminoid	1.9	5	-	-
Clear Water	0.5	1	-	-
Turbid Water	0.4	1	4.3	10
Ice	-	-	-	-

Table 5-15
Vegetation Cover Within Bridge Staging, River Gravel Mine Sites, Overpass Staging, Passenger Terminal, and Access Roads for the Delta Alternative Segments[a] (continued)

	Delta 1		Delta 2	
Vegetation Class	**Area (acres)**	**ROW Area (%)**	**Area (acres)**	**ROW Area (%)**
Sparse Vegetation	3.0	7	0.2	1
Gravel/Rock	1.9	5	3.0	7
Mud/Silt/Sand	20.3	50	12.6	30
Urban	-	-	0.2	0
Agriculture	0.9	2	2.9	7
Total Area	**40.6**		**42.8**	

[a] Source: BLM *et al.*, 2002.

No-Action Alternative

Under the No-Action Alternative, there would be no impacts from rail line construction or operations activities. Vegetation within the alternative segment alignments would continue to be influenced by urban and agricultural development, permafrost distribution, and the natural processes of flooding and fire that initiate ecological succession in the boreal forest.

5.3.3 Summary of Impacts to Vegetation

The primary impacts to vegetation from construction and operation of the proposed NRE would be loss of the existing vegetation cover and spread of invasive plants. A summary of the results of the quantitative analysis of vegetation clearing impacts for the NRE alternative segments is presented in Table 5-16. Estimates are maximums based on clearing of the entire 200-foot ROW.

Construction of the proposed NRE would result in surface disturbance of an estimated 3,071 acres, including a permanent loss of 2,364 acres of forests, 324 acres of shrubs, 47 acres of grass/sedge and 84 acres of other vegetation habitats for a total loss of an estimated 2,819 acres of vegetation cover (Table 5-16). The minimum and maximum range of construction impacts would result in surface disturbance of an estimated 3,021 to 3,137 acres, including 2,325 to 2,424 acres of forests, 305 to 354 acres of shrubs, 33 to 40 acres of grass/sedge, and 128 to 68 acres of other vegetation, for a total loss of an estimated 2,791 to 2,885 acres of vegetation cover (Table 5-16). Vegetation cover losses represent a small total area compared to the vegetation cover surrounding the project alternatives because of the primarily undeveloped nature of the project area. Loss of vegetation cover, soil disturbance, and the use of fill materials and seed sources contaminated with invasive plant seeds would contribute to the spread of weed species. Some cleared areas would likely be restored after construction; other areas would be covered by fill.

Vegetation clearing would be considered a long-term impact for forest communities even with restoration, especially for late-succession forests. Vegetation clearing would be considered a short-term impact on shrub and graminoid communities, if appropriate restoration was completed.

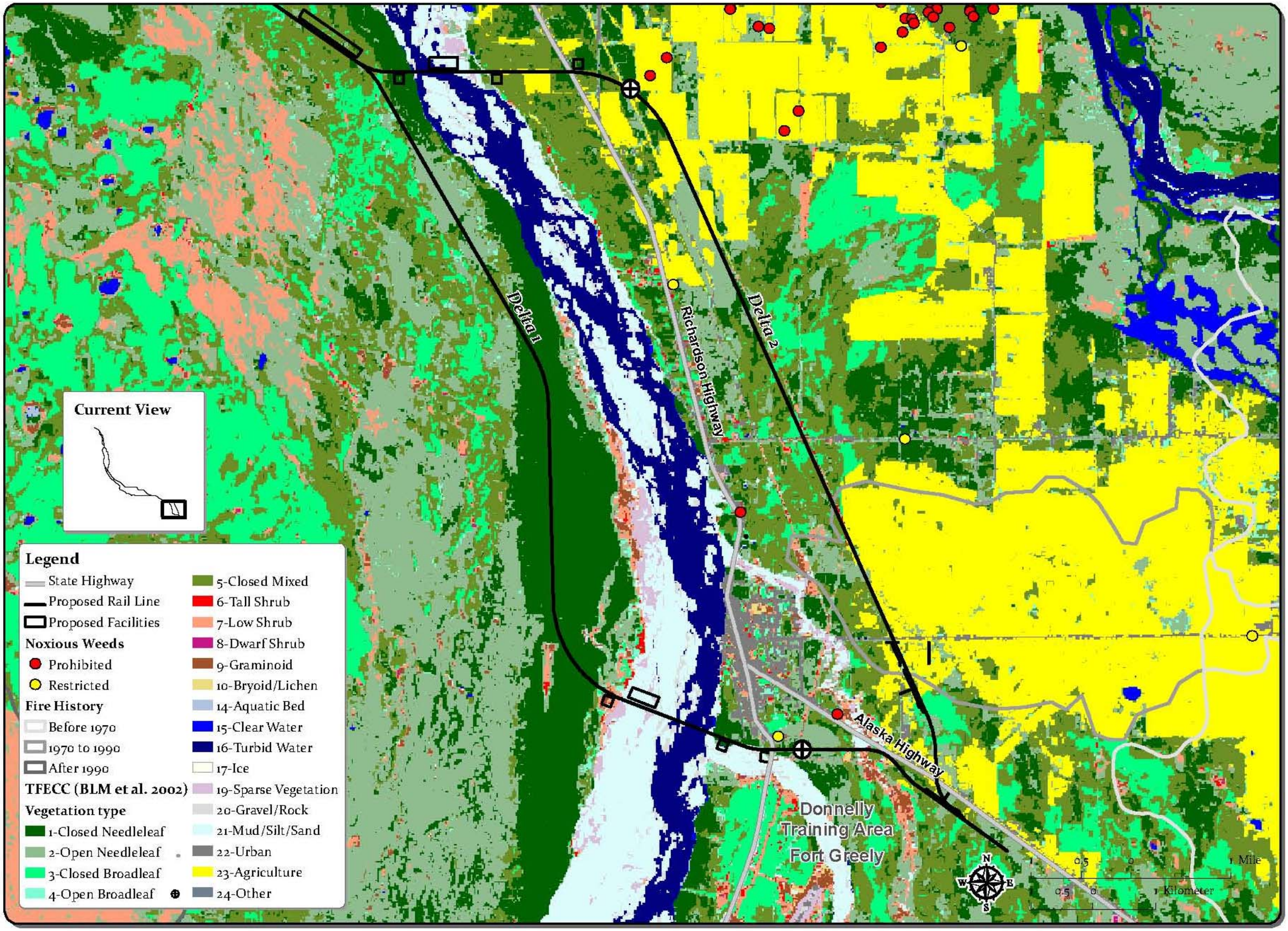

Figure 5-9 – Vegetation along the Delta Alternative Segments

Table 5-16
Summary of Vegetation Impacts (acres) by Alternative Segment[a]

Alternative or Segment	Closed NL Forest	Open NL Forest	Closed BL forest	Open BL Forest	Closed NL/BL Forest	All Forests	All Shrubs	Gramin-oid	Other Vege-tated	Total Vege-tated Area	Non-vege-tated	*Total Area*[b]
Common Facilities	80.9	192.9	75.8	35.1	126.8	511.4	197.4	11.9	0.9	721.6	30.4	752.0
North Common	1.0	7.2	7.5	6.1	14.3	36.1	18.2	6.7	0.8	61.6	2.2	63.8
Eielson 1	20.6	72.0	38.6	30.2	73.6	235.0	10.4	1.0	0.0	246.4	0.8	247.3
Eielson 2	13.7	104.9	30.5	18.1	54.0	221.2	10.1	9.7	0.0	241.0	0.4	241.4
Eielson 3	11.8	91.4	43.5	10.2	53.5	210.5	17.0	11.0	0.0	238.5	4.8	243.4
Salcha 1 + Extra	50.0	41.1	52.8	82.7	154.7	381.4	52.3	1.3	0.0	434.9	97.6	532.5
Salcha 2 + Extra	167.0	100.6	64.8	28.2	110.9	471.4	61.0	3.0	1.5	536.8	103.3	640.2
Central 1	16.5	40.0	1.8	9.2	21.1	88.6	17.4	0.2	16.5	122.6	0.2	122.8
Central 2	64.7	7.8	-	-	11.8	84.3	0.0	-	0.6	84.9	2.1	86.9
Connector A	29.4	30.7	0.4	3.6	26.2	90.2	15.0	0.5	0.0	105.7	0.0	105.7
Connector B	56.6	12.2	-	0.2	9.6	78.5	0.0	-	0.0	78.5	0.8	79.4
Connector C	30.6	8.6	0.1	2.0	3.6	44.9	10.5	0.2	0.0	55.6	0.4	55.9
Connector D	19.4	0.4	-	-	1.4	21.2	0.0	-	0.0	21.2	0.0	21.2
Connector E	8.2	8.0	1.3	0.1	6.8	24.3	0.2	-	33.6	58.2	0.3	58.4
Donnelly 1 + Extra	123.0	324.1	7.1	17.1	75.3	546.5	26.8	11.2	43.0	627.5	56.2	683.7
Donnelly 2 + Extra	209.4	149.7	36.1	8.4	157.4	561.0	16.5	2.7	56.1	636.4	56.7	693.1
South Common	57.8	99.1	18.7	8.5	60.1	244.2	6.1	0.9	0.0	251.2	1.5	252.7
Delta 1 + Extra	124.3	63.8	9.0	5.3	44.0	246.4	5.9	4.2	5.2	261.7	57.3	318.9
Delta 2 + Extra	44.8	53.1	21.5	6.6	80.8	206.9	4.5	0.0	69.7	281.1	38.4	319.5
Proposed Action[c]	578.3	847.6	215.6	165.3	556.9	2363.6	323.8	47.1	84.1	2818.6	253.1	3071.7
Minimum Area Alternative[d]	578.8	668.1	242.8	165.7	669.6	2325.0	305.0	33.2	128.1	2791.3	230.0	3021.3
Maximum Area Alternative[e]	621.7	908.2	223.2	141.6	529.7	2424.4	353.6	39.1	67.8	2885.0	252.3	3137.2

[a] Source: BLM *et al.*, 2002.
[b] Totals may not sum exactly due to rounding, column subtotal for all forest cover is sum of the five forest cover types.
[c] Proposed Action includes North Common, Eielson 3, Salcha 1, Connector B, Central 2, Connector E, Donnelly 1, South Common, and Delta 1.
[d] Minimum Project Area includes North Common, Eielson 2, Salcha 1, Connector B, Central 2, Donnelly 2, South Common, and Delta 2.
[e] Maximum Project Area includes North Common, Eielson 1, Salcha 2, Connector C, Central 1, Donnelly 1, South Common, and Delta 1.

5.4 Fisheries Resources

This section describes the existing conditions of fisheries in the project and potential impacts from the proposed NRE.

5.4.1 Affected Environment

Important fish resources and habitats occurring in the project area include waters supporting recreational, commercial and subsistence/personal use fisheries for trout, char, whitefish and salmon. Table 5-17 lists fish species identified by Federal and state agencies as potentially occurring in or downstream of proposed NRE stream crossings. Fish resources in the project area include resident (life cycle does not include extended migration), fresh water migratory (life cycle includes seasonal migrations within fresh waters) and anadromous (life cycle includes migrations to marine waters) species. Many freshwater fish in Interior Alaska make extensive seasonal movements within and between drainages. Some fish species have resident populations, freshwater migratory populations and anadromous populations within the project area. Additional supporting information on fisheries resources in the mid-Tanana River Basin can be found in Appendix F.

Table 5-17
Fish Occurring in the Mid-Tanana River Basin[a]

Common Name[b]	Species	Potential Use[c]	Anadromy (Y/N)	Conservation Concern[d] (Y/N)
Alaska Blackfish	*Dallia pectoralis*	--	N	Y
Alaskan Brook Lamprey	*Lampetra alaskense*	--	N	Y
Arctic Char (I)	*Salvelinus alpinus*	R	N	N
Arctic Lamprey	*Lampetra japonica*	--	Y	Y
Broad Whitefish	*Coregonus nasus*	R,S	Y	Y
Burbot	*Lota lota*	R,S	N	N
Chinook (King) Salmon	*Oncorhynchus tshawytscha*	C,R,S	Y	N
Chum (Dog) salmon	*Oncorhynchus keta*	C,R,S	Y	N
Coho (Silver) Salmon	*Oncorhynchus kisutch*	C,R,S	Y	N
Dolly Varden	*Salvelinus malma*	R	Y/N	N
Arctic Grayling	*Thymallus arcticus*	R,S	N	N
Humpback Whitefish	*Coregonus oidschian*	R,S	Y/N	N
Lake Trout	*Salvelinus namaycush*	R	N	N
Least Cisco	*Coregonus said*	S	Y/N	N
Longnose Sucker	*Catostomus catostomus*	S	N	N
Northern Pike	*Esox lucius*	R,S	N	N
Rainbow Trout (I)	*Oncorhynchus mykiss*	R	N	N
Round Whitefish	*Prosopium cylindraceum*	R	N	N
Inconnu (Sheefish)	*Stenodus leucichthys*	R,S	N	N
Trout Perch	*Percopsis omiscomaycus*	--	N	Y

[a] Sources: Parker, 2006; ADF&G, 2007a and 2007b.
[b] I = introduced.
[c] Potential Use Codes: C = commercial, R = recreational, S = subsistence/personal use (as reported in Busher *et al.*, 2007).
[d] Species of Conservation Concern are listed in the Alaska Comprehensive Wildlife Conservation Strategy.

Perennial and intermittent streams that connect to major tributaries along proposed rail alternative segments may contain fish or habitats suitable for fish use during portions of the year.

These streams may support spawning, foraging, rearing, refuge, and migratory use by resident and anadromous fish species. The proposed NRE would require a minimum of 19 crossings and a maximum of 35 crossings of streams that have been documented to contain either fish or fish habitat. The combination of alternatives and segments that has the least number of stream crossings documented to contain either fish or fish habitat is the North Common Segment, Eielson Alternative Segment 1, Salcha Alternative Segment 1, Connector A, Donnelly Alternative Segment 1, South Common Segment, and Delta Alternative Segment 1. The maximum number of crossings would include the North Common Segment, Eielson Alternative Segment 3, Salcha Alternative Segment 2, Central Alternative Segment 1, Connector C, Donnelly Alternative Segment 1, South Common Segment, and Delta Alternative Segment 1. All alternative segments could affect three fisheries protected by the Essential Fish Habitat (EFH) provisions of the Magnuson-Stevens Act (Public Law 104-297)—the Chinook, coho, and chum salmon fisheries. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Figure 5-10 shows major streams supporting EFH protected fisheries in the project area (Johnson and Weiss, 2007). Not all streams crossed by the alternative segments have been documented to contain EFH fisheries or other anadromous fishes. Some of these waters may contain undocumented EFH-protected species and most streams are likely to contain other common resident or anadromous fishes as listed in Table 5-17. For additional information on fish habitat, site-specific habitat conditions and documented fish species use for proposed stream crossings, and for an analysis of project construction and operation affects on EFH, please refer to Appendices F and G.

5.4.2 Environmental Consequences

This section discusses the potential impacts on fisheries resulting from the proposed NRE. Supporting descriptions of environmental consequences, results of quantitative analyses and illustrations are presented in Appendices F and G.

The NRE would require multiple stream crossings at locations likely to contain fish or fish habitat. The magnitude of effects of construction and operation of the project on fisheries would be influenced by the stream type, conveyance structure, type of fish and habitat occurring within the stream, and timing of construction. The primary impacts of crossing structures to fish and fish habitat are loss and degradation of instream habitats due to placement of structures, alteration of stream hydrology and blockage of movements. Alterations of stream hydrology caused by conveyance structures are discussed in Chapter 4. The primary impact of instream gravel removal would be temporary or permanent habitat alteration depending on the amount of gravel removed and the gravel recharge rate. Most effects from the construction and operation of the project would include increased erosion and sedimentation from removal of riparian vegetation, and loss or alteration of stream and riparian habitats. Impacts to fisheries would vary with type of stream, quality of fish habitat, and timing of fish use of the habitat.

Each stream crossing would have site-specific impacts on aquatic and riparian habitats. The extent and duration of these impacts would depend on the specific characteristics of conveyance type and design and the fish community present. Impacts would occur during rail line construction and operations. To minimize and offset potential impacts to fish resources, all fish habitat and water quality permit conditions would be incorporated into the design phase and construction of the project stream crossings.

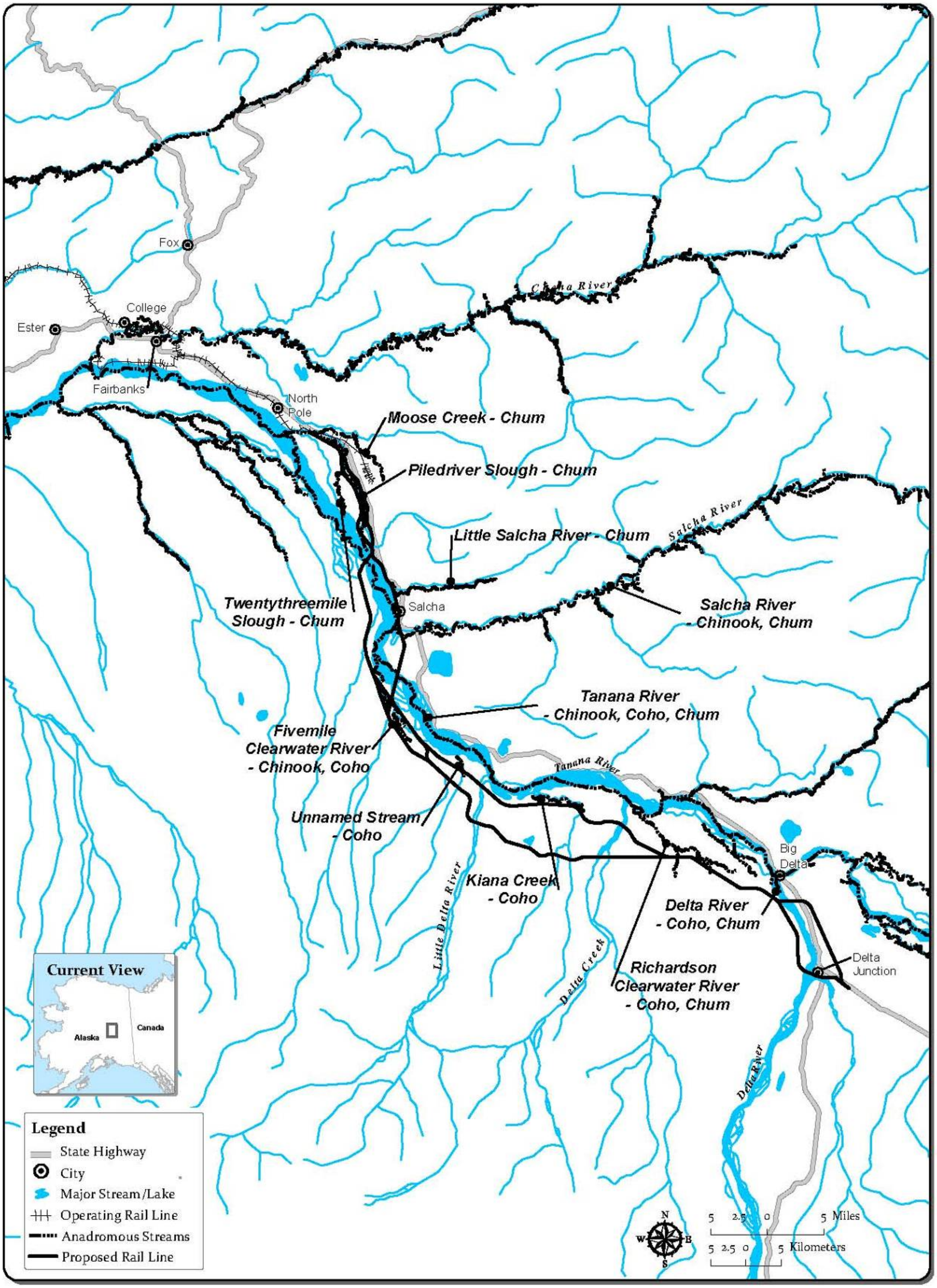

Figure 5-10 – Waters Documented as Important for Chinook, Coho and Chum Salmon under Alaska Statute 16.15.871(a) in the Project Area (Johnson and Weiss, 2007)

Methodology

Effects to fisheries from the construction and operation of the proposed NRE were evaluated based on habitat use, habitat requirement, and seasonal movement of fish within the project area. Habitat analysis was based on a review of stream crossings presented in Chapter 4, anadromous fish stream data, and fish occurrence and habitat data provided by the ADF&G (ADF&G, 2005a) and collected at or near proposed crossing sites from 2005 to 2007 (Noel, 2007a).

Construction Impacts

Construction of the rail line would result in short-term disturbance and long-term habitat modification along the approximately 80-mile rail line. The following discussion describes the types of potential construction-related impacts on fish and fish habitats that would be applicable to all of the alternative segments proposed for the NRE.

- **Loss or Alteration of Instream and Riparian Habitats.** Installation of bridge pilings, bank armoring, and culverts would permanently remove streambed area that would otherwise be available for fish use. Loss of gravel bottoms, sandy shoal areas, stands of emergent vegetation, and other habitat would impact rearing, foraging, and spawning. Temporary loss of instream habitat would also occur if water is diverted from the channel to facilitate installation of bridge pilings, bank armoring, or culverts. Removal of gravel from glacial river beds would also cause a temporary alteration in the river bed. The pit formed for gravel removal would generally be refilled with gravel during the following spring breakup periods by bed load migration and would generally not result in permanent fish habitat loss or alteration.

  Riparian vegetation would be removed as a result of bridge, culvert, and access road construction. Trees and other woody vegetation provide protection to fish habitat by filtering runoff, shading the stream, providing large woody debris (LWD) and other organic matter to the stream. Riparian clearing would also eliminate important streambank habitats such as undercut banks. Removal of riparian vegetation and disturbance to streambanks could result in erosion, sediment loading and turbidity, elevated water temperatures, reduced productivity, and a reduction in habitat complexity.

- **Mortality from Instream Construction.** Instream construction activities could cause direct mortality of fish when equipment or materials are placed in the stream bed. Small, larval or juvenile fish may become stranded in pools created when equipment is driven through the stream. Pools could then subsequently drain or dry resulting in desiccation of the fish. Fry are particularly vulnerable because they are weak swimmers and are susceptible to stranding by wave action created as equipment is driven through or along the stream bed. Large fish would be expected to avoid vehicle wheels and ruts. Redds, eggs, and fry within or downstream of the construction site could be impacted by sedimentation, excessive vibration, and scour (Banner and Hyatt, 1973; Crisp, 1990). Water diversions and temporary dewatering could also impact fish embryos and pre-emergent fry (Becker *et al.*, 1982; Holland, 1987) through desiccation and/or freezing.

- **Blockage of Fish Movement.** In-stream construction activities would impact fish movements during construction where water diversions create temporary physical barriers to fish passage or alter stream flows sufficiently to create either high water or low water conditions that would prevent fish passage. Water diversions and culverts could physically restrict access to spawning habitat, and turbidity created during construction could also trigger avoidance behavior which would lead to a behavioral blockage of movements (Bisson and Bilby, 1982; Warren and Pardew, 1998). These impacts would be expected to be temporary during bridge construction. Ice bridge stream-crossings can alter spring breakup timing and create ice jams with high flows that restrict movements of resident fish and out-migrating salmon.

Improperly installed conveyance structures could impede fish passage by increasing the velocity or decreasing the depth of water flowing through the structure. Culverts could pose a physical barrier (as with a hung culvert) if not installed properly. Conveyance structures blocking or impeding fish passage could result in a loss of access to spawning and rearing habitat which could reduce fish productivity. Water diversions could also create temporary physical barriers to fish passage or alter stream flows sufficiently to create either high-water or low-water conditions that would prevent fish passage, potentially restricting access to rearing and spawning habitat.

Bridges and culverts can also create choke points where the downstream movement of ice is restricted. Culverts often freeze solid and are very slow to melt due to the insulation of road or rail embankments. Fish that migrate to upstream spawning or foraging areas in the spring can be blocked by frozen culverts.

- **Degradation of Water Quality**. Clearing of the ROW, grading and placement of conveyance structures, and construction of new access roads would expose soil to erosive forces of wind, rain, and surface runoff during construction. Such erosion would deliver sediment into streams which would degrade water quality and fish habitat. Increased turbidity from suspended sediment would degrade spawning and rearing habitat for a variety of species (Wood, 2004; Grieg *et al.*, 2005). Sedimentation (infiltration of fine particles into substrate interstices) can smother eggs and newly-hatched fry, reducing survival (Wood, 2004; Grieg *et al.*, 2005). High turbidity could also trigger avoidance behavior, affect foraging success in fish that rely on sight for feeding (Barret *et al.*, 1992), and clog gills.

  Small fuel or oil leaks from construction equipment could contribute to water quality degradation during construction. Spills and leaks could enter the water either directly as equipment crosses the stream or indirectly with runoff from the bridge or adjacent road- or railbed.

- **Alteration of Stream Hydrology and Breakup**. Construction activities would cause changes in flow patterns through the hyporheic zone by dislodging fine sediments during excavation and vegetation clearing which can infiltrate the hyporheic zone and clog interstitial spaces; and by vibrations from construction equipment which can cause substrates to settle and become compacted (Sear, 1995; Huggenberger *et al.*, 1998). The hyporheic zone is a region beneath a stream bed where there is mixing of shallow groundwater and surface water. Hyporheic flow and warm groundwater upwelling are important factors in salmonid egg development, and provide a warm water refuge for overwintering fishes (Brown and Mackay, 1995; Baxter and McPhail, 1999). Permanent alterations in subsurface flows could result from the changes in permafrost distribution, bank and substrate armoring, instream support structures and changes in channel morphology associated with bridges and culverts (Sear, 1995; Hanrahan, 2006). Sub-surface structures that stabilize bridges can alter flow patterns within the hyporheic zone. Warm water upwelling can also prevent a stream from freezing, thus allowing fish to overwinter in areas that would otherwise be unavailable.

Ice bridges used during winter construction of conveyance structures could alter spring breakup timing and create ice jams that redirect flows. Fish species moving upstream or downstream could have difficulty passing areas where ice bridges have been constructed. In extreme cases, this can lead to the formation of ice dams that limit flow downstream of the bridge. Downstream habitat can be dewatered, which can be particularly problematic for anadromous salmonids whose eggs and fry over-winter in glacial streams such as the Tanana River. Water tends to back up behind ice dams that can result from stream constriction at bridges and culverts, and once the ice dam is breached a large volume of water can be released over a short period of time. This sudden flush of water can scour downstream substrates, radically altering channel morphology, eliminating redds, and causing high mortality in overwintering sac-fry.

- **Noise and Vibration Impacts**. Noise and vibrations caused by pile driving and culvert installation during bridge construction could impact egg mortality and hatch timing in areas at and near stream crossings. Vibrations could be of sufficient magnitude to negatively impact the development of salmonid eggs in redds near bridges and culverts. Vibration could disrupt egg membranes leading to egg death. Salmonid eggs are especially susceptible to disruption just after laying and fertilization prior to hardening. Exposure to vibration could affect fish by disrupting their sense of hearing and the function of the lateral line, a sensory organ that detects vibration (Hastings *et al.*, 1996; McCauley *et al.*, 2003). Noise and vibration from winter construction activities could also trigger avoidance behavior, displacing fish from overwintering habitat, especially near the Tanana River bridge crossings.

Operations Impacts

The following are types of potential impacts that would be expected during project operations.

Maintenance activities such as clearing drainage ditches and management of vegetation in the ROW could cause some increase in sedimentation and turbidity over background levels in streams. Water quality could be negatively affected in the unlikely event of a release of hazardous materials from a train derailment or collision. However, the likelihood of a release is low because ARRC anticipates few shipments of hazardous materials, and railcars used to transport hazardous materials are designed to withstand various types of impacts.

Impacts by Alternative Segment

All alternative segments cross streams or waterbodies with fish resources and would potentially cause impacts as discussed above. Notable site-specific impacts on fish and fish habitats for alternative segments are summarized below. Appendix F presents additional supporting information on fish and fish habitats for each alternative.

North Common Segment

The North Common Segment crosses Piledriver Slough, which seasonally supports resident fish populations and some spawning of chum salmon, and an un-named slough, which supports resident fish (Table 5-18, Figure 5-11). Blockage of fish migration at Piledriver Slough would be of consequence to in-migrant adult chum salmon and arctic grayling headed to spawning habitats and out-migrant chum salmon fry headed to marine rearing habitats that would pass beneath the bridge. Out-migration of chum salmon fry would coincide with spring breakup during April to May and could be hindered by ice jams that could result from channel constriction at the proposed bridge site. The crossing of the un-named slough by two ten-foot culverts would alter instream habitats and would potentially block movements of resident fish.

Piledriver Slough is generally blocked from receiving direct flow from the Tanana River, although during flood conditions flushing flows occur. During most of the year, stream flows are maintained by precipitation and surface water/groundwater exchange. Flushing flows through Piledriver and Twentythreemile Sloughs reduce beaver dams. Any changes in the local hydrology could have corresponding impacts on spawning or overwintering habitat within this reach. Chum salmon and arctic grayling spawning have been documented near this crossing site (Crossing 1; Noel, 2007a, Record 1).

Eielson Alternative Segments

Fish and fish habitats at the 12 crossings of fish-bearing clearwater sloughs that would be affected by construction are listed in Table 5-19 and shown in Figure 5-11. Each of the Eielson alternative segments crosses Piledriver Slough, although crossings are in different locations for each alternative segment. Eielson Alternative Segment 3 crosses Piledriver Slough nearest the outflow of the slough where it receives flow from Moose Creek and rejoins the Tanana River. Eielson Alternative Segment 2 crosses Piledriver Slough before its confluence with Twentythreemile Slough. Eielson Alternative Segment 1 crosses Piledriver Slough just north of where it previously connected to the Tanana River; the channel is currently blocked by fill materials (see Appendix F for a history of alterations to Piledriver Slough). Of these crossings, the crossings further downstream have the largest flows from groundwater exchange and would have the largest affect on instream resident and anadromous fish habitats. Eielson Alternative Segment 1 and Eielson Alternative Segment 2 cross Twentythreemile Slough near where it flows into Piledriver Slough. Twentythreemile Slough supports resident fish and chum salmon.

Eielson Alternative Segment 3 crosses a meandering, un-named slough five times. This slough supports resident fish for rearing and summer forage. Construction across these meanders would likely lead to loss of fish habitat at stream margins, increased erosion and sedimentation associated with disturbance of the riparian buffer zone. Because the crossings would be primarily culverts, there would also be a potential for limiting fish movements during low-flow periods. Groundwater upwelling could be affected by changes in channel morphology related to the installation of multiple culverts. Eielson Alternative Segment 2 and Eielson Alternative Segment 3 cross another un-named slough that contains pool and riffle habitats suitable for rearing, migration and spawning habitats for resident fish.

Salcha Alternative Segments

Fish and fish habitats at the 12 crossings of fish-bearing waterbodies crossed by the Salcha alternative segments are listed in Table 5-20 and shown in Figure 5-12. The Salcha alternative segments would both cross the Tanana River, which provides year-round habitat for resident and anadromous fish. A bridge crossing the Tanana River would include bank armoring, rock revetments and levee construction upstream of the bridge and channel plugs for side channels on

Table 5-18
Fish-bearing Streams Crossed by the North Common Segment

Alternative or Segment	Crossing Number ID	Stream Name	Waterbody Type	Fish Use	Channel Width (feet)	Crossing Type	Crossing Size (feet)	Spawning Habitat	Rearing Habitat	Migration Habitat	Over-winter Habitat
North Common	1	Piledriver Slough	Slough	Anadromous	65	Bridge	100	√	√	√	√
North Common	105	Unnamed	Slough	Resident	20	Culvert	2 x 10	√	√		

Note: Spawning, rearing, migration, or over-winter habitats for either or both anadromous and resident fish species.

Table 5-19
Fish-bearing Streams Crossed by the Eielson Alternative Segments

Alternative or Segment	Crossing Number ID	Stream Name	Waterbody Type	Fish Use	Channel Width (feet)	Crossing Type	Crossing Size (feet)	Spawning Habitat	Rearing Habitat	Migration Habitat	Over-winter Habitat
Eielson 1	3	Twentythreemile Slough	Slough	Anadromous	100	Bridge	100	√	√	√	√
Eielson 1	10	Piledriver Slough	Slough	Anadromous	30	Culvert	3 x10	√	√	√	√
Eielson 2	3	Twentythreemile Slough	Slough	Anadromous	100	Bridge	100	√	√	√	√
Eielson 2	314	Piledriver Slough	Slough	Anadromous	105	Bridge	330	√	√	√	√
Eielson 2	13	Un-named	Slough	Resident	80	Bridge	60		√		
Eielson 3	113	Piledriver Slough	Slough	Anadromous	80	Bridge	300	√	√	√	√
Eielson 3	111	Unnamed	Slough	Resident	30	Culvert	3 x10		√		
Eielson 3	110	Unnamed	Slough	Resident	20	Culvert	3 x10		√		
Eielson 3	129	Unnamed	Slough	Resident	20	Culvert	3 x10		√		
Eielson 3	131	Unnamed	Slough	Resident	20	Culvert	3 x10		√		
Eielson 3	5	Unnamed	Slough	Resident	25	Bridge	130		√		
Eielson 3	13	Unnamed	Slough	Resident	80	Bridge	60		√		

Note: Spawning, rearing, migration, or over-winter habitats for either or both anadromous and resident fish species.

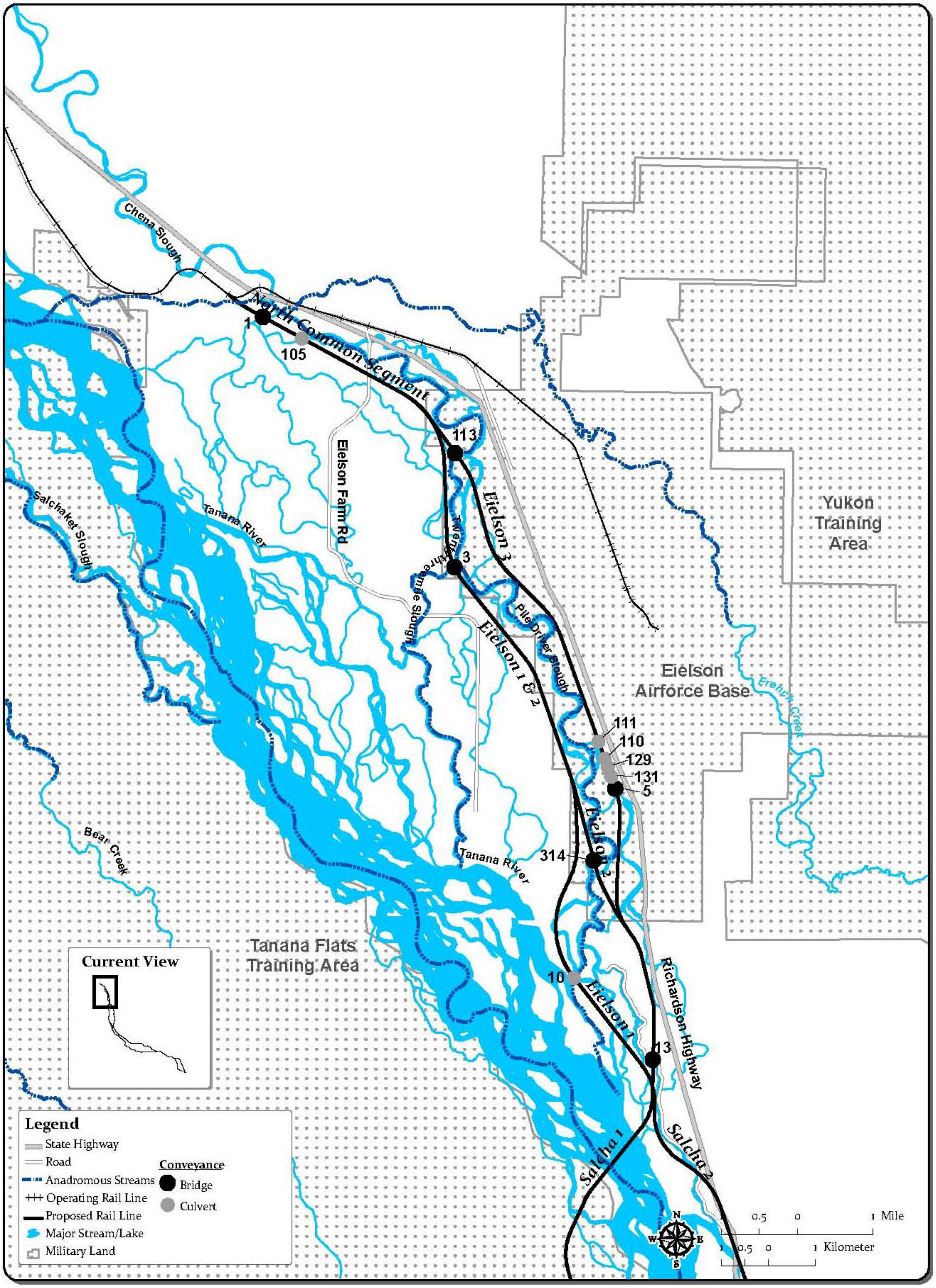

Figure 5-11 – Fish-bearing Streams Crossed by the North Common Segment and Eielson Alternative Segments (ADF&G, 2005; Johnson and Weiss, 2007; Noel, 2007a)

Table 5-20
Fish-bearing Streams Crossed by the Salcha Alternative Segments

Alternative or Segment	Crossing Number ID	Stream Name	Waterbody Type	Fish Use	Channel Width (feet)	Crossing Type	Crossing Size (feet)	Spawning Habitat	Rearing Habitat	Migration Habitat	Over-winter Habitat
Salcha 1		Tanana River	Stream	Anadromous	3,800	Bridge	3,600	√	√	√	√
Salcha 1	89	Un-named	Slough	Resident	34	Culvert	3 x 10[a]	√	√	√	√
Salcha 1	295	Un-named	Stream	Resident	125	Culvert	125		√	√	√
Salcha 2	16	Little Salcha River	Stream	Anadromous	65	Bridge	160	√	√	√	√
Salcha 2	17	Unnamed	Overflow	Probable	20	Culvert	3 x 10	√	√		
Salcha 2	18	Unnamed	Slough	Anadromous	15	Bridge	390	√	√	√	√
Salcha 2		Salcha River	Stream	Anadromous	195	Bridge	2,500[a]	√	√	√	√
Salcha 2		Tanana River	Stream	Anadromous	1,500	Bridge	4,000	√	√	√	√
Salcha 2	22	Unnamed	Slough	Anadromous	130	Bridge	4,000	√	√		
Salcha 2	23	Unnamed	Slough	Anadromous	150	Culvert	3 x 10[a]	√	√		
Salcha 2	340	Unnamed	Stream	Probable	10	Culvert	10		√	√	√
Salcha 2	341	Unnamed	Stream	Anadromous	20	Culvert	2 x 10		√	√	√

Note: Spawning, rearing, migration, or over-winter habitats for either or both anadromous and resident fish species.
[a] The conveyance size is a SEA estimate based on proposed lengths of similar crossings. The final conveyance distance would be determined during final design.

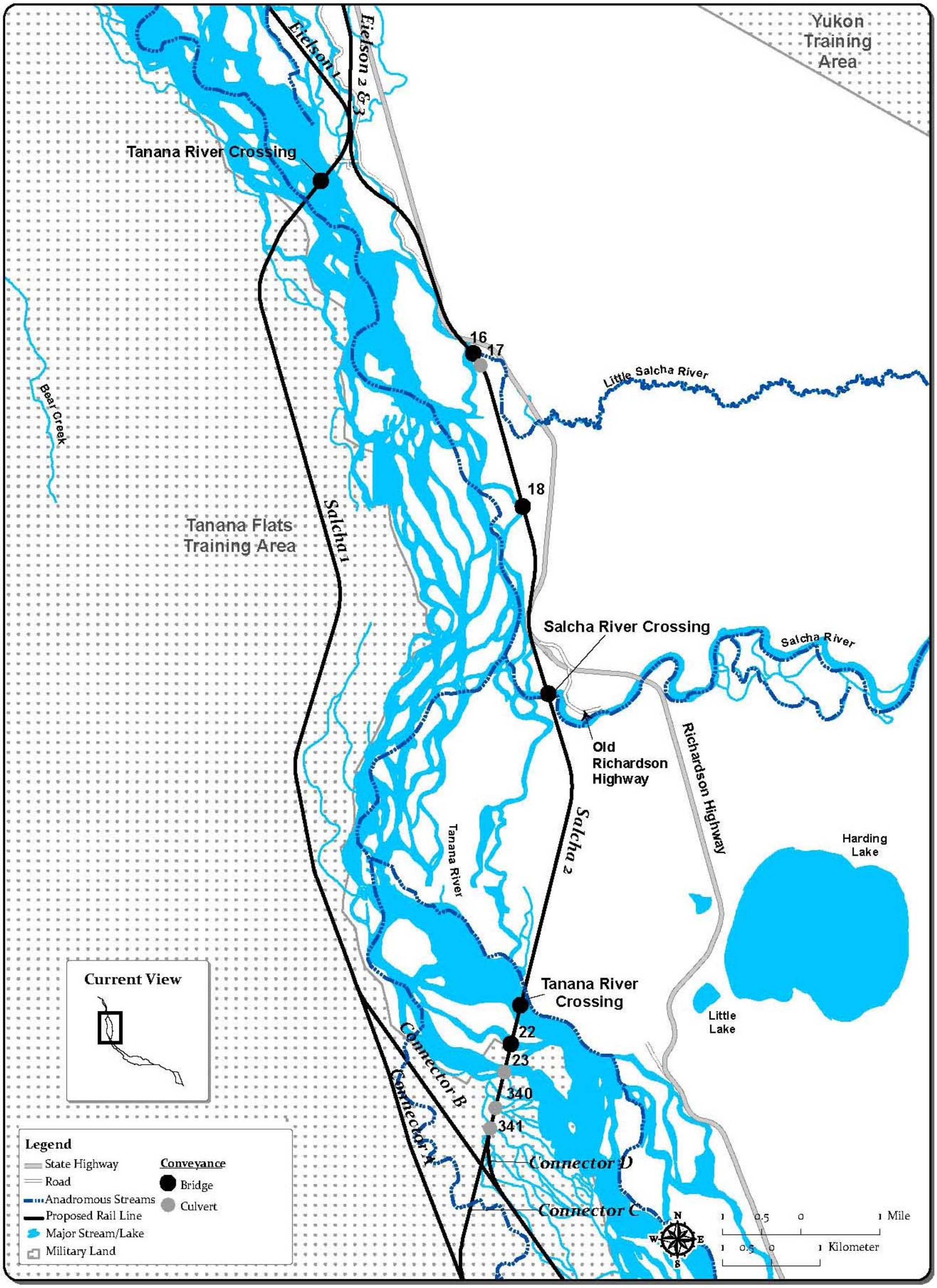

Figure 5-12 – Fish-bearing Streams Crossed by the Salcha Alternative Segments (ADF&G, 2005; Johnson and Weiss, 2007; Noel, 2007a)

the east and west banks of the Tanana River. Revetments change the local hydrology, and though riprap may provide some habitat for juvenile salmonids along the stream reaches that have been severely degraded, riprap does not provide the habitat required for multiple age classes of salmonids or for resident fishes equivalent to that provided by naturally vegetated banks (Schmetterling *et al.*, 2001; Fischenich, 2003). Fall run chum salmon spawn in the numerous side channels of the Tanana River upstream and downstream of both Salcha alternative segments (Barton, 1992; Driscoll, 2008). Bridge abutments, levees, and revetments alter hydraulic patterns resulting in locally altered sediment transport, deposition patterns, and scour, creating unstable depositional features that impact fish habitats, and could limit the delivery of coarse sediments to downstream habitats.

Salcha Alternative Segment 1 includes two additional waterbody crossings (Table 5-20), including one side channel of the Tanana River that provides spawning, summer foraging and rearing habitats for resident fish. A shot-rock revetment and channel plug would be placed across the upstream connection of this side channel; which would result in the creation of a groundwater-fed, clear water slough. Passage of river flow is critical for anadromous fish use of side-channel habitats. Blockage or filling of side-channels and sloughs would cause significant habitat alteration, resulting in the eventual loss of salmon spawning. Flushing flows, which prevent the establishment of beaver dams in side channels and sloughs, would be blocked by revetments and channel plugs. Similarly modified side channels of the Tanana River near Fairbanks exhibit lower dissolved oxygen levels, reduced flows, substrates of finer particle size, and increased pH, hardness, water temperature, specific conductance, and cover (Mecum, 1984); conditions generally unsuitable for salmonids. These changes would reasonably be expected to alter fish use of affected channels by shifting habitats from a riverine to a more littoral character. Salcha Alternative Segment 1 also crosses a small perennial stream that drains a large wetland complex that provides high quality spawning and rearing habitat for arctic grayling.

Salcha Alternative Segment 2 would include eight additional waterbody crossings including the Little Salcha River, the Salcha River, two un-named streams, three un-named sloughs, and one overflow channel. Six of these crossings are documented as anadromous fish streams, while two have probable fish occurrence (Table 5-20). Salcha Alternative Segment 2 would include running the railbed through a side channel of the Tanana River at the confluence of the Little Salcha River. This Tanana River side channel has been identified as fall chum salmon spawning habitat (Barton, 1992; Driscoll, 2008). The channel modification illustrated at the Tanana River crossing for the Salcha Alternative Segment 2 in Figure 2-17, would result in the creation of a major new channel, redirecting all the flow from the existing side channel and likely leading to the destruction of the portions of the vegetated island that are not protected by the shot-rock revetment. The potential for instability of this channel alteration is high, given the highly permeable nature of the gravels supporting the Tanana River bars as discussed in Chapter 4. The Little Salcha River supports chum salmon spawning (Johnson and Weiss, 2007). Salcha Alternative Segment 2 crosses the Salcha River about a mile above the confluence with the Tanana River across potential spawning habitats for fall-run chum salmon and migration habitat for Chinook salmon.

Central Alternative Segments and Connectors

Fish and fish habitats at the 17 crossings of fish-bearing waterbodies crossed by the Central alternative segments and Connectors that would be affected by construction are listed in Table 5-21 and shown in Figure 5-13. Central Alternative Segment 1 crosses one un-named stream which provides spawning and rearing habitat for resident fish. Central Alternative Segment 2 crosses an un-named slough with possible salmon habitat (Table 5-21). This slough periodically receives flow from the Tanana River, which would allow it to provide temporary fish refuge during high-flow events, and as a route for resident and possibly anadromous fishes to and from habitats in the Fivemile Clearwater River and its tributaries. Both crossings periodically receive flow from the Tanana River, and would support seasonal use by resident fish.

Connectors B, C, and E cross the Fivemile Clearwater River, which provides migration and rearing habitat for Chinook and coho salmon and as spawning, migration and foraging habitats for resident fish. The Connectors are widely variable in length and number of stream crossing.

Table 5-21
Fish-bearing Streams Crossed by the Central Alternative and Connector Segments

Alternative or Segment	Crossing Number ID	Stream Name	Waterbody Type	Fish Use	Channel Width (feet)	Crossing Type	Crossing Size (feet)	Spawning Habitat	Rearing Habitat	Migration Habitat	Over-winter Habitat
Central 1	84	Unnamed	Stream	Resident	40	Bridge	40	√	√		
Central 2	35	Unnamed	Overflow	Resident	50	Bridge	130		√	√	
Central 2	38	Unnamed	Overflow	Probable	30	Bridge	75		√	√	
Connector A	85	Unnamed	Stream	Anadromous	80	Bridge	40		√	√	√
Connector B	86	Fivemile Clearwater	Stream	Anadromous	105	Bridge	160	√	√	√	√
Connector B	27	Unnamed	Slough	Anadromous	90	Culvert	2 x 10		√	√	
Connector C	342	Unnamed	Stream	Anadromous	35	Bridge	90		√	√	
Connector C	343	Unnamed	Slough	Probable	20	Culvert	2 x 10		√	√	
Connector C	344	Unnamed	Overflow	Anadromous	90	Culvert	2 x 10		√	√	
Connector C	345	Fivemile Clearwater	Stream	Anadromous	135	Bridge	135	√	√	√	√
Connector C	346	Unnamed	Stream	Anadromous	30	Culvert	3 x 10		√	√	√
Connector C	396	Unnamed	Stream	Anadromous	80	Bridge	40		√	√	√
Connector D	501	Unnamed	Stream	Anadromous	35	Bridge	90		√	√	
Connector D	502	Unnamed	Stream	Anadromous	4	Culvert	2 x 10		√	√	
Connector D	503	Unnamed	Stream	Anadromous	20	Bridge	90		√	√	
Connector D	504	Unnamed	Stream	Anadromous	20	Bridge	90		√	√	
Connector E	351	Fivemile Clearwater	Stream	Anadromous	65	Bridge	115	√	√	√	

Note: Spawning, rearing, migration, or over-winter habitats for either or both anadromous and resident fish species.

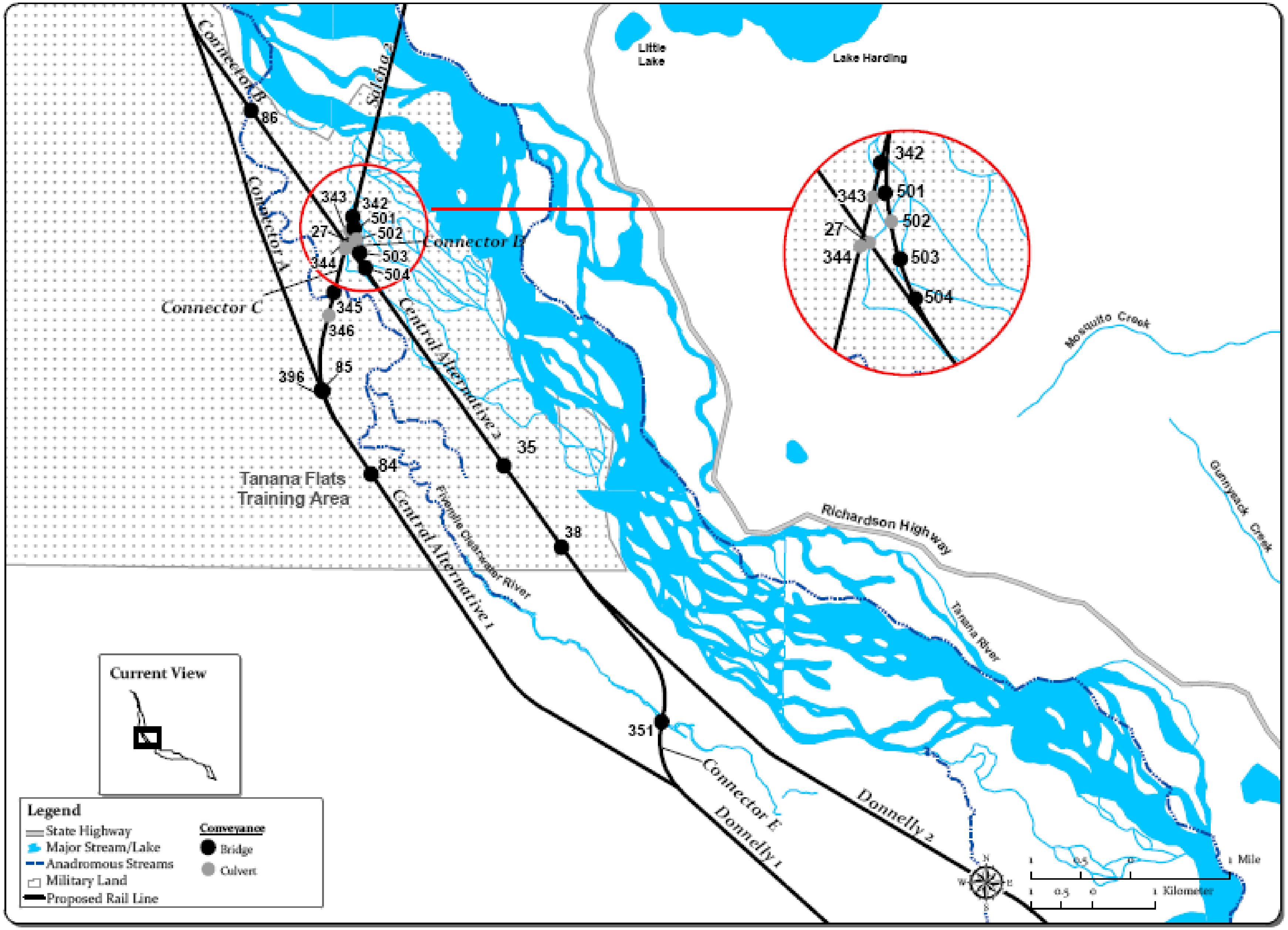

Figure 5-13 - Fish-bearing Streams Crossed by the Central Alternative Segments and Connectors (ADF&G, 2005; Johnson and Weiss, 2007; Noel, 2007a)

Donnelly Alternative Segments

Fish and fish habitats at the 14 crossings of fish-bearing streams crossed by the Donnelly alternative segments are listed in Table 5-22 and shown in Figure 5-14. The Donnelly alternative segments both cross the Little Delta River, Kiana Creek and Delta Creek.

The six streams crossed by Donnelly Alternative Segment 1 provide primarily resident rearing and migration habitats. Donnelly Alternative Segment 1 crossings of the Little Delta River and Delta Creek could be less likely to contain fish habitats than Donnelly Alternative Segment 2 crossings because they are farther from the Tanana River. Resident fish likely use both of these glacial rivers to move between summer foraging habitats and over-wintering habitats in the Tanana River.

Donnelly Alternative Segment 2 crosses the Kiana Creek drainage in the lower reaches compared to Donnelly Alternative Segment 1. The lower portions of the Kiana Creek drainage support coho salmon rearing; and spawning habitats for coho salmon spawning and arctic grayling likely occur in the upper reaches of the watershed, but have not yet been identified. Donnelly Alternative Segment 2 crosses two narrow clearwater streams that flow into a beaver complex, which supports adult arctic grayling and potential spawning habitat for long-nose suckers. These streams appear to be primarily groundwater fed, with the ridges blocking subsurface flows forcing them to the surface, and icings were observed throughout this area during late-winter and spring surveys indicating that the area may provide thermal refuge for over-wintering fish or eggs.

South Common Segment

Fish and fish habitats at the three crossings of fish-bearing streams crossed by the South Common Segment are listed in Table 5-23 and shown in Figure 5-15. The South Common Segment crosses several tributaries of the Richardson Clearwater River; which support coho spawning and rearing. Construction of road and rail line bridges at these three crossings would lead to the removal of some of the few remaining trees that line these streams.

Delta Alternative Segments

Fish and fish habitats at the two crossings of fish-bearing streams crossed by the Delta alternative segments are listed in Table 5-24 and shown in Figure 5-16. Both of the Delta alternative segments cross the Delta River, which supports resident fish especially during seasonal movements. The lower 2 miles of the Delta River provides fall chum and coho spawning habitat where upwelling cleans gravels of glacial silts and maintains sufficient flows to remain unfrozen during the winter. Delta Alternative Segment 1 crosses the Delta River near the confluence of Jarvis Creek; which supports resident fish populations especially during seasonal movements to and from upstream foraging, rearing and spawning habitats.

Table 5-22
Fish-bearing Streams Crossed by the Donnelly Alternative Segments

Alternative or Segment	Crossing Number ID	Stream Name	Waterbody Type	Fish Use	Channel Width (ft)	Crossing Type	Crossing Size (ft)	Spawning Habitat	Rearing Habitat	Migration Habitat	Over-winter Habitat
Donnelly 1	137	Unnamed	Stream	Resident	10	Bridge	40		√	√	
Donnelly 1		Little Delta River	Stream	Resident	30	Bridge	800		√	√	
Donnelly 1	279	Unnamed	Stream	Resident	6	Culvert	2 x 10		√		
Donnelly 1	76	West Kiana Creek	Stream	Resident	3	Bridge	40		√		
Donnelly 1	74	Kiana Creek	Stream	Resident	55	Bridge	65		√	√	
Donnelly 1		Delta Creek	Stream	Resident	200	Bridge	700		√	√	
Donnelly 2	40	Un-named	Stream	Anadromous	75	Culvert	3 x 10	√	√	√	√
Donnelly 2	41	Un-named	Stream	Anadromous	18	Bridge	40	√	√	√	√
Donnelly 2		Little Delta River	Stream	Resident	240	Bridge	900		√	√	
Donnelly 2	252	Un-named	Wetland	Probable	85	Culvert	4		√		
Donnelly 2	100	Kiana Creek	Stream	Anadromous	35	Bridge	80	√	√	√	√
Donnelly 2		Delta Creek	Stream	Resident	160	Bridge	700		√	√	
Donnelly 2	101	Unnamed	Stream	Resident	10	Culvert	2 x 10		√		
Donnelly 2	102	Unnamed	Stream	Resident	5	Culvert	10		√		

Note: Spawning, rearing, migration, or over-winter habitats for either or both anadromous and resident fish species.

Table 5-23
Fish-bearing Streams Crossed by the South Common Segment

Alternative or Segment	Crossing Number ID	Stream Name	Waterbody Type	Fish Use	Channel Width (feet)	Crossing Type	Crossing Size (feet)	Spawning Habitat	Rearing Habitat	Migration Habitat	Over-winter Habitat
South Common	136	Un-named	Stream	Anadromous	10	Bridge	50		√	√	
South Common	103	Un-named	Stream	Probable	35	Bridge	65	√	√	√	√
South Common	104	Un-named	Stream	Anadromous	15	Bridge	40	√	√	√	√

Note: Spawning, rearing, migration, or over-winter habitats for either or both anadromous and resident fish species.

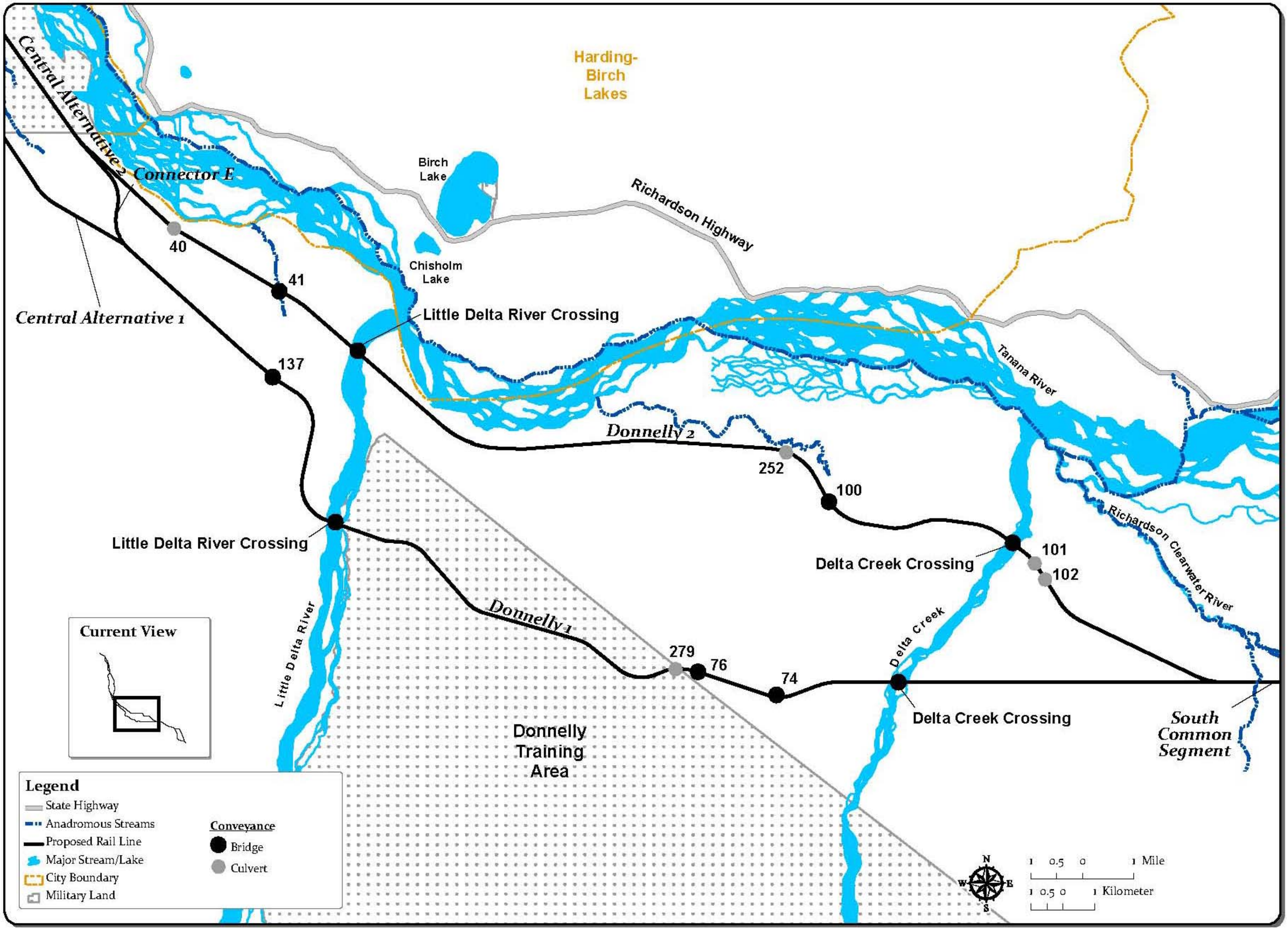

Figure 5-14 – Fish-bearing Streams Crossed by the Donnelly Alternative Segments (ADF&G, 2005; Johnson and Weiss, 2007; Noel, 2007a)

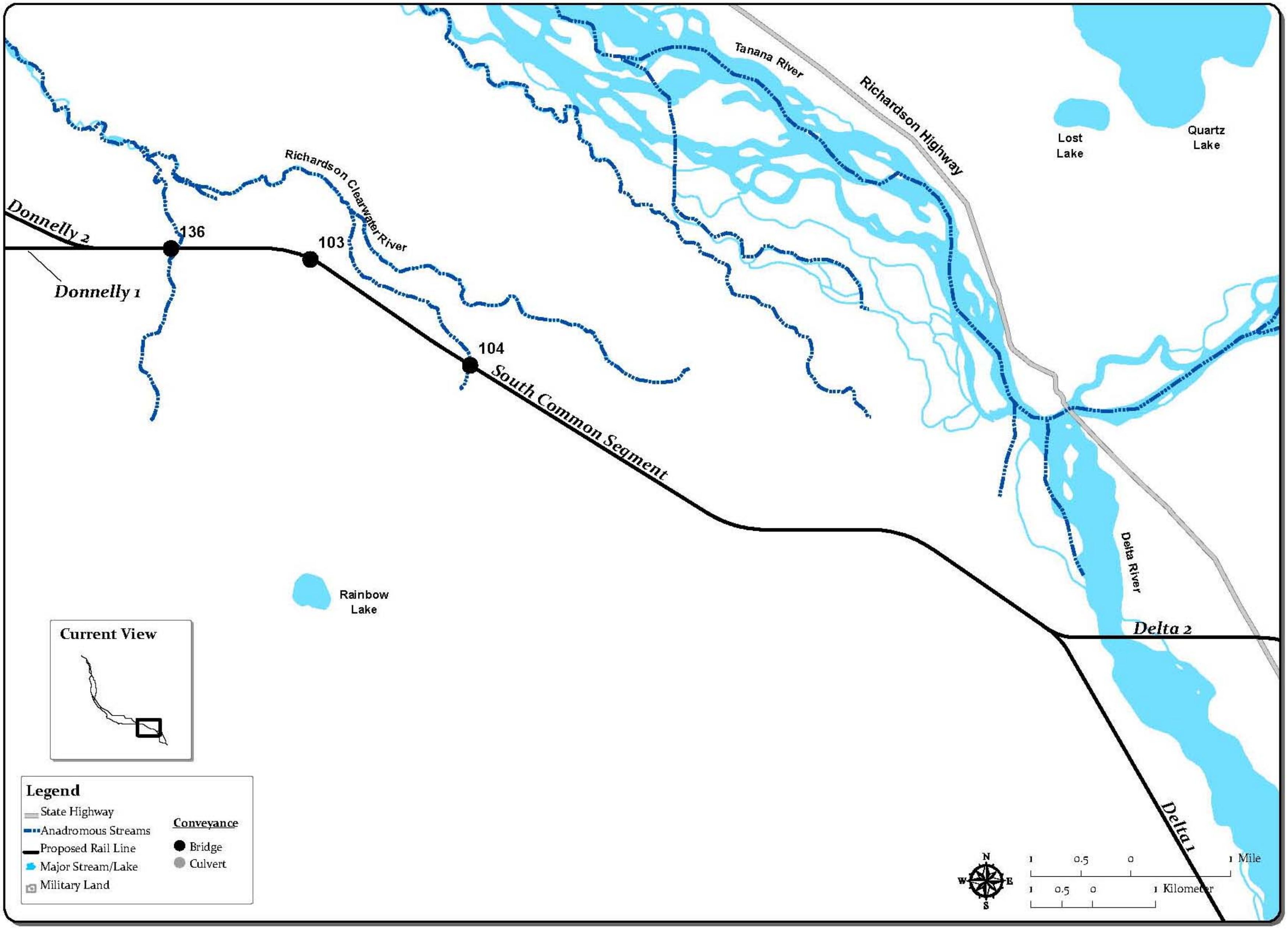

Figure 5-15 - Fish-bearing Streams Crossed by the South Common Segment (ADF&G, 2005; Johnson and Weiss, 2007; Noel, 2007a)

Table 5-24
Fish-bearing Streams Crossed by the Delta Alternative Segments

Alternative or Segment	Crossing Number ID	Stream Name	Waterbody Type	Fish Use	Channel Width (feet)	Crossing Type	Crossing Size (feet)	Spawning Habitat	Rearing Habitat	Migration Habitat	Over-winter Habitat
Delta 1		Delta River	Stream	Resident	630	Bridge	2000		√	√	
Delta 2		Delta River	Stream	Resident	290	Bridge	2000		√	√	√

Note: Spawning, rearing, migration, or over-winter habitats for either or both anadromous and resident fish species.

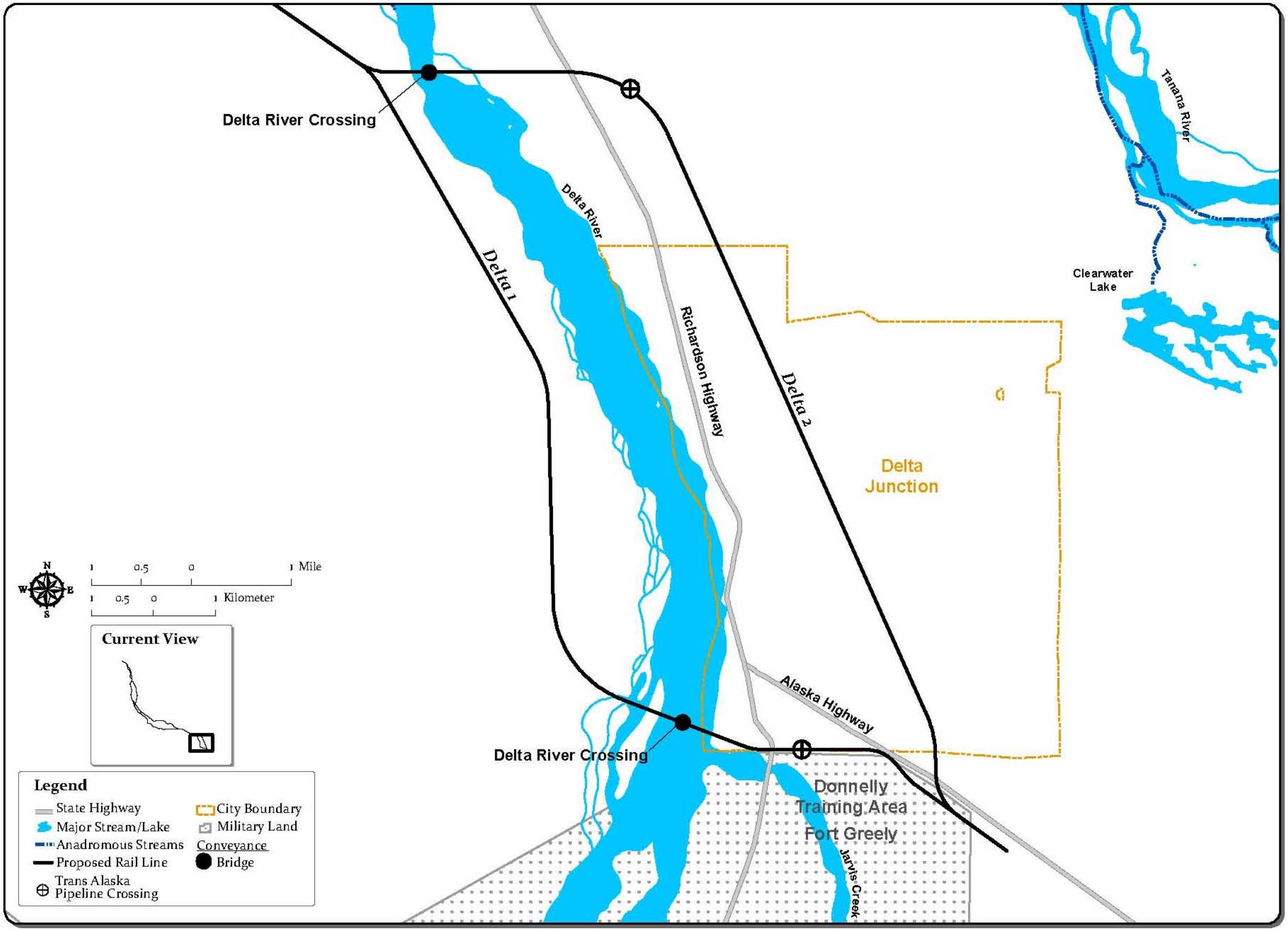

Figure 5-16 – Fish-bearing Streams Crossed by or Near the Delta Alternative Segments (ADF&G, 2005; Johnson and Weiss, 2007; Noel, 2007a)

No-Action Alternative

Under the No-Action Alternative, impacts on fisheries resources from rail line construction and operations activities would not occur.

5.4.3 Summary of Impacts to Fisheries

The primary impacts to fisheries from construction and operation of the proposed NRE would be loss and degradation of instream and riparian habitats due to placement of structures, alteration of stream hydrology and blockage of movements. Alterations of stream hydrology caused by conveyance structures are discussed in Chapter 4. The primary impact of instream gravel removal would be temporary or permanent habitat alteration depending on the amount of gravel removed and the gravel recharge rate. Most effects from the construction and operation of the project would include increased erosion and sedimentation from removal of riparian vegetation, and loss or alteration of stream and riparian habitats. All stream crossings would result in some loss and degradation of instream and riparian habitats as discussed in Chapter 4. Bridged crossings would normally result in a smaller area of instream habitat loss compared to closed bottom culverts. In general, clear-span bridges (those without instream bridge pilings) would have less potential to create conditions that would cause blockage of fish movements. Most alternatives would cross previously identified anadromous fish streams with bridges. The proposed action would require 27 fish-stream crossings, including eight crossings of anadromous fish streams, 18 crossings of resident fish streams, and one crossing of a stream containing fish habitat (Table 5-25). In addition to these crossings, Salcha Alternative Segment 2 would result in filling and alteration of a Tanana River side channel near the outflow of the Little Salcha River, and Delta Alternative Segment 1 would run next to Jarvis Creek, a resident fish stream. Construction and operation of the Tanana River bridge and river training structures in the river channels associated with Salcha Alternative Segment 1 and Salcha Alternative Segment 2 would have direct adverse effects on anadromous and resident fish habitats in the vicinity of the structures. The minimum number of fish-bearing stream crossings that would be required for NRE would be 19 (74 percent bridges, 63 percent resident fish streams), and the maximum number would be 35 (63 percent bridges, 46 percent resident fish streams). Most (67 percent) fish-stream crossings for the proposed action would use bridges, and would cross primarily (67 percent) resident fish streams (Table 5-25). Construction of the NRE would have moderate impacts to resident and anadromous fisheries resources in the project area.

5.5 Game Mammal Resources

This section discusses the existing game mammal conditions in the project area as well as potential impacts resulting from the project.

Table 5-25
Summary of Fish-bearing Streams Crossed by the NRE Alternative Segments

Alternative or Segment	Anadromous Fishes	Probable Fish Habitat	Resident Fishes	Total Crossings	Spawning Habitat	Rearing Habitat	Migration Habitat	Over-winter Habitat	Bridges	Culverts
North Common Segment	1		1	2	2	2	1	1	1	1
Eielson 1	2			2	2	2	2	2	1	1
Eielson 2	2		1	3	2	3	2	2	3	
Eielson 3	1		6	7	1	7	1	1	3	4
Salcha 1	1		2	3	2	3	3	3	1	2
Salcha 2	7	2		9	7	9	6	6	5	4
Central 1			1	1	1	1			1	
Central 2		1	1	2		2	2		2	
Connector A	1			1		1	1	1	1	
Connector B	2			2	1	2	2	1	1	1
Connector C	5	1		6	1	6	6	3	3	3
Connector D	4			4		4	4		3	1
Connector E	1			1	1	1	1		1	
Donnelly 1			6	6		6	4		5	1
Donnelly 2	3	1	4	8	3	8	5	3	4	4
South Common Segment	2	1		3	2	3	3	2	3	
Delta 1			1	1		1	1		1	
Delta 2			1	1		1	1	1	1	
Proposed Action[a]	8	1	18	27	9	27	18	8	18	9
Minimum Crossings Alternative[c]	7	0	12	19	9	19	15	10	14	5
Maximum Crossings Alternative[b]	16	3	16	35	15	35	22	13	22	13

Note: Spawning, rearing, migration, or over-winter habitats for either or both anadromous and resident fish species.

[a] Proposed action includes North Common, Eielson 3, Salcha 1, Connector B, Central 2, Connector E, Donnelly 1, South Common, and Delta 1.

[b] Minimum crossings includes North Common, Eielson 1, Salcha 1, Connector A, Central 1, Donnelly 1, South Common, and Delta 1.

[c] Maximum crossings includes North Common, Eielson 3, Salcha 2, Central 1, Connector C, Donnelly 1, South Common, and Delta 1.

5.5.1 Affected Environment

The proposed NRE would be located within ADF&G's Game Management Unit (GMU) 20 (50,397 square miles); and more specifically, crossing through subunits 20A (6,796 square miles), 20B (9,114 square miles), and 20D (5,637 square miles) (Figure 5-17). Moose and black bears are the primary big game mammals occurring within the project area, which is defined as the area within 5 miles of the proposed alternatives. The eastern end of the proposed rail line is home to the Delta bison herd. Trappers primarily harvest marten, beaver, red fox, lynx, mink, and wolves in the project area. The descriptions of abundance, distribution, harvest, and life histories developed for this section were compiled from various sources including ADF&G's GMU 20A, 20B, and 20D Management Reports; ADF&G's Wildlife Notebook Series; and NatureServe, Animal Diversity Web.

Bison

Plains bison were introduced to Alaska in 1928 to the Delta River, near the mouth of Jarvis Creek, from the National Bison Range in Montana. The free-ranging Delta bison herd has been maintained by hunting at approximately 450 animals since the 1990s (DuBois, 2004a). Fire suppression in the range of the reintroduced bison led to an increase in forested habitats. The increase in forested areas reduced foraging habitat for the plains bison, which feeds on graminoid vegetation such as sedges and grasses.

In the Delta area, bison began to use hay crops and cereal grains during the fall and winter as farms were developed within the herd's traditional winter range. Conflict between bison and the agricultural community escalated with development of the Delta Agricultural project in 1979, which lead to the establishment of the 90,000-acre Delta Junction State Bison Range (Figure 5-17). The purpose of the bison range is to provide adequate winter range and to alter seasonal movements of bison to reduce damage to agriculture. Winter habitat development in the bison range includes annual fertilization of about 500 acres, forage management using controlled burns, and mowing and disking to control over growth of the native bluejoint reedgrass.

Bears

Black and brown (grizzly) bears are common in GMU 20. During spring, black bears use moist lowlands where early growing vegetation, especially horsetail (*Equisetum* spp.), comprises the bulk of their diet. Black bears also eat carrion moose calves, and salmon when available. During fall, black bears primarily feed on berries, especially blueberries, in open meadows or alpine areas. Black bears selectively use black spruce-tamarack forests with abundant low-bush cranberries and blueberries in the fall and broadleaf forests with horsetails in the spring (Smith, 1994). Brown bears feed on a variety of plants and animals; using their long claws to expose ground squirrels in burrows and dig roots. Brown bears feed on berries, grasses, sedges, horsetails, cow parsnips, fish, roots, and various mammals including ground squirrels, and moose and caribou calves.

Black bears mate during June and July. Brown bears mate during May through July. As food becomes scarce and temperatures drop in the fall, both black and brown bears go into hibernation in dens generally excavated into small mounds, hillsides or river terraces. Bears may remain dormant in winter dens as long as 7 to 8 months. Sows give birth to their young while in their

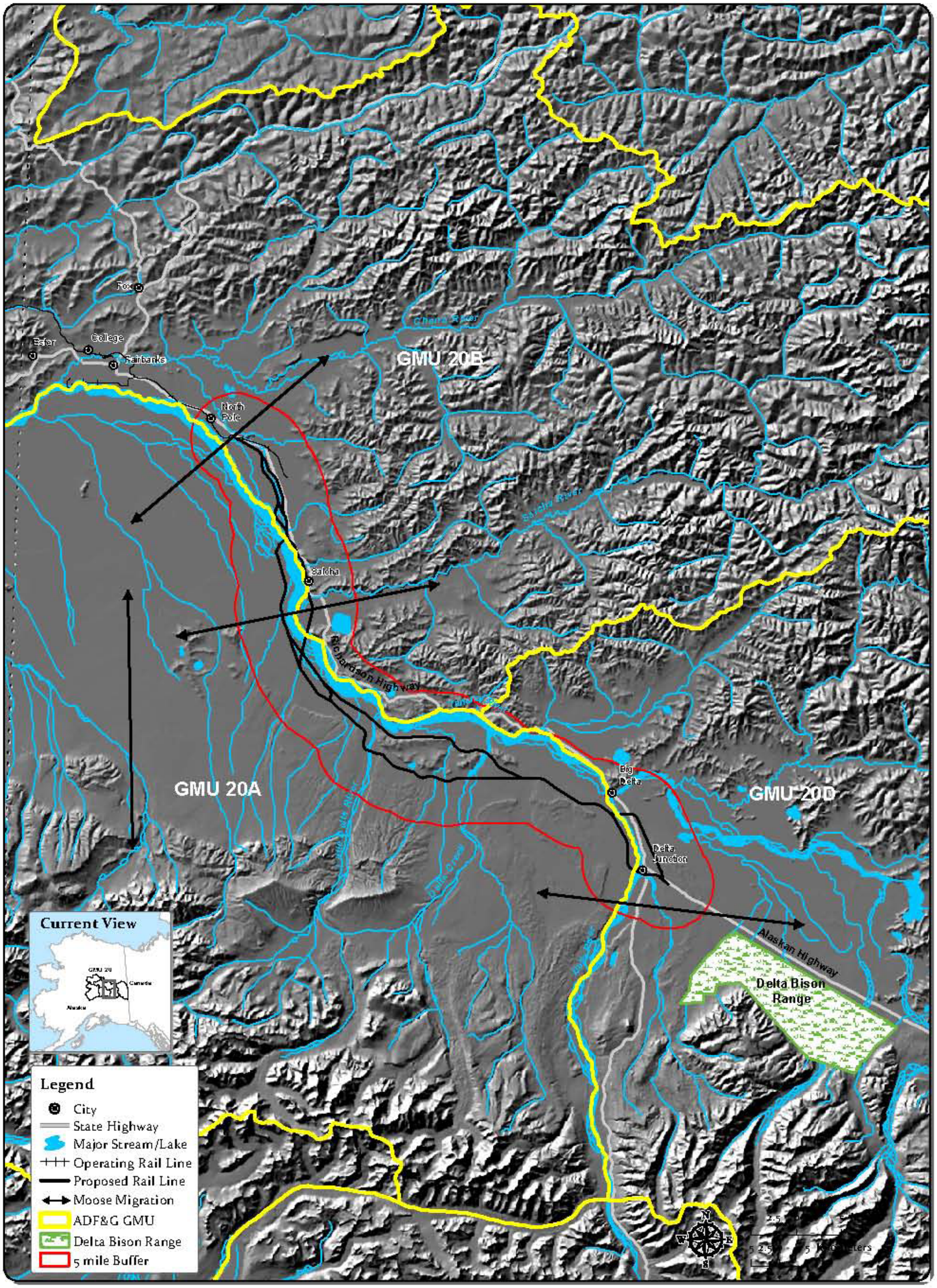

Figure 5-17 – Alaska Department of Fish and Game's Game Management Units, Moose Migration Directions, and the Delta Bison Range

winter dens and emerge with their young in May. Black bear cubs remain with the female for 1 or 2 years, while brown bear cubs remain with the female for 2 to 3 and up to 5 years.

An average of 222 black bears per year was harvested by hunters in GMUs 20A, 20B and 20D from 2001 to 2003. Most black bears are harvested during May and June by local resident hunters as bears emerge from their dens. Harvest is generally concentrated in areas where road systems facilitate access and transport of baits for bait stations. An average of 34 brown bears was harvested annually by hunters in GMUs 20A, 20B, and 20D from 2000 to 2004, mostly in the fall.

Caribou

Two caribou herds may occur within the project area. The Delta caribou herd ranges in the northern foothills of the central Alaska Range between the Parks and Richardson highways, and the Macomb caribou herd ranges in the northern foothills of the eastern Alaska Range between the Richardson Highway and the Robertson River. Caribou from the Delta and Macomb herds are most likely to occur within the project area during the late fall and winter, but would generally not be common in this section of the Tanana River Valley.

Moose

Moose are distributed throughout Alaska and are the primary large mammal harvested within the Tanana River Valley. The moose population in central GMU 20A have been the subject of intensive research and management for decades. Moose in central GMU 20A have been maintained at a high population density and nutritional studies of the area indicate that the population is nutritionally stressed (Boertje *et al.*, 2007). The moose population in GMU 20A appears to have peaked about 2002 at nearly 15,000 individuals, followed by a declining trend in 2004 and 2005 to around 13,000 individuals (ADF&G, 2008a; Young, 2004a and 2006a). The moose population in GMU 20B is also managed for high density because of high demand for moose hunting opportunities in this region which is accessible by roads and waterways. This population appears to have increased since the early 1990s and was numbered at approximately 14,000 individuals in 2005 supporting an average harvest of about 650 moose per year (Young, 2006b). The moose population in GMU 20D has also been increasing since the mid 1990s to approximately 5,500 individuals in 2005, although population and harvest management objectives have not been met (DuBois, 2006b). In all three game management subunits, vehicle collisions continue to be a source of mortality, as is mortality due to collisions with trains in GMU 20A and 20B (see Appendix F for discussion of collision-related moose mortality). Primary predators of moose calves in this region are wolves, black bears and grizzly bears (Boertje *et al.*, 2000). Moose in this region include both migratory and non-migratory populations (Gasaway *et al.*, 1983). Migratory moose ranges may be over 200 square miles, while non-migratory moose may range 100 square miles (Ballard *et al.*, 1991). Moose range size is influenced by the sex and age of the individual, the range characteristics of the cow, and habitat conditions. During calving in mid-May to June, cow moose generally select habitats with heavy cover such as dense tall shrub or closed needleleaf forests. Moose forage on sedges, horsetail, pondweeds and grasses during the spring, and vegetation in shallow ponds, forbs and the leaves of birch, willow and aspen during the summer. Aquatic habitats provide aquatic and emergent vegetation, insect relief, drinking water and water for cooling to assist with thermoregulation. Moose mate during September to October, selecting more open habitats during the rut. During the fall, moose transition from a leafy to a woody diet, feeding on willow, birch, and aspen twigs during the winter. Moose generally use open areas with abundant shrub forage during winter. Moose are well adapted to traveling across snow, but depth of more than 28 inches can affect moose movements and habitat use. Moose may seek closed canopy needleleaf forests, which generally have lower snow depths, as snowpack reaches more than 38 inches (Peek, 1997).

Wolves

Wolves are common throughout the Tanana River Valley. Wolves are social animals that live in packs of 2 to 12 animals; which usually include parents and pups with larger packs of multiple females and two or three litters of pups. Wolves breed in February and March, and litters are born in May or early June, averaging four to seven pups. Pups are born in a den excavated in well drained soil. Wolves center their activities around their den sites, traveling as far as 20 miles in search of food to bring back to the den. Pups are weaned during mid-summer, and pups are usually moved away from the den in mid to late-summer.

Wolf populations in GMUs 20A, 20B, and 20D are managed to provide for compatible human uses including hunting, trapping, photography, viewing, listening, scientific and educational purposes (Young, 2006c; DuBois, 2006c). Management of wolves focuses on providing sustained, diverse uses (Young, 2006c). Most harvested wolves are taken by trappers using snares and traps although some are shot by hunters, with an average annual harvest of 78 wolves per year in GMU 20A; 79 wolves per year in GMU 20B; and 29 wolves per year in GMU 20D (Young, 2006c; DuBois, 2006c).

The primary foods of wolves in GMU 20 are moose and caribou. During winter a pack may kill a moose every few days. Wolf and prey populations can be affected by a number of factors including weather and food availability. Severe winters coupled with active wolf and bear predation can contribute to local big game scarcities. Within GMU 20, wolf numbers are primarily regulated by prey availability (Gasaway *et al.*, 1983; NRC, 1997), but wolf-control programs have been used periodically to reduce wolf populations to enhance the harvestable surplus of moose and caribou. Because availability of moose and caribou for human consumption has been a dominant interest of GMU 20 residents, wolf control measures were initiated within the GMU to reverse moose and caribou population declines. Fall wolf populations within these three subunits appear to have remained fairly stable, at around 500 individuals, from 1998 to 2005 (Young, 2003 and 2006c; DuBois, 2003 and 2006c).

Furbearers

There are no comprehensive surveys throughout the project area for furbearers to indicate density or abundance. Common furbearers harvested in the project area are listed in Table 5-26. The primary species targeted by trappers in this area are marten, wolf, wolverine, and lynx (Blejwas, 2006). Wolverine are also harvested by hunting. Harvest data give an indication of abundance and are used by wildlife managers. However, as access into remote areas is increased by the creation of transportation alignments, harvest data can give a false impression of species abundance as new areas are opened and local populations are reduced through harvest. Most trappers in Interior Alaska use traps or snares to harvest furbearers and run their traplines using snow machines and highway vehicles (Blejwas, 2006). Wildlife managers request that trappers

Table 5-26
Estimated Abundance, Population Trends, and Harvest of Furbearer for GMUs 20A, 20B, and 20D Within the Project Area

Common Name	Species	Relative Abundance	Trend	20A Harvest Estimate	20B Harvest Estimate	20C Harvest Estimate	*Totals*
Beaver	*Castor canadensis*	abundant	none	153	871	24	1,048
Coyote	*Canis latrans*	common	none	94	141	29	264
Short-tailed Weasel (Ermine)	*Mustela erminea*	common	none	47	165	6	218
Lynx	*Lynx canandensis*	scarce	none	371	33	29	433
Marten	*Martes americana*	common	none	1,024	1,671	306	3,001
Mink	*Neovison vison*	common	none	365	35	12	412
Muskrat	*Ondatra zibethicus*	scarce	none	0	0	41	41
Red Fox	*Vulpes vulpes*	common	none	406	141	141	688
Red Squirrel	*Tamiasciurus hudsonicus*	abundant	none	94	141	29	264
River Otter	*Lontra canadensis*	scarce	none	9	9	0	18
Wolf	*Canis lupus*	common	decline	75	69	69	213
Wolverine	*Gulo gulo*	scarce	none	16	5	11	32
All Furbearers				2,654	3,281	697	6,632
Prey Species							
Hare	*Lepus americanus*	common	increase	(Abundance peaked during 2006; ADF&G 2008c)			
Grouse		common	none	(Abundance peaked during 2005; ADF&G 2008c)			
Ptarmigan	*Lagopus* spp.	scarce	none	(Abundance peaked during 2006; ADF&G 2008c)			
Mice/Rodents		abundant	increase				

Notes: Harvest estimates are for the 2004-2005 season based on the ADF&G's Trapper Questionnaire (Blejwas, 2006). Questionnaire totals were adjusted by percent of sealed furs using either the reported percentages or the average percentage for Region 3 – Interior Alaska (Blejwas, 2006).

qualitatively evaluate furbearer abundance to indicate if populations appear to be increasing or decreasing; these qualitative trends are reported in Table 5-26 (Blejwas, 2006).

Furbearers are quite varied in ecology and habitat use. Beaver, mink, muskrat and river otter all depend on aquatic habitats, but only beaver and muskrat forage on vegetation. Ermine and mink prefer riparian woodlands and feed on small warm-blooded mammals, but will eat birds, eggs, frogs, fish and insects. Wolverine, a weasel relative, are habitat generalists which can be expected to use available forested and riparian habitats within the project area. They are solitary animals that are primarily scavengers, although they will also prey on small mammals.

The canids—red fox, coyote and wolf—range widely using many habitat types with home range size increasing with the increasing size of the species. Foxes, coyote, and wolves are susceptible to rabies, distemper, and other diseases which may cause periodic declines in populations; although rabies has not been demonstrated to cause declines in Interior Alaska populations. These three species compete for smaller prey and will exclude the smaller species from their range such that, foxes are less abundant where coyote are common, and coyote are absent or scarce where wolves are abundant.

Lynx also have a wide range; the size of their range is dependent on prey availability. Lynx populations are particularly influenced by hare populations, which in turn are regulated through vegetation following an 8 to 10-year cycle. All furbearers use some type of nest, den, or burrow for reproduction and some species use these structures year-round. Some species rely on delayed implantation to separate and regulate the breeding and birthing periods.

5.5.2 Environmental Consequences

The magnitude of environmental consequences of construction and operation of the NRE on game mammals would be influenced by the animal's dependence on specific habitats, the availability of preferred and used habitats, the amount of preferred habitat affected by the project, ecology and life history, and past and current population trends. Because game mammal populations are managed for sustainable human harvest, project-related effects on population abundance, distribution, available habitat, and predator-prey relationships would also affect management of these game mammals. Supporting descriptions of environmental consequences, results of quantitative analyses and illustrations are presented in Appendix F.

Impacts common to all alternative segments are presented first, followed by a discussion of these impacts as they apply to the common game mammals. Most effects from construction and operation of the NRE would be similar for game mammals regardless of the specific alternative segment selected for construction and are discussed under common impacts. In a few cases, construction or operation impacts for game mammals from individual alternative segments could differ and these are discussed under the specific alternative segments. Some game mammal resources are limited in distribution within the project area and affects of construction and operation of the NRE on these resources are discussed under the specific alternative. Proposed mitigation for impacts to game mammals is presented in Chapter 20 of the EIS.

Methodology

Effects on game mammals from the construction and operation of the proposed NRE were evaluated based on habitat use, habitat requirements, and seasonal movements of game mammals within the project area. Habitat analysis for game mammals was based on the vegetation analyses presented in the EIS, and the reported density of animals expected within the project area.

Habitat fragmentation due to roads and trails was evaluated by comparing the existing density of roads and trails (miles per square mile) within 9.5-square-mile (25–square-kilometer) blocks established to summarize aerial transect survey data. Original road and trail density was calculated, as was the density after including the proposed NRE. The difference between the existing road and trail density within the analysis block, the increase in density as a result of construction of the NRE, and the final post-construction density were compared. The NRE was treated as a single alignment, even though it includes adjacent rail and road alignments within the 200-foot ROW along most of the route.

Fragmentation of riparian areas was based on GIS data that includes 25-foot buffers (50 feet total width) for riparian areas of minor rivers and 100-foot buffer (200 feet total width) for riparian areas of major rivers. Spatial analyses were completed using ArcGIS and hydrology data taken from U.S. Geological Survey 1:63360-scale mapping for water. Major rivers were defined as the Tanana River, Salcha River, Richardson Clearwater River, Fivemile Clearwater River, Delta Creek, Little Delta River and Delta River.

Potential fragmentation of large contiguous habitat areas, referred to as core areas or habitats, was evaluated by visual comparison and consideration of spatial statistics generated using the Patch Analyst extension for ArcGIS. Core habitats were created from the existing landcover map (BLM *et al.*, 2002) by aggregating polygons constructed from the raster image by landcover class within the 5-mile area surrounding the alternative segments. Core areas were constructed using a 100-foot buffer, based on the 98-foot (30-meter) pixel size for the landcover map. Core habitats that would be crossed by the alternative segments were then identified and spatial statistics were computed. A buffer of the proposed NRE was then created and used to produce fragmented core habitats. The fragmented core habitats were then compared to the original core habitats both visually and using spatial statistics.

Rail collision mortality for moose was estimated based on the reported annual mortality for moose from the existing 58 miles of rail line currently running through GMU 20B. Locations with suspected increased frequency of collisions were evaluated based on winter moose track survey data (Noel, 2006b), and moose distribution data collected during spring and fall aerial transect surveys (Noel, 2007b).

Common Construction Impacts

This section describes the common types of environmental consequences that construction-related activities could have on game mammals. In situations where certain game mammals are more susceptible to a construction action, the impact is explained in detail under the type of mammal. Construction would include clearing the ROW and laying the new rail line, installing communication towers and power lines, operation of work camps and construction staging areas as well as potential borrow area sites. Some impacts would be initiated during construction but would continue through operations, such as habitat modification and impacts from power lines and communication towers.

- **Habitat loss, alteration, and fragmentation**. Construction of the rail line and additional facilities would result in short-term disturbance and long-term habitat loss and modification within the ADF&G's GMUs 20A, 20B and 20D. The NRE would require removal of about 2,800 to 3,000 acres of mainly undisturbed native vegetation across the Tanana River Valley. For all cover types, the maximum area of impact would represent less than one percent of habitats available within 5 miles of the proposed alternatives. Review and analysis of land cover mapping (BLM *et al.*, 2002) indicates that the rail alignment would contribute to habitat fragmentation of forested and riparian habitats. Habitat fragmentation-related issues relevant for game mammals include barriers to movement, creation of edge effects, reductions in core areas of available habitats, facilitation of predator movements, intrusion of invasive species, and intrusion of humans (Jalkotzy *et al.*, 1997). Much of the habitat that would be crossed by the proposed rail line has not been previously fragmented by improved transportation alignments; however, an extensive network of trails can be found in the area.

- **Direct mortality from construction.** Construction-related traffic along the access and maintenance roads would involve many gravel haul truck trips as well as other traffic. Game mammals could be hit and killed by construction vehicles traveling back and forth, especially in areas or weather conditions with poor visibility coincident with high traffic levels. Game mammals in hibernation or in dens with young that are unable to move during construction could be killed during clearing and excavation. Food- conditioned bears investigating worksites or construction camps may end up as Defense of Life or Property mortalities. Additional hunting mortality could occur if workers are allowed to hunt from work camps.

- **Reduced survival from exposure to construction noise and from increased human activity**. Construction noise and human activity could cause mammals to flee from hibernation sites or abandon young. Abandoned young could die and energy expended fleeing could cause reduced survival over harsh winter months. Game mammals that reuse den or nest sites could be forced to abandon them due to proximity to the project. This would require extra energy and could reduce survival. Bears and moose may be intentionally harassed by hazing to protect workers and equipment.

- **Loss of breeding success from exposure to construction noise and from increased human activity**. Construction during individual breeding seasons of game mammals could lead to loss of breeding success especially if mammals are differentially displaced because of sex or age. Construction in favored breeding habitats could result in energy spent finding more suitable habitats thus limiting survival of offspring or adults.

- **Reduced survival or mortality due to spills and leaks of toxic materials.** Game mammals could be exposed to leaks of fuels, oils, antifreeze and other toxic substances used to operate and maintain equipment used during construction. Many game mammals are curious and could experience fatalities if toxic substances were ingested either directly or through self cleaning of oiled fur or hair. Canids and bears are both attracted by antifreeze.

Bears

The proposed action and alternatives would have similar effects on black and brown (grizzly) bears. Based on the reported densities, an estimated 118 to 177 black bears and three to eight brown bears would occur within 5 miles of the proposed NRE. Aerial transect surveys during the spring and fall identified brown bears near proposed alternative segments during fall surveys only (Noel, 2006a).

Black and brown bear foraging habitat that would be affected by construction of the proposed NRE are summarized in Appendix F. The proposed project would affect less than 1 percent of available habitat within 5 miles of the proposed alternatives. This level of habitat loss or alteration would likely be of no consequence to existing black and brown bear populations.

Habitat fragmentation may be of more consequence to black and brown bears than direct habitat loss or alteration. It is likely that most bears would be displaced from habitats within as much as 0.3 mile from roads, especially during spring (Waller and Servheen, 2005) by heavy construction-related traffic. In some areas, the existing road densities are sufficient to displace black bears (2 miles per square mile) and brown bears (0.5 mile per square mile) (Jalkotzy *et al.*, 1997). The NRE would increase area road densities sufficient to displace black bears from the current value of 9 percent to a predicted value of 12 percent, and would increase area road densities sufficient to displace brown bears from the current value of 36 percent to a predicted value of 52 percent of the 316-square-mile area analyzed. Displacement of bears, however, would be of unknown consequence because differential habitat values for the surrounding region are not quantified.

The access road and rail line could act as a fire break leading to decreased incidence of wildland fires spreading across the rail alignment. Fire could be beneficial to bears by increasing plant growth and berry crops leading to increased forage and prey animals. It could also be detrimental to bears by clearing large areas of forest, thus reducing black bear numbers, or adversely affecting salmon streams, thus reducing prey.

Bears use riparian corridors for travel and forage. Fragmentation of riparian habitats would occur due to construction of the proposed rail line across rivers and streams, and by excavation of gravel sources within river beds. Most major rivers would be crossed by bridges, which generally would have sufficient height and span to allow bears to cross beneath them. If construction of bridges and bridge approaches for streams with salmon spawning runs occurred coincident with these runs during the summer into early winter, bears could be temporarily displaced from these foraging habitats.

The proposed action and alternatives could coincide with den sites. Because some of these sites would be reused (18 percent), destruction of an unoccupied den site could reduce survival of the individual attempting to reuse the site (Smith, 1994). Several black bear dens were located on bars in the Tanana (Smith, 1994). Fall and winter vegetation clearing activities and excavation would potentially affect approximately one black bear den based on the minimum and maximum project areas and the estimated density of black bears in the project. While effects to a few individuals could occur, effects to the population would be minor. No brown bears would be expected to den within the project area.

Food-conditioned bears could be attracted to the worksites if foods and garbage create odors. If bears investigating worksites or construction camps gain access to foods or garbage, they would not avoid these areas and would likely end up as Defense of Life or Property mortalities. Sows which become food-conditioned teach their cubs to also associate humans with food, which can eventually lead to the destruction of entire family groups. Between 2001 and 2005, six black bears and six brown bears were killed in Defense of Life or Property in GMUs 20A, 20B and 20D (ADF&G, 2005b).

Caribou

Caribou from the Delta and Macomb herds are most likely to occur within the project area during the late fall and winter, but would generally not be common along the rail line. If the Fortymile Caribou herd were to increase in size and range, these animals could also winter near the NRE. Within the project area, needleleaf forests, open broadleaf forest, graminoid and bryoid/lichen habitats would contain plants and lichens preferred by caribou as winter forage. Direct habitat loss would affect less than one percent of habitats available within 5 miles of preferred alternatives.

Winter construction would have the greatest potential to disrupt caribou within the region. A few caribou could be hit by construction vehicles. Construction activities could displace caribou from winter foraging habitats which could increase their energy expenditure leading to reduced survival. However, few caribou would be expected within the region and any mortality due to collisions, or reduced survival or reproduction due to disturbance and displacement would be expected to be negligible.

Moose

Preferred moose habitats include riparian willow, poorly drained meadows, and early succession forests. Direct habitat loss would affect less than one percent of habitats available within 5 miles of the proposed alternatives. Based on fall moose densities, adjusted by proportion of the project area within each GMU, habitat used by an estimated 12 moose would be lost or substantially altered by construction of the project.

Moose reproduction parameters, population size, and trend and browse condition within the region indicate that availability of high quality forage may be inadequate for the size of the moose population within the GMU 20A portion of the project area (Boertje *et al.*, 2007). Some of the most valuable browse for moose—broadleaf forests and tall shrub habitats—are not abundant within the project area. These habitats account for about 15 percent of habitats within 5 miles of the proposed action and alternatives and total acres removed would be less than one percent of habitats available within 5 miles of the proposed alternatives. The area of vegetation removed, however, may underestimate the total habitat impact if moose avoid roadways (Rolley and Keith, 1980). Snow conditions and migratory behaviors could negate avoidance, however, and because moose use a variety of habitats, and readily cross transportation alignments during most of the year, habitat loss and fragmentation by the rail line would generally be of minor consequence to moose.

Wolves

Wolves sometimes den in areas such as the low rise south of the Tanana River and also have seasonal den sites in diverse habitat. Therefore, construction of the proposed project could directly affect the natal and seasonal den sites of the estimated four wolf packs in the project area. Noise from construction activities would affect a greater area than the direct footprint of the project and could result in displacement of a few individual wolves away from the immediate area. If construction activities occurred in early spring shortly after pups are born, disturbance near an active den site could lead to abandonment of the den and loss of the pups, but could also result in movement of the pups to a new den site by the adult wolves.

In portions of the project area the existing road densities are sufficient to displace wolves (1.5 miles per square mile) (Jalkotzy *et al.*, 1997). The addition of NRE would increase area road densities to more than 1.5 miles per square mile within 3 percent of the project area. Although the rail line would not be open to public access, hunters and trappers could trespass on the alignment. Road and trail densities sufficient to limit wolf numbers due to access by hunters and trappers, estimated at 1 to 1.3 miles per square mile (Jalkotzy *et al.*, 1997), would increase within 6 percent of the project area. This level of increased road density would be unlikely to affect wolf populations within the project area, even if hunters and trappers trespassed on the alignment.

Wolves are habitat generalists, and would not likely be directly affected by habitat loss due to construction of the proposed alternatives, but could be indirectly affected by habitat loss if changes in potential prey species resulted.

Furbearers

Appendix F describes habitat use, breeding season, den type and use and home range size estimates and estimated habitat impact area for furbearers. Forested and riparian habitats would be the primary habitats used by the diverse assemblage of furbearing animals within the region. Minimum and maximum impacts to habitats used by each furbearing animal are quantified in Appendix F. Direct habitat loss would affect less than 1 percent of habitats available within 5 miles of the proposed alternatives. A few furbearers would be expected to be hit and killed by construction vehicles.

Common Operations Impacts

This section describes the common types of environmental consequences that operation-related activities would have on game mammals. In situations where certain game mammals are more susceptible to a project operation, the impact is explained in detail under the type of mammal. Project operation would include running five round trip trains per day (ten one-way trains) over the rail line and maintaining the ROW. Some impacts would be initiated during construction but would continue through operation such as habitat modification and impacts from power lines and communication towers.

- **Mortality due to collision with trains**. Train traffic on the rail line would result in mammal fatalities, especially in areas or weather conditions with poor visibility and in areas with concentrated use by specific game mammals.

- **Reduced survival due to habitat alteration – attraction/ displacement**. Game mammals displaced from or attracted to the rail line may have increased or reduced survival. For example, increased availability of carcasses from animals colliding with the train would benefit predators such as wolves and coyotes, which may change their distribution as a result of the transportation alignment through the region. Increases in predators along the rail line could, however, be negated if trapping increases by unauthorized use of the maintenance road. Changes in the natural fire regime which maintains the boreal forest ecosystem could result from the addition of the rail line through this region.

- **Reduced breeding success due to disturbance from trains or humans**. Train operation during individual breeding seasons of game mammals could lead to loss of breeding success especially if mammals are differentially displaced because of sex or age. ARRC regulations prohibit access to rail ROW; however, the cleared rail ROW and maintenance road could make remote regions of the project area more accessible to unauthorized users. This would affect the pattern of hunter and trapper harvest activities within the project area by facilitating access to existing trail systems or to previously remote, roadless areas.

- **Reduced or enhanced survival due to disruption of predator-prey relationships.** Any alteration of predator survival (especially for wolves and bears; the primary predators of moose in the region), due to increased nutrition from rail-killed moose or other large game mammals would have the potential to disrupt predator-prey relations within the region. Increased trapping or hunting facilitated by unauthorized access to remote locations from new roads would also have the potential to disrupt predator-prey relations within the region.

- **Reduced survival or mortality due to exposure to spilled toxic materials.** In the unlikely event of a fuel spill or leak caused by derailment or chronic leaks from engines and tank cars during operation, game mammals would be exposed to contamination. Oiled mammals ingest contaminants during grooming or through consumption of oiled prey, leading to toxicity. Fur provides insulation which is lost upon contact with petroleum-based products, such as diesel fuel and oil, leading to hypothermia especially for mammals tied to aquatic environments such as beavers and otters. Spills could also lead to reduced food abundance.

Bears

Few bears would be expected to be hit by trains, as no bears have been reported killed by rail lines within the project area or along the Richardson Highway. Bears would generally be expected to avoid the rail line, although some bears may be attracted to the rail line if grains or animal feeds such as wheat, barley, oats or dog foods were spilled and not effectively removed. Bears could also be attracted to the rail line by rail-killed carrion during their active periods – spring through fall. The five round trip trains per day and periodic summer maintenance work would cause minor displacement of a few bears from the rail line. All but very small cubs would be expected to successfully cross the rail line.

Moose

Based on early-winter densities, an estimated 2,300 moose would occur within 5 miles of the proposed project alternatives, including about 1,400 seasonal migrants that would move across the proposed rail line at least twice a year. The existing 58 miles of rail line through GMU 20B averages an annual moose-train collision mortality of 0.35 moose/mile or about 20 moose per year (annual range 0.16 to 1.05 moose per mile) (Young, 2004b; 2006b). Assuming that the frequency of trains for the NRE would be roughly 40 percent higher than the frequency of trains on the existing 58-mile rail line at the western end of the project area, the increase in moose-train collision mortality from operation of the proposed 81.5-mile NRE would average 40 moose per year, ranging from 18 to 120 collision mortalities per year. If the frequency of trains is also increased on the existing rail line because of operation of the NRE, the number of moose-train collision mortalities would be expected to increase on the existing line.

These mortalities would primarily occur during November, December and January and would likely be concentrated along specific rail alternatives (discussed in alternative sections below). Moose-train collision mortalities resulting from operation of the NRE could range higher than the estimated values during years with snow depths greater than 30 inches, or if a greater proportion of seasonal moose movements occur across the NRE than occur across the existing 58-mile rail line west of the project area.

Indirect effects of the NRE on moose habitat, movements, survival and reproduction related to disturbance would be minor compared to the direct loss of moose due to moose-train collision mortality. All moose would be expected to successfully cross the rail line, unless hit by a train or work vehicle. The five round trip trains per day and periodic summer maintenance work would cause minor displacement of moose from the rail line. Harvest pressure on moose is directly related to the ease of hunter access and road development into moose range (Timmerman and Buss, 1997).

Wolves

Wolf packs may travel as much as 10 to 30 miles a day during winter, and dispersing wolves may travel 100 to 700 miles from their original pack range. The estimated 36 wolves residing within the project area would likely be attracted to and travel along the rail line. Wolves hunt daily traveling in areas that provide the best passage, such as rivers, ridges, creeks, trails, and little-used roads. Few wolves would be expected to be hit by trains, because no wolves were reported as killed by vehicles on the section of the Richardson Highway that crosses through the project area (ADF&G, 2005b).

Indirect effects due to disturbance may cause some additional displacement of wolves from the vicinity of the NRE alignment. Wolves could also be attracted to the rail line by the increased availability of animal carcasses from moose-train collisions and bird-powerline collisions. During winter, wolves attracted by carcasses to the rail line could experience reduced survival because of facilitated unauthorized access for hunters and trappers to remote areas south of the Tanana River (Jalkotzy *et al.*, 1997).

Furbearers

Several train collision mortalities could be expected each year due to operation of the NRE. Habitat loss effects on furbearer populations in the project area would likely be negligible, although changes in access, if hunters and trappers trespass on the new ROW, could increase furbearer harvest in remote locations south of the Tanana River.

Impacts by Alternative Segment

This section describes the environmental consequences of the common and alternative segments of the proposed NRE to game mammals where these are notable or apply to specific species only.

North Common Segment

Moose and furbearers are expected to occur within this portion of the NRE. Current access for hunting and trapping, along with residential and agricultural development reduce the occurrence of wolves, bears and some furbearing animals within this area.

Eielson Alternative Segments

Impacts for the Eielson alternative segments would be the same as the impacts discussed for North Common Segment.

Salcha Alternative Segments

All game mammals are expected to occur within this portion of the project area, although densities are expected to be higher in Salcha Alternative Segment 1 than in Salcha Alternative Segment 2 because of the remoteness of the Salcha Alternative Segment 1 habitats. In Salcha Alternative Segment 2, current residential and agricultural development could reduce the occurrence of wolves, bears and some furbearing animals.

Both alternative segments cross the Tanana River and areas of riparian habitats, potentially used by moose, bears, and furbearers for forage and travel upstream from these crossings would be altered by bank armament. All furbearers would be expected to be abundant within the extensive riparian habitats in this area, although hunting and trapping may have reduced abundance in the vicinity of the Salcha Alternative Segment 2.

The Salcha Alternative Segment 1 is within a region that is considered prime moose calving habitat. Construction within this area during the calving period would likely displace some calving moose. Displacement from and disturbance within calving habitats may alter reproductive success, primarily thorough changes in predation rates.

Central Alternative Segments and Connectors

The areas of the Central alternative segments and Connectors currently provide riparian habitats for bears, moose, and furbearers. Furbearers would be expected to be abundant due to the remoteness of this area. Moose would be expected to be abundant within this portion of the project area.

Construction of Central Alternative Segment 2, and Central Connectors B, C, and D would contribute to fragmentation of large areas of closed needleleaf forest core habitats (Figure 5-18). Fragmentation of these core forested habitats would have mixed effects on game mammals. Openings created in the closed needleleaf forest would benefit moose, but would be detrimental for furbearers that require dense forests for cover. However, increased edge habitat created by construction of Central Alternative Segment 2 would benefit some furbearers by opening up habitats for prey species such as voles, hares and grouse. Fragmentation of needleleaf forested core habitats would likely be detrimental for red squirrels.

Donnelly Alternative Segments

Both Donnelly alternative segments cross primarily forested habitats. Donnelly Alternative Segment 1 ROW is 77 percent forested and Donnelly Alternative Segment 2 is 81 percent forested. Black bears, moose, wolves, and furbearers would be expected to be common along both Donnelly alternative segments, primarily because of their remoteness, although there are several trails that coincide with Donnelly Alternative Segment 1. Furbearers would be expected to be more common along Donnelly Alternative Segment 2 because of its proximity to riparian habitats of the Tanana River and Kiana Creek and their tributaries.

Habitat fragmentation would be of greater consequence for the closed canopy forests crossed by the Donnelly alternative segments than for the large areas of open canopy forests, which by definition contain breaks with open habitats. Construction of Donnelly Alternative Segment 1 would contribute to fragmentation of core areas of open and closed needleleaf forest habitats (Figure 5-19). Construction of Donnelly Alternative Segment 2 would contribute to fragmentation of core areas of closed needleleaf and closed broadleaf forest habitats (Figure 5-20). Fragmentation of these forested habitats would have mixed effects on game mammals. Openings in closed needleleaf forest would benefit moose, but could be detrimental for furbearers that require conifer forests for cover. Openings in open needleleaf forests would be of less consequence because these habitats have openings in the canopy. While openings in closed broadleaf forests would benefit moose, effects on other game mammals would be varied. Increased edge habitat created by construction of the Donnelly alternative segments could benefit some furbearers by opening up habitats for prey species such as voles, hares and grouse. Fragmentation of closed needleleaf forest would likely be detrimental to red squirrels.

South Common Segment

Black bears, brown bears, moose and wolves would be expected to be common within this portion of the project area based on the relative remoteness of the area, proximity to salmonid streams, an extensive recent burn habitat, and moose observations.

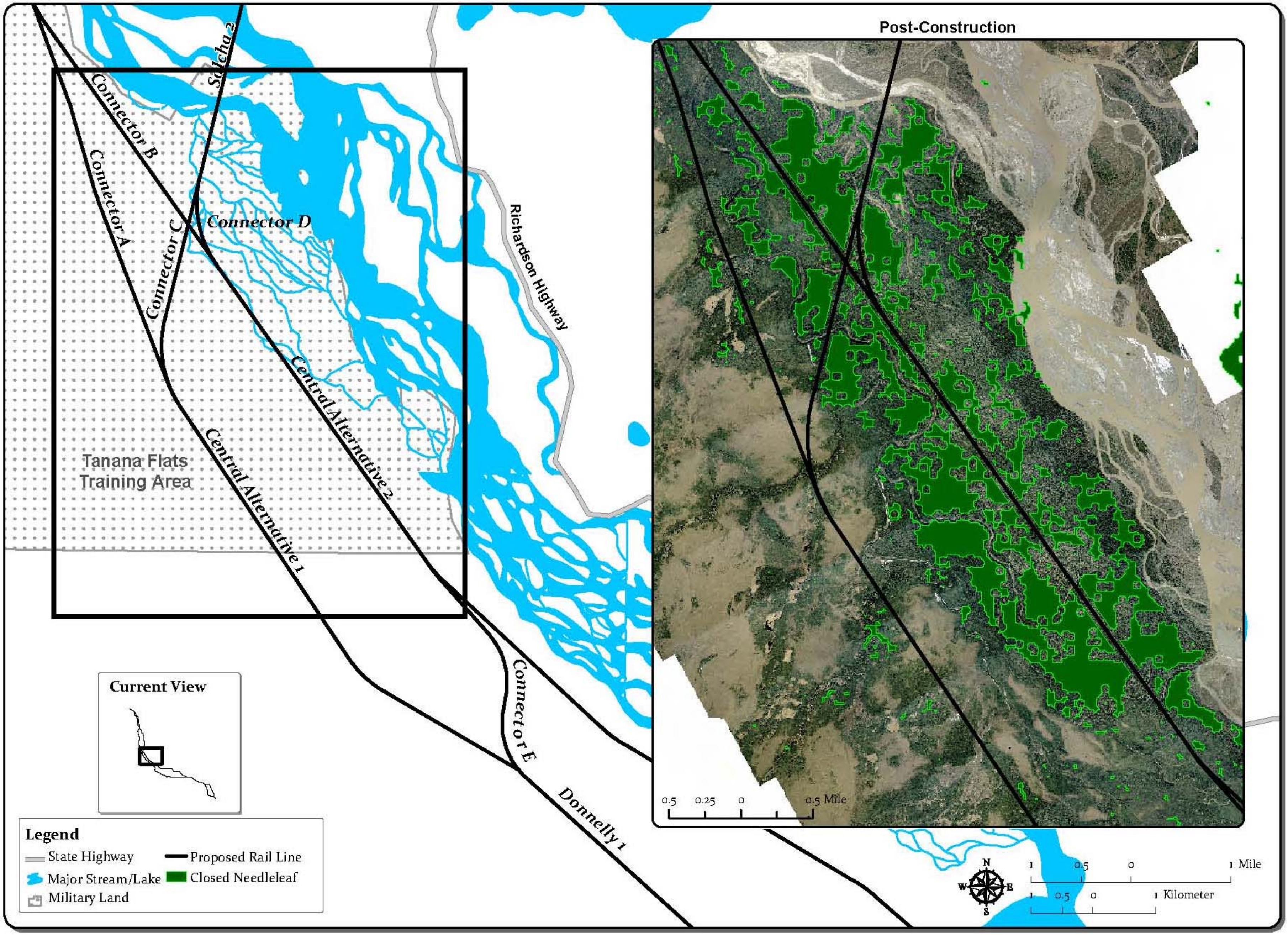

Figure 5-18 – Fragmentation of Core Closed Canopy Needleleaf Forest Habitats Crossed by Central Alternative Segment 2 (BLM *et al.*, 2002)

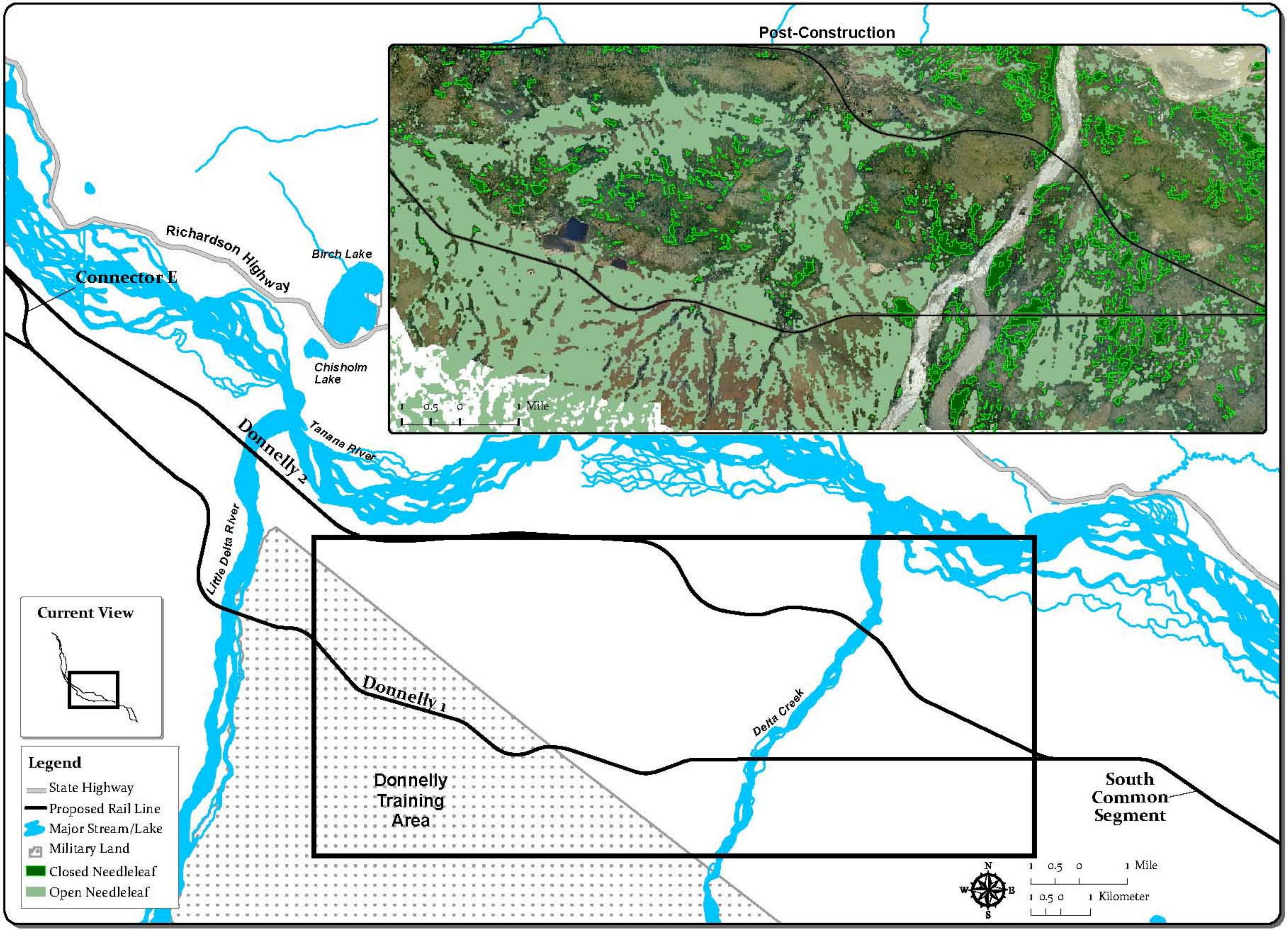

Figure 5-19 – Fragmentation of Core Forest Habitats Crossed by Donnelly Alternative Segment 1 (BLM *et al.*, 2002)

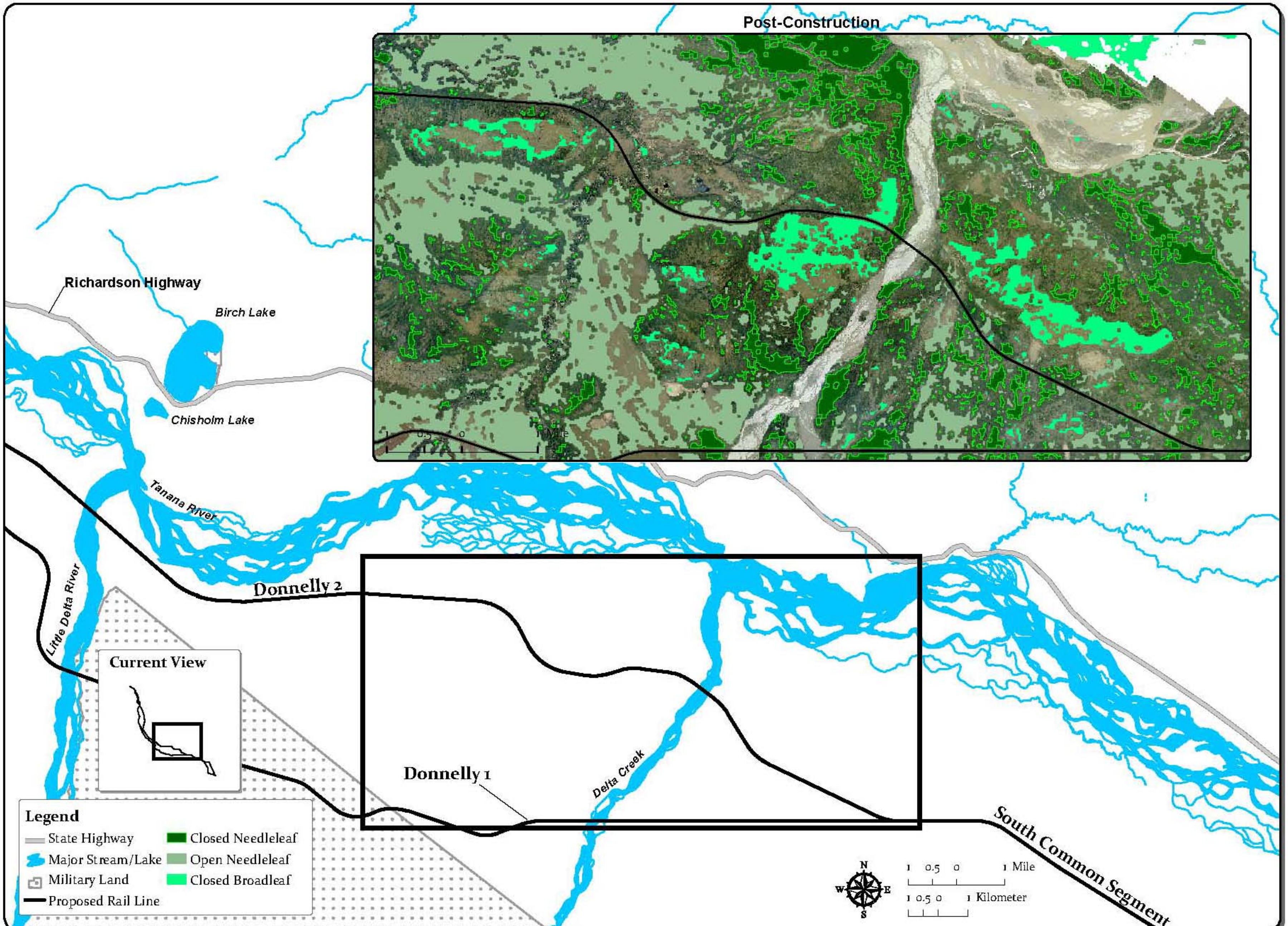

Figure 5-20 – Fragmentation of Core Forest Habitats Crossed by Donnelly Alternative Segment 2 (BLM *et al.*, 2002)

Delta Alternative Segments

Bison, black bear, brown bear, moose, wolves and furbearers would be expected to occur within this portion of the project area. All game mammals except bison would be expected to be more common along Delta Alternative Segment 1 than Delta Alternative Segment 2 because of the extent of residential, commercial, and agricultural development within Delta Alternative Segment 2.

The Delta bison herd is intensively managed to maintain the current population size and distribution; it is unlikely that many bison would occur within the proposed rail line. Delta Alternative Segment 2 would affect more area of habitat preferred by bison for forage than Delta Alternative Segment 1. Neither alternative segment would cause substantial fragmentation to graminoid habitats preferred by bison. Based on the rate of 0.4 bison per year for bison-vehicle collisions, anticipated bison-train collision mortality would be expected to occur at a rate of less than one every 10 years. Bison-train collisions would be more likely to occur in Delta Alternative Segment 2 than in Delta Alternative Segment 1, based on habitat and historic distributions. This mortality rate would be of no consequence to the Delta bison herd or its harvest management.

Delta Alternative Segment 1 would contribute to fragmentation of a large closed needleleaf forest patch (Figure 5-21). Fragmentation of this forested habitat would have mixed effects on game mammals. Openings in closed needleleaf forest would benefit moose, but could be detrimental for furbearers that require coniferous forests for cover. However, increased edge habitat created by construction of Delta Alternative Segment 1 would be beneficial for some furbearers, by creating early successional habitats for prey species such as voles, hares and grouse. Fragmentation of closed needleleaf forest would likely be detrimental for red squirrels.

No-Action Alternative

The No-Action Alternative would not affect game mammal populations or game mammal management within the project area.

5.5.3 Summary of Impacts to Game Mammals

The primary consequences of construction of the rail line through the project area are train-moose collision mortality and potential changes in access to the remote areas south of the Tanana River facilitated by the maintenance road along the rail line and roads to communication towers. ARRC regulations prohibit access to rail ROW, however, the cleared rail ROW and maintenance road could make remote regions of the project area more accessible to unauthorized users. Both increased moose mortality and changes in hunter and trapper access would potentially require changes in the management of game mammals within the portions of GMU 20A, 20B, and 20D crossed by the alternative segments. These impacts are unrelated to the individual alternative segments selected for construction. Small changes in the loss and alteration due to habitat fragmentation for habitats used by game mammals would benefit some game mammals and would be detrimental to others. Habitat impacts for alternative segments are presented in

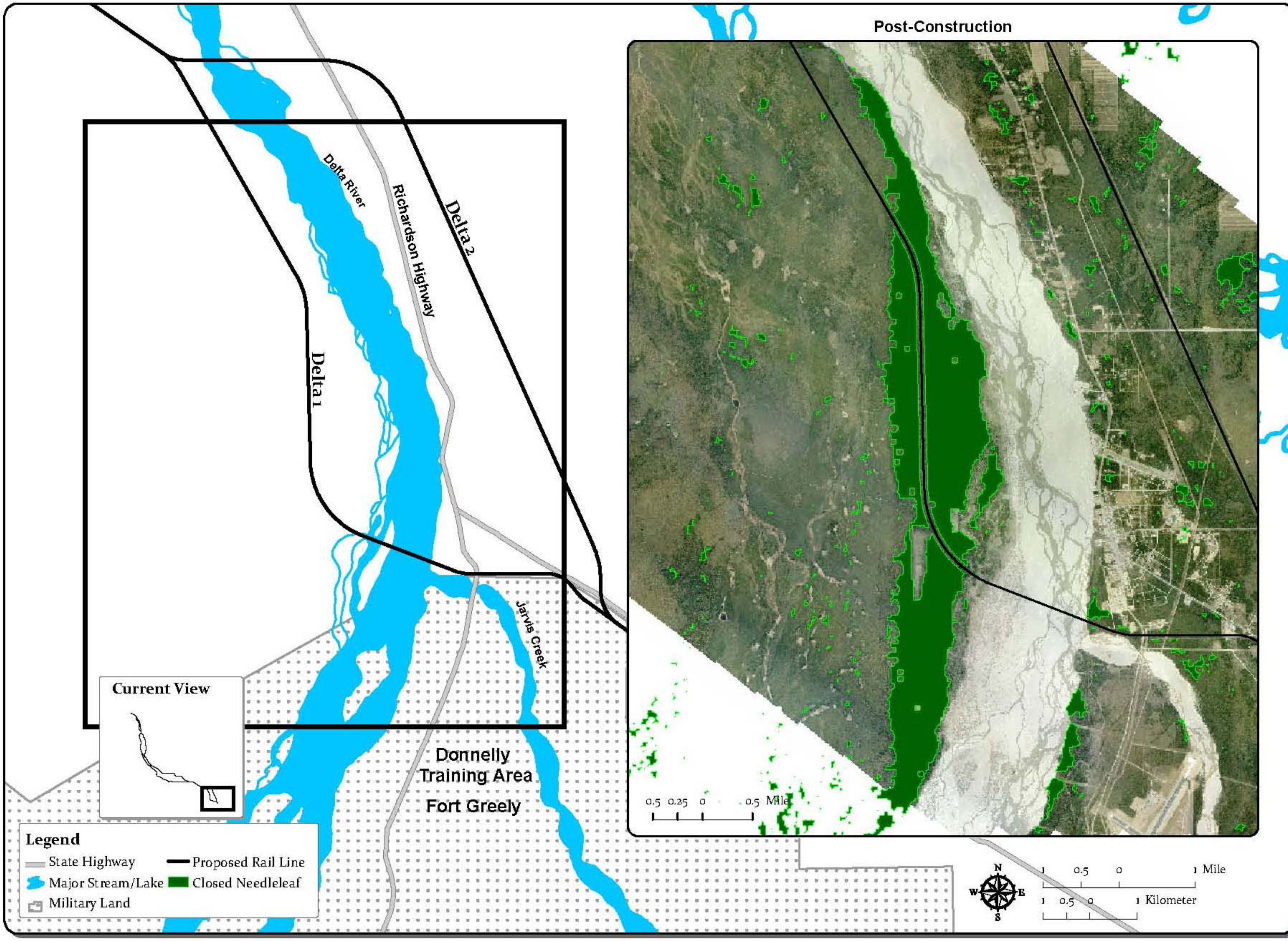

Figure 5-21 – Fragmentation of Core Closed Needleleaf Forest Habitat Crossed by Delta Alternative Segment 1 (BLM *et al.*, 2002)

Appendix F and are summarized in Table 5-27. Riparian habitats impacts for alternative segments are presented in Table 5-28. In general the NRE would affect a small proportion of the available habitat and a small proportion of the game mammal populations within the project area.

Table 5-27
Direct Loss of Habitats used by Game Mammals[a] (acres)

Alternative Segment	Bison[b]	Bears[c]	Caribou[d]	Moose[e]	Wolves[f]	Furbearers[g]
Common Facilities	-	718.8	321.7	718.8	750.7	589.6
North Common	-	60.5	21.7	60.5	61.6	42.0
Eielson 1	-	246.4	123.8	246.4	247.3	237.2
Eielson 2	-	241.0	146.4	241.0	241.2	222.9
Eielson 3	-	238.5	124.5	238.5	239.3	222.0
Salcha 1	-	434.9	175.2	434.9	447.6	426.4
Salcha 2	-	535.1	299.1	536.2	580.4	506.0
Central 1	-	122.6	65.9	122.6	122.8	88.9
Central 2	-	84.9	72.5	84.9	86.9	84.3
Connector A	-	105.7	64.1	105.7	105.7	91.0
Connector B	-	78.5	68.9	78.5	78.5	78.5
Connector C	-	55.6	41.4	55.6	55.6	45.3
Connector D	-	21.2	19.7	21.2	21.2	21.2
Connector E	-	58.2	16.3	58.2	58.4	24.5
Donnelly 1	-	626.9	475.3	626.9	658.8	549.8
Donnelly 2	-	636.4	370.2	636.4	669.7	564.9
South Common	-	251.2	166.3	251.2	251.2	244.2
Delta 1	14.6	256.4	198.2	256.4	311.2	247.5
Delta 2	74.2	211.4	104.6	211.4	304.0	209.0
Proposed Action[h]	14.6	2,808.7	1,640.5	2,808.7	2,944.3	2,508.8
Minimum Area Alternative[i]	74.2	2,717.6	1,447.5	2,717.6	2,891.5	2,461.8
Maximum Area Alternative[j]	14.6	2,873.4	1,713.3	2,874.7	3,039.6	2,550.5

[a] Source: (BLM *et al.*, 2002).
[b] Habitats summed for bison include Tall Shrub, Low Shrub, Graminoid, Other, and Agricultural categories for Delta Alternatives only.
[c] Habitats summed for bears include All Forests, Tall Shrub, Low Shrub, Other, and Graminoid categories.
[d] Habitats summed for caribou include Needleleaf Forests, Open Broadleaf Forest, Graminoid, and Bryoid/Lichen categories.
[e] Habitats summed for moose include All Forests, Tall Shrub, Low Shrub, Graminoid, Aquatic Bed and Other categories.
[f] Habitats summed for wolves include All categories except Aquatic Bed, Water and Urban
[g] Habitats summed for furbearers include All Forests, and Tall Shrub.
[h] Estimate based on footprint area for the proposed action includes North Common, Eielson 3, Salcha 1, Connector B, Central 2, Connector E, Donnelly 1, South Common, Delta 1 and associated facilities.
[i] Estimate based on minimum area alternative includes North Common, Eielson 2, Salcha 1, Central 2, Connector B, Donnelly 2, South Common, Delta 2 and associated facilities.
[j] Estimate based on maximum area alternative includes North Common, Eielson 1, Salcha 2, Central 1, Connector C, Donnelly 1, South Common, Delta 1 and associated facilities.

Table 5-28
Riparian Habitat Crossed by Alternative Segments

Alternative Segment	Riparian Area for Major Rivers[a] (acres)	Riparian Area for Minor Rivers[b] (acres)	Total Riparian Area (acres)
North Common	-	1.6	1.6
Eielson 1	-	11.0	11.0
Eielson 2	-	8.6	8.6
Eielson 3	-	8.7	8.7
Salcha 1	19.0	4.5	23.5
Salcha 2	39.4	5.7	45.1
Central 1	-	1.2	1.2
Central 2	-	4.2	4.2
Connector A	-	1.4	1.4
Connector B	2.3	0.9	3.3
Connector C	1.4	2.5	4.0
Connector D	-	2.3	2.3
Connector E	2.8	0.9	3.6
Donnelly 1	15.4	7.6	23.0
Donnelly 2	14.2	2.4	16.5
South Common	2.1	-	2.1
Delta 1	-	1.6	1.6
Delta 2	-	0.9	0.9
Proposed Action[c]	41.6	30.0	71.6
Minimum Area Alternative[d]	37.6	23.1	60.8
Maximum Area Alternative[e]	58.4	31.2	89.6

[a] Major Rivers include Tanana River, Salcha River, Richardson Clearwater River, Fivemile Clearwater River, Delta Creek, and Little Delta River
[b] Minor Rivers include all other streams mapped at 1:63,360 scale resolution.
[c] Estimate based on footprint area for the proposed action includes North Common, Eielson 3, Salcha 1, Connector B, Central 2, Connector E, Donnelly 1, South Common, Delta 1 and associated facilities.
[d] Estimate based on minimum area alternative includes North Common, Eielson 2, Salcha 1, Central 2, Connector B, Donnelly 2, South Common, Delta 2 and associated facilities.
[e] Estimate based on maximum area alternative includes North Common, Eielson 1, Salcha 2, Central 1, Connector C, Donnelly 1, South Common, Delta 1 and associated facilities.

5.6 Bird Resources

This section discusses the existing birds in the project area as well as potential impacts resulting from the NRE.

5.6.1 Affected Environment

A suite of resident birds occur within the project area including owls, ptarmigan and grouse, ravens and jays, woodpeckers, chickadees, and finches. Many birds occurring within the project area are migratory; arriving or passing through in the spring beginning with raptors and waterfowl in April continuing with the arrivals of songbirds through May and passing through or leaving in late summer and fall during July through October. All migratory birds are protected by the Migratory Bird Treaty Act; eagles are also protected by the Bald and Golden Eagle Act. Migratory waterfowl and resident upland game birds are hunted. Waterfowl are harvested primarily during the fall migration from September to December, while upland game birds are harvested during late summer through March.

Waterfowl and Waterbirds

Waterfowl and waterbirds occurring within the project area are considered migratory. The most common species include: American wigeon, bufflehead, mallard, northern pintail, northern shoveler, scaup and trumpeter swans. Many geese, ducks and sandhill cranes stage in and migrate through the Tanana River Basin during spring and fall. A few loons and grebes occur within the project area as do gulls and shorebirds. Nesting season densities within the region crossed by the proposed NRE are presented in Appendix F. Ducks, geese, swans, loons, grebes and gulls generally nest near aquatic habitats. Shorebirds and cranes generally nest in wetland habitats, although shorebirds also nest in upland habitats. Hunters harvest ducks, geese, snipe and sandhill cranes from ponds, lakes, wetlands, agricultural fields, and rivers during fall migrations.

Raptors

Bald and golden eagles in Interior Alaska are primarily summer residents, arriving in late April and departing by freeze-up in mid-to-late September (Ritchie and Ambrose, 1996). Approximately 20 active bald eagle nests were identified within the project area during 2005 to 2007; representing about 20 reproducing pairs and their associated territories (Prichard and Ritchie, 2007). Bald eagle nests within the areas crossed by the proposed alternative segments during 2005-2007 were primarily associated with habitats along the Tanana River; occurring in balsam poplar trees (77 percent), and spruce trees (20 percent) (Prichard and Ritchie, 2007). Most nests on the Tanana River were within 300 feet of a shoreline (Ritchie and Ambrose, 1996) and clusters of nest structures may be associated with side channels with chum salmon spawning areas. Bald eagles regularly occur on the lower Delta River during midwinter where they are found near open water associated with wintering waterfowl and fall spawning chum salmon (Ritchie and Ambrose, 1996). Limited band recoveries suggest that Tanana River bald eagles migrate through inland areas and overwinter in western North America including Washington and northwestern Wyoming (Ritchie and Ambrose, 1996).

Approximately 13 peregrine falcon nests were identified within the project area from 2005 to 2007 (Prichard and Ritchie, 2007). Peregrine falcons nest on cliffs and four of these nests were located within about a half mile of the proposed NRE. Five species of owls commonly occur within the project area. The two largest of these owls, the great gray owl and the great horned owl, nest in white spruce trees within closed canopy forests (Prichard and Ritchie, 2007; BLM *et al.*, 2002). Six of the seven identified nests of large owls were associated with clear-water, anadromous-fish streams.

Upland Game Birds and Landbirds

Ptarmigan and grouse are the primary upland game birds found throughout in the project area. Ptarmigan are harvested from August to February and grouse are harvested August to March. Landbirds belong to many diverse groups and include both migrant and resident birds. Resident birds remain active during the winter. Resident ptarmigan, grouse, woodpeckers, chickadees, crossbills, and redpolls rely primarily on fruit and seed crops. Resident ravens and gray jays scavenge on winter or predator-killed carrion. Many birds; however, feed primarily on insects which are not available during the winter and these birds remain in Interior Alaska only during the summer breeding season when insects are abundant.

Birds of Conservation Concern

The USFWS defines birds of conservation concern as species, subspecies and populations that are not already federally listed as threatened or endangered but without additional conservation actions, are likely to become candidates for Federal listing (USFWS, 2002). While there are no federally listed threatened or endangered birds occurring in the project area, various agencies have identified birds of conservation concern within Interior Alaska beginning with the Boreal Partners in Flight (a working group made up of government representatives and individuals) listing for landbirds in 1999 (revised in 2004), USFWS listing of birds of conservation concern (USFWS, 2002), and the ADF&G's Comprehensive Wildlife Conservation Plan (ADF&G, 2006). Birds of conservation concern that have been documented within the project area during the breeding season are listed in Table 5-29. The State of Alaska also maintains a Species of Special Concern listing which includes the American peregrine falcon, northern goshawk, olive-sided flycatcher, gray-cheeked thrush, Townsend's warbler and blackpoll warbler (ADF&G, 1998).

5.6.2 Environmental Consequences

Impacts to birds were analyzed for short-term and long-term effects of construction and operation of the proposed NRE. The primary mechanisms for impacts to birds from construction and operation of the proposed NRE are habitat loss, alteration and fragmentation and collision mortality with power lines on poles, and communication towers. The nature of impacts from the project to birds would vary based on the phase of the project and the type of bird. Construction of the rail line and additional facilities would result in short-term disturbance and long-term habitat modification along the approximately 80-mile alignment. Following construction, operation of the rail line would result in disturbance due to train movement. Common impacts based on project phase are discussed below, followed by a comparison of the impacts specific to alternative segments is provided where appropriate. Supporting descriptions of environmental consequences, results of quantitative analyses and illustrations are presented in Appendix F. Proposed mitigation for impacts to birds is presented in Chapter 20 of the EIS.

Methodology

Effects to game and protected birds from the construction and operation of the proposed NRE were evaluated based on habitat use, habitat requirements, and seasonal movements of birds within the project area. Analysis of habitat impacts for birds is based on the vegetation analysis presented in the EIS, combined with the reported density of breeding birds within the project area. Analysis of habitat impacts for eagles and other raptors is based on raptor survey data collected for the proposed NRE combined with vegetation cover data. Examples of collision mortality for sandhill cranes due to contact with power lines within the rail alignment is based on reported habitat use, and spring and fall sandhill crane survey data (Noel, 2006q).

Common Construction Impacts

This section describes the common types of environmental consequences that construction-related activities would have for all of the alternative segments. Construction would include clearing the ROW and access roads of vegetation, excavation of gravel fill, building gravel rail and roadbeds, laying the new rail line, installing communication towers and power lines, and operating work camps and construction staging areas.

Table 5-29
Priority Bird Species Documented During the Breeding Seasons Within the Project Area[a]

Species (Migration)[b]	Status[c]	Global Rank[d]	Alaska Rank[e]	Alaska Abundance	Alaska Trend[f]	Rationale
American Three-toed Woodpecker (R)	ADF&G	G5	S4	200,000	+6.5%	Sensitive to forest management - cavity nester
American golden plover (L)	BCC	G5	S4B	200,000[g]		Small declining population
Bald Eagle (S)	PIF	G5	S4B/S4N	20,000	+	Sensitive to changes in forests
Belted Kingfisher (S)	ADF&G	G5	S5	140,000	-2.5%	Widespread long-term population declines
Blackpoll Warbler (L)	PIF	G5	S3B	4,000,000	-3.8%	In decline (sensitive to changes in riparian habitats)
Boreal Chickadee (R)	ADF&G	G5	S5	1,100,000	-0.5%	Sensitive to forest management - cavity nester
Dark-eyed Junco (S)	ADF&G	G5	S3N/S5B	40,000,000	-1.1%	Widespread long-term population declines
Gray-cheeked Thrush (L)	SOC	G5	S3B	2,000,000	unknown	Long-term declines, sensitive to removal of riparian shrubs
Hairy Woodpecker (R)	ADF&G	G5	S4	120,000	+6.8%	Sensitive to forest management - cavity nester
Hermit Thrush (S)	ADF&G	G5	S4B	1,300,000	-1.8%	Long-term declines
Northern Flicker (S)	ADF&G	G5	S5B	180,000	+0.2%	Sensitive to forest management - cavity nester
Northern Goshawk (R)	PIF	G5	S4	13,000	unknown	Breeding sensitivity to forest changes
Olive-sided Flycatcher (L)	PIF & ADF&G	G4	S3/S4B	200,000	-3.3%	In decline (sensitive to forest management - canopy nester)
Peregrine Falcon (L)	BCC & PIF	G4	S3B	1,100	+	Recently delisted - sensitive to changes on cliffs, rocks, etc. & vulnerable to contaminants
Pine Siskin (S)	ADF&G	G5	S5	500,000	+5.5%	Sensitive to forest management - canopy nester
Ruffed Grouse (R)	PIF	G5	SNR	200,000	unknown	Sensitive to changes in forests
Rusty Blackbird (S)	PIF	G4	S4B	400,000	-5.8%	In decline (sensitive to climate and riparian habitat changes)
Short-eared Owl (L)	PIF	G5	S4/S5B	18,000	unknown	Declining population
Smith’s Longspur (S)	PIF	G5	S3/S4B	unknown	unknown	Small population, restricted distribution
Townsend’s Warbler (L)	PIF & ADF&G	G5	S3B	1,500,000	+0.2%	Sensitive to forest management - canopy nester
Varied Thrush (S)	PIF & ADF&G	G5	S5	6,000,000	-0.1%	Sensitive to forest management - canopy nester
Whimbrel (L)	BCC	G5	S3/S4B	26,000 *	stable	Declining population trend, small population
White-crowned Sparrow (L)	ADF&G	G5	S3N/S5B	13,000,000	-1.9%	Long-term declines
White-winged Crossbill (R)	ADF&G	G5	S5	2,000,000	+4.3%	Sensitive to forest management - canopy nester
Wilson’s Warbler (L)	PIF & ADF&G	G5	S3B	7,000,000	+1.0%	Sensitive to changes in riparian habitats

[a] Sources: Rosenberg, 2004; ADF&G, 2006; Prichard and Ritchie, 2007; Benson, 1999; Anderson *et al.*, 2000; Harding and Sharbaugh 2005.
[b] (R) = Resident, (S) = Short-distance migrant, (L) = Long-distance migrant.
[c] Status: BCC – USFWS, 2002; PIF – Rosenberg, 2004; ADF&G - ADF&G, 2006; SOC - ADF&G, 1998.
[d] Rankings: G5 = Globally secure, G4 = Globally apparently secure, S5 = State secure, S4 = State apparently secure, S3 = State vulnerable, SNR = State not ranked, N = Non-breeding, B = Breeding.
[e] Average annual long-term population trend in Alaska portion of the Boreal Partners in Flight Bird Conservation Region 4 (Rosenberg, 2004; ADF&G, 2006).
[f] – Represents declining trend of unknown magnitude; + represents increasing trend of unknown magnitude.
[g] Morrison *et al.* 2006.

- **Habitat loss, alteration, and fragmentation.** Construction of the approximately 80-mile NRE rail line would require a minimum project area of about 3,020 acres and a maximum project area of 3,140 acres of primarily undisturbed native vegetation along the Tanana River Valley. All birds would experience nesting, foraging and staging habitat loss or alteration due to construction of the linear alignment. After construction, some of the vegetation would be restored to its natural condition along the ROW. Loss of forest communities would generally be considered long-term even with restoration. It would require 5 to 20 years or more to reestablish trees and shrub habitat for cover, perching, and nesting for most raptors and landbirds; 50 to 100 years for trees large enough to support eagle and large owl nests; and over 50 years to grow the snags to support cavity nesting landbirds.

- Construction of rail and roadbeds across wetlands would alter the suitability of habitats near these structures for ground nesting waterbirds and waterfowl due to changes in water abundance and distribution. Construction of the large bridge crossings on the Tanana River, Little Delta River, Delta Creek and Delta River could lead to channel constriction, altering the stream channels, scour of woody vegetation and bar formation within these river segments leading to loss of habitat and reduction in habitat suitability for roosting cranes and swans (Folk and Tacha, 1990; Currier, 1997). Habitat loss and altered suitability indirectly affects bird survival and reproductive potential. Tree nesting raptors and cavity nesting landbirds reuse nest structures and loss of nest trees could lead to reduced or lost reproduction in subsequent years from energy spent establishing new nests. These increased energetic costs would have a large consequence for long-distance migrant landbirds.

- Habitat fragmentation issues that are relevant for birds include creation of edge effects, reduction in patch size of available habitats, facilitation of predator movements, intrusion of invasive species, and intrusion of humans. Habitat fragmentation caused by loss and changes in vegetation cover within the ROW through large areas of core forest habitats would have the greatest effect on resident and migrant landbirds (Hinkle *et al.*, 2002). Forest-nesting landbird abundance, diversity, and reproduction rates all become depressed as a result of fragmentation associated with linear developments (Jalkotzy *et al.*, 1997). Linear alignments increase landbird nest predation and nest parasitism by fragmenting forest habitats facilitating access of edge-loving landbirds and predators.

- **Loss of breeding success and reduced survival from exposure to construction noise and from increased human activity.** Disturbance by vehicles or people on foot to nesting birds causes incubating birds to flush from their nests leaving the nest vulnerable to mammalian and avian predators. For ground nesting birds, flushing of birds from nests alerts nearby mammalian and avian predators to the location of the nest which leads to nest depredation resulting in lost reproduction. Ducks, geese, sandhill cranes and swans stage, remaining within an area to congregate and feed on their way to and from breeding and wintering habitats, within the project area during spring and fall migrations. Many landbirds migrate through Interior Alaska on their way to and from nesting grounds in western and arctic Alaska. Disturbance of migrant birds in staging habitats could inhibit the birds' capacity to acquire the fat stores necessary to continue migration, and could reduce reproductive outputs of migrant birds headed to nesting grounds in the spring, or reduce survival of migrants while headed to wintering grounds in the fall.

- **Loss of individuals and habitats due to construction equipment fuel spills.** In the unlikely event of fuel spills and leaks during construction, birds could be exposed to contamination. Oiled birds ingest contaminants during preening, leading to toxicity. Feathers of birds provide insulation and buoyancy which is lost upon contact with petroleum-based products such as diesel fuel and oil, leading to hypothermia and an inability to float for waterbirds and waterfowl. Spills could lead to a reduction in available food as it kills forage such as insects and small mammals. Raptors could ingest oiled prey leading to toxicity.

- **Collision or electrocution mortality from power lines and communication towers.** Power lines on poles associated with the rail line and three new communication towers would increase the collision potential for birds. Factors influencing collision risk are related to the type of bird, environmental factors, location, and the configuration of the lines and towers. Power line poles and communication towers provide perches for raptors and other predatory birds which facilitate predation on ground-nesting waterfowl, waterbirds, gamebirds and landbirds leading to reduced productivity of birds nesting in proximity to these structures. Heavy-bodied, less-agile birds and birds within large flocks such as cranes, swans and geese are more likely to experience fatalities from power lines and communication towers as they may lack the ability to quickly negotiate obstacles. The power poles associated with the project could result in fatalities from electrocution for opportunistic raptors using them for nesting sites, vantages for territorial defense, or vantages for hunting. Raptors are particularly susceptible to electrocution by poorly designed power poles, especially when these are placed near nesting territories or foraging habitats.

- **Direct mortality from project construction.** Collisions with construction equipment and fatalities of birds present within the construction ROW could occur. Active nests present within the ROW during construction would also be destroyed by equipment during vegetation clearing and gravel deposition resulting in the loss of nests, eggs, or young.

Common Operations Impacts

This section describes the common types of environmental consequences that operation-related activities would have on birds. Project operation would include running five round trip trains per day (ten one-way trains) over the rail line and maintaining the ROW. Some impacts would be initiated during construction but would continue through operation such as habitat modification and impacts from power lines and communication towers discussed above.

- **Reduced survival because of stress or avoidance of feeding due to exposure to disturbance.** Birds that nest near the tracks would be flushed from their nest when trains pass leaving the nest vulnerable to predators and disrupting incubation. Train movement could disturb migrating waterfowl and waterbirds in staging habitats and could inhibit the birds' capacity to acquire the fat stores necessary to continue migration. Train movement could also disrupt migrating landbirds passing through the project area. This could reduce reproductive outputs of migrant birds headed to nesting grounds in the spring, or reduce survival while headed to wintering grounds in the fall.

- **Loss of individuals and habitats due to exposure to toxic materials, or fuel spills.** In the unlikely event of a fuel spill or leak caused by derailment or collision during operations, birds would be exposed to contamination. Oiled birds ingest contaminants during preening, leading to toxicity. Feathers of birds provide insulation and buoyancy which is lost upon contact with petroleum-based products such as diesel fuel and oil, leading to hypothermia and an inability to float for waterbirds and waterfowl. Spills could lead to a reduction in available food as it kills forage such as insects and small mammals. Raptors could ingest oiled prey leading to toxicity.

- **Direct mortality from collisions with trains.** Large, less-agile birds would be most noticeable when they collide with trains; however, all sizes of birds occurring within the project area would be vulnerable to train collision mortality. Birds that feed on carrion from previous collisions with trains and birds attracted to gravels along the road and railbeds would likely have an increased incidence of collision mortality.

Impacts by Alternative Segment

The following section describes impacts which would occur from construction and operation of each alternative segment to waterbirds and waterfowl, raptors, upland game birds, landbirds, and birds of conservation concern where differences between alternative segments were identified, or where potential impacts were notable. With the exception of tree and cliff nesting raptor surveys (Prichard and Ritchie, 2007) and spring and fall sandhill crane migration surveys (Noel, 2006a), project specific bird data were not available for analyses; so analyses were based on regional data using the minimum, maximum and proposed project impacts. Additional descriptions of the existing data and analyses used in estimating impacts are found in Appendix F.

North Common Segment and Eielson Alternative Segments

Construction during bird migration periods in this portion of the project would disturb and displace aggregations of sandhill cranes, swans, and ducks associated with wetlands and ponds near the alternatives. The power lines and communication tower associated with the North Common and Eielson alternative segments could increase the collision risk to staging birds including sandhill cranes and migratory flocks of ducks. Construction of Eielson Alternative Segment 1 and Eielson Alternative Segment 2 would result in destruction or disturbance of one bald eagle nest and one red-tailed hawk nest. Construction of the North Common and Eielson alternative segments would contribute to fragmentation of some remaining open needleleaf and closed broadleaf forested core habitats contributing to habitat degradation for raptors, owls and landbirds within this portion of the project area. The powerline and communication tower would also increase collision and electrocution hazards for the bald eagle nest site and the red-tailed hawk nest site along these alternatives.

Salcha Alternative Segments

Construction of Salcha Alternative Segments 1 and 2 would result in degradation of Tanana River roosting habitats used by sandhill cranes. Construction of Salcha Alternative Segment 1 would result in destruction or disturbance of one nesting pair of bald eagles, one great horned owl nest, as well as contribute to fragmentation of core areas of closed needleleaf, closed broadleaf, and closed mixed forest habitats especially for tree nesting raptors and landbirds. Construction of Salcha Alternative Segment 2 would result in the destruction or disturbance and degradation of foraging habitat for two nesting pairs of bald eagles and three nest structures, as well as three nesting pairs of peregrine falcons. The power lines associated with Salcha Alternative Segment 2 would further degrade foraging habitat at the Salcha River crossing creating an additional hazard for the bald eagles that use that area. The power line and communication tower associated with Salcha Alternative Segment 1 would increase collision risk for forest nesting raptors and landbirds in the area.

Central Alternative Segments and Connectors

Construction of Central Alternative Segment 2 would result in destruction or disturbance of one nesting pair of bald eagles, and construction of Connector A or B would result in the destruction or disturbance of one nesting pair of great horned owls. Construction of Central Alternative Segment 2, and Connectors B, C, and D would contribute to fragmentation of large areas of closed needleleaf forest core habitat, contributing to habitat degradation for tree nesting raptors and landbirds. The power lines associated with Central Alternative Segment 2, and Connectors B, C, and D would be located through an area of undisturbed closed needleleaf forest, which would increase collision risk for forest nesting birds and reduce habitat suitability.

Donnelly Alternative Segments

Construction of Donnelly Alternative Segment 2 would result in the destruction or disturbance of one bald eagle nest structure and disturbance to one nesting pair of peregrine falcons as well as would contribute to fragmentation of core areas of closed needleleaf and closed broadleaf forest habitats. Construction of Donnelly Alternative Segment 1 would result in the destruction or disturbance of one northern goshawk nest structure and would contribute to fragmentation of core areas of open and closed needleleaf forest habitats. The power line and communication tower associated with these alternative segments would contribute to increased risk of collision mortalities for sandhill cranes and peregrine falcons.

South Common Alternative

Construction of the South Common Segment would result in destruction or disturbance of two red-tailed hawk nests, two great gray owl nests, and one great horned owl nest. Construction of this segment would contribute to some fragmentation of the few small patches of forest habitats remaining along streams after the 1998 fire. The power lines associated with this segment would contribute to increased risk of collision mortality for sandhill cranes flying between foraging and roosting habitats.

Delta Alternative Segments

Construction of the Delta alternative segments would result in destruction or disturbance of three northern goshawk nest structures. Construction of Delta Alternative Segment 1 would contribute to fragmentation of large patches of closed needleleaf forest habitats, contributing to habitat degradation for forest nesting birds. The power line associated with Delta Alternative Segment 1 would contribute to increased risk of collision mortality for sandhill cranes flying between foraging and roosting habitats and for forest nesting landbirds.

No-Action Alternative

Under the No-Action Alternative, impacts from construction or operations activities would not occur. Bird populations residing or migrating through the project area would remain unaffected.

5.6.3 Summary of Impacts to Birds

Construction of the proposed action would reduce the acreage of available habitat, primarily (75 percent) forested habitats, for an estimated 3,148 nesting birds within the Tanana River Valley (Table 5-30). The minimum area alternative would alter nesting habitat for an estimated 3,144 birds and the maximum area alternative would alter nesting habitat for an estimated 3,225 birds, primarily landbirds (Table 5-30). Alternative segments passing through late-succession forest habitats would have the greatest potential impact on forest nesting landbirds by fragmenting large patches of forest and creating edge habitat that decreases reproductive potential for forest nesting landbirds. Power lines on poles and communication towers built to support the rail line would increase collision mortality for all birds, but would have the greatest potential for damage where lines and towers lie between wetland or agricultural foraging habitats and riverine roosting habitats used by sandhill cranes, geese, swans, and ducks during migration; or when lines and towers are near raptor nest and foraging sites. Twenty-five bird species of conservation concern have been documented in the project area and would be affected by a loss of habitat and reduction in habitat suitability due to construction of the rail line. Estimated habitat impacts for nesting birds based on regional and averaged project area densities and project footprint requirements are listed in Table 5-30. In general the NRE would affect a small proportion of the available habitat and a small proportion of the total avian population within the project area, with the greatest potential for moderate impacts to forest nesting owls and landbirds.

Table 5-30
Estimated Bird Impacts Due to Nesting Habitat Loss or Alteration from the Proposed NRE Based on Regional and Averaged Local Area Density During the Nesting Season[a]

Bird Type		Individuals Displaced		
Bird Type	**Estimated Project Area Population[b]**	**ARRC Proposed Action[c]**	**Minimum Project Area[d]**	**Maximum Project Area[e]**
Waterbirds	480	2	2	2
Geese & Swans	310	2	2	2
Ducks	4,300	21	21	21
Raptors and Owls	11,600	76	74	91
Upland Game Birds	8,900	43	43	44
Landbirds	618,800	3,004	3,002	3,065
Resident	89,600	435	435	444
Long-Distance Migrant	366,600	1,779	1,778	1,815
Short-Distance Migrant	162,700	790	790	806
Birds of Conservation Concern[f]	230,920	1,127	1,124	1,167
Total Individuals[g]	644,390	3,148	3,144	3,225

Table 5-30
Estimated Bird Impacts Due to Nesting Habitat Loss or Alteration from the Proposed NRE Based on Regional and Averaged Local Area Density During the Nesting Season[a] (continued)

[a] Source: USFWS, 2008; Anderson *et al.,* 2000; Benson 1999; Prichard and Ritchie, 2007, Appendix F4).
[b] Estimate based on regional or average project area densities multiplied by area within 5 miles of all proposed alternative segments.
[c] Estimate based on footprint area for all proposed alternative segments and all associated facilities. Estimate based on footprint area for the proposed action includes: North Common, Eielson 3, Salcha 1, Connector B, Central 2, Connector E, Donnelly 1, South Common, Delta 1 and associated facilities.
[d] Estimate based on minimum area alternative includes: North Common, Eielson 2, Salcha 1, Central 2, Connector B, Donnelly 2, South Common, Delta 2 and associated facilities.
[e] Estimate based on maximum area alternative includes: North Common, Eielson 1, Salcha 2, Central 1, Connector C, Donnelly 1, South Common, Delta 1 and associated facilities.
[f] Estimate based only on species for which an abundance within the project area could be calculated. Estimate includes species with widely divergent populations and totals do no reflect the condition for individual species of conservation concern (see Appendix F).
[g] Total includes waterbirds, geese and swans, ducks, raptors and owls, upland game birds and landbirds. Landbird categorized by migration are subcategories of landbirds and totals for birds of conservation concern are included within the appropriate category above.

5.7 BLM Alaska Special Status Species

BLM's Alaska State Office maintains a list of Special Status Species (SSS) with objectives to conserve listed species and the ecosystems they depend on, and ensure that BLM actions do not contribute to the need to list or perpetuate listings under the Federal Endangered Species Act or BLM's SSS policies. Seven birds and one mammal from the Alaska SSS list are known to occur in the project area. There are no Alaska SSS fish or plants in the project area. A summary of potential project impacts to these eight SSS species is provided in Table 5-31. Analysis and discussion of these species are provided in Sections 5.5.3 and 5.6.3, and Appendix F.

Table 5-31
Summary of Assessment of Impacts from the NRE to BLM Alaska Special Status Species[a]

Species (Migration)[b]	Rationale[c]	Estimated Project Area Population[d]	Habitat Impact Description[e]	Estimated Proposed Project Impact[f] (number of birds)	Estimated Minimum Project Impact[g] (number of birds)	Estimated Maximum Project Impact[h] (number of birds)
Federally Delisted Species						
American Peregrine Falcon (L)	Delisted in 1999 - Sensitive to changes on cliffs, rocks, etc. & vulnerable to contaminants	26	Disturbance during nesting and foraging, power line, communication tower collision mortality	0	0 pair	8
BLM Alaska Sensitive Birds						
Blackpoll Warbler (L)	In decline (Sensitive to changes in riparian habitats)	24,544	70 acres riparian habitat removed, fragmented; 300 acres shrub habitat removed, fragmented, power line, communication tower collision mortality	119	119	122
Gray-cheeked Thrush (L)	Long-term declines, sensitive to removal of riparian shrubs	Unknown	300 acres shrub habitats, 70 acres riparian habitats removed fragmented, power line, communication tower collision mortality	√	√	√
Long-tailed Duck (S)	Sea ducks have experienced significant declines	8	Disturbance during nesting, brood-rearing, habitat loss, degradation, power line collision morality	0	0	0
Olive-sided Flycatcher (L)	In decline (Sensitive to forest management - Canopy nester)	1,718	1,900 acres needleleaf/mixed forested habitats removed, fragmented, power line, communication tower collision mortality	8	8	9
Surf Scoter (S)	Sea duck populations in decline (Scoter data combined for all three species)	149	Disturbance during nesting, brood-rearing, habitat loss, degradation, power line, communication tower collision mortality	1	1	1
Townsend's Warbler (L)	Sensitive to forest management - Canopy nester	Unknown	1,900 acres needleleaf/mixed forested habitats removed, fragmented	√	√	√
Trumpeter Swan (S)	NA	203	Disturbance during spring/fall migration, nesting, brood-rearing, habitat loss, degradation, power line collision morality	1	1	1

Table 5-31
Summary of Assessment of Impacts from the NRE to BLM Alaska Special Status Species[a] (continued)

Species (Migration)[b]	Rationale[c]	Estimated Project Area Population[d]	Habitat Impact Description[e]	Estimated Proposed Project Impact[f] (number of birds)	Estimated Minimum Project Impact[g] (number of birds)	Estimated Maximum Project Impact[h] (number of birds)
BLM Alaska Sensitive Mammals						
Canada Lynx	NA	Unknown/ Scarce	Disturbance, habitat loss and alteration, Spruce and hardwood forest habitats (2,127 to 2,171 acres) especially mosaic habitats caused by fire – forage primarily on hares, grouse, ptarmigan, squirrels, rodents	√	√	√

[a] Sources: Anderson *et al.*, 2000; Benson, 1999; Benson, 2001; Harding and Sharbaugh, 2005; Prichard and Ritchie, 2007; ADF&Gs Alaska Wildlife Notebook, NatureServe, Animal Diversity Web; Blejwas, 2006.
[b] (S) = Short-distance migrant, (L) = Long-distance migrant. √ indicates the species has been documented in the project area and impacts would occur but data are insufficient to estimate the scale of impact.
[c] Rationale for inclusion in Alaska's comprehensive wildlife Conservation Strategy (ADF&G, 2006), NA = not applicable (species not listed in Conservation Strategy)
[d] Estimates generated only for species with an abundance estimate within the project area.
[e] Number of nesting birds impacted is based on the estimated project area nesting density multiplied by the area of footprint impact for the proposed action, the minimum area alternative, and the maximum area alternative.
[f] Proposed Action includes North Common, Eielson 3, Salcha 1, Connector B, Central 2, Connector E, Donnelly 1, South Common, Delta 1 and associated facilities.
[g] Minimum Project Area includes North Common, Eielson 2, Salcha 1, Central Connector B, Central 2, Donnelly 2, South Common, Delta 2 and associated facilities.
[h] Maximum Project Area includes North Common, Eielson 1, Salcha 2, Central Connector C, Central 1, Donnelly 1, South Common, Delta 1 and associated facilities.

6. CULTURAL RESOURCES

This chapter assesses the impacts that the proposed Northern Rail Extension (NRE) would have on cultural resources within the project area. A discussion of regulations is followed by a characterization of cultural resources in the project area. The subsequent section describes the direct and indirect impacts on cultural resources that would result from construction and operation of the rail line, followed by documentation of consultation with Alaska Native organizations. The analyses draw from three reports, which are incorporated here by reference: (1) a predictive model of cultural resources in the area (Potter, 2006), (2) 2006 survey results (Potter *et al.* 2007a), and (3) 2007 survey results (Potter *et al.*, 2007b).

6.1 Applicable Regulations

Section 106 of the National Historic Preservation Act (NHPA), as amended (16 U.S.C. 470), requires that Federal agencies consider the effects of their undertakings (including the issuance of permits, licenses, or authorizations) on historic properties and provide the Advisory Council on Historic Preservation (ACHP or the Council) an opportunity to comment. As the lead Federal agency for Alaska Railroad Corporation's (ARRC) proposed NRE, Section of Environmental Analysis (SEA) is responsible for consulting with the State Historic Preservation Office (SHPO), land managing agencies, Indian tribes, and other interested parties about the potential for this project to affect historic properties.

6.2 Affected Environment

This section summarizes the prehistoric and historic background of the project area as a baseline for evaluating the project's potential impacts on cultural resources. This cultural chronology of prehistoric and historic human activity in the project area draws from known archeological and historic resources, and illustrates the current extent of knowledge about prehistory and history of the Tanana River Basin.

6.2.1 Prehistoric Cultural Chronology

Archeological research in Interior Alaska indicates that humans have inhabited the middle Tanana River Basin for over 14,000 calendar years (12,000 radiocarbon years), making this region of Alaska the focus of some of the earliest dated sites in the Americas. This regional cultural history is divided into three broad archeological traditions: the American Paleoarctic Tradition (13,300 to 6,000 years ago), Northern Archaic Tradition (6,000 to 1,000 years ago), and Athabascan Tradition (1,000 years ago to 1880 AD), as well as two phases of the historic period, the historic Athabascan followed by Euroamerican. These periods represent major Alaskan cultural traditions and are based on differences in the material culture (artifacts), settlement type, and subsistence practices.

American Paleoarctic Tradition (13,300 to 6,000 years ago)

Paleoarctic inhabitants of the Tanana River Basin were hunters whose patterns of settlement reflect their strategies for hunting and processing of large and small game (Holmes, 1996; Bowers, 1999). They were nomadic and followed wapiti (elk) and other large herds on their seasonal cycles of migration across Alaska. They supplemented their diets with small game and fish. Previously identified archeological sites from this period in the Tanana River Basin include residential areas, temporary hunting camps, hunting look-outs, tool production sites, meat and hide processing camps, and other small settlements. In their annual hunting cycles, sites near productive hunting grounds were often revisited, leading to stratified archeological deposits that represent reuse over many years.

Archeological features and material culture from the region reflect the hunting mode of subsistence. In general, sites are very ephemeral, and represented only by hearth features, faunal bones from hunted game, and stone tools and debitage (the byproduct of tool production). The lithic industry, or “stone tool kit,” of hunters in the middle Tanana River Basin is characterized by a number of artifact forms, including “Chindadn” triangular projectile points, which have been found at a number of sites throughout the Basin and date to approximately 12,000 years ago. Bone implements, including worked mammoth ivory pieces, suggest bone points were in use during the 14,000 to 13,000 year time period. An eyed-bone needle was dated to 12,000 years and likely relates to processing of hides for clothing or shelters (Holmes, 1996:313). The variety of faunal remains includes ungulates (hoofed animals) like wapiti, bison, caribou, sheep, and moose, as well as small game like fox, wolf, hare, ground squirrel, and other small rodents. The remains of waterfowl such as duck, geese, and swan, as well as salmonid fish, indicate that river resources were exploited as well (Holmes, 1996; Yesner, 1996).

An example of the American Paleoarctic Tradition from the region is the Gerstle River site, east of Delta Junction, which reflects many of the components of settlement in the area. The site contained cultural materials dated between 12,000 and 9,000 years ago, comprising at least five separate periods of use at the site (Potter, 2005). The site had a wide variety of stone tools, ten hearth features, and multiple bones of wapiti and bison. The site functioned as a temporary field camp where large mammals killed nearby were processed (Potter, 2005). An extensive analysis of the faunal bones was conducted, indicating that lower and upper limbs were removed from the carcass and processed for marrow around hearths while meat and fat associated with ribs, cervical, and thoracic vertebrae were likely prepared for transport, removed from the site, and taken to a nearby residential base camp.

In general, sites of the American Paleoartic Tradition are ephemeral, in part because of the temporary nature of their use, but also as a result of their age and preservation. Many questions remain as to the nature of social organization as well as environmental interactions among these hunting populations. The work at Gerstle River (Potter, 2005) suggests stone tool technology in the area was related to site function, raising questions as to whether the artifacts can be associated with specific cultures or populations over time.

Northern Archaic Tradition (6,000 to 1,000 years ago)

At approximately 6,000 years ago, the characteristic stone tools of the region, which had been stable for thousands of years, began to change. In addition to the previously used tools, side-notched projectile points began to appear in Interior Alaska at this time (Potter, 2000, 2004). The reasons for why this happened are not clear (*e.g.*, Anderson, 1968; Workman, 1977), but some have argued that their occurrence throughout Interior Alaska and southwestern Yukon possibly is related to environmental transformations. The new tool kit may represent a new cultural tradition or new subsistence practices oriented towards exploitation of boreal forest resources, which were on the rise (Anderson, 1968; Dixon, 1985).

A number of sites in the Tanana River Basin provide examples where side-notched projectile points and narrow tapering lance-shaped points have been found, including the Swan Point site (Holmes *et al.*, 1996), the Tok Terrace site (Sheppard *et al.*, 1991), the Healy Lake Village site

(Cook, 1969), Dixthada (Shinkwin, 1979), the Chugwater site, and several other localities. The changes in tool type in the area are clear, but explanations for what they mean are not.

Athabascan Tradition (1,000 years ago to AD 1880)

The Athabascan Tradition is a prehistoric culture attributed to ancestors of northern Athabascan Indians of Alaska. Sites of the Athabascan Tradition in the Yukon Basin date from about 1,000 years ago to about AD 1880. Aspects of this tradition continued into the historic period of the late 19th century and up to the present time. Early prehistoric Athabascan Tradition sites are characterized by housepit and subsurface cache features. The artifacts that characterize this cultural group generally show less flaked stone tools than in previous periods and an increase in ground stone, bone, and antler artifacts.

Recent testing in an early historic house depression near Tok indicates a significant change in the Athabascan Tradition was an increased use of expedient tools, tools made as needed from readily available materials (Sheppard, 2001). Faunal materials found at Athabascan Tradition sites suggest a more broad spectrum use of natural resources, including bird fauna (Rainey, 1939), as well as black bear, Dall sheep, and marmot (Plaskett, 1977). Much of our understanding of sites from the Athabascan Tradition in Alaska results from excavations outside of the project area, including excavations at Lake Minchumina (Holmes, 1986) and sites near Eagle (Andrews, 1987), Tok (Sheppard, 2001), and Chitina (Rainey, 1939; Shinkwin, 1979). Athabascan Tradition sites in the project area include Swan Point, which contained pecked and ground stone artifacts as well as flaked artifacts, and where the flaked stone tools included lance-shaped projectile points and microblades (Holmes *et al.*, 1996).

The proto-historic Athabascan sites include those characterized by a mix of Native-made items and non-Native trade goods such as iron and glass beads, and copper tools. These artifacts on Athabascan sites reflect indirect contact with the Hudson’s Bay Company and Russian American Company fur traders, as well as prospectors and missionary influences from the Yukon River (AD 1740–1850). Historic Athabascan sites (post-1850) generally have a mixture of log cabin and house pit dwellings affiliated with a larger percentage of Euroamerican artifacts, and were sometimes relocated away from traditional site location to areas that facilitated trading.

6.2.2 Historic Cultural Chronology

Historic Athabascans

At the time of direct Euroamerican contact, the project area was occupied by several bands of Tanana Athabascans (Andrews, 1977; McKennan, 1981). The Athabascan social group included a “band” of families whose subsistence activities centered on procurement of fish resources and terrestrial game animals. Athabascan settlement locations are tied to a yearly subsistence cycle. Traditional Athabascan land use includes fall hunting of moose, caribou, sheep, and small terrestrial animals, and also trapping (Andrews, 1975; McKennan, 1981). Hunting was associated with seasonal movements along trails and frozen rivers, particularly as bands moved between rivers and uplands.

Fishing was done near the village sites, and the fish were stored in large subsurface caches. In the early fall, the bands dispersed into small family units who then went on hunting ventures (Mishler, 1986). Seasonal procurement of caribou occurred at various times, focused on their fall and late-winter and early spring migrations. Sheep hunts occurred in the upland areas. Hares, ptarmigan, spruce grouse, and over-wintering waterfowl were also hunted. These subsistence patterns were similar to those practiced in the area for thousands of years.

Contact with Euroamericans brought about change. The establishment of trading posts as well as the movement of miners and missionaries coming into the country brought the Athabascans into the cash economy and systems of wage-labor for goods and services. Their former subsistence-based lifestyle was greatly disrupted (Simeone, 1995).

Noted geologist Alfred Brooks was the first non-native to record the Salcha River and place it on a map, during his 1898 expedition for the U.S. Geological Survey (USGS) (Andrews, 1975). Prior to the influx of Euroamericans into the Tanana River Basin just after 1900, Salchaket was a seasonally occupied site for the Salcha band of Athabaskan Indians. McKennan (1981:567) refers to Salchaket as “an old Salcha fish camp” (Figure 6-1). After the gold rush and the accompanying influx of Euroamerican settlers to the region, Salchaket became an important village for the Salcha band and was occupied year round (Andrews, 1975). In 1911, there were about 40 Salcha people living in the settlement of Salchaket (Grider, 1911) (Figure 6-2). The population steadily declined, and a church official noted in 1936 that the people in Salchaket had mostly moved away or died off and that “the few souls” remaining in that “old camp” were under the care of the reverend from St. Matthew’s in Fairbanks (Bentley, 1936). By 1945, only two Salcha people were living in the village. These two people moved to Fairbanks during the early 1950s (Andrews, 1975).

In 1915 a meeting was held in Fairbanks with chiefs from the lower portions of the Tanana River Basin and U.S. government officials; the purpose of the meeting was to discuss the possibility of establishing reservations for the Natives. After hearing about the conditions of reservation life in other parts of the country, the chiefs decided against establishing reservations for their people in Alaska. At that time there were very few Euroamericans living outside the major settlements and the chiefs still felt that “there would be plenty of room for everyone” (Olson, 1981:706).

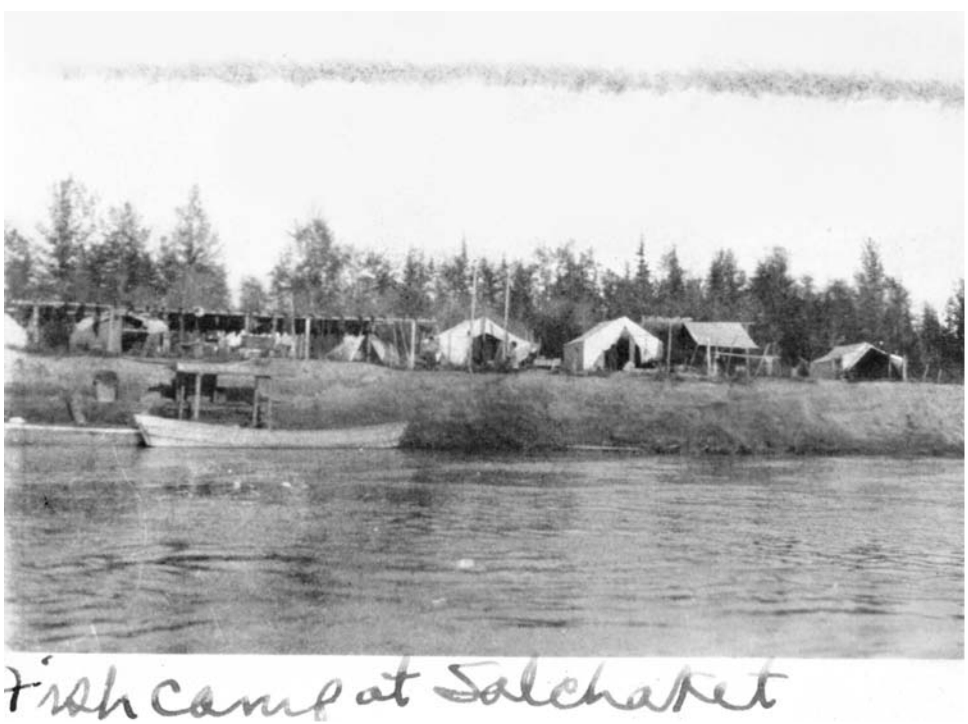

Figure 6-1 – Fish Camp at Salchaket (Frederick B. Drane Collection, UAF-1991-46-594, Archives, Alaska and Polar Regions Collections, Rasmuson Library, University of Alaska Fairbanks)

Figure 6-2 – St. Luke's Mission House, Salchaket, Alaska (Walter and Lilian Phillips Album, UAF-1985-72-118, Archives, Alaska and Polar Regions Collections, Rasmuson Library, University of Alaska Fairbanks)

Euroamericans

The Tanana River area has a documented Euroamerican history of less than 130 years, and like the Tanana Athabascan history, it has experienced significant changes since 1878. Tanana River Basin Euroamerican history is characterized by mineral exploration and construction of trading posts, roadhouses, and missions, followed by trade and commerce, and military buildup related to World War II and the Cold War.

Initial Euroamerican presence in the Tanana River Basin started with Yukon traders Harper and Mayo who began exploration of the greater Tanana River Basin in 1878 (Robe 1943). In 1898, Mendenhall's (1900) geological expedition reached the Tanana River Basin via the Copper and Delta rivers. His party ventured as far as Jarvis Creek, near present-day Delta Junction, but failed to reach the Tanana River before having to return to the Copper River.

The U.S. Army was responsible for the construction of the Washington-Alaska Military Cable and Telegraph System (WAMCATS), constructed during the first years of the 20th century. WAMCATS included a telegraph system spanning Interior Alaska, linking western Alaska with the rest of the state and crossing near the confluence of the Salcha and Tanana rivers. Portions of this 1903 telegraph system remain on the landscape (Quirk, 1974).

Perhaps the most notable event in the history of the Interior was the gold rush that occurred at the beginning of the 20th century. In 1902, Felix Pedro struck gold on a small stream 12 miles northeast of Fairbanks, and a rush began that brought settlers to the Tanana River Basin in force. The industry eventually became mechanized through the use of large dredges, in part due to the transportation advances that lowered the cost of shipping equipment to the mines and the opening of the Healy Coal Fields in the 1920s. Agriculture provided an additional viable occupation for people living in the region (Monahan, 1959). Fairbanks had been founded in 1901–1902, and its growth led to the development of the historic Valdez-Fairbanks Trail connecting Fairbanks to Alaska's southern coast. The trail later became Richardson Highway. This route would not have been feasible without roadhouses and other facilities constructed to assist the freighters, mail contractors, miners, hunters, and other travelers that traversed the wilderness trail. In the 1920s the Alaska Road Commission began upgrading the Valdez Trail to automobile standards. Richardson Highway was first paved in 1957.

Located at the northwestern end of the proposed project area, the military base eventually known as Eielson Air Force Base (AFB) came into existence in 1942–1943, when military planners desired an alternate satellite field for Ladd Field in Fairbanks. The facility was originally known as “Mile 26” due to its location 26 miles southeast of Fairbanks and was later renamed Eielson AFB. Ladd Field was then transferred to the U.S. Army. The U.S. Army formally took over the installation on January 1, 1961, and it was renamed Fort Wainwright (Price, 2001). The project area also includes two sites that were part of the Ballistic Missile Early Warning System (BMEWS) during the Cold War. BMEWS stations generally consisted of a radio relay building, a so-called POL (petroleum, oils, lubricants) tank, and a TD-2 communication tower. There was a BMEWS station at Harding Lake and one near Delta Junction (Reynolds, 1988). A military history of the project area is found in the U.S. Army Lands Environmental Impact Statement (CEMML, 1999) and the Fort Wainwright and Fort Greely Draft Integrated Cultural Resources Management Plan (Lewis, 1999).

6.2.3 Previously Known Cultural Resources in the Project Area

Previous surveys for cultural resources have been conducted only in the extreme northwestern and southeastern portions of the NRE. The Trans-Alaska Pipeline System (TAPS), Alaska Natural Gas Transportation System (ANGTS), and Alaska Gas Producers Pipeline Team (AGPPT) surveys were located on the east side of the Tanana River, but there has been some surveys west of the Tanana River. The Fort Greely surveys (Higgs *et al.*, 1999; Holmes, 1979) took place generally to the south of the project area. The various surveys in support of the U.S. Army units (Hedman *et al.*, 2003; Raymond-Yakoubian and Robertson, 2005; Robertson *et al.*, 2005) were conducted to the east of the Delta River. The Golden Valley Electric Association, Inc. and Fort Wainwright surveys (Bowers *et al.*, 1995; Dixon *et al.*, 1980; Potter, 1999) were conducted to the west of the project area, though the Fort Wainwright survey did cover a large portion of the project area northwest of Flag Hill, including the Blair Lakes area. These surveys were assessed with respect to survey methods, coverage, and results in developing the predictive model for the NRE surveys (Potter, 2006).

The main Fort Greely base in Delta Junction has had more comprehensive and wide-scale surveys over the past 30 years than any other region in the Tanana River Basin (Dixon *et al.*, 1980; Reynolds, 1986; Potter *et al.*, 2000). The current understanding of regional prehistory and history in the mid-Tanana River Basin is dominated by sites found east of the Tanana River and Richardson Highway. Given the lack of survey in the western areas, cultural resource surveys for this proposed action focused on those areas, which correspond with the vast majority of the NRE build alternatives (Potter, 2006; Potter *et al.*, 2007a; 2007b).

6.3 Environmental Consequences

6.3.1 Methodology

Section 106 regulations, (36 Code of Federal Regulations [CFR] Part 800) use “historic properties” as a general term to include the entire range of different cultural resources, such as archeological sites and historic structures. The National Environmental Policy Act of 1969 (NEPA) requires an assessment of impacts on historic properties. To assess the potential impacts on historic properties in the project area, SEA used a combination of direct identification of sites in the project area, as well as computerized modeling of potential for the presence of buried archeological resources in different parts of the project area.

In general, the purpose of cultural resource surveys is to identify historic properties within the Area of Potential Effect (APE) that are eligible for listing on the *National Register of Historic Places*. For the purposes of the NRE cultural resources surveys, the limits of potential disturbance were considered to be 100 feet on either side of the track centerline. This would encompass the actual railbed. The overall APE for the project was established as 328 feet (100 meters) on either side of the rail centerline. This APE would account for the proposed mainline track, as well as ancillary support facilities and the potential indirect impacts that could result from construction and operation of the rail line. A complete field survey of the entire APE, including all alternative segments, was not feasible because of climate and field conditions. The survey was conducted as a systematic sampling survey, which included development of a predictive model for the project area, followed by strategic field sampling of certain moderate and high probability locations. This workplan was approved by the Alaska SHPO and Bureau of Land Management (BLM) prior to survey.

Discussions of the predictive model and the field survey results are presented below. Proposed mitigation for impacts to cultural resources is presented in Chapter 20 of the Environmental Impact Statement (EIS).

Site Location Model

To develop the predictive model for cultural resources in the project area (Potter, 2006), a range of values from low potential to high potential was assigned to the landscape. Factors considered important in predicting prehistoric archeological site locations in Interior Alaska include local microtopography and slope, geomorphology and sediments, distance to and type of water source, percentage of surface cover, exposed stratigraphy, mineral licks, spawning sites in clearwater tributaries of larger rivers, lake shores, the margins of swampy lowlands, caribou migration routes, habitats favorable to large mammals and waterfowl, and lithic (stone) resource localities.

The predictive model was applied to areas with proposed rail alternative segments and ancillary facilities, which were then surveyed by Type A or Type B surveys. Type A surveys consisted of low-altitude, low-speed helicopter fly-over supplemented by ground survey in sample locations. Type B surveys, conducted in high probability areas, consisted of pedestrian walkover in transects, combined with subsurface excavations. Testing was discretionary and based on overflights of the areas, review of aerial photographs, review of the archeological literature of the area, and previous experience conducting surveys, reviews, and excavations in Interior Alaska (Bowers *et al.*, 1995; Gerlach *et al.*, 1996; Higgs *et al.*, 1999; Potter *et al.*, 2000; Potter *et al.*, 2002). Areas determined to have high and moderate potential were more intensively tested and included riverbanks, alluvial terrace edges, lakeshores with positive relief, bedrock ridges and other elevated terrain features. The overall survey strategy was designed to meet Phase II survey requirements by the Alaska SHPO and intended to gather sufficient data for a determination of eligibility for listing on the National Register (Potter *et al.*, 2007a).

6.3.2 Field Results

Survey of the alternative segments totaled 239.3 miles (385.1 kilometers), which included 149.9 miles (241.2 kilometers) of Type A survey and 89.4 miles (143.9 kilometers) of Type B survey. About 70 percent of the build alternative segments have been surveyed. The 2006-2007 surveys identified and tested 198 high potential areas for subsurface cultural remains, resulting in the excavation of 949 test pits and the discovery of 61 historic properties including archeological sites and standing structures. Of those, 51 were prehistoric archaeological sites, representing the full range of occupation in the region from American Paleoartic to Athabascan settlements (Potter *et al.*, 2007b: see Appendix C). Ten sites were historic or recent sites associated with Athabascans or Euroamericans.

Summary data on all 61 historic properties discovered during the 2006-2007 surveys are provided in Table 6-1. Of the 61 historic properties evaluated for this project, 7 were considered not eligible for listing on the National Register because they are less than 50 years old. A total of 51 were considered eligible under Criterion D of the Department of Interior's guidelines for assessing site significance. Historic properties eligible for listing on the National Register under Criterion D are those that have the potential to yield important information about prehistory or history. Criterion D is generally used to describe the research potential of archeological resources whose full extent and integrity are unknown. Of the 61 properties, 3 historic properties need more information before eligibility can be adequately determined: XBD-293, 294, and 295, comprised of historic archeological deposits associated with Salchaket Village. These sites are likely eligible for listing on the National Register, but more research is needed to fully determine their significance.

Table 6-1
Archaeological Site Summary Data

Site[a]	Nearest Alternative	Description	Age[b]	Eligibility for National Register Listing
FAI-1750	North Common Segment	Cabin	Recent	Not Eligible
FAI-1751	Salcha 2	Buried lithic site	250±40 BP	Eligible (D)
FAI-1607	Salcha 1	Cabin	Recent	Not Eligible
XBD-281	Delta 2, MT5*	Buried lithic site	2760±40 BP	Eligible (D)
XBD-282	Delta 2, MT5*	Buried lithic site	5920±50 BP	Eligible (D)
XBD-283	Delta 1	Buried lithic site	5000±50 BP	Eligible (D)
XBD-284	Delta 2	Cabin and land use area	Recent	Not Eligible
XBD-285	Delta 1	Cabin	Recent	Not Eligible
XBD-286	Donnelly 2	Buried lithic site	1860±50 BP	Eligible (D)
XBD-287	Donnelly 2	Buried lithic site	4490±50 BP	Eligible (D)
XBD-288	Donnelly 2	Buried lithic site	6060±60 BP	Eligible (D)
XBD-289	Donnelly 2	Buried lithic site	7960±70 BP	Eligible (D)
XBD-290	Donnelly 2	Buried lithic site	1170±40 BP	Eligible (D)
XBD-291	Donnelly 2	Buried lithic site	7350±60 BP	Eligible (D)
XBD-292	Salcha 2	Axe-cut stumps	Recent	Not Eligible
XBD-293	Salcha 2	Associated with Salchaket	19^{th}-20^{th} cent.	Data needed
XBD-294	Salcha 2	Associated with Salchaket	19^{th}-20^{th} cent.	Data needed
XBD-295	Salcha 2	Associated with Salchaket?	AD 1940s	Data needed
XBD-296	Salcha 2	Buried lithic site	2010±40 BP	Eligible (D)
XBD-297	Donnelly 1	Buried lithic site	3620±50 BP	Eligible (D)

Table 6-1
Archaeological Site Summary Data (continued)

Site[a]	Nearest Alternative	Description	Age[b]	Eligibility for National Register Listing
XBD-298	Donnelly 1	Buried lithic site	Component 1: 11,300±40 BP Component 2: 9670±40 BP Component 3: 9650±60 BP Component 4: 8880±40 BP	Eligible (D)
XBD-299	Donnelly 1	Buried lithic site	4500-8900 BP	Eligible (D)
XBD-300	Donnelly 1	Buried lithic site	4500-8900 BP	Eligible (D)
XBD-301	Donnelly 1	Buried lithic site	4360±50 BP	Eligible (D)
XBD-302	Donnelly 1	Buried lithic site	4500-8900 BP	Eligible (D)
XBD-303	Donnelly 1	Buried lithic site	9340±80 BP	Eligible (D)
XBD-304	Donnelly 1	Buried lithic site	4500-8900 BP	Eligible (D)
XBD-305	Donnelly 1	Buried lithic site	9300-10000 BP	Eligible (D)
XBD-306	Donnelly 1	Buried lithic site	8930±90 BP	Eligible (D)
XBD-307	Donnelly 1	Buried lithic site	8070±60 BP	Eligible (D)
XBD-308	Donnelly 1	Buried lithic site	10050±70 BP	Eligible (D)
XBD-309	Donnelly 1	Buried lithic site	9300-10000 BP	Eligible (D)
XBD-311	Donnelly 1	Buried lithic site	6490±50 BP	Eligible (D)
XBD-312	Donnelly 1	Buried lithic site	9290±50 BP	Eligible (D)
XBD-313	Donnelly 2	Buried lithic site	6750±60 BP	Eligible (D)
XBD-314	Donnelly 2	Buried lithic site	1000-4000 BP	Eligible (D)
XBD-315	Donnelly 2	Buried lithic site	4100-6800 BP	Eligible (D)
XBD-316	Donnelly 2	Buried lithic site	4050±50 BP	Eligible (D)
XBD-317	Donnelly 2	Buried lithic site	5610±50 BP	Eligible (D)
XBD-318	Donnelly 2	Buried lithic site	4100-6800 BP	Eligible (D)
XBD-319	Donnelly 2	Buried lithic site	4100-6800 BP	Eligible (D)
XBD-320	Donnelly 2	Buried lithic site	4100-6800 BP	Eligible (D)
XBD-321	Donnelly 2	Buried lithic site	4100-6800 BP	Eligible (D)
XBD-322	South Common Segment	Buried lithic site	1000-2700 BP	Eligible (D)
XBD-323	MT3*	Buried lithic site	1000-2700 BP	Eligible (D)
XBD-324	MT3*	Buried lithic site	2070±50 BP	Eligible (D)
XBD-325	DCMPS*	Buried lithic site	7360±40 BP	Eligible (D)
XBD-326	DCMPS*	Buried lithic site	7740±60 BP	Eligible (D)
XBD-327	DCMPS*	Buried lithic site	5200-7700 BP	Eligible (D)
XBD-328	DCMPS*	Buried lithic site	5170±50 BP	Eligible (D)
XBD-329	Donnelly 2	Cabin	Recent	Not Eligible
XBD-330	Donnelly 1	Cabin	Recent	Not Eligible
XBD-335	Donnelly 1	Buried lithic site	Component 1: 5400±40 BP Component 2: 1000-2700 BP	Eligible (D)
XBD-336	Donnelly 1	Buried lithic site	3040±40 BP	Eligible (D)
XBD-337	Donnelly 1	Buried lithic site	2180±40 BP	Eligible (D)

Table 6-1
Archaeological Site Summary Data (continued)

Site[a]	Nearest Alternative	Description	Age[b]	Eligibility for National Register Listing
XBD-338	Donnelly 1	Buried lithic site	Component 1: 12,000-11,000 BP Component 2: 10,000±80 BP	Eligible (D)
XBD-339	Donnelly 1	Buried lithic site	8000-3600 BP estimated	Eligible (D)
XBD-340	Donnelly 1	Buried lithic site	8000±50 BP	Eligible (D)
XBD-341	Donnelly 1	Buried lithic site	10000-8000 BP estimated	Eligible (D)
XBD-342	Donnelly 1	Buried lithic site	4670±40 BP	Eligible (D)
XBD-343	Donnelly 1	Buried lithic site	4160±40 BP	Eligible (D)

[a] The sites listed in this table are identified by their site identifier codes.
[b] Age is the uncalibrated radiocarbon date associated with the site or site component.
* DCMPS = Delta Creek Material Processing Site Location, MT = Microwave Tower Location. These are possible sites identified by ARRC for ancillary facilities associated with the proposed NRE.

6.3.3 Common Impacts

This section describes the possible types of impacts that construction and operation of the proposed NRE could have on cultural resources. Direct impacts include surface and subsurface disturbances resulting from construction, operation, and maintenance activities associated with the proposed rail line. Ground disturbance would directly and adversely impact the integrity of archeological sites through removal of surface artifacts, disturbance of site contexts, soil compaction, watershed modification, and contamination of organic residues of a site. Where vegetation is cleared, erosion could increase and expose archaeological resources. For historic properties eligible for the NRHP, construction of the project could have impacts to the aesthetics and visual site setting, depending on proximity.

Indirect project impacts would include increased erosion and site degradation. The project would likely alter the watershed in the area. Changes to the surface flow of water, from removal of vegetation or cutting and filling, can cause changes in soil deposition across the area. New erosion patterns could expose buried archeological sites. There could also be changes to groundwater, which affects soil pH levels and has an overall effect on the preservation of buried artifacts and features at sites.

6.3.4 Impacts by Alternative Segment

This section compares the impacts of each alternative segment on known historic properties as well as the potential to affect buried archeological sites. This section also provides a summary and description of potential impacts on historic properties by the build alternatives. The limits of disturbance for the mainline track extend 100 feet on either side of the track centerline. These are areas subject to direct impacts. The overall project APE is considered 328 feet (100 meters) from the centerline. These areas, outside the limits of direct disturbance, are subject to indirect impacts from the build alternatives.

All known historic properties associated with NRE alternative segments, both previously known and newly discovered, are listed in Table 6-2. There are a total of 16 sites within 328 feet of

Table 6-2
Summary of Site Proximity to Main Track Alternative Segments

Segment	Historic Properties[a] (within the Area of Potential Effect)	Historic Properties[a] (within 1,312 feet of Area of Potential Effect)
North Common Segment	0	0
Eielson 1	0	1 (FAI-071*)
Eielson 2	0	0
Eielson 3	0	0
Salcha 1	0	0
Salcha 2	2 (FAI-1751, XBD-293**)	4 (FAI-156*, XBD-027, XBD-294**, 296)
Central alternative segments	0	0
Donnelly 1	8 (XBD-335-336, 338-343)	17 (XBD-188*, 189*, 297-309, 312, 337)
Donnelly 2	4 (XBD-291, 313, 320-321)	11 (XBD-287-289, 314-319, 325-326)
South Common Segment	0	1 (XBD-322)
Delta 1	1 (XBD-091)*	0
Delta 2	1 (XBD-281)	2 (XBD-282, XBD-129))

[a] The historic sites listed in this table are identified by their site identifier codes.
* Sites have not undergone determinations of eligibility for listing on the National Register.
** Sites related to Salchaket Village require more data for a determination of eligibility for listing on the National Register, and would likely be eligible.

proposed project alternative segments, 15 prehistoric and 1 historic. Testing to date has involved a limited sample and the full spatial boundaries of these 15 sites have not been determined. It is assumed here that historic properties within 328 feet of proposed alternative segments have the potential to receive direct and indirect impacts from construction and operation of the rail line. Historic properties up to 1,312 feet (400 meters) from the APE would not likely be affected by the right-of-way, but could be affected by the final design of ancillary features and their access roads.

In addition to sites affected by the right-of-way, some ancillary facility locations have associated historic properties (Table 6-3). The list in Table 6-3 includes only those ancillary feature locations that have been proposed by ARRC and which have historic properties within 1,312 feet (400 meters) of the APE.

Table 6-3
Survey Results of Ancillary Facilities

Ancillary Facility	Historic Properties[a] (within the Area of Potential Effect)	Historic Properties[a] (within 1,312 feet of Area of Potential Effect)
Delta Creek Material Processing Site	4 (XBD-327-330)	0
Material Site 7	1 (XBD-293)	1 (XBD-294)
Microwave tower 1	0	1 (FAI-1750)
Microwave tower 2	0	2 (XBD-128, 296)
Microwave tower 3	2 (XBD-323-324)	0

Table 6-3
Survey Results of Ancillary Facilities (continued)

Ancillary Facility	Historic Properties[a] (within the Area of Potential Effect)	Historic Properties[a] (within 1,312 feet of Area of Potential Effect)
Microwave tower 5	1 (XBD-282)	1 (XBD-281)
Southern Terminus Depot	0	1 (XBD-129)

Note: Sites located in the vicinity of both rail line alternatives and ancillary facilities are noted in Tables 6-2 and 6-3.
[a] The historic sites listed in this table are identified by their site identifier codes.

Historic properties within the APE can be divided into two groups with respect to significance and impacts. The first group includes all buried prehistoric sites. The sites are all eligible for listing on the NRHP for their potential to yield information important in prehistory or history. These sites consist of buried cultural materials including features, artifacts, and faunal remains.

The second group is comprised of two historic sites near Salchaket Village (XBD-293 and 294). More data collection and research is necessary to determine National Register eligibility of these sites; however, they would almost certainly be considered eligible. Large portions of the Salchaket Village area were not surveyed because they are on private property, in some cases Native allotments. No alignments considered in the EIS affect Native Allotments, because the eastern alignment through Salcha was removed from consideration.

North Common Segment

The North Common Segment is located in an area of relatively low archeological sensitivity for prehistoric sites and moderate sensitivity for historic sites. No historic properties are known within the APE, though much of the area has not been surveyed. Given its proximity to Richardson Highway, no direct impacts on cultural resources are anticipated for this segment. Any indirect impacts to resources that have not been identified during survey would be minimal.

Eielson Alternative Segments

Eielson Alternative Segments 1, 2, and 3 are also located in an area of relatively low archeological sensitivity for prehistoric sites and moderate sensitivity for historic sites. Most of Eielson Alternative Segment 2, about half of Eielson Alternative Segment 1, and less than a fourth of Eielson Alternative Segment 3 have been surveyed, but all lie within similar surface geology and vegetation. No historic properties are known within the APE. No direct impacts on cultural resources are anticipated for these segments. Any indirect impacts to resources that have not been identified during survey would be minimal.

Salcha Alternative Segments

The two Salcha alternative segments are very different in their potential to affect archeological remains. Salcha Alternative Segment 1 lies west of the Tanana River in floodplain alluvium with little topographic relief. Salcha Alternative Segment 1 has not been surveyed, but lies just southwest of a surveyed area and is considered to have relatively low potential for historic or prehistoric sites. No historic properties are known in or near the APE. No direct impacts and minimal indirect impacts on cultural resources are anticipated for Salcha Alternative Segment 1.

Salcha Alternative Segment 2 lies in areas having high potential for both prehistoric and historic sites. Two historic properties lie in or very near the APE, prehistoric site FAI-1751, and historic site XBD-293, which is associated with Salchaket Village. Four other prehistoric and historic sites are known within 1,312 feet of the APE. One of these, XBD-294, is related to Salchaket Village and features associated with the site may extend into the APE. Three testing areas were identified and surveyed within the APE of Salcha Alternative Segment 2. Numerous archeological resources were encountered. A comprehensive survey of the Salchaket area has yet to be completed. In sum, there are considerable direct and indirect impacts on historic properties anticipated for Salcha Alternative Segment 2.

Connectors A, B, C, and D

The Connector alternative segments A, B, C, and D lie in an area of relatively low potential for prehistoric and historic sites. The area is low, flat, and boggy forest with creek channels and sloughs running through it. Connectors A, B, and C were surveyed by type A survey methods. Four testpits were excavated along Connector A and eight testpits excavated along Connector C. No cultural resources were identified in any of the surveys. A trapper's cabin, first constructed in 1959, was located along Connector B. No historic properties are known in or near the Connector alternative segments. No direct impacts and minimal indirect impacts to historic properties are anticipated for the Connector alternative segments.

Central Alternative Segments

The Central alternative segments lie in an area of relatively low potential for prehistoric and historic sites. Central Alternative Segment 2 is situated on floodplain alluvium with little topographic relief and many areas of water saturation. No historic properties are known in or near the APE along this segment. Central Alternative Segment 1 is farther inland, but still lies in an area of abandoned floodplain with no terraces and is considered lowlands. Four areas of subsurface testing were identified along Central Alternative Segment 1 by computer model. Ten testpits were excavated, but no cultural remains were identified in any of the tests. No direct impacts and minimal indirect impacts on historic properties are anticipated for the Central alternative segments.

Donnelly Alternative Segments

Both Donnelly alternative segments are located in areas with high potential for prehistoric resources. Twenty-six areas of the APE along Donnelly Alternative Segment 1 were tested. There are eight sites within the APE; all are buried prehistoric sites (XBD-335-336, 338-343). Twenty-two areas between 328 and 1,640 feet of the APE were tested, and 17 historic properties were identified (XBD-297-307, 312, 337-341). Site XBD-298 returned a radiocarbon date indicating the site is one of the earliest human habitation sites in North America. Donnelly Alternative Segment 1 also contains the Donnelly-Washburn Trail (RS 2477 Trail No. 0064).

The entire extent of Donnelly Alternative Segment 2 has been surveyed. Four prehistoric archeological sites were recorded, XBD-291, 313, 320, 321. Eleven prehistoric sites were identified in 7 test areas within 1,312 feet of the APE.

The two Donnelly alternative segments would both have direct impacts on historic properties. Overall, Donnelly Alternative Segment 1 contains more archeological sites than Donnelly Alternative Segment 2, including some that have exceptional significance for understanding human migrations to North America. Consequently, Donnelly Alternative Segment 1 would have proportionally greater direct impacts on historic properties than Donnelly Alternative Segment 2. Both alternatives would have similar indirect impacts.

South Common Segment

The South Common Segment lies in an area of low to moderate potential for prehistoric and historic sites. Six areas were tested in the APE, but no cultural resources were identified. One prehistoric site, XBD-322, was identified, within 1,312 feet of the APE. Minimal direct and indirect impacts on historic properties would be anticipated for the South Common Segment.

Delta Alternative Segments

Both Delta alternative segments have moderate potential for prehistoric and historic archeological sites. Delta Alternative Segment 1 is located primarily west of Delta River in an area of moderate potential for prehistoric and historic sites. The segment is situated in abandoned and active floodplain alluvium. Four areas were identified for testing within the APE but no resources were identified. A previously recorded site in the vicinity, XBD-091, is presumed to have been eroded by Jarvis Creek.

Delta Alternative Segment 2 is located primarily east of the Delta River in an area of moderate potential for prehistoric sites and high potential for historic sites. Eight areas in the APE were tested, and one prehistoric site was identified, XBD-281. Two sites were identified within 1,312 feet of the APE, a prehistoric site, XBD-282, and historic site XBD-129, a Cold War-era BMEWS station.

The Delta alternative segments are relatively similar, with moderate potential to affect historic properties. From the known data, Delta Alternative Segment 2 would likely have greater direct impacts on historic properties.

6.3.5 No-Action Alternative

If this project is not constructed, there would be few potential impacts on cultural resources. More vehicle traffic, both commercial and private, on Richardson Highway is anticipated for the No-Action Alternative. Increased traffic raises the potential for erosion and road damage, and if the highway is widened there would be direct impacts to compensate for lack of rail transport. Tourism associated with recreational and other vehicles may have more direct and indirect impacts on cultural resources than tourism associated with the rail line.

6.4 Programmatic Agreement

SEA has developed a Programmatic Agreement (PA) for the NRE that will govern the completion of the Section 106 process. The regulations implementing Section 106 allow for the development of a PA when the effects on historic properties cannot be fully determined prior to approval of an undertaking (36 CFR 800.14.). The PA for the NRE provides for the completion of the Level 2 identification survey once an alignment has been chosen and the locations of ancillary facilities have been established. Additionally, the PA establishes responsibilities for the treatment of historic properties, the implementation of mitigation measures, and ongoing consultation efforts. The draft PA is Appendix H of the EIS.

6.5 Tribal Consultation

Consultation with Native American tribes in the project area vicinity, required under 36 CFR 800, is ongoing. Consultation was initiated as part of the government-to-government consultation and coordination for the EIS process, and is discussed in Section 1.4.2, Tribal and

Government-to-Government Consultation, and summarized in Table 1-2. A total of 23 federally-recognized tribes, tribal groups and Alaska Native Regional Corporations were contacted as part of the government-to-government consultation and coordination. Several agency meetings specifically addressing Section 106 consultation and cultural resources issues were held at the Alaska SHPO in Anchorage, and SEA's cultural resources subcontractor, Northern Land Use Research, Inc. (NLUR), met with Tanana Chiefs Conference (TCC) in Fairbanks to present the results of each season's fieldwork. These meetings occurred on November 20, 2006 and October 26, 2007 and were attended by cultural resource specialists from NLUR, TCC, BLM, and the U.S. Army. Additional consultation will take place throughout this project, as described in the government-to-government consultation and coordination plan, and as detailed in the draft PA (see Appendix H).

7. SUBSISTENCE

Subsistence uses are central to the customs and traditions of many cultural groups in Alaska, including the peoples of Interior Alaska. Their customs and traditions encompass processing, sharing, redistribution networks, cooperative and individual hunting, fishing, and ceremonial activities. Both Federal and state regulations define subsistence uses to include the customary and traditional uses of wild renewable resources for food, shelter, fuel, clothing, and other uses (Alaska National Interest Lands Conservation Act, Title VIII, Section 803, and Alaska Statute [AS] 16.05.940[33]). The Alaska Federation of Natives (AFN) not only views subsistence as the traditional hunting, fishing, and gathering of wild resources but also recognizes the spiritual and cultural importance of subsistence in forming their worldview and maintaining ties to their ancient cultures (AFN, 2005).

Subsistence fishing and hunting are traditional activities that help transmit cultural knowledge between generations, maintain the connection of people to their land and environment, and support healthy diet and nutrition in almost all rural communities in Alaska. The Alaska Department of Fish and Game (ADF&G) estimates that the annual wild food harvest in Interior Alaska is approximately 6,360,000 pounds, or 613 pounds per person per year (Wolfe, 2000). Subsistence harvest levels vary widely from one community to the next. Sharing of subsistence foods is common in rural Alaska and can exceed 80 percent of households giving or receiving resources (ADF&G, 2001b). The term harvest and its variants—harvesters, harvested—are used as the inclusive term to characterize the broad spectrum of subsistence activities, including hunting and fishing.

This chapter summarizes the regulations governing subsistence uses in the proposed Northern Rail Extension (NRE) area (Section 7.1), describes subsistence resource uses (Section 7.2), and analyzes the potential impacts on subsistence uses resulting from the NRE (Section 7.3) by examining direct and indirect effects of construction and operations. Appendix I describes the methodology for evaluating subsistence use areas and provides baseline data and potential impacts on subsistence communities. Appendix O contains the ANILCA Section 810 analysis of subsistence impacts.

7.1 Applicable Regulations

The U.S. Congress adopted ANILCA recognizing that “the situation in Alaska is unique” regarding food supplies and subsistence practices. ANILCA specifies that any decision to withdraw, reserve, lease, or permit the use, occupancy, or disposition of public lands must evaluate the effects of such decisions on subsistence use and needs (16 United States Code [U.S.C.] 3111-3126). In 2005, the Departments of the Interior and the Department of Agriculture established a Federal Subsistence Board to administer the Federal Subsistence Management Program (70 *Federal Register* [*FR*] 76400). The project area is comprised of private, state, and Federal (military) lands. Alaska and the Federal Government regulate subsistence hunting and fishing in Alaska under a dual management system. The Federal Government recognizes subsistence priorities for rural residents on Federal public lands, while Alaska considers all residents to have an equal right to participate in subsistence hunting and fishing when resource abundance and harvestable surpluses are sufficient to meet the demand for all subsistence uses and other uses.

The Alaska Board of Fisheries and the Alaska Board of Game have adopted regulations enforced by the state for subsistence fishing and hunting on all State of Alaska lands and waters and lands conveyed to Alaska Native Claims Settlement Act (ANCSA) groups. The Federal Subsistence Board has adopted regulations that are enforced by the Federal Government for subsistence fishing and hunting on Federal public lands, and federally reserved waters in Alaska.

7.1.1 State Regulations

State law is based on Title 16 of Alaska Statutes (AS 16) and Title 5 of the Alaska Administrative Code (AAC) (05 AAC 01, 02, 85, 92, 99) and regulates state subsistence uses. Under Alaska law, when there is sufficient harvestable surplus to provide for all subsistence uses and other uses, all residents qualify as eligible subsistence users. The state distinguishes subsistence harvests from personal use, sport, or commercial harvests based on where the harvest occurs, not where the harvester resides. More specifically, state law provides for subsistence hunting and fishing regulations in areas outside the boundaries of “nonsubsistence areas,” as defined in state regulations (5 AAC 99.015). The nonsubsistence areas include the areas around Anchorage, Matanuska Susitna Valley, Kenai, Fairbanks, Juneau, Ketchikan, and Valdez (Wolfe, 2000).

7.1.2 Federal Regulations

The Federal Subsistence Board under Title VIII of ANILCA and regulations found in 36 Code of Federal Regulations (CFR) 242.1 and 50 CFR 100.1, recognizes and regulates subsistence practices for rural residents. Federal regulations recognize subsistence activities based on a person’s residence in Alaska, defined as either rural or nonrural. Only individuals who permanently reside outside federally designated nonrural areas are considered rural residents and qualify for subsistence harvesting on Federal lands.

However, Federal subsistence regulations do not apply to certain Federal lands regardless of their rural designations. These include lands withdrawn for military use and closed to general public access (50 CFR Part 100.3). The Final Rule, *Subsistence Management Regulations for Public Lands in Alaska, Subpart A*, further clarifies decisions regarding why subsistence regulations do not apply to military lands (36 CFR Part 242, 50 CFR Part 100):

> [t]he military lands, including U.S. Coast Guard, and Federal Aviation Administration have never been included in the Federal Subsistence Management Program because of national security and defense reasons. These lands have been and are closed to access by the general public, and are, therefore, not available for use by rural Alaska residents for harvest of subsistence resources. (70 *FR* 76400)

In Alaska, the general public may obtain a Recreation Access Permit (RAP) to access certain Interior military lands for sport hunting, sport fishing, trapping, off-road recreational vehicle use and other recreational activities (U.S. Army Alaska [USARAK], 2005). Federal lands near and within the project area boundaries include the Tanana Flats and Donnelly Training Areas, as well as Eielson Air Force Base (AFB) and Fort Greely. The Chena Lakes Flood Control Project, managed by the U.S. Army Corps of Engineers for flood control and recreation, is also located in the project area, and allows for sport hunting and fishing activities under state regulations (see Figure 7-1).

7.2 Affected Environment

The entire project area lies in ADF&G's Fairbanks nonsubsistence area (5 AAC 99.015(a)(4); Figure 7-1). Therefore, under state definitions, all harvests of wildlife and fish in the project area do not qualify as subsistence activities and are instead managed under general sport hunting regulations, or by personal use or sport fishing regulations.. However, subsistence users may harvest subsistence resources that migrate through or use the project area from locations outside of the state-designated nonsubsistence area.

All residents outside the Fairbanks nonrural area (Fairbanks North Star Borough) are considered rural and are eligible for subsistence harvesting on Federal lands (see Figure 7-1). As discussed in Section 7.1.1, Applicable Regulations, Federal subsistence regulations do not apply to Federal land withdrawn for military use. Instead, state sport hunting and fishing regulations govern all hunting and fishing activity on military land. However, the U.S. Army Garrison Alaska (USAG-AK) at Fort Wainwright, which manages the Tanana Flats and Donnelly Training Areas, acknowledges that subsistence users, under sport regulations, do use subsistence resources on USAG-AK lands, and the USAG-AK is responsible for managing those resources for subsistence users (USAG-AK 2006a). Furthermore, the USAG-AK recognizes that "USAG-AK lands were traditionally used for subsistence activities by Alaska Natives. USAG-AK has a trust responsibility to conserve these subsistence resources" (USAG-AK, 2006a:23).

Regarding the military lands in and near the project area, specifically the Tanana Flats and Donnelly Training Areas (see Figure 7-1), the USAG-AK recognizes the areas' importance to the subsistence way of life for regional populations including residents of Healy Lake, Dot Lake, Tanacross, Tetlin, Northway, Delta Junction, Big Delta, Deltana, and Dry Creek (USAG-AK, 2006b). Several additional communities are also recognized by the U.S. Army including Minto, Nenana, and Cantwell as having subsistence interests on army lands in Alaska (USARAK, 2004). Furthermore, previous literature shows subsistence use areas for Healy Lake, Dot Lake, Tanacross, Tok, Minto, and Nenana in or near the project area (see Section 7.2.3 Communities). The moose harvest tickets collected by ADF&G are the source of data for this. In Alaska, a harvest ticket is required in most areas for general hunts for deer, moose, caribou, and sheep. The tickets are available free from license vendors, must be carried in the field, and are validated by cutting out the day and month immediately upon taking game. Moose harvest ticket records, sent to ADF&G by moose harvesters, describe the date, location, and success of hunts within or near the project area by residents of Cantwell, Delta Junction, Dot Lake, Minto, Nenana, Salcha, and Tok (ADF&G, 2007c).

7.2.1 Subsistence Access

Subsistence users use land and waterway routes to reach harvest areas located in and near the project area. Watercraft and off-road recreational vehicles constitute the primary modes of transportation to these areas. The U.S. Army publishes maps of hunting areas to guide use and access on military lands (*e.g.*, USARAK 2008). There are established trails and cleared corridors, including traplines that harvesters follow within the project area and to lands outside the project area. Traplines, which have a history of long-term repeated use, are susceptible to changes in access given that they are usually a defined linear route on which a user has spent considerable effort to establish and maintain. It is a common practice for individuals to claim

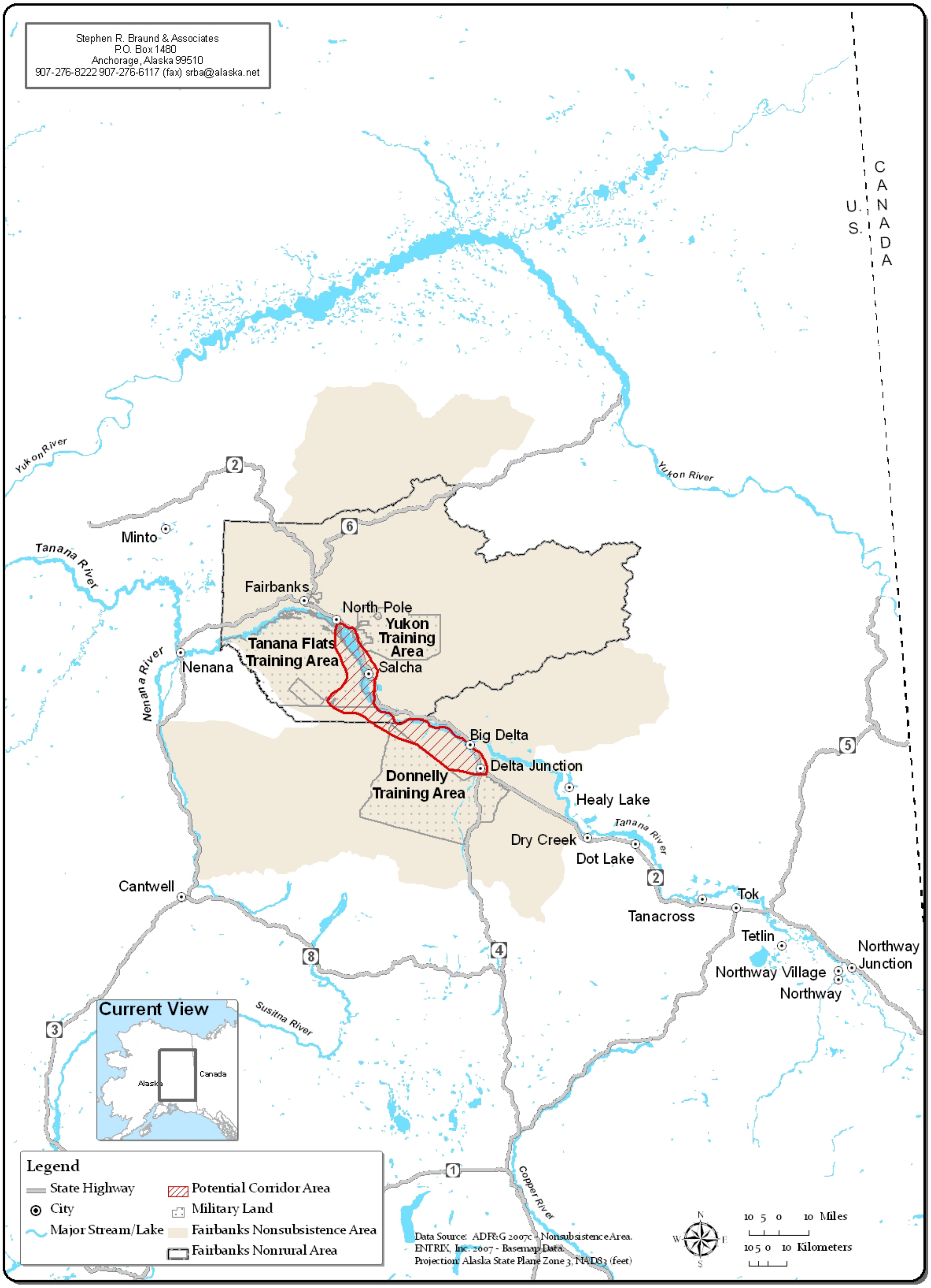

Figure 7-1 – NRE Project Area

"ownership" of a particular trapline, even if they do not own the land, and trappers generally respect each individual's traplines. Little documentation of specific traplines within the project area has been done in the past. Traplines are accessed during the winter months, often by snowmachine, when fur pelts are in prime condition. Chapter 12, Navigation, and Chapter 13, Land Use, describe of current policies regarding access to private, state, and military lands in the project area.

7.2.2 Resource Availability

Subsistence users harvest a variety of wildlife and fish resources as well as other non-game resources (*e.g.*, plants and berries) in and near the project area. The majority of the project is located in ADF&G's Game Management Unit (GMU) 20, subunit 20A (see figure I-1). GMUs are areas of the state defined by ADF&G, each with its own set of regulations governing the harvest limit and timing of hunts for various wildlife species in that unit. Many of the GMUs are further divided into subunits with additional regulations. ADF&G Tanana River Drainage regulations govern sport fishing in the project area. Under state sport hunting and fishing regulations for ADF&G GMU 20A and the Tanana River drainage, Alaska residents can harvest several species of big game, including moose, black bear, grizzly bear, sheep, and caribou as well as small game species and seasonally available migratory waterfowl. Arctic grayling, whitefish, Dolly Varden, northern pike, trout, and several species of salmon are available in nearby lakes, streams, and rivers. ADF&G trapping regulations for GMU 20A allow for the trapping of wolf, wolverine, beaver, coyote, red fox, lynx, marten, mink, weasel, muskrat, river otter, squirrel, and marmot. In recent years trapping has declined in many areas of Alaska due to a drop in fur prices and increase in gas costs; this in turn has led to an increase in resource availability of some furbearer species. A 2007 Furbearer Management Report by ADF&G for the central and lower Tanana Valley states that trapping remains an important use of wildlife resources today that can significantly contribute to the economies of rural areas through cash income and also provide food and clothing for personal use (ADF&G, 2007f). Alaska does not regulate the taking of non-game resources such as berries, medicinal plants, or wood. Chapter 5, Biological Resources, provides more information on the wildlife, fish, and vegetation resources in the project area.

7.2.3 Communities

SEA identified 12 communities for this subsistence analysis based on:

- Their proximity to the NRE,
- Documented subsistence uses in and near the proposed rail line, and
- The U.S. Army's recognition of communities with subsistence interests on nearby military lands.

Appendix I summarizes each of the 12 study communities' subsistence uses. This includes descriptions of the seasonal round, which is the cycle by which hunters exploit different resources throughout the year as they become available. The process often means moving subsistence activities to different areas several times a year to maximize several kinds of subsistence harvests across different use areas. The subsistence use area maps in Appendix I depict the project area overlaid on each community's documented subsistence use areas (where available). Of the 12 study communities, Cantwell, Delta Junction, Dot Lake, Healy Lake, Minto, Nenana, Salcha, and Tok have documented use areas in the project area or reported moose harvests in minor drainages (harvest areas assigned by ADF&G based on reported harvest locations) that overlap the project area (Table 7-1). The Tanacross use areas are located within 25 miles of the project area. The majority of the Cantwell, Dot Lake, Healy Lake, Minto, and Tok use areas are not located near the proposed NRE and would not be directly affected. Lifetime use areas for Healy Lake overlap the project area and indirect effects could occur because of those residents' ties to those traditional use areas.

While the data in Table 7-1 show some overlap of subsistence use areas or harvest activities in the project area, the majority of each communities' subsistence use area lies outside the project area. Given the available data, use of the project area for subsistence activities is relatively low. However, subsistence use area data are not available for some communities located near or in the project area (*e.g.*, Delta Junction and Salcha), thus the precise level of subsistence uses in the project area for those communities is unknown.

Table 7-1
Overlap of Subsistence Use Areas and Moose Harvesters in the Project Area[a]

Community	Subsistence Use Area Overlaps NRE Area[b]	Number of Moose Harvesters Overlaps NRE Area 1983–2006[b]	Total Moose Harvesters in GMU 20A Minor Drainages 1983–2006[b]
Cantwell [c]	No	3	109
Delta Junction	N/A	302	389
Dot Lake [d]	No	2	3
Dry Creek	N/A	N/A	N/A
Healy Lake [e]	Yes	N/A	N/A
Minto [f]	No	2	4
Nenana [g]	No	33	283
Northway [h]	No	N/A	N/A
Salcha	N/A	184	284
Tanacross [i]	No	N/A	N/A
Tetlin [j]	No	N/A	N/A
Tok [i]	Yes	17	22

[a] Data source is ADF&G, 2008d, unless otherwise noted.
[b] N/A = not available
[c] Stratton, 1984
[d] Martin, 1983
[e] Stephen R. Braund & Associates, 2002
[f] Andrews, 1988
[g] Shinkwin and Case, 1984
[h] Case, 1986
[i] Marcotte, 1991
[j] Halpin, 1987

7.2.4 Competition

Harvesters from the 12 study communities may already experience competition for subsistence resources on or near the project area lands. The majority of the proposed rail extension is located within GMU 20A, where hunting is permitted for all Alaskan residents. Thus, residents from the

12 communities hunting in GMU 20A may not only compete with one another but also with hunters from other Alaskan communities, including Fairbanks and Anchorage. Table 7-2 presents the number of harvesters and success rates by community for moose in GMU 20A from 1998 through 2007. From 2005 to 2007, GMU 20A had the highest total number of moose harvesters and successful moose harvests of any GMU subunit within the state (Table 7-3).

Table 7-2
1998–2007 GMU 20A Moose Harvesters by Community [a]

Community [b]	Success Rate (% of moose harvesters)	Total Harvesters (1998-2007) [c]	Harvesters (% of Population)
Fairbanks	29.4	7,602	35.5
North Pole	30.9	3,441	16.0
Anchorage	27.4	2,241	10.5
Wasilla	32.4	1,168	5.5
Delta Junction	**35.8**	**643**	**3.0**
Healy Lake	**26.9**	**633**	**3.0**
Eagle River	26.1	614	2.9
Palmer	28.5	558	2.6
Nenana	**24.3**	**444**	**2.1**
Salcha	**29.0**	**390**	**1.8**
Anderson	18.1	363	1.7
Eielson AFB	31.7	357	1.7
Chugiak	32.6	218	1.0
Fort Wainwright	25.1	207	1.0
Soldotna	35.2	202	0.9
Juneau	32.6	178	0.8
Ester	36.5	178	0.8
Valdez	36.9	168	0.8
Cantwell	**34.5**	**29**	**0.1**
Tok	**43.0**	**7**	**0.0**
Dot Lake	**100.0**	**1**	**0.0**
Minto	**100.0**	**1**	**0.0**
Other	35.2	1,785	8.3
Totals	30.0	21,428	100.0

[a] Data source is ADF&G, 2007c
[b] Study communities are presented in bold font.
[c] Includes study communities and communities reporting five or more hunters in each of the study years. All other communities are included under Other.

7.3 Environmental Consequences

This section provides a general discussion of methodology and the analysis of impacts. Chapter 20 of the EIS describes proposed mitigation for impacts to subsistence.

Table 7-3
2005-2007 State of Alaska Moose Harvesters by Subunit [a]

	Unit Location	Subunit	Total Successful Harvesters	Total Harvesters	Percent of Total Harvesters
2007	Fairbanks - Central Tanana	20A	962	3,772	12.1
	Fairbanks - Central Tanana	20B	762	3,258	10.4
	Matanuska Susitna Valley	14A	417	2,813	9.0
	Fairbanks - Central Tanana	20D	806	1,739	5.6
	Kenai	15C	230	1,309	4.2
	Nelchina - Upper Susitna	13A	206	1,137	3.6
	Kenai	15A	113	1,116	3.6
	Remainder of State	78 Subunits	4,005	16,095	51.5
		Totals	7,501	31,239	100.0
2006	Fairbanks - Central Tanana	20A	1,051	3,729	11.7
	Matanuska Susitna Valley	14A	531	3,318	10.4
	Fairbanks - Central Tanana	20B	790	3,247	10.2
	Kenai	15C	237	1,383	4.3
	Nelchina - Upper Susitna	13B	173	1,217	3.8
	Nelchina - Upper Susitna	13A	225	1,164	3.6
	Kenai	15A	133	1,126	3.5
	Remainder of State	78 Subunits	4,222	16,774	52.5
		Totals	7,362	31,958	100.0
2005	Fairbanks - Central Tanana	20A	1,132	4,236	13.1
	Matanuska Susitna Valley	14A	542	3,171	9.8
	Fairbanks - Central Tanana	20B	600	2,818	8.7
	Kenai	15C	307	1,406	4.3
	Nelchina - Upper Susitna	13B	149	1,157	3.6
	Kenai	15A	124	1,081	3.3
	McGrath	19A	176	1,024	3.2
	Remainder of State	77 Subunits	4,393	17,539	54.1
		Totals	7,423	32,432	100.0

[a] Source: ADF&G, undated.

7.3.1 Methodology

Impacts are analyzed according to potential construction and operation-related impacts and their direct and indirect effects. Potential impacts on subsistence are evaluated by measuring changes in the following variables: use areas, user access, resource availability, and competition. Appendix I summarizes baseline data for all four variables by study community.

7.3.2 Common Impacts

Subsistence resource uses in and near the project area would be affected similarly by the construction of the proposed rail extension regardless of the route that could be authorized. Subsistence use and harvest studies conducted in the study communities indicate use of this region both in residents' lifetimes and in the last 10 to 20 years. While regulation of subsistence uses for resource management or military purposes may reduce or limit the use of these lands, residents from a number of communities reported using these lands to harvest subsistence resources. The use of the project area relative to each community's overall use areas is low; however, as noted above, subsistence use area data are not available for some communities located near or in the project area (*e.g.*, Delta Junction and Salcha).

Subsistence use impacts include direct effects on user access to those use areas, including traplines, and resource availability in those areas. If the rail line is constructed and ARRC's regulation barring public access along and across the rail line was implemented, the project would create a linear barrier preventing free range of hunters across the area. The proposed rail line could also impact the movement of some wildlife. This would be especially acute in areas west of the Tanana River, which subsistence users from the east generally access by traveling across the river. Chapter 5, Biological Resources, provides additional information on wildlife and migration in the area.

If a community does not harvest resources in or near the project area or use resources that move or migrate through the area, then that community's user access and resource availability would not be directly affected. However, even if a community does not use or harvest resources from the project area, competition could be directly affected because changes in access to the area created by the rail line could cause harvesters to begin using other communities' use areas, subsequently increasing the number of harvesters competing for resources in those places. Any direct effects on user access or resource availability would have the greatest chance of affecting Delta Junction, Healy Lake, Nenana, Salcha, and Tok subsistence users because of their greater level of subsistence use overlap documented in the project area. Direct effects stemming from changes to user access and resource availability would least affect the remaining study communities (Cantwell, Dry Creek, Dot Lake, Minto, Northway, Tanacross, and Tetlin). Although Cantwell, Dot Lake, and Minto show moose harvests in minor drainages that overlap the project area, these numbers are relatively low and there would be less potential for a direct effect on their subsistence uses.

7.3.3 Construction Impacts

Construction-related activities resulting from the development of the NRE would have direct effects on subsistence use areas, user access, resource availability, and competition, particularly for Delta Junction, Healy Lake, Nenana, Salcha, and Tok because those communities have greater documented uses in the NRE. These impacts would occur for the duration of the construction activity and primarily in the area where the construction was occurring.

Traditional but undocumented uses by subsistence users living along the proposed rail line and using roads/trails or the river system to access harvest areas could be affected if harvest activities take place at the same time and location as construction-related activities and no alternative use areas are available or adequate to the harvesters.

Construction activities would likely limit user access to existing trails and portions of the river. Subsistence users may be temporarily blocked from certain waterways stemming from construction of bridges and construction in the right-of-way (ROW) over existing trails or traplines. Timing certain construction activities to occur during the winter, especially activities related to bridge construction and in the ROW where access would be temporarily blocked, could help mitigate this effect as travel is less restricted during the winter months. Increased noise and activity in the project area arising from construction activities could deflect resources away from use areas, resulting in a decrease in resource availability and corresponding increase in competition for remaining resources. Construction activity could also deflect subsistence species towards Richardson Highway or farther from the river, in turn increasing competition or decreasing availability of those species. Impacts to resident and anadromous fish resources resulting from construction of the NRE, including loss of riparian and stream habitat and potential blockage of fish movements, could decrease the availability of these fish species to harvesters both within the project area and to communities on the Tanana and Yukon rivers located downstream of the project area.

Indirect effects on Healy Lake residents' lifetime harvest areas located in the project area could occur as a result of construction activities. This could lead to a sense of loss and intrusion by outsiders into their traditional harvest areas. However, the recent Healy Lake subsistence use area has a relatively small overlap with the project area. Decreased access to use areas arising from construction would result in indirect effects such as potential increased costs and risks incurred in traveling to less familiar and more distant hunting and fishing areas. Additional indirect effects could include increased hunter effort resulting from a decrease in resource availability and an increase in competition if resources are deflected away from their traditional harvest areas at the usual time and place of harvest. Construction occurring in use areas could also lead to user avoidance of the area, causing them to hunt or harvest resources elsewhere.

7.3.4 Operations Impacts

Operations-related impacts resulting from the development of the NRE would have direct effects on subsistence use areas, user access, resource availability, and competition, especially for those communities with uses that overlap the project area (Delta Junction, Healy Lake, Salcha, Nenana, and Tok). The cleared rail line would represent new access points to some areas and would redirect travel routes for subsistence users and wildlife that would likely follow the corridor. Such use of the rail line as a conduit, when combined with restrictions on crossing the rails, would impact subsistence use patterns in the region.

Unless an individual acquires a permit to cross the proposed NRE rail line at locations other than authorized crossing points, ARRC regulations barring public access across the rail line would block user access to harvest areas, including traplines. This regulation would have a direct effect on subsistence use of the areas by reducing access. These effects would be particularly restrictive in areas west of the Tanana River, including Salcha Alternative Segment 1, the Central and Donnelly alternative segments, and the South Common Segment. Although grade crossings at public and private roads and trails would maintain existing access along established routes, user access to other areas across the rail line would be eliminated. Thorough identification of existing trails and routes, as well as installation of grade crossings at these locations, could help mitigate reduced access by providing users multiple crossing points to reach their use areas. The fewer the number of crossings installed along the rail line, the greater the direct effect of reduced access to use areas.

The project's vegetation-free ROW could result in moose and other mammals traveling along and crossing the rail line. This could result in more train-moose collisions, and potentially affect overall moose resource availability in the area. ARRC regulations prohibit access to rail ROW; however, the cleared rail ROW could make areas more accessible to unauthorized four wheelers and snow machines. This could, in turn, increase moose harvest success and reduce the amount of time needed to harvest moose. It is likely that competition among subsistence users in and near the ROW would, in turn, decrease due to these access restrictions. User access and competition for subsistence resources in the ROW would be further decreased if the military no longer constructs ice bridges in the winter. It is not expected that the Tanana River Bridge would result in an increased number of subsistence users accessing areas west of the Tanana River because access across the bridge would be controlled for military and rail purposes only.

Noise from rail line operations could deflect resources and/or harvesters from the area. This could reduce users' connection to traditional use areas.

Indirect effects to subsistence users resulting from rail line operations could include increased costs and increased risks. The reduced access to harvest areas because of the rail line could potentially increase harvesters' costs and risks should they have to hunt in less familiar or more distant use areas. As with construction-related impacts, indirect effects to Healy Lake residents could occur as a result of the intrusion of rail line operation-related activities in traditional use areas.

Increased activity resulting from rail line operations in the area could cause user avoidance of traditional harvest areas due to perceptions of being observed, perceptions of adverse effects on the quality of resources due to contamination or exposure to humans, and hunter feelings of being excluded or denied access by authority figures. Communities hunting or harvesting resources in the project vicinity have numerous alternative harvest areas potentially available to them; however, certain locations in the project area could have traditional and historic associations with certain communities and harvesters. Those areas could be preferred by harvesters because of familiarity based on long-time use of the area patterned by culturally based rules of land use, tenure, and association.

7.3.5 No-Action Alternative

Under the No-Action Alternative, the NRE would not be constructed and there would be no impacts on subsistence uses. As a result, the existing conditions pertaining to subsistence use areas, user access, resource availability, and competition described in Section 7.2, Affected Environment, would stay the same.

8. Climate and Air Quality

This chapter describes climate and air quality in the project area and potential impacts to climate and air quality from implementation of the proposed action. Section 8.1.1 identifies applicable regulations. Section 8.2 describes the existing climate and air quality along the proposed Northern Rail Extension (NRE). Section 8.3, describes potential impacts of emissions from proposed rail line construction and operations. Section 8.4 describes potential greenhouse gas emissions and their effects on climate associated with rail line construction and operations.

8.1 Applicable Regulations

This section describes Federal, State of Alaska, and local regulatory requirements related to air quality, and identifies the regulating agencies responsible for air quality management and the regulations relevant to the air quality analysis. There are no regulatory requirements for greenhouse gas emissions.

8.1.1 Federal Regulations

Section of Environmental Analysis's (SEA) regulations (49 Code of Federal Regulations [CFR] 1105.7[e][5]) set thresholds for analysis of anticipated effects on air quality. When a case before the Surface Transportation Board (STB or the Board) would result in an increase in rail traffic of at least eight trains per day on any segment of rail line affected by a project, SEA quantifies the anticipated effect on air emissions. The proposed action would increase train traffic on the proposed new rail line and on approximately 20 miles of the existing Eielson Branch by ten trains per day. Therefore, SEA analyzed potential air quality impacts for all alternative segments. SEA used conformity thresholds to determine whether estimated increases in emissions would be *de minimus*.[1]

U.S. Environmental Protection Agency (USEPA) regulations specify the maximum acceptable ambient concentration level for six air pollutants. As defined by the Clean Air Act (CAA) Amendments of 1990 (42 U.S.C. 7409), there are two types of National Ambient Air Quality Standards (NAAQS) for these air pollutants—primary NAAQS set limits to protect public health, and secondary standards set limits to protect public welfare. The USEPA Office of Air Quality Planning and Standards has set NAAQS for six primary, or ”criteria” pollutants, as follows: ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), respirable particulate matter (PM), and lead (Pb). The Alaska Department of Environmental Conservation (ADEC) has adopted the same standards for Alaska (Alaska Administrative Code [AAC] Title 18, Chapter 50.010 Ambient Air Quality Standards). Table 8-1 lists and summarizes the primary and secondary standards.

[1] Although U.S. Environmental Protection Agency's General Conformity Rule is not directly applicable to STB actions, it nevertheless provides useful thresholds for measuring impacts to air quality from a proposed project before the Board. The General Conformity Rule defines a "conforming" project as one that conforms to the approved State Implementation Plan's (SIP's) overall objective of eliminating or reducing the severity and number of air quality violations in a state, and achieving expeditious attainment of the NAAQS; does not cause or contribute to new NAAQS violations in the area; and does not increase the frequency or severity of existing NAAQS or impede required progress toward attainment. The General Conformity Rule establishes emissions thresholds, or *de minimis* levels, for use in evaluating the conformity of a project. If the net emission increases due to a project would be less than these thresholds, the project is presumed to conform and no further conformity evaluation is warranted. The General Conformity Rule is codified at 40 CFR Part 51, Subpart W.

Table 8-1
National and Alaska Ambient Air Quality Standards[a]

Pollutant	Primary Standard (Public Health)			Secondary Standard (Public Welfare)		
	Level[b]	**Averaging Time**	**Form**	**Level**	**Averaging Time**	**Form**
Ozone (O_3)	80 ppb	8 hours	3-year average of annual fourth highest daily maximums	Same as primary standard		
Particulate Matter less than 10 microns (PM_{10})	150 $\mu g/m^3$	24 hours	Not to be exceeded more than once per year on average over 3 years	Same as primary standard		
Particulate Matter less than 2.5 microns ($PM_{2.5}$)	35 $\mu g/m^3$	24 hours	3-year average of the 98th percentile 24-hour concentrations	Same as primary standard		
	15 $\mu g/m^3$	Annual	3-year average of annual averages			
Carbon Monoxide (CO)	35 ppm	1 hour	No more than once per year	No secondary standard		
	9 ppm	8 hours	No more than once per year			
Sulfur Dioxide (SO_2)	140 ppb	24 hours	No more than once per year	0.5 ppm	3-hour	No more than once per year
	30 ppb	Annual	Not to be exceeded			
Nitrogen Dioxide (NO_2)	53 ppb	Annual	Not to be exceeded	Same as primary standard		
Lead (Pb)	1.5 $\mu g/m^3$	Quarterly	Not to be exceeded	Same as primary standard		

[a] Source: 40 CFR Part 50.
[b] ppm = parts per million; $\mu g/m^3$ = micrograms per cubic meter.

USEPA has designated certain lands as mandatory Federal Class I areas because air quality was considered a special feature of the area. These Federal Class I areas have special protection under the CAA Prevention of Significant Deterioration (PSD) program. In general, if a new stationary source within 62 miles of a Class I area, its impacts on the Class I area must be determined. The nearest Class I area to the proposed NRE is Denali National Park, at a distance of 80 miles. Because the NRE would not be a stationary source and would be beyond more than 62 miles from Denali National Park, SEA did not analyze potential impacts to that Class I area.

8.1.2 State Regulations

The proposed NRE would be in an attainment area[2] for all criteria air pollutants. However, the NRE would result in additional train traffic over 1.2 miles of the existing Eielson Branch within the North Pole CO maintenance area[3] and 7.2 miles within the Fairbanks CO maintenance area (the Fairbanks urban area and Fort Wainwright), which are designated as CO maintenance areas (AAC Title 18, Chapter 50.015, Air quality designations, classifications and control regions).

These areas have recently met the CO air quality standard and currently have a 10-year maintenance plan for continuing to meet and maintain air quality standards. To continue to maintain attainment status and meet the CO standard, ADEC must have in place a CO maintenance strategy as part of the SIP (AAC Title 18, Chapter 50, Section 030, State Air Quality Control Plan). ADEC submitted a maintenance plan on June 21, 2004, and USEPA approved the plan on July 27, 2004 (69 *Federal Register* [*FR*] 44601). The plan's goals and objectives focus on enhancements to the existing vehicle Inspection & Maintenance (I/M) program, including technical improvements through vehicle equipment upgrades, support of ADEC enforcement efforts, implementation of onboard motor vehicle diagnostic checks, electrical plug-ins to facilitate the use of block heaters for employee parking spaces, and public awareness campaigns to boost public transit ridership.

8.1.3 Local Regulations

There are no local air quality regulations or plans that would directly or indirectly affect rail line construction or operations.

8.2 Affected Environment

Existing Climate and Air Quality

SEA relied on current climate characterizations along the proposed NRE for information on existing conditions. Two principal sources of climate information are available for the project area. Near the northern end of the project area, data are available for Fairbanks. For the southern portion of the project area, climate information is available at Big Delta, which is approximately 9 miles northwest of Delta Junction.

Big Delta has the northern continental climate of Interior Alaska, which is characterized by short, moderate summers; long, cold winters; and low precipitation and humidity. Average monthly temperatures in Delta Junction (Western Regional Climate Center [WRCC], 2008) over the 71-year period 1937 through 2007 ranged from -3 degrees Fahrenheit (ºF) in January to 60 ºF in July, with an average annual temperature of 28 ºF. The all-time low temperature recorded was -63 ºF and the highest was 92 ºF. Thunderstorms are infrequent and occur only during the summer. Average annual precipitation is approximately 12 inches, most of which falls during summer and early fall. The average monthly precipitation ranges from a low of 0.24 inch in March and April to a high of 2.6 inches in July. Average annual snowfall is approximately 44

[2] An attainment area is any area, other than a non-attainment area, that meets the national primary or secondary ambient air quality standard for the pollutant. A non-attainment area is any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant.

[3] A maintenance area is an area that was previously designated as a non-attainment area, has attained the national air quality standards, and has an approved maintenance plan that provides for maintenance of the national primary ambient air quality standard for the air pollutant in the area for at least 10 years.

inches, but more than twice this amount falls some years. For example, a record 92.7 inches fell in 1994. Heavy fog is relatively common during December and January. Ice fog can occur at temperatures below -20 °F when water vapor is emitted to the atmosphere and forms into tiny ice particles. Ice fog typically forms from water vapor generated by human activity such as motor vehicle emissions.

Average monthly temperatures in Fairbanks (WRCC, 2008) over the 30-year period 1961 to 1990 ranged from -10.1 ºF in January to 62.5 ºF in July, yielding a yearly average temperature of 26.9 ºF. The all-time low temperature recorded was -62 ºF and the highest was 96 ºF. Average monthly precipitation ranges from 0.32 inch in April to 1.96 inches in August. The annual average precipitation was 10.9 inches. Most precipitation falls during the summer months, with some additional rainfall during the fall months. During the 20 years from 1987 through 2006, monthly temperatures were higher, with an average January temperature of -8.3 ºF and an average July temperature of 63.0 ºF, with an average yearly temperature of 28.4 ºF. Annual average precipitation for the same period was 10.6 inches per year. Average snowfall over the past 59 winters (1948 through 2007) was 66.9 inches, with a maximum of 147.3 inches during the winter of 1990–1991. Heavy ice fog occurs during December through January, with 3 to 4 days each month having a quarter-mile or less visibility.

Prevailing winds during June and July are from the southwest. During the other months, prevailing winds are from the north, with an average speed of about 5.3 miles per hour. The highest average wind speeds occur during the spring months, May being the windiest with an average speed of 7.7 mph. Wind speeds are 5 miles per hour or less approximately 60 percent of the time. Thunderstorms are infrequent and typically occur in June and July, with an average of three in June and two in July.

Air quality in the project area is influenced by a combination of flow channelized along the Tanana River valley, low winds and strong, shallow temperature inversions during the winter months. During these winter periods, emissions from human activities are trapped within the shallow temperature inversions that lead to increased concentrations of CO and $PM_{2.5}$.

Available data on air quality in the project area are limited to the greater Fairbanks area. Locations that are beyond the greater Fairbanks area would be expected to have lower air pollutant concentrations because emissions associated with human activities would be much lower.

Fort Wainwright, just east of Fairbanks, conducted ambient air quality monitoring to establish a baseline air quality database in support of construction projects envisioned for the U.S. Army units. Fort Wainwright ambient air monitoring was conducted for a 1-year period from February 3, 2003, to February 2, 2004 (Air Sciences, 2007).[4] Table 8-2 lists the highest, second highest, and annual average concentrations of selected criteria pollutants measured over the monitoring period in relation to the NAAQS. During the monitoring period, neither station showed an exceedance of the NAAQS. There was no monitoring for $PM_{2.5}$. These data are representative of the likely maximum existing ambient levels of the monitored air pollutants along the proposed NRE.

[4] The air monitoring was conducted in the vicinity of Fort Wainwright's coal-fired Central Heat and Power Plant (CHPP). The CHPP accounts for 97 percent of the aggregate air emissions from sources operated at Fort Wainwright. Two sites were monitored—one about 1,650 feet north-northeast of the CHPP and the other approximately 4,900 feet south-southwest of the CHPP. These locations were chosen based on air quality modeling, which indicated that maximum pollutant concentrations should occur in these vicinities.

Table 8-2
Measured Ambient Air Concentrations – Fort Wainwright, Alaska
(February 2, 2003, to February 2, 2004)[a]

			Concentration					
			Northern Station			Southern Station		
Pollutant	**Averaging Period**	**NAAQS[b]**	**Highest**	**2nd High**	**Annual Average**	**Highest**	**2nd High**	**Annual Average**
SO_2	3 hours[c]	500 ppb	186	166	N/A[d]	47.4	46.5	N/A
	24 hours	140 ppb	107	47.0	N/A	29.5	20.2	N/A
	Annual	30 ppb	N/A	N/A	5.6	N/A	N/A	3.0
CO	1 hour	35 ppm	5.15	4.92	N/A	4.71	4.63	N/A
	8 hours	9 ppm	3.85	3.41	N/A	3.77	3.48	NA
NO_2	Annual	53 ppb	N/A	N/A	11.1	N/A	N/A	9.7
PM_{10}	24 hours	150 µg/m^3	77.4	71.2	N/A	100.0	85.9	N/A

[a] Monitoring data source: Air Sciences, 2007.
[b] Concentrations are expressed in either parts per million, (ppm), parts per billion (ppb), or micrograms per cubic meter (µg/m3), consistent with the NAAQS.
[c] Secondary air quality standard only.
[d] N/A = not applicable.

Alaska has three CO monitoring sites in Fairbanks—the Old Post Office, Hunter Elementary School, and U.S. Army National Guard building. The Old Post Office is at 2nd and Cushman in downtown Fairbanks, two blocks south of the Chena River. Hunter Elementary School is at 17th and Gilliam Way. The school is on the edge of a residential neighborhood. The National Guard building is at 202 Wien Street in a downtown residential community west of the Old Post Office and just south of the Chena River. None of these monitoring sites exceeded the ambient CO standard from 2004 through 2006 (USEPA, 2008a).

In the late 1980s, monitoring sites for particulate matter less than 10 microns in size (PM_{10}) were installed in Fairbanks to investigate wood smoke concerns (ADEC, 2008a). Despite monitoring at several locations, the monitoring program did not find significant levels of either wood smoke or elevated levels of PM_{10}. While monitoring focused on road corridors and subdivisions with higher woodstove use, the city's program to pave roads and lower home heating fuel costs might have helped keep PM_{10} levels below the standard. The last ADEC monitor was uninstalled in the late 1990s based on low PM_{10} measurements and the need to switch focus to $PM_{2.5}$ (ADEC, 2008a).

Fairbanks has consistently experienced the highest $PM_{2.5}$ values measured in the state (ADEC, 2008a). Fairbanks has a single $PM_{2.5}$ monitor at the State Office Building in downtown Fairbanks. During the winter months, Fairbanks' strong winter inversions concentrate local $PM_{2.5}$ emissions. Fairbanks has had many days each year that exceed the new 24-hour $PM_{2.5}$ standard (35 µg/m^3). Emissions of SO_2, NO_2, O_3, and Pb have not been recently monitored by ADEC for reasons similar to PM_{10} (*i.e.*, historically low monitored values). Thus, the only pollutants ADEC routinely monitors in the area are CO and $PM_{2.5}$. Table 8-3 lists monitoring data for 2005 through 2007 for the vicinity of the existing rail line over which the proposed NRE would travel through Fairbanks.

Table 8-3
Measured Ambient Air Concentrations — Fairbanks, Alaska (2004–2006)[a,b]

Station Location	1-Hour CO Maximum (ppm)			8-Hour CO Maximum (ppm)		
	2005	2006	2007	2005	2006	2007
Old Post Office	7.8	6.9	7.5	4.7	4.0	3.4
Hunter Elementary School	6	6	5.6	4.9	3.8	3.3
U.S. Army National Guard	4.7	3.9	2.8	3.2	2.6	2.3
	24-Hour $PM_{2.5}$ 98th percentile ($\mu g/m^3$)			Annual Average $PM_{2.5}$ ($\mu g/m^3$)		
	2005	2006	2007	2005	2006	2007
State Office Building	40.6	42.2	29.7	14.0	11.2	10.2

[a] Source: USEPA, 2008a.
[b] ppm = parts per million; µg/m3 = micrograms per cubic meter.

8.3 Environmental Consequences

8.3.1 Methodology

SEA evaluated the potential impacts of increased emissions of NAAQS air pollutants in three steps. First, SEA identified and characterized the emission sources that would result from project construction and operation. Second, SEA aggregated these emission sources to obtain estimated total emissions per year for rail line construction and estimated total emissions per year for rail line operations for each NAAQS air pollutant. Third, SEA compared the increase in emissions with the Fairbanks North Star Borough (FNSB) emissions inventory and *de minimus* conformity thresholds.

Chapter 20 of the EIS describes proposed mitigation for impacts to air quality.

8.3.2 Common Impacts

SEA developed an emissions estimate for construction of the proposed rail line. Because the length of new rail line would be similar under all of the alternatives, the estimated emissions would be expected to be similar. To be conservative, SEA based the emissions analysis on the alternative segment requiring the most rail construction (82 miles, the longest potential route). Because only limited preliminary engineering information was available for the types of construction equipment to be used and their associated activity levels, SEA estimated construction-related emissions based on construction emission estimates developed in the detailed analysis conducted for the Eielson Branch Realignment Air Quality Assessment Study (Sierra Research, 2007).

Table 8-4 lists the results of the estimated construction emissions in comparison with the most recently available (USEPA 2001b) FNSB total emissions inventory. As shown, construction-related emissions would be expected to be a small fraction of the Borough's total annual emissions during the construction period. Estimated nitrogen oxides (NO_x), PM_{10}, and $PM_{2.5}$ construction-related emissions range from 0.6 to 0.9 percent of FNSB total emissions for each pollutant. These emissions would be spread out across the 82 miles of new rail line and approximately half of the rail line would be outside FNSB. None of the construction would occur in the Fairbanks and North Pole CO maintenance areas. In addition, the estimated emissions are well below the *de minimus* conformity thresholds (100 tons per year for each pollutant). Furthermore, estimated construction emissions would be temporary (that is, limited to the construction period). The fugitive dust emission rates include the use of watering during the summer season to limit fugitive dust emissions during construction.

Table 8-4
Estimated Construction Emissions along the Proposed NRE[a] and the Fairbanks North Star Borough 2001 Emission Inventory

Emission Sources	VOCs (mton/yr) [b]	CO (mton/yr)	NO_x (mton/yr)	PM_{10} (mton/yr)	$PM_{2.5}$ (mton/yr)	SO_2 (mton/yr)
Northern Rail Extension						
Construction Exhaust	4.8	33.6	52.6	5.9	5.9	0.03
Construction Fugitive Dust				22.2	8.3	
Total Construction	**5**	**34**	**53**	**28**	**14**	**0.03**
Fairbanks North Star Borough						
Off Highway (2001)	995	15,787	1,728	46	35	59
Highway Vehicles (2001)	1,393	5,831	482	65	59	63
Other Sources (Point and Area)	1,317	24,886	6,788	3,331	1,447	4,203
Total North Star Borough	**3,705**	**46,503**	**8,998**	**3,442**	**1,541**	**4,325**

[a] Based on Eielson Branch Realignment Air Quality Assessment conducted by Sierra Research 2006, Report No. SR2006-11-01(Sierra Research, 2007); most similar construction as segment "B."

[b] VOCs = volatile organic compounds; mton/yr = metric tons per year. Measurements are in metric tons per year. Totals assume construction takes place over a 3-year period and that the length of the new rail construction would be no more than 82 miles.

SEA also developed a conservative emissions estimate for the proposed NRE operations based on the longest rail line alternative. SEA estimated emissions assuming an average of one round trip freight rail train per day (this includes military and commercial freight) and four round trip passenger trains per day. Freight trains were assumed to have a total average length of 35 cars using one locomotive and an operational start year of 2012[5] or later using ultra low-sulfur diesel (effective December 1, 2010, all diesel fuel sold in Alaska is required to be ultra low sulfur diesel).

All base emission factors (grams per brake-horsepower-hour) were obtained from USEPA's Regulatory Support Document, Appendix O (USEPA, 1998) for line-haul Class I locomotives, with the exception of SO_2, which was not available in the support document. SEA obtained the SO_2 factor from a Sierra Research Study on the Development of Railroad Emission Inventory Methodologies (Sierra Research, 2004). SEA also used the Sierra report to identify appropriate mixed freight use fuel efficiency—710.6 ton-miles per gallon—for a rail line operating over similar grades (1 percent or less).

It is expected that passenger service would be provided using either one diesel motorized unit or a locomotive with two passenger cars. To be conservative, SEA estimated emissions based on the higher emitting configuration—the conventional passenger train using a single locomotive and two passenger railcars with a total passenger capacity of 185 seats operating on average at four times per day or a total of eight one-way trips per day.

Table 8-5 lists the estimated annual average operations emissions. These estimated operations emissions are small fractions in comparison to FNSB's annual highway vehicle emissions (see Table 8-4). In addition, the estimated emissions would occur over more than 100 miles of rail line (approximately 20 miles of existing Eielson Branch rail line and approximately 80 miles of proposed new rail line). Emissions of NO_x represent the largest fraction in comparison with the highway vehicle emissions at approximately 10 percent when only the NRE emissions within FNSB are included. Additionally, the emission totals for each of the pollutants are well below the *de minimis* conformity thresholds of 100 tons per year for each pollutant.

[5] Assuming construction would require 3 years.

Table 8-5
Estimated Annual Average Operations Emissions along the Proposed NRE[a]

Emission Sources	VOCs (mton/yr[b])	CO (mton/yr)	NO_x (mton/yr)	PM_{10} (mton/yr)	$PM_{2.5}$ (mton/yr)	SO_2 (mton/yr)
Freight Train Operation	3.1	10.3	55.1	2.0	2.0	0.2
Passenger Service Operation	1.2	3.9	20.6	0.8	0.7	0.1
Total Operations	**4.3**	**14.2**	**75.7**	**2.8**	**2.7**	**0.3**

[a] Based on the operation of eight one-way passenger (two diesel multiple units per trip) trains and an average of one freight train (each way) per day.
[b] mton/yr = metric tons per year

To further compare the relative increase in emissions, SEA estimated the current highway traffic emissions along Richardson Highway between Balch Way and Old Richardson Highway (a distance of 18 miles) and compared those emissions with the estimated emissions from proposed rail line operations over the same distance. SEA obtained the average number of vehicle miles traveled over this section of highway from the Alaska Department of Transportation and Public Facilities (ADOT&PF, 2007a) for 2006 at 73,480 vehicle miles traveled (VMT) with a projected arterial growth rate of 0.6 percent per year (Federal Highway Administration [FHWA], 2007a) so that by 2012, the total VMT is estimated at 76,160. ADOT&PF also provided information on the truck fraction along this portion of the highway at 12 percent.

SEA estimated highway traffic emissions along this segment of the highway using the vehicle traffic information volume information above and emission factors (grams per mile) from USEPA's MOBILE6.2[6] for the year 2012. The emission factors used were based on Fairbanks-specific mobile emission inputs and an average of the winter and summer seasons' vehicle registration information (USEPA, 2003). Table 8-6 lists the estimated annual emissions from rail line operations over an 18-mile segment of the proposed NRE in comparison with estimated vehicle emissions along a comparable length of Richardson Highway between Balch Way and Old Richardson Highway. These results show that the estimated rail emissions would be a small fraction of the highway emissions, with the exception of NO_x and particulate matter. This is due to the fairly high NO_x and PM emission rates for diesel-fueled locomotives.

Table 8-6
Comparison of Estimated Annual Proposed NRE Operations and Highway Emissions[a]

Emission Sources	VOCs (mton/yr[b])	CO (mton/yr)	NO_x (mton/yr)	PM_{10} (mton/yr)	$PM_{2.5}$ (mton/yr)	SO_2 (mton/yr)
Freight Train Operation	0.54	1.8	9.7	0.36	0.35	0.03
Passenger Train Service Operation	0.20	0.68	3.6	0.13	0.13	0.01
Total Operations	**0.74**	**2.5**	**13.3**	**0.49**	**0.48**	**0.04**
Traffic along Richardson Highway	19.0	369.8	46.9	1.4	0.9	0.3

[a] Annual average traffic projected for 2012 along Richardson Highway between Balch Way and Old Richardson Highway and rail traffic along 18-mile segment of the NRE.
[b] mton/yr = metric tons per year.

[6] A model that estimates emission rates for the on-road fleet of vehicles taking into consideration such factors as fleet age, miles driven, type of fuel, vehicle engine size, engine technology and ambient temperature

It is expected that emissions from the current highway activity would decrease as a result of the proposed NRE to the extent that transportation activity by car or truck would be shifted to rail.

Based on the findings presented above, SEA has concluded that estimated increase in emissions from construction and operation of the proposed NRE would be minimal in the context of existing conditions.

8.3.3 Greenhouse Gas Emissions

Greenhouse gas emissions associated with the proposed action would be overwhelmingly carbon dioxide (CO_2) emissions. Table 8-7 lists estimated CO_2 emissions associated with construction and operation of the proposed NRE. Construction emissions would be limited to the construction period, conservatively assumed to be 3 years, and operations emissions would occur in subsequent years. In comparison, the 2005 annual CO_2 emissions from rail operations for all of Alaska are estimated at 120,000 metric tons per year (ADEC, 2008b).

Table 8-7
Annual Average Emissions of Greenhouse Gases Associated with Construction[a] and Operations of the Proposed Northern Rail Extension

Emission Sources	**CO_2** (metric tons per year)
Freight Train Operation	4,261
Passenger Service Operation	3,186
Total Operations	**7,447**
Construction	3,733

[a] Construction is assumed to take place over 3 years.

The proposed action would represent a 6.3-percent increase in Alaska rail CO_2 emissions. For the state as a whole, this would represent an increase in CO_2 emissions of less than 0.02 percent (ADEC, 2008b). Rail line operations would represent about 0.0001-percent increase in the U.S. annual (2006) average emission rate of 5,983,100,000 metric tons of CO_2 (USEPA, 2008b).

The U.S. emission rate represents about 24 percent of the total global CO_2 emission rate. Also, CO_2 emissions from current highway activity would be expected to decrease as a result of the proposed action to the extent that transportation activity by car or truck would be shifted to rail. Therefore, the incremental emissions and climate change impacts of the proposed NRE are considered very small.

8.3.4 No-Action Alternative

Under the No-Action Alternative, any increases in air emissions in the area would not be attributed to the proposed NRE. Current emissions associated with traffic from passenger vehicles, military, and commercial trucks are anticipated to remain the same.

9. NOISE AND VIBRATION

This chapter presents Section of Environmental Analysis' (SEA's) analysis of potential noise and vibration impacts that would be expected from construction and operation of the proposed Northern Rail Extension (NRE). Section 9.1 provides applicable regulations and noise criteria. Section 9.2 discusses the affected environment, including both areas with existing rail traffic and areas with no existing rail traffic. Alaska Railroad Corporation's (ARRC's) existing Eielson Branch from the Fairbanks Intermodal Facility and Depot (FBX) to just south of the Chena River floodway is included in the analysis because anticipated rail traffic on the proposed NRE would travel over this portion of the Eielson Branch to reach FBX. Noise measurement data are also presented in this section. Section 9.3 discusses the analysis methodology and noise and vibration impacts, including modeled noise contours and estimated numbers of sensitive receptors potentially affected. Appendix J presents the equations and methods used in the noise and vibration analysis.

9.1 Applicable Regulations

9.1.1 Federal Regulations

Federal laws, regulations and guidelines that specify requirements and provide guidance on noise and vibration analysis and impact assessment include:

- Surface Transportation Board (STB or the Board) environmental regulations at 49 Code of Federal Regulations (CFR) 1105.7
- Noise Control Act of 1972 (42 United States Code [U.S.C.] 4910)
- Federal Railroad Administration (FRA) Guidelines (Report Number 293630-1, December 1998)
- Occupational Safety and Health Administration (OSHA) Occupational Noise Exposure; Hearing Conversation Amendment (*Federal Register* 48 (46), 9738–9785)
- U.S. Environmental Protection Agency (USEPA) Railroad Noise Emission Standards (40 CFR 201)
- FRA Railroad Noise Emission Compliance Regulations (49 CFR 210)
- FRA Final Rule on the Use of Locomotive Horns at Highway-Rail Grade Crossings (49 CFR Parts 222 and 229)
- Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06, May 2006)

The STB environmental review regulations for noise analysis (49 CFR 1105.7e(6)), have the following criteria:

- An increase in noise exposure as measured by a **day-night average noise level (DNL)** of 3 **A-weighted decibels (dBA)** or more.

> **Day-night average noise level (DNL):** The energy average of A-weighted decibels (dBA) sound level over a 24-hour period includes a 10 decibel adjustment factor for noise between 10 p.m. and 7 a.m. to account for the greater sensitivity of most people to noise during the night. The effect of nighttime adjustment is that one nighttime event, such as a train passing by between 10 p.m. and 7 a.m., is equivalent to 10 similar events during the daytime.
>
> **A-weighted decibels (dBA):** A measure of noise level used to compare noise from various sources. A-weighting approximates the frequency response of the human ear.

- An increase to a noise level of 65 DNL or greater.

If the estimated noise level increase at a location exceeds either of these criteria, SEA estimates the number of affected receptors (*e.g.*, schools, libraries, residences, retirement communities, nursing homes) and quantifies the noise increase. The two components (3 dBA increase, 65 DNL) of the STB criteria are implemented separately to determine an upper bound of the area of potential noise impact. However, recent noise research indicates that both criteria components must be met to cause an adverse noise impact (STB 2003, p. 4-82). That is, noise levels would have to be greater than or equal to 65 DNL and increase by 3 dBA or more for an adverse noise impact to occur. This assessment looks at both indicators in combination to evaluate potential impact.

9.1.2 State Regulations

The Alaska Administrative Code (AAC) does not include requirements applicable to railroad noise.

9.1.3 Local Regulations

The proposed NRE would be located in both the Fairbanks North Star Borough (FNSB) and the Southeast Fairbanks Census Area, an unincorporated area. The existing rail line also is in the FNSB, which does not have applicable noise restrictions. In addition, portions of the existing rail line that would be used by rail traffic from the proposed NRE would pass through the incorporated cities of Fairbanks and North Pole. The City of Fairbanks (Code of Ordinances, Article II, Section 46-42(a)(3)) and the City of North Pole (Ordinance 8.04 160-Noise Section B) regulate construction noise, but the proposed action would not involve construction within the city limits. Other City of Fairbanks regulations (Article II, Section 46-42(d)(1)) do not prohibit noise from safety signals or warning devices.

9.2 Affected Environment

Existing noise conditions vary considerably along the various alternative segments proposed for this project. In areas such as Salcha and Delta Junction, existing noise sources include vehicles on nearby roads, occasional aircraft, other human activities, and natural sources such as wind. Noise levels in the vicinity of the build alternatives near Eielson Air Force Base (AFB) also are influenced by aircraft noise (ASCG, 2006). In other areas, far away from major noise sources, ambient sound levels can be quite low.

Along the existing portion of the Eielson Branch that would be used by rail traffic from the proposed NRE, rail operations that produce noise include the diesel locomotive engine and wheel/rail noise (collectively referred to as wayside noise), as well as locomotive horn sounding at at-grade highway-rail grade crossings. This dominates the noise environment near the tracks. Other noise sources along the existing rail line include the aircraft and weapons firing range associated with Fort Wainwright (ASCG, 2006).

As indicated above, SEA's environmental regulations require counting receptors (noise sensitive locations) where the proposed NRE would result in 65 DNL or greater or would increase noise levels by 3 dBA or greater. Where there is existing rail traffic, existing noise levels can be calculated. Ambient sound measurements are used to characterize background noise levels in areas where there is no existing rail traffic.

SEA measured ambient sound levels for 24 hours at six locations during November 13 and 14, 2007. Table 9-1 shows the results of this sound level monitoring.

Table 9-1
Measured Ambient Sound Levels

Location No.	Description	DNL (dBA)[a]
1	Baptist Church Road	67
2	Stringer Road	49
3	Old Richardson Highway	50
4	Between Canaday and Munson Sloughs	33
5	Jack Warren Road	54
6	Nistler Road	54

[a] DNL = day-night average noise level; dBA = A-weighted decibels.

With the exception of location 1, sound level measurements fall within USEPA's 'small town residential' category, or lower (see Figure 9-1). The sound monitor at location 1 was near an at-grade road crossing of the existing track where locomotive horn sounding currently occurs. The noise measurement results from location 1 are reasonably consistent with the results of modeling of existing rail noise at this location. However, the long-term (annual) rail traffic volumes and speeds are likely more statistically reliable than a single day's noise measurement, and thus the calculated rail noise levels were used at this location. Location 1 would be situated in the 'very noisy urban residential' USEPA category.

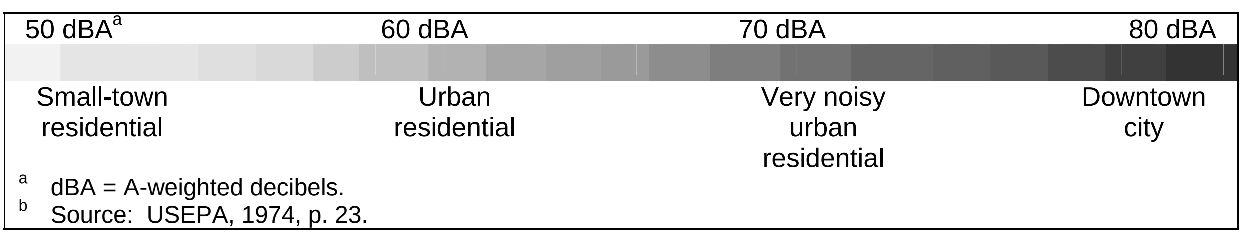

Figure 9-1
Typical day-night average noise levels (DNL) for residential areas[b]

9.3 Environmental Consequences

9.3.1 Methodology

The following methods were used to evaluate whether the build alternatives would result in vibration impacts or rail line noise levels (attributable to wayside noise and locomotive warning horn) that would equal or exceed 65 DNL and/or result in an increase of 3 dBA or greater. Appendix J provides the equations and methods used in the noise and vibration analyses. Proposed mitigation for impacts to noise and vibration is presented in Chapter 20 of the Environmental Impact Statement (EIS).

- Noise models. SEA used Computer Aided Noise Abatement program (CADNA), an environmental noise computer program, and wayside and horn reference levels from previous studies to generate noise level contours. The overall noise model results are sensitive to the horn noise, locomotive and railcar noise, train length, train speed, and the shielding effects of buildings. SEA used train length and speed information provided by the Applicant. SEA based wayside noise estimates on information compiled for previous SEA analyses, including the Conrail Acquisition EIS and the Draft Environmental Assessment for the Canadian National/Illinois Central Railway Acquisition. SEA used data on horn noise compiled by FRA. These sources were used because of the size of their noise measurement database, statistical reliability, and other factors.

- Estimate or measure existing noise exposure. For areas that would be traversed by the proposed NRE, SEA measured ambient noise levels at selected locations to establish a baseline for determining if there would be a 3 dBA or greater increase in noise. For areas along the existing rail line that would be used by proposed NRE rail traffic, SEA calculated existing noise levels based on wayside and horn noise from current rail traffic.

- Estimate future noise exposure. SEA estimated noise exposure in terms of DNL using future rail operation plans and model outputs and information on distances and noise propagation paths to sensitive receptors.

- Identify and count noise-sensitive receptors. SEA estimated the number of noise sensitive receptors within the 65 DNL noise contours or where the DNL would increase by at least 3 dBA. SEA used digital aerial photographs and Geographic Information Systems (GIS) software to estimate the number of noise-sensitive receptors, including residences, schools, and places of worship, for future train volumes. The final result of this analysis was an estimate of the total number of sensitive receptors that would be exposed to 65 DNL or greater and the number of receptors where the DNL would increase by at least 3 dBA due to the proposed NRE. The accuracy of the estimated numbers of potentially affected receptors is limited by the resolution and age of the available aerial photographs and interpretation of these photographs.

- Estimate vibration levels. SEA based this analysis on published train and construction equipment vibration data resulting from both operation and construction of the rail line.

9.3.2 Common Impacts

Rail Operations Noise

Noise levels due to rail operations vary by location because of varying train speed, number of trains per day, and train length. Table 9-2 provides train operations data used to estimate distances from the centerline of the rail line to the 65 DNL noise contour. The average length of new trains is much shorter than for existing trains because the existing train traffic is exclusively freight traffic while most of the new trains (eight out of ten per day) would be much shorter passenger trains. As a result, the average length of trains on the new rail line would be substantially less than on the existing rail line (with the existing freight traffic). The noise contour modeling is based on one locomotive per train.

Table 9-2
Train Operations Data Inputs to Noise Modeling[a]

Alternative Segment[b]	Future average train length (feet)	Future average trains/ day	Existing average train length (feet)	Existing average trains/ day	Speed (miles per hour)
Delta 2	639	10	--	--	30
Salcha 2	639	10	--	--	76
Salcha 1	639	10	--	--	76
Eielson 1	639	10	--	--	76
Eielson 2	639	10	--	--	76
Eielson 3	639	10	--	--	76
North Common	639	10	--	--	76
Existing Track 4	639	11	635	1	20
Existing Track 3	1432	15	3223	5	20
Existing Track 2	1432	15	3223	5	20
Existing Track 1	1464	16	2838	6	20

[a] Sources: See Chapter 11

[b] Alternative segments listed are those for which SEA performed noise modeling. SEA did not model other segments because review of aerial photographs provided no indication that sensitive receptors would potentially be affected.

Existing Track 1: FBX depot to Fairbanks airport turn-off

Existing Track 2: Airport turn-off to SE corner of Fort Wainwright

Existing Track 3: SE corner of Fort Wainwright to North Pole Refinery

Existing Track 4: North Pole Refinery to Chena Flood Road (junction with proposed NRE)

Table 9-3 gives estimated distances to the 65 DNL noise contour for the various train operation scenarios used in the analysis.

Table 9-3
Distance to 65 DNL[a] Contour

Train Operations	Horn Noise Contour (feet)	Wayside Noise Contour (feet)
10 trains per day, 20 miles per hour	630	105
10 trains per day, 76 miles per hour	630	115
11 trains per day, 20 miles per hour	670	110
15 trains per day, 20 miles per hour	830	145
16 trains per day, 15 miles per hour	865	175

[a] DNL = day-night average noise level.

Figures 9-2 through 9-7 show 65 DNL and 3 dBA increase contours for the segments listed in Table 9-2 above. These figures show the estimated extent of day-night average noise levels equal to or greater than 65 decibels—the area enclosed by the red line—and increases in noise level of 3 A-weighted decibels or greater—the area shaded in light green. The sometimes "ragged" appearance of the 65 dBA contour (red line) illustrates the effect of buildings shielding areas farther from the rail line such that increases in noise levels would be reduced. In addition, the figures show the locations of noise measurements collected during preparation of the EIS and the locations of noise sensitive receptors, identified based on interpretation of the available aerial photography, with one exception. Siku Basin housing, which was constructed on Fort Wainwright near the existing Eielson Branch and just west of the Chena River after the aerial photography was taken, is included in the analysis.

SEA calculated the 3 dBA increase contours using the ambient sound measurements presented in Section 9.2 to define baseline (current) conditions for areas where there is currently no rail traffic. Published noise contours for Eielson AFB and Fort Wainwright were also used to determine the limits of 3 dBA increase contours in areas affected by those existing noise sources. The area within the 3 dBA increase contour can be quite large if the ambient sound level is sufficiently low. An example of this can be seen in the vicinity of sound measurement location 4 (Salcha area, Figure 9-6) where measured sound levels were relatively low. For areas with existing rail traffic, SEA based existing ambient noise levels on calculated noise levels resulting from existing rail traffic.

SEA did not perform noise level modeling in areas where no receptors were identified near the proposed rail line. Specifically, SEA did not model noise for Salcha Alternative Segment 1, Central Alternative Segments 1 and 2, Donnelly Alternative Segments 1 and 2, South Common Segment, and Delta Alternative Segment 1.

In areas densely packed with buildings, modeling of the shielding effects of buildings was performed to account for the fact that buildings can act as noise barriers, which can limit the size and change the shape of noise contours. This in turn can affect the number of receptors potentially included within a noise contour. An example of the effects of building shielding can be seen along the existing rail line between FBX and Fort Wainwright.

SEA used GIS software to count receptors identified (based on aerial photographs) within the modeled noise contours. The resulting receptor count information is presented in Table 9-4.

Table 9-4
Noise Receptor Counts for the Proposed NRE

Alternative Segment	65 DNL[a]	+ 3 dBA[b]	Increase in noise level within 65 DNL Contour (dBA)
Delta 2	0	3	
Salcha 2	32	163	15-30
Salcha 1	0	0	
Eielson 1	0	17	
Eielson 3	4	49	15
Eielson 2	0	0	
North Common Segment	0	0	
Existing Track	446	1643	4-10

[a] DNL = day-night average noise level.
[b] dBA = A-weighted decibels.

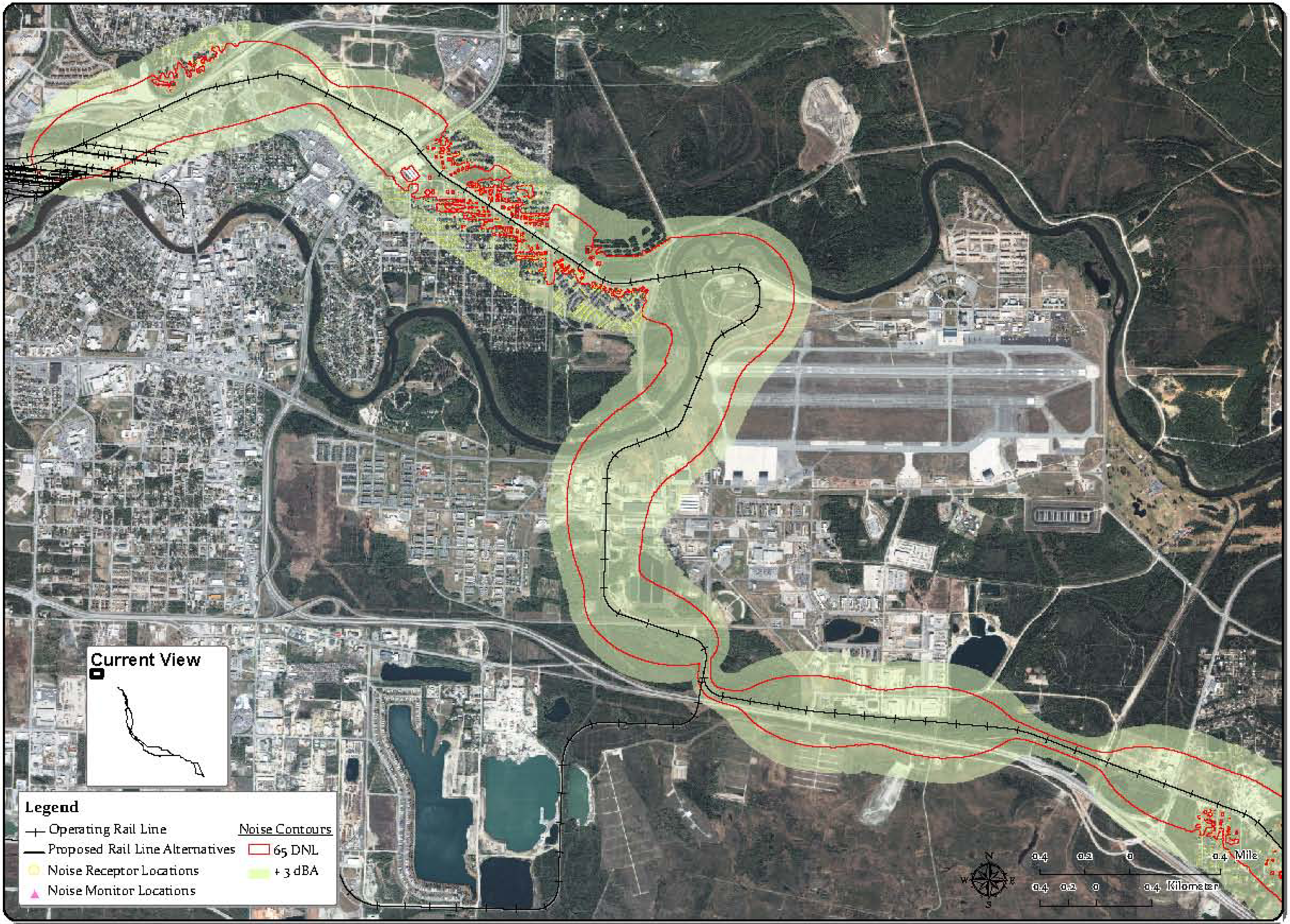

Figure 9-2 – Modeled Noise Contours – Eielson Branch Mile Post 0 to Mile Post 8.8

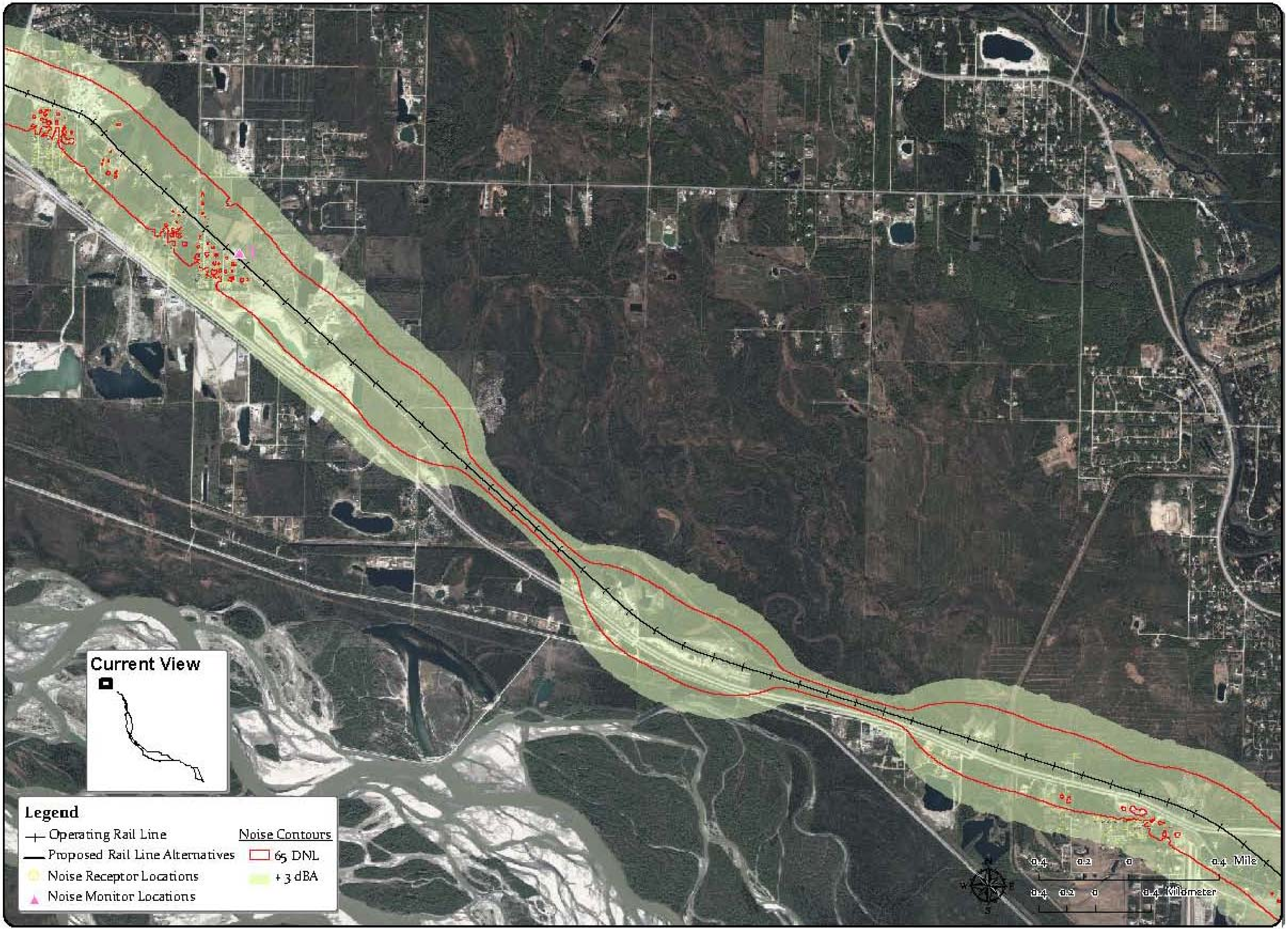

Figure 9-3 – Modeled Noise Contours – Eielson Branch Mile Post 8.3 to Mile Post 15

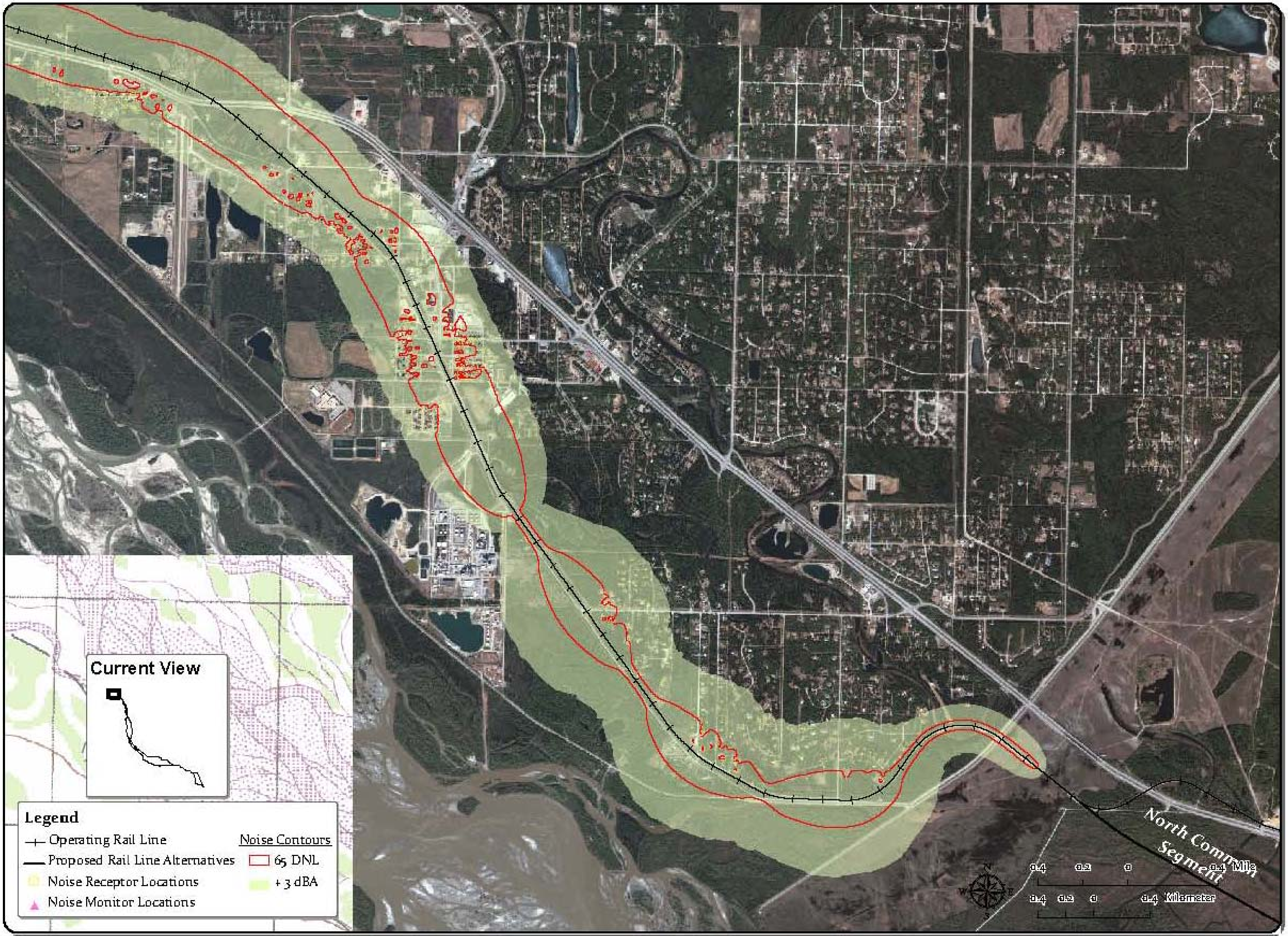

Figure 9-4 – Modeled Noise Contours – Eielson Branch Mile Post 14 to Mile Post 21

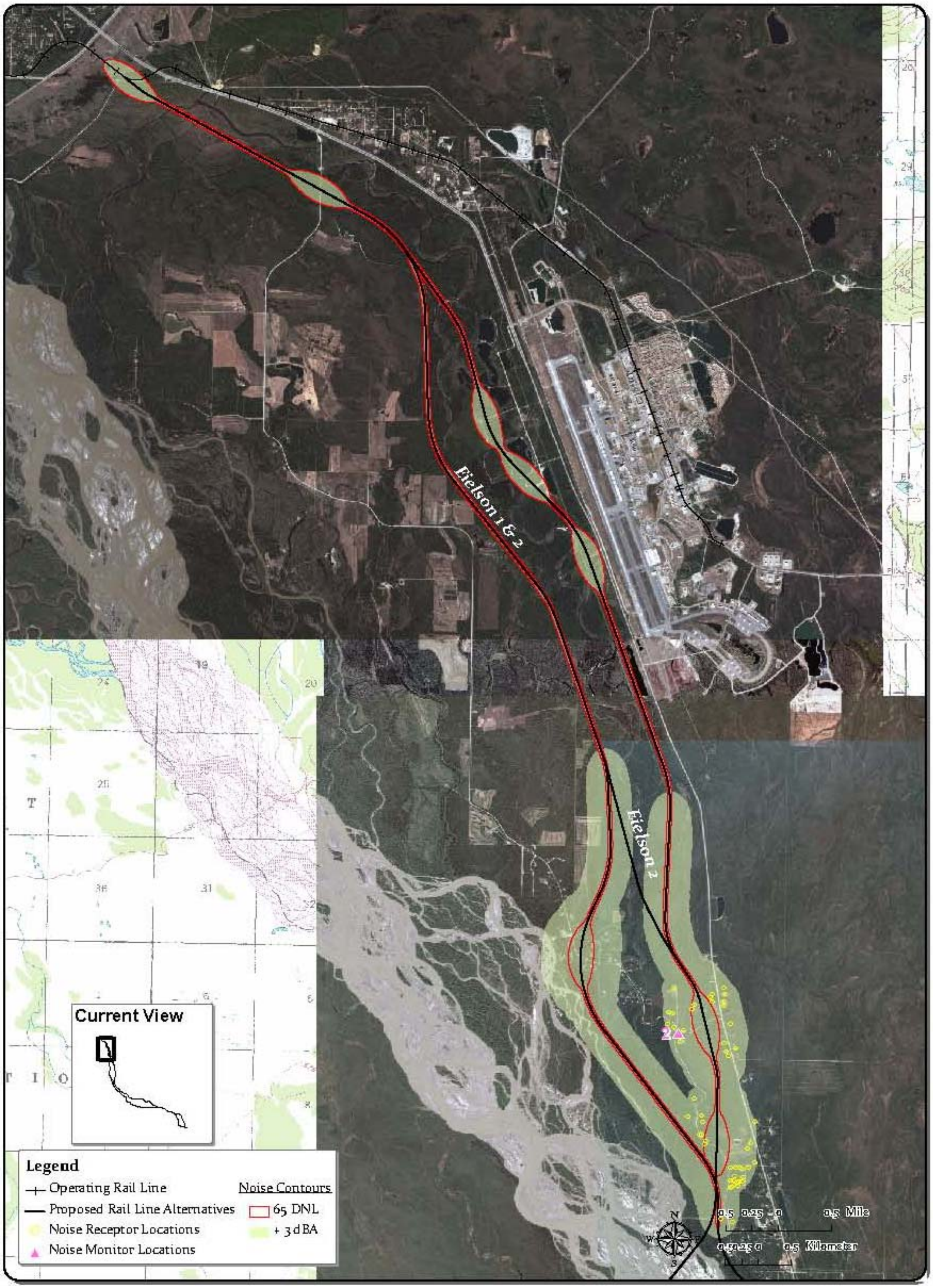

Figure 9-5 – Modeled Noise Contours – Eielson Alternative Segments

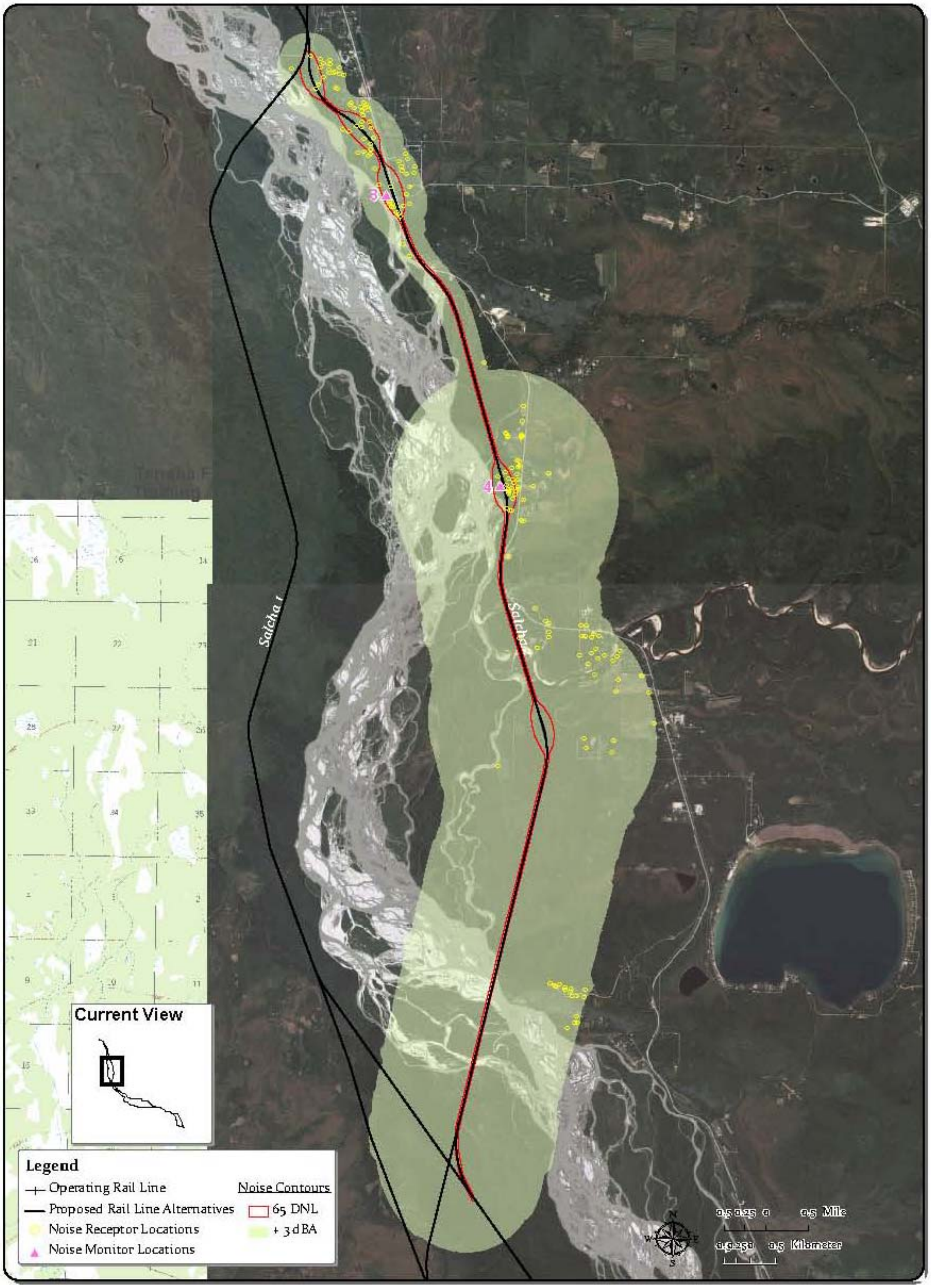

Figure 9-6 – Modeled Noise Contours – Salcha Alternative Segment 2

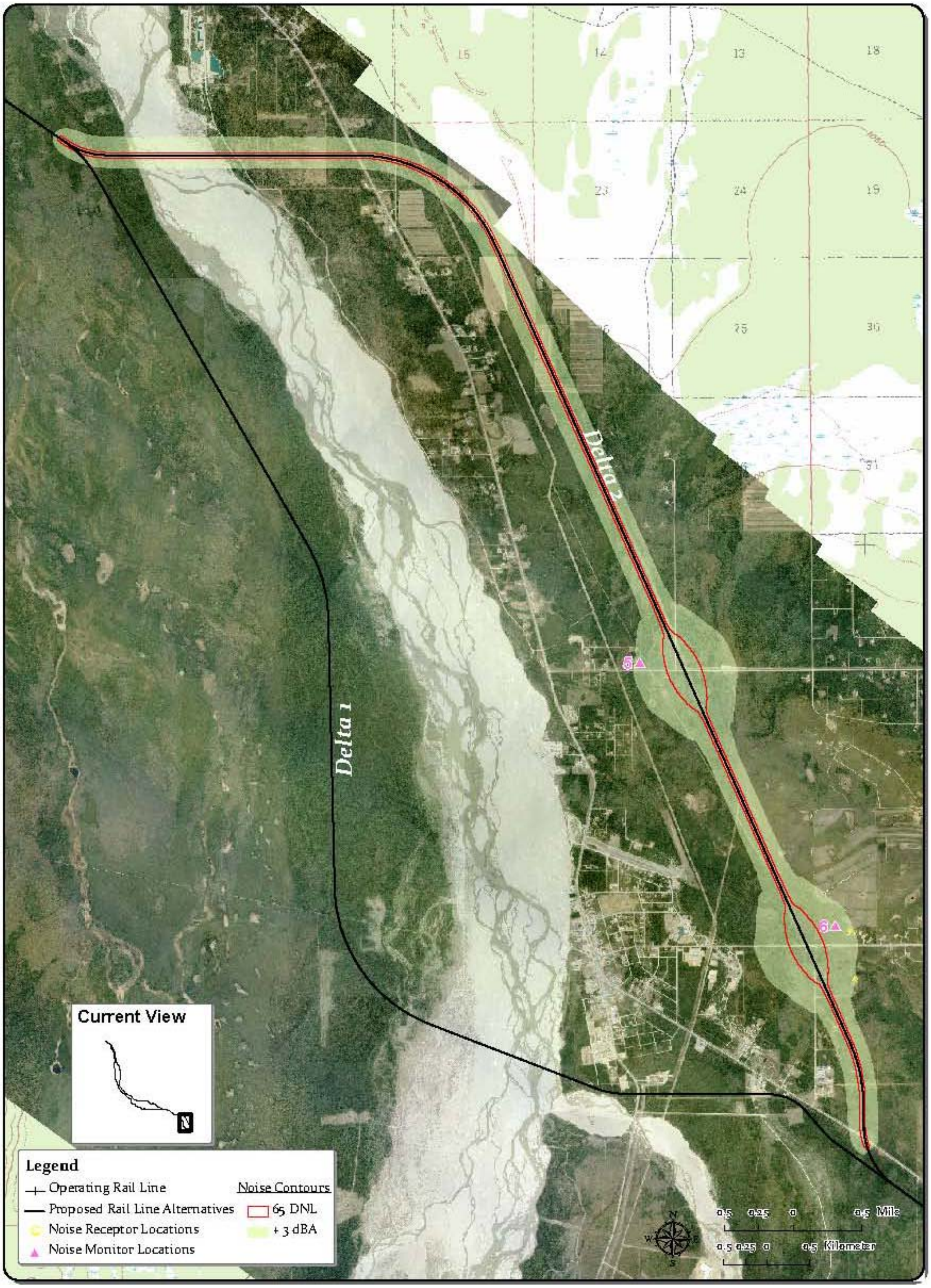

Figure 9-7 – Modeled Noise Contours – Delta Alternative Segment 2

Table 9-4 shows that an estimated 32 receptors near the Salcha Alternative Segment 2 would experience an adverse noise impact; they would be exposed to greater than or equal to 65 DNL and an increase in noise level of 15 to 30 dBA. Ambient noise levels are relatively low in this area, and the proposed NRE would cause a substantial increase in noise.

An estimated four receptors near the Eielson Alternative Segment 3 would experience an adverse noise impact; they would be exposed to greater than or equal to 65 DNL and would experience an increase in noise level up to 15 dBA.

An estimated 446 receptors along the Eielson Branch between FBX and the connection point for the proposed NRE would experience an adverse noise impact at greater than or equal to 65 DNL with an increase of 4 to 10 dBA as a result of the increased rail traffic anticipated in the Applicant's operating plans for the proposed NRE.

The estimated noise impacts along the Eielson Branch are based on the current location of the Eielson Branch track. SEA is aware that realignment of much of the Eielson Branch is under consideration with the goals of reducing transit times and improving safety, in part by reducing the number of at-grade highway rail grade crossings. Elimination of at-grade crossings would reduce locomotive horn noise and would reduce the estimated impacts presented here. In addition, some of the new alignments considered for the Eielson Branch would be farther from developed areas, which would further reduce noise impacts from increased rail traffic resulting from the proposed NRE. SEA used the existing Eielson Branch location in estimating potential impacts because it is uncertain whether or when a realignment of the Eielson Branch may occur and, if it occurs, where the new track location would be.

FRA regulations provide for the establishment of quiet zones in which locomotive horn sounding is not required at at-grade crossings if adequate safety protection is provided through other means. SEA examined the estimated effect that quiet zones could have on sensitive receptor exposure to noise levels of 65 DNL with an increase of 3 dBA or greater along the portion of the Eielson Branch that would be used by rail traffic associated with the proposed NRE. Table 9-5 shows the estimated number of receptors that would experience noise levels of 65 DNL or greater with an increase of 3 dBA or greater as a result of the proposed NRE if locomotive horns were not sounded on the Eielson Branch between FBX and junction with the proposed NRE at Milepost G20.18. The receptor counts in Table 9-5 are based on wayside noise only.

Table 9-5
Noise Receptor Counts with Quiet Zones

Segment[a]	65 DNL[b] & +3 dBA[c]
Existing Track 1	54
Existing Track 2 and 3	3
Existing Track 4	0

[a] See Table 9-2 for segment descriptions
[b] DNL = day-night average noise level.
[c] dBA = A-weighted decibels.

Rail Operations Vibration

There are two ground-vibration impacts of general concern for assessing effects: annoyance to humans and damage to buildings.

Assuming the top train speed anticipated for the proposed NRE, 76 miles per hour, a crest factor (the difference between average and peak vibration levels) of 4, and FTA's fragile building damage criterion of 0.20 inch per second, the building damage contour width would be 25 feet from the tracks. No buildings would be located within 25 feet of the tracks, so no building damage would be expected.

Vibration impacts with respect to human annoyance are evaluated on the basis of maximum vibration level. Because train speed would not increase along the existing rail line, maximum vibration levels also would not change, and therefore no change in vibration impact would be expected along the existing rail line.

Root-mean-square velocity (VdB) is a measure of ground vibration in decibels used to compare vibration from various sources.

Assuming a maximum speed of 76 miles per hour, the vibration annoyance contour along the proposed new rail line, using FTA's infrequent event criterion of 80 VdB, would be 140 feet from the track centerline. There are four receptors within that distance along Salcha Alternative Segment 2 and SEA estimates that they would experience vibration levels in excess of 80 VdB.

Construction Noise and Vibration

SEA used FTA's general assessment method to evaluate potential construction noise and vibration impacts. This method is used when the details of the construction schedule are not known. The two noisiest pieces of general construction equipment are identified and it is assumed that both pieces of equipment would be operating simultaneously. Table 9-6 shows the assumed two noisiest construction pieces of equipment, corresponding noise levels, and combined noise level.

Table 9-6
Construction Equipment Noise Levels

	Equipment	Average Noise Level at 50 feet (dBA[a])
1	Heavy Truck	88
2	Bulldozer	85
3	1 and 2 Combined	90
4	Pile Driver	101

[a] dBA = A-weighted decibels.

The combined noise level is then estimated at the receptor nearest each alternative segment, and compared with the applicable criteria (see Appendix J, Table J-3). SEA also identified bridge locations where pile driving might occur and estimated pile driving noise and vibration levels at the nearest receptors.

Table 9-7 provides estimated construction noise levels by alternative segment.

Assuming daytime construction, the noise levels shown in Table 9-7 would be below FTA's construction noise limits; therefore no construction noise impacts would be expected.

Table 9-8 provides estimated construction vibration levels by alternative segment.

SEA used a bulldozer as the vibration source to estimate vibration from general construction because this is the type of general construction equipment that imparts the highest vibration levels to the ground. Estimated construction vibration levels at the nearest receptors are below FTA's 0.20 inch per second fragile building damage criterion; therefore no building damage due to vibration would be expected.

Table 9-7
Estimated Construction Noise Levels

Alternative Segment	General Construction: Distance to nearest receptor (feet)	General Construction: Noise Level at receptor (dBA[b])	Pile Driving: Distance to nearest receptor (feet)[a]	Pile Driving: Noise Level at receptor (dBA)
Delta 2	1639	59	1639	71
Salcha 2	105	83	1695	70
Salcha 1	410	71	--	--
Eielson 3	360	73	603	79
Eielson 2	2227	57	2227	68
Eielson 1	650	67	--	--

[a] "—" indicates that no receptors were identified near pile driving locations
[b] dBA = A-weighted decibels.

Table 9-8
Estimated Construction Vibration Levels

Alternative Segment	General Construction (Bulldozer): Distance to nearest receptor (feet)	General Construction (Bulldozer): Vibration Level at receptor (PPV, inches/second)[a]	Pile Driving: Distance to nearest receptor (feet)[b]	Pile Driving: Vibration Level at receptor (PPV, inches/second)
Delta 2	1,639	0.000168	1,639	0.0029
Salcha 2	105	0.010340	1,695	0.0027
Salcha 1	410	0.001340	–	–
Eielson 3	3,60	0.001629	603	0.0128
Eielson 2	2,227	0.000106	2,227	0.0018
Eielson 1	650	0.000671	–	–

[a] Peak Particle Velocity (PPV) is the instantaneous positive or negative peak of a vibration signal, measured as a distance per time.
[b] "–" indicates that no receptors were identified near pile-driving locations.

To support rail line construction, ARRC proposes to establish and use a rock storage and transfer facility adjacent to the Eielson Branch near Eielson AFB. This would be done if the Tanana River bridge construction would precede construction of the rail line extension to the bridge location. Under these circumstances, rock would be hauled by rail from the Curry quarry to the staging area and then hauled by truck from the staging area to the proposed Tanana River crossing location (for Salcha Alternative Segment 1 or 2). Additional noise would be generated by these construction activities, and would be more noticeable in areas where trucking/rail activity is low or does not currently exist. However, such increased noise due to construction would be temporary and would not constitute an adverse noise impact.

No-Action Alternative

Under the No-Action Alternative, there would be no additional noise or vibration impacts because rail operations would be unchanged from current conditions. SEA estimates that under current conditions, 159 sensitive receptors experience noise levels of 65 DNL or greater (see Table 9-9).

Table 9-9
Noise Receptor Counts for Current Conditions

Segment[a]	65 DNL[b]
Existing Track 1	66
Existing Track 2 and 3	92
Existing Track 4	1

[a] See Table 9-2 for segment descriptions
[b] DNL = day-night average noise level.

9.4 Summary of Noise and Vibration Impacts

Operational noise impacts resulting from increased rail traffic would be greatest in terms of the number of receptors affected on the existing rail line between Fairbanks Depot and the junction with the proposed NRE. An estimated 446 receptors would be exposed to 65 DNL with an increase of 4 to 10 dBA as a result of the additional rail traffic. The Salcha Alternative Segment 2 would have an estimated 32 receptors exposed to 65 DNL, with an increase of 15 to 30 dBA because of low existing ambient sound levels. The Eielson Alternative Segment 3 would have an estimated 4 receptors exposed to 65 DNL with an increase of 15 dBA. No receptors would be exposed to 65 DNL on the other proposed segments.

Four receptors along Salcha Alternative Segment 2 would experience vibration impacts exceeding FTA's 80 VdB criterion for human annoyance.

Assuming daytime construction only, there would be no construction noise and vibration impacts according to FTA's General Assessment method.

10. ENERGY RESOURCES

Under the Council on Environmental Quality's (CEQ's) National Environmental Policy Act of 1969 (NEPA) regulations (40 Code of Federal Regulations [CFR] 1502.16 (e)), the Surface Transportation Board (STB or the Board) Section of Environmental Analysis (SEA) must consider the energy requirements and conservation potential of various alternatives of a proposed project. STB environmental regulations (49 CFR 1105.7) require that environmental impact analyses describe the effect of the proposed action on transportation of energy resources, the effect of the proposed action on recyclable commodities, and whether the proposed action would result in an increase or decrease in overall energy efficiency and explain why.

This chapter examines energy resources potentially affected by the proposed Northern Rail Extension (NRE) project. Energy resources include fuel consumption as a result of the proposed action, as well as utility and pipeline corridors potentially affected by the construction of the proposed rail line extension.

10.1 Affected Environment

The proposed rail line roughly follows the Tanana and Big Delta river valleys and extends south of Fairbanks to Delta Junction. Along much of the proposed rights-of-way, the rail line would generally follow the Richardson or Alaska highways. These highways serve as important transportation links between isolated communities in the rugged and chiefly undeveloped region of interior Alaska. Energy and utility rights-of-way occur in proximity to these highways because of the landscape and the convenience of access for construction and maintenance activities these highways provide.

Existing pipeline and utility rights-of-way are primarily located east of the Tanana and Big Delta rivers in the project area. Lands west of these rivers are primarily undeveloped and no energy or public utility rights-of-way have been identified.

Utility corridors in the project area, including phone and electrical transmission lines, generally run parallel or in proximity to Richardson Highway (Alaska Department of Natural Resources [ADNR], 2006a; Alaska Railroad Corporation [ARRC], 2006a). The existence of these and additional rights-of-way near the highway were confirmed by SEA via aerial photography. Utility lines running from the main transmission lines to individual residences also exist in numerous locations in the project area.

Two pipeline rights-of-way are located in the project area (ADNR, 2006b). The Trans-Alaska Oil Pipeline is a 48-inch diameter crude oil pipeline running 800 miles from Prudhoe Bay to the Port of Valdez. In the project area, the pipeline route runs from just north of Fairbanks to east of North Pole, near the current terminus of the Alaska Railroad. It then heads east out of the project area but re-enters the Tanana River valley just north of the confluence of the Big Delta and Tanana rivers. After returning to the valley, the pipeline runs south through Delta Junction and surrounding agricultural areas, roughly paralleling Richardson and Alaska highways at a distance of 300 to 5,000 feet.

The Haines to Fairbanks pipeline is an 8-inch diameter, 626-mile long military fuel transport pipeline from Haines, Alaska to Fairbanks, Alaska (U.S. Army Corps of Engineers, 2004). In the project area, the pipeline runs just east of Richardson Highway from Delta Junction to its terminus in Fairbanks (ADNR, 2006b). The Haines to Fairbanks pipeline has been inactive since

1974. State and Federal investigations into historic petroleum and herbicide contamination in the right-or-way are ongoing.

10.2 Environmental Consequences

10.2.1 Methodology

SEA investigated the effects on energy resources that would result from the construction and operation of the proposed NRE rail line. SEA examined the location of pipeline and electrical distribution line infrastructure in relation to each segment. Effects from potential fuel usage by trains were also examined. Part of this assessment was a qualitative comparison of truck to rail transport on the overall energy efficiency resulting from the movement of freight (both commercial and Department of Defense).

10.2.2 Common Impacts

Electrical Transmission Lines

In several locations, in particular near Eielson Air Force Base and Delta Junction, the proposed rail line would cross or run alongside existing electrical transmission lines. Where an alternative segment would cross an existing electrical transmission line, the line might need to be raised or a pylon—the tower supporting the line—might need to be relocated. ARRC would need to coordinate with Golden Valley Electric Association, Inc., and other line owners and users to ensure any service disruptions that might be necessary were minimized. In addition, ARRC would need to ensure that any alterations to transmission lines or pylons meet industry standards. The overall potential effects to electrical transmission lines are considered to be negligible.

Energy Consumption

SEA based its conservative fuel usage estimate for NRE operations on the longest potential rail line configuration of 82 miles. Fuel usage estimates were based on the assumption that one round trip freight train and eight one-way passenger trains per day would operate on the rail line. SEA's analysis also conservatively assumed that freight trains would consist of one locomotive and 35 railcars of mixed freight with a weight of 100 tons per car loaded (outbound leg of the round trip) and 50 tons per car unloaded (return leg of the round trip). SEA estimated fuel usage for the eight one-way passenger trains per day by assuming the use of a single locomotive and two 70-ton passenger cars with a total ridership of 185 passengers per train. SEA used the fuel efficiency standard of 710.6 ton-miles per gallon for mixed freight cargo identified in a Sierra Research, Inc. study of rail routes operating over similar grades (Sierra Research Inc., 2004). Using these conservative assumptions, total diesel fuel usage per week would be approximately 7,400 gallons for freight trains and 2,800 gallons for passenger trains. Emissions resulting from this fuel usage are analyzed in Chapter 8, Climate and Air Quality.

In terms of overall fuel usage, SEA expects that construction and operation of the proposed NRE would result in no change or a slight decrease in fuel usage. Any change in energy consumption would result from the substantial fuel efficiency advantage of rail versus truck transport (more than four times as efficient [Abacus Technology Corporation, 1991]) in the movement of mixed freight, as well as the assumption that the proposed commercial and military freight that would be shipped via the NRE would have otherwise been shipped by truck (commercial freight) or driven (military vehicles) over existing roads. ARRC has not estimated the shift of passenger traffic from road-to-rail, however, so SEA has conservatively assumed that operation of the rail passenger service would represent an increase in fuel usage. Depending on the amount of passenger car and truck traffic shifted to more fuel efficient passenger rail, overall fuel consumption could decrease.

Transportation of Energy Resources and Recyclable Commodities

The transportation of energy resources and recyclable commodities make up part of the anticipated cargo of the proposed rail line. Because the rail line is not expected to generate new demand for these commodities, but instead shift them from existing truck transportation, SEA has concluded that the proposed action would have no effect on these resources.

Overall Energy Efficiency

The proposed project is expected to result in the truck-to-rail diversion of freight. SEA has conservatively assumed that operation of the rail passenger service would represent a decrease in energy efficiency because the Applicant has not estimated the shift of passenger traffic from road-to-rail. However, given the increased efficiency resulting from truck-to-rail diversions of freight, SEA estimates rail operations would not decrease overall energy efficiency.

10.2.3 Impacts by Alternative Segment

Delta Alternative Segments 1 and 2 would both cross the Trans-Alaska Oil Pipeline near Delta Junction. ARRC would have to closely coordinate all construction activities with the Alyeska Pipeline Service Company and would adhere to all industry standards to ensure safety and minimal disruption to pipeline operations. ARRC's frequency of train accidents, such as derailments, is lower than the national average (see Chapter 11, Transportation Safety and Delay, and Appendix K). In the unlikely event of a derailment, no impact on this pipeline is expected to occur because of the grade separated design of the pipeline crossings. Overall, SEA does not anticipate any distribution disruption to this pipeline or long- or short-term effects on pipeline safety as a result of proposed rail line construction or operation.

Delta Alternative Segment 2 would, at certain points, run directly adjacent to an existing electrical transmission line northeast of Delta Junction. This proximity within the alternative segment's right-of-way is not considered a safety hazard due to the low frequency of train accidents, such as derailments (see Chapter 11, Transportation Safety and Delay, and Appendix K). In the unlikely event of an accident, electrical service along this line could be disrupted. This risk is considered negligible due to the low frequency of train accidents and the fact that a derailed train would likely need to impact a pylon to cause a service disruption.

10.2.4 No-Action Alternative

The No-Action Alternative would result in no change to the existing conditions for energy resources in the project area because the Applicant would take no action to extend the line. There would be no change in the use of fuel in the area since freight and personal transport would continue to be by road.

11. TRANSPORTATION SAFETY AND DELAY

Chapter 11 describes the applicable rules, existing conditions, and impacts on transportation safety and delay associated with the proposed action and alternatives. Rail construction activities and operational support facilities, including proposed construction camps, construction staging areas, a passenger depot in Delta Junction, end-of-track facilities (maintenance facilities and loading dock), and communication towers, are included as part of the proposed action and alternatives, except for the No-Action Alternative.

The potential effects on rail and road transportation systems within the region are also addressed in this analysis. Rail systems analyzed in this Environmental Impact Statement (EIS) include both a portion of the existing Eielson Branch and the proposed rail line extension. The existing Eielson Branch from Fairbanks to the Chena River floodway is included because rail traffic on the proposed Northern Rail Extension (NRE) would use this portion of the existing rail line network to reach the Fairbanks rail yard. Road systems analyzed in the EIS include roads in the vicinity of the existing and proposed rail lines.

The safety and delay analyses consider the potential impacts of the construction and operation of the proposed action and alternatives on rail and road systems. Rail and road accidents and fatalities are examined in the safety analysis. The delay analysis examines the increased delay that would be experienced by vehicles at at-grade highway rail crossings as a result of increased rail traffic anticipated for the proposed Northern Rail Extension.

11.1 Applicable Regulations

Section 11.1 describes applicable rules and oversight agencies that pertain to rail transportation, hazardous materials transportation, and grade crossing safety.

11.1.1 Rail Transportation Safety

The Federal Railroad Administration (FRA) has regulatory jurisdiction over rail operations and safety. FRA regulates most aspects of rail line safety including operations, track, signaling, and rolling stock (*e.g.*, locomotives and passenger and freight cars) for common carrier rail lines that are part of the general rail line system of transportation (see 49 Code of Federal Regulations [CFR] Parts 200 through 299). For example, 49 CFR Part 238 establishes safety standards for passenger cars, Part 213 establishes track safety standards, and Part 236 provides requirements for signal and train control systems, including a block system of train control to ensure that no other train is given permission to enter a block occupied by a passenger train for passenger train operations over 49 mph. In addition, individual states oversee public safety, especially for highway/rail line crossings. Several rail line associations, including the Association of American Railroads (AAR), American Short Line and Regional Railroad Association (ASLRRA), and American Railway Engineering Maintenance-of-Way Association (AREMA), have also developed standards and practices for the industry.

The Federal Railroad Safety Act of 1970 (FRSA) gave the FRA Administrator rulemaking authority over all areas of rail line safety. Subsequently, the FRA issued rules covering a wide array of safety-critical rail line equipment, infrastructure, procedures and established enforcement tools for rail line companies and employees who violate these rules.

FRA enforces U.S. Department of Transportation (USDOT) rules that require shippers to transport hazardous materials in railcars designed to safely transport specified commodities (49 CFR Parts 171 through 180).

Rail line track safety standards (49 CFR Part 213) are based on classifications of track that determine maximum operating speed limits, inspection frequencies, maintenance tolerances, record keeping, and other requirements.

11.1.2 Hazardous Materials Transportation Safety

Several Federal agencies have established requirements for hazardous materials transportation on rail lines, as well as for emergency planning and spill response for hazardous materials. These agencies include USDOT, U.S. Environmental Protection Agency (USEPA), and Occupational Safety and Health Administration (OSHA).

USDOT rules include requirements for shipping and packaging containers for hazardous materials, emergency response information, and training. USDOT's FRA has authority to ensure the safe movement of rail traffic. Regulatory and enforcement powers of FRA are found at 49 CFR 200 through 240. USDOT's Pipeline and Hazardous Materials Safety Administration (PHMSA) has established design standards and requirements, found in 49 CFR 171 and 179, for railcars used to transport hazardous materials.

USEPA rules address spill prevention and cleanup. Most USEPA rules address only fixed facilities rather than transport activities. However, USEPA rules in 40 CFR 263, Standards Applicable to Transporters of Hazardous Waste, specify immediate response actions, discharge cleanup, and other requirements for transporters of hazardous waste.

Finally, OSHA rules in 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, specify emergency response and clean-up operations for releases, or substantial threats of releases, of hazardous substances.

11.1.3 Grade Crossing Safety and Delay

The Federal Highway Administration (FHWA) and FRA have regulatory jurisdiction over safety at highway/rail grade crossings under the Highway Safety Act (HSA) and FRSA. USDOT has promulgated rules addressing grade crossing safety and provides funding for installation and improvement of warning devices. All warning devices installed at crossings must comply with FHWA's *Manual on Uniform Traffic Control* Devices (23 CFR Part 655, Subpart F). This manual provides standards for the types of warning devices that must be installed at all grade crossings. FRA has issued rules under its railroad safety authority that impose minimum standards for grade crossings (49 CFR Parts 234-36).

According to the *Railroad-Highway Grade Crossing Handbook* (FHWA, 2007b), "Jurisdiction over highway/rail grade crossings resides primarily with the States." The states perform onsite inspections and order safety improvements. USDOT maintains oversight and approval of state determinations. Thus, Section of Environmental Analysis (SEA) analyzed grade separation of highway/rail crossings based on FHWA guidelines, including the *Alaska Traffic* manual, which provides guidelines for improvements in grade crossing warning devices (ADOT&PF, 2005b). The guidelines include consideration of delay, highway classification, average daily traffic, number of trains per day, and train speed at grade crossings.

11.2 Affected Environment

Section 11.2 describes the existing safety and delay conditions on roads and rail facilities in the study area and the region. Section 11.2.1 describes the transportation region of influence; Section 11.2.2 describes the transportation safety environment; Section 11.2.3 describes the transportation delay environment; and Section 11.2.4 describes the grade crossing environment.

11.2.1 Transportation Region of Influence

The region of influence for transportation includes a portion of the existing Eielson Branch and the area of the proposed rail lines and associated facilities, as well as public roads in the vicinity of the Eielson Branch and proposed rail line extension. The region of influence includes the population centers of Fairbanks, North Pole, and Delta Junction, as well as rural and military training areas (Tanana Flats and Donnelly) in remote areas. The rail line would be within the Alaska Department of Transportation and Public Facilities (ADOT&PF) Northern Region.

Rail line construction would occur mostly in remote and rural areas. During rail line construction, new access roads to construction camps and construction staging areas would originate from nearby intersections with existing public roads. The region of influence is principally the vicinity of the proposed rail line extension, but also includes other roads that Alaska Railroad Corporation (ARRC) could use to supply materials, equipment, and workers during the construction phase. During construction, completed segments of the rail line could be used to transport materials to construction sites, camps, and staging areas.

The region of influence for rail line operations would also include the existing Eielson Branch rail line between the Fairbanks Intermodal Facility and Depot (FBX) and Milepost 20.18 (near Chena Flood Road) where the NRE would connect to the Eielson Branch.

11.2.2 Transportation Safety Environment

Rail Transportation Safety

ARRC carried over 7.6 million tons of freight using its 525-mile rail system in 2006. Its main route runs northward from Seward on the Gulf of Alaska through Anchorage, Wasilla, Talkeetna, and Denali before reaching the FBX, from where it continues along the Eielson Branch to Eielson Air Force Base (AFB) (ARRC, 2008a).

Table 11-1 presents a summary of existing rail traffic over ARRC's Eielson Branch between FBX and the proposed connection to the NRE. To facilitate analysis in the EIS, SEA divided this portion of the Eielson Branch into four segments. Segment 1 starts at FBX in northern Fairbanks and runs generally southeast until the turn-off to the Fairbanks airport. Segment 2 continues from the airport turn-off to the southeastern corner of Fort Wainwright at the location of a proposed new offloading facility. Segment 3 continues to the Flint Hills Resources North Pole Refinery. Finally, Segment 4 continues from the North Pole Refinery to Chena Flood Road.

Two trains per day transport coal to the Fairbanks airport. These trains run 5 to 6 days per week and operate on the Eielson Branch from FBX to the airport turn-off. One train per day transports coal to Eielson AFB and typically runs six times a week, half the time combined with a petroleum train to the North Pole Refinery. These combined trains are disassembled at the North Pole Refinery, from where the coal railcars continue to Eielson AFB. Petroleum trains that are

Table 11-1
Existing Daily Rail Traffic[a]

Train Type	Average Number of Daily Passbys	Average Train Length (feet)	Number of Locomotives	Approximate Number of Railcars	Eielson Segment[b]			
					1	2	3	4
Airport Train	1.571	1,750	1	30	✓			
AFB Coal Train	0.429	635	2	10	✓	✓	✓	✓
Petroleum/Coal Train	0.429	3,500	2	55	✓	✓	✓	
Petroleum Train	3.571	3,500	2	55	✓	✓	✓	

[a] Sources: ARRC, 2007b; URS, 2007
[b] Segment 1, FBX depot to Fairbanks airport turn-off; Segment 2, Airport turn-off to Southeast corner of Fort Wainwright; Segment 3, Southeast corner of Fort Wainwright to North Pole Refinery; Segment 4, North Pole Refinery to Chena Flood Road.

not combined with coal trains run four times daily on average on the Eielson Branch to the North Pole Refinery. All train counts represent passbys or one-way trains; and, therefore, include loaded and unloaded trains moving to and from their destinations.

Appendix K describes the general characteristics of rail line accidents in the United States and in Alaska. The accident rate, measured as the number of accidents per million train miles, over the most recent 5- and 10-year periods is lower for ARRC than the five largest rail lines in the Continental United States (Union Pacific, BNSF Railway, CSX Corporation, Norfolk Southern, and Kansas City Southern). It is also lower than the national average.

Between 1998 and 2007, ARRC has been involved in 31 accidents of different degrees of severity, eight of which have been in Fairbanks North Star Borough. One accident occurred on the Eielson Branch, where two railcars not containing hazardous materials derailed at a switching yard in July 1999 (FRA, 2008).

ARRC is involved in emergency preparedness training with local communities, including how to respond in case of a train accident or a hazardous material incident (ARRC, 2006b; ARRC, 2007c).

Hazardous Materials Transportation Safety

Based on the information presented in Table 11-1, ARRC moves approximately 110 loaded tank cars per day (on average) of refined petroleum products over the Eielson Branch between the North Pole Refinery and FBX. Between 1998 and 2007, no incidents involving hazardous materials in the region of influence occurred. During the same time, four accidents occurred involving trains that carried hazardous materials in Fairbanks North Star Borough. Two of those accidents involved one or two derailed railcars containing hazardous materials, but there was no release in either of those circumstances (FRA, 2008).

The ADOT&PF does not have formal emergency management standards for rail line emergency management. If a rail line accident affected the road system, ADOT&PF would initiate its emergency response according to its 2006 Incident Field Operations Guide (ADOT&PF, 2008a).

Highway Transportation Safety

Highway safety statistics for Alaska show that the fatality rate per 100 million vehicle-miles traveled is approximately 1.43 (2.07 in rural areas), which is slightly less than the national average (FHWA, 2005). Fatality rates are also measured based on population. Fairbanks North

Star Borough (FNSB) and Southeast Fairbanks Census Area, which includes Delta Junction, have annual fatality rates of 12.56 and 15.41 per 100,000 population, respectively, which are significantly lower than the national average of 23.36 (NHTSA, 2005). Statistics from the Alaska Highway Safety Office also indicate that vehicle-miles traveled fatality rates in Alaska have been decreasing over the past 10 years; whereas, fatality rates relative to population have remained constant (AHSO, 2006). Of all highway accidents in Alaska in 2002, less than 0.1 percent involved a rail line crossing (ADOT&PF, 2004).

11.2.3 Transportation Delay Environment

Generally, the main roads within the region of influence are two-lane roads, with the exception of some roads in Fairbanks and North Pole, as well as portions of Richardson and Alaska highways. Most roads within the region of influence are operating at level of service (LOS) A, which indicates free-flow conditions. Four roads are operating at LOS D: Old Steese Highway and Neely Road in Fairbanks, 3-Mile Gate south of Fort Wainwright Air Base, and 8th Avenue in North Pole.[1] Table K-2 in Appendix K characterizes the public roads at current highway-rail/at-grade crossings.

The volume of rail traffic on the Eielson Branch is an average of six or fewer trains per day, and trains typically operate at speeds of 20 miles per hour (mph) or less. Transit times are not limited by current rail traffic volumes. ARRC continues to study realigning and rehabilitating much of the Eielson Branch to improve the track geometry and transit times and reduce the number of grade crossings. The Fairbanks Metropolitan Area Transportation Systems Policy Committee has also supported realignment, but where or when realignments may occur is not known at this time.

11.2.4 Grade Crossing Environment

SEA reviewed the grade crossing conditions associated with the existing rail line that would be used under the proposed action and alternatives. Table 11-2 summarizes the number of existing public grade crossings along the portion of the Eielson Branch that would be used by anticipated passenger and freight rail traffic operating over the proposed NRE, along with the typical train speed and existing rail traffic. Current rail traffic at these grade crossings is all freight traffic. Appendix K includes a list of data sources used in the review of safety and delay conditions at existing grade crossings.

The *Fairbanks Metropolitan Area Transportation System Plan* recommends that two grade crossings be considered for grade separation within the region of influence: 3-Mile Crossing and Richardson Highway/Peridot Road (ADOT&PF, 2005a). As noted above, realignment of the Eielson Branch is under study and, if implemented, would be expected to result in closure or elimination of many existing grade crossings.

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[1] Levels of service are defined by the *Highway Capacity Manual* 2000 (TRB, 2001). Appendix K includes more detailed information about how levels of service were determined.

Table 11-2
Existing Public Grade Crossings Along Eielson Branch[a]

Rail Segment[b]	Number of Grade Crossings	Existing Rail Traffic (trains/day)	Typical Train Speed (mph)
Segment 1	16	6	10–15
Segment 2	1	5	20
Segment 3	14	5	20
Segment 4	3	1	20

[a] Source: Alaska ARRC, 2005.
[b] Segments along Eielson Branch are described in Table 11-1.

11.3 Environmental Consequences

SEA analyzed the proposed action and alternatives in the context of the existing operational and safety conditions described in Section 11.2. Section 11.3 describes the transportation safety consequences related to construction and operation of the proposed NRE. This includes potential impacts due to rail and road accidents and fatalities. Section 11.3.1 describes rail transportation safety; Section 11.3.2 describes hazardous materials transportation safety; Section 11.3.3 describes road transportation safety; and Section 11.3.4 describes grade crossing safety. Proposed mitigation for impacts to transportation is presented in Chapter 20 of the EIS.

11.3.1 Rail Transportation Safety

SEA analyzed rail transportation safety for traffic on the proposed rail line and the continuation of this traffic over a portion of the existing rail line (Eielson Branch) to FBX.

The methods presented in Section 11.3.1 use both qualitative and quantitative components. The number of fatalities and accidents resulting from train travel were based on fatality and accident rates provided by FRA statistics. The rates were used in combination with the specifics of an operation (*e.g.*, number of trains, route length) to estimate the likelihood of accidents and fatalities.

Construction Impacts

Equipment and materials needed for construction of the proposed rail line extension would be transported by rail and/or road, with the relative use of road and rail dependent on the construction schedule and the approach selected by the construction contractor. SEA anticipates that the increased rail traffic during the construction period would be less than during operation (*i.e.*, fewer than 10 trains per day), discussed below, and potential impacts on safety also would be less.

Operations Impacts

Passenger and freight traffic over the proposed rail line would travel a total one-way distance ranging from about 95 to approximately 100 miles, depending on the alternative segments included, between FBX and Delta Junction. Given the similarities in the overall length of the possible combinations of the alternative segments, SEA analyzed the longest route alternative of 82 miles to provide a conservative estimate of the potential impacts.

This analysis includes both existing and proposed rail traffic. Besides the existing rail traffic presented in Table 11-1, there would be on average two proposed daily freight trains and eight proposed passenger trains along the entire route alternative.

Based on FRA statistics, the accident rate per train mile for ARRC is 1.62×10^{-6} based on the time period 2003–2007 (FRA, 2008). Because there were no fatalities from train accidents in Alaska during this time, the national fatality rate of 1.61×10^{-8} per train mile was used to calculate predicted fatalities. Given the anticipated rail traffic associated with proposed NRE, there would be a predicted 0.64 annual train accident on the proposed new rail line and the portion of the Eielson Branch that would be used by proposed NRE traffic. This would represent an increase of 0.59 predicted train accident per year as a result of the proposed rail line extension; the number of predicted fatalities would be negligible. Accidents and fatalities associated with highway-rail crossings are not included in these calculations because they are considered in the grade crossing safety analysis.

No-Action Alternative

Because no new construction or changes in rail operations would occur, SEA expects that rail-related accidents would be unchanged from current conditions.

11.3.2 Hazardous Materials Transportation Safety

SEA evaluated the potential impacts on hazardous materials transportation safety qualitatively due to (1) the limited quantity of hazardous materials anticipated to be transported on the proposed rail line, (2) the low population density of areas through which the rail line does and would run, and (3) the results of previous analyses conducted by SEA that indicate that the probability of a hazardous materials release would be extremely low (SEA, 2002).

An assessment of potential public safety consequences typically involves three basic steps: (1) identification of the hazardous materials expected to be transported, the volume carried per car, and their hazardous characteristics; (2) determination of the area and population potentially affected; and (iii) assessment of the nature and magnitude of the potential consequences.

SEA used the following information on hazardous materials transport on the proposed rail line for the analysis of operations (ARRC, 2007a):

- 42 railcars per year containing fuel (mix of gasoline and diesel fuel);
- 16 railcars per year containing propane; and
- 5 railcars per year containing chemicals (*e.g.*, fertilizers).

For the purposes of the assessment of potential health consequences, SEA considered the most densely populated area along the rail line, which would be the segment of the rail line located in Fairbanks. SEA then compared the conditions in this project to the conditions previously analyzed for similar projects.

Construction Impacts

No transport of hazardous materials associated with the new rail line during the construction phase has been proposed by ARRC, so no impacts are anticipated.

Operations Impacts

The potential consequences of a release depend on the accident location, the amount released, the material released, and the weather conditions at the time of the release. For rail traffic associated with the proposed rail line extension, the likelihood of a release is low due to the limited amount of hazardous material shipments anticipated and the fact that railcars used for transportation of hazardous materials are designed to withstand various types of impacts. Even if a release were to occur, most would be small as a result of the railcars' design standards.

SEA previously analyzed rail transport of hazardous materials in situations involving many more railcars of flammable and/or toxic materials and in areas with much higher population densities and overall train traffic, and found the potential impacts to be low (SEA, 2002). Thus, SEA concludes that potential impacts of moving 63 hazardous material-containing railcars annually on the proposed rail line would be minimal.

No-Action Alternative

Because no new construction or changes in rail operations would occur, no change in rail safety is expected to result from the No-Action Alternative.

11.3.3 Road Transportation Safety

The road transportation safety analysis addresses road accidents and fatalities caused by additional traffic along local roads due to project-related traffic. Transportation safety at grade crossings is analyzed separately in Section 11.3.4.

The methods presented in Section 11.3.3 use qualitative considerations due to lack of specific information on traffic levels that would be needed to quantify road accidents and fatalities caused by the proposed rail line.

Construction Impacts

During the construction of the new rail line, personnel, equipment, and construction materials would be moved initially by truck and other vehicles, and could be moved by rail once portions of the rail line were completed. It is anticipated that construction materials and specialized equipment would be moved by rail where rail is available due to the generally lower cost. Some increased road traffic is expected during construction, however, and could lead to road accidents and fatalities.

If the proposed Tanana River bridge is constructed before the rail line, most road traffic from construction would occur on Richardson Highway. Construction materials would be transported from the existing Eielson Branch rail line to the bridge location. Average traffic volumes on this portion of Richardson Highway are approximately 10,000 vehicles per day. A quantitative estimate of potential construction traffic volumes is not available, but SEA anticipates that the volume of construction traffic would be small compared to existing vehicle traffic levels on Richardson Highway, and the potential impacts on roadway safety would be similarly small.

Operations Impacts

Operation of the proposed rail line extension would increase road traffic from rail workers going to and from work and individuals traveling by car to and from passenger rail stations in Fairbanks and Delta Junction. Given the approximately 100 miles between Fairbanks and Delta Junction, SEA anticipates that such traffic would be more than offset by the resulting reduction in vehicle miles traveled on Richardson Highway due to use of the rail passenger service. Reductions could also be realized because military vehicles could be transported to the training areas by rail, thereby reducing military vehicle traffic on Richardson Highway. Thus, SEA concluded that the potential impacts on road transportation safety by the proposed rail line extension would be minimal at worst and potentially positive.

No-Action Alternative

Because no new construction or changes in road operations or traffic would occur, no road transportation safety impacts are expected to result from the No-Action Alternative.

11.3.4 Transportation Delay

This section examines rail transportation delay, road transportation delay, and grade crossing delay. Proposed mitigation for impacts to transportation is presented in Chapter 20 of the EIS.

Rail Transportation Delay

Because construction and operation of the new rail line would place additional trains on the existing Eielson Branch, SEA examined potential consequences for rail delay from the increased traffic by comparing rail traffic volumes projected for the proposed rail line extension to existing traffic. SEA analyzed rail transportation delay qualitatively because existing rail traffic on the Eielson Branch is relatively low.

Construction Impacts

SEA examined the delay impacts of additional rail traffic related to rail line construction on existing rail traffic along the Eielson Branch. At present, there is an average of six freight trains or fewer per day on the existing rail line, depending on location. Based on the information provided by ARRC on the anticipated quantities of materials required for construction of the proposed NRE, SEA anticipates that additional train traffic associated with construction would average less than one train per day. SEA expects that ARRC would coordinate this limited, additional construction-related rail traffic with existing rail traffic to avoid delays, and therefore anticipates minimal delays.

Operations Impacts

SEA also examined the impacts of additional freight and passenger trains on existing rail traffic on the Eielson Branch. There would be two additional one-way freight trains and eight additional one-way passenger trains per day on the Eielson Branch as a result of the proposed rail line extension. Because the existing rail traffic volume on the Eielson Branch is relatively low—ranging from an average of one to six trains per day, depending on location—SEA does not expect that trains would experience noticeable delays as a result of the projected additional rail traffic. Furthermore, passenger trains, which represent the majority of new rail traffic, would run on a routine schedule, so coordination between existing freight trains and new passenger trains would be simplified. Thus, SEA concludes that potential impacts of additional freight and passenger trains on existing rail traffic would be minimal.

No-Action Alternative

Because no new construction or changes in rail operations would occur, no delay impacts on existing rail traffic are expected to result from the No-Action Alternative.

Road Transportation Delay

An adverse impact on road transportation delay within the region of influence could occur if construction or operation of the proposed rail line were to degrade road levels of service to unacceptable levels (below a service level of C) as a result of project-related traffic.

SEA assessed the impacts of the proposed rail line on roads within the region of influence qualitatively for two reasons. First, increased road traffic associated with the proposed rail line extension would stem primarily from construction activities and depend on the construction schedule and approach the contractor selects, so quantitative estimates are not currently available. Second, most roads within the region of influence are currently operating at level of service A, which indicates either free-flow or near free-flow conditions. Appendix K, Section K.1.2, discusses existing annual average daily traffic data for the major roads within the region of influence. Baseline levels of service of the roads were determined using *Highway Capacity Manual* guidelines (TRB, 2001).

Construction Impacts

Construction of the proposed rail line would place some additional traffic on existing roads. Construction would generate vehicle trips and potentially increase delay caused by the movement of materials, equipment, and workers to and from work sites, construction staging areas, and construction camps. In addition, temporary delays might occur on portions of existing roads, such as Grieme Road/Old Richardson Highway and Old Valdez Trail, that ARRC proposes to widen to provide better access to the Tanana River bridge on Salcha Alternative Segments 1 and 2, respectively. Similarly, temporary delays might occur for traffic on Richardson Highway in the Salcha area during relocation of two sections of the highway that would be required for construction of Salcha Alternative Segment 2. Construction of both grade separated and highway/rail at-grade crossings on the various segments for the new rail line could also introduce temporary delays.

As the principal roadway in the region, Richardson Highway would carry most of the increased traffic. At present the highway is mainly operating at levels of service A or B, with an average daily traffic level ranging from approximately 10,000 vehicles per day near Eielson, where the largest increase in construction traffic would be expected, to approximately 2,000 vehicles per day in the Salcha area. Although specific estimates of road traffic resulting from construction are not available, SEA concludes that road delays would likely be limited given existing levels of service and capacity, with the possible exception of vehicle delays during grade crossing construction or roadway widening. Those delays would be temporary.

Operations Impacts

After construction of the rail line, rail support facilities would generate very limited additional road traffic from employees commuting to and from their homes. These facilities would include end-of-track, freight, and passenger facilities at Delta Junction.

Some impacts would result from drivers commuting to and from rail stations during boarding and alighting times, especially if they coincide with peak-hour traffic. Depending on the exact location of the rail stations, this could negatively affect the level of service on roads adjacent to the rail stations. In Fairbanks, where some of the main arterials are already operating at level of service D or worse, the rail station would be located in the FBX depot, and most likely the road access would be through the intersection of Danby Street and Johanssen Expressway, which are currently operating at level of service A. The same is true for the roads adjacent to the rail station locations proposed in Delta Junction.[2] Therefore, SEA anticipates that the impacts of road transportation delay from drivers' commutes to rail stations would be minimal.

Vehicle trips along Richardson Highway could decrease because some of the military and commercial freight hauled there could move on the proposed rail line. Vehicle trips on

[2] See Chapter 2 for the locations of the passenger stations proposed for Delta Alternative Segments 1 and 2.

Richardson Highway would also decrease to the extent that individuals use the new passenger rail service instead of driving. Because estimates of the number of individuals who would use the proposed rail service were not available, SEA did not attempt to quantify a potential reduction in the number of vehicle trips that could result from the new passenger rail service.

SEA anticipates that some transportation using trucks and automobiles would shift to the new rail service, which would decrease traffic volumes on Richardson Highway. SEA expects the resulting change in road transportation delay would be small due to the relatively low traffic volumes on the highway between North Pole and Delta Junction.

No-Action Alternative

Because no new construction or changes in road operations would occur, no delay impacts on existing roads are expected to result from the No-Action Alternative.

Grade Crossing Delay

Highway/rail at-grade crossings can be a source of delay to motorists because trains have movement priority. SEA examined the potential effects of the proposed NRE on vehicle delay at grade crossings on the existing Eielson Branch.

SEA conducted its grade crossing analysis according to FHWA's guidelines (FHWA, 2002). These guidelines take into account the frequency, length, and speed of trains, as well as the volume of road traffic and physical characteristics of roads at grade crossings (*e.g.*, road classification, number of lanes). The quantitative analysis of road transportation delay at existing public grade crossings took into consideration the existing rail traffic volumes included in Table 11-1. The analysis also considered the additional proposed rail traffic, including an average of two daily freight trains and eight daily passenger trains. Estimates of annual average daily vehicle traffic for each crossing were calculated for 2012. Further information on SEA's grade crossing analysis methods can be found in Appendix K.

The calculation of road transportation delay was limited to existing public grade crossings on the Eielson Branch due to the low traffic volume on private roads and roads that would be crossed at-grade by the proposed rail line. Therefore, the transportation delay analysis for future grade crossings is qualitative.

Construction Impacts

Construction of the new rail line would potentially cause vehicle delay at grade crossings on the Eielson Branch to the extent that construction would increase rail or vehicle traffic. SEA anticipates that the increased rail traffic during the construction period would be much less than during operations, discussed below, and potential delay impacts also would be less. SEA anticipates that increased vehicle traffic resulting from construction activities would be small in the context of existing traffic levels and the potential delay impacts would be minimal.

Operations Impacts

After construction of the new rail line, there would be additional freight and passenger rail traffic that would increase vehicle delay at grade crossings. SEA's grade crossing delay analysis shows that no change in level of service is anticipated at any grade crossing as a result of the proposed NRE. SEA estimates that the number of vehicles delayed by rail traffic would increase as a result of the proposed NRE from approximately 1 percent of all vehicles using the highway/rail at-grade crossings to approximately 1.6 percent and that the average delay experienced by each delayed vehicle would decrease from approximately 1.67 minutes per vehicle to 1.34 minutes per vehicle (because the average train length would decrease). The average delay per vehicle for all vehicles in a 24-hour period as a result of the proposed NRE would range from 0.19 to 2.83 seconds. This would be an increase of 0.15 to 0.53 second from existing conditions. Estimated total delay experienced by drivers in a 24-hour period at all crossings analyzed would be approximately 50 hours, which would be an increase of approximately 10 hours from existing conditions. Approximately 15 percent of the increase in total estimated delay would occur at Neely Road, which is currently operating at level of service D due to high traffic volume for a two-lane road.

ARRC has proposed to grade separate crossings with major roads[3] (Richardson Highway, Alaska Highway), and all roads that would cross the new rail line at-grade have low traffic volumes.[4] The roads that would be crossed at-grade by the new rail line in aggregate have an estimated average daily traffic volume of approximately 2 percent of the existing crossings. Estimate delay for stopped vehicles would be less than 1 minute per vehicle and total estimated delay for all vehicles would be less than 10 minutes per day. Delay would be substantially lower at new crossings than existing crossings due to much lower average daily vehicle traffic and faster train speeds.

There could be some road delay impacts on response time for emergency vehicles resulting from blocked crossings. SEA analyzed the location of hospitals and fire stations in relation to the crossings that would have the greatest delay. In Fairbanks, where most of the estimated increase in grade crossing delay would occur, all hospitals are located southwest of the rail line. However, there are many alternate routes for emergency vehicles to cross the rail line should an emergency occur north of the tracks. There are two fire stations in Fairbanks, one on each side of the rail line. If a fire vehicle needed to cross the tracks when a train was passing, there would be many alternate routes. In North Pole and Delta Junction, the estimated increase in delay at grade crossings would be less than in Fairbanks, because of lower traffic volumes. Therefore, SEA anticipates that the operations impacts on emergency vehicle response time would be small.

As noted above, ARRC has been studying alternatives for realigning portions of the Eielson Branch between FBX and approximately Milepost 20. One of the purposes of the realignment initiative is to reduce the number of at-grade crossings. If the Eielson Branch is realigned in the future, then the increased delay times estimated here would be less.

Appendix K presents the location of each grade crossing, as well as the crossing delay per stopped vehicle, average delay for all vehicles, total number of vehicles delayed, and total daily delay for as well as the change in, average delay for existing and proposed conditions resulting from the proposed NRE.

No-Action Alternative

Because no new construction or changes in rail operations would occur, no change in delay from existing conditions is anticipated.

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[3] Major roads refer to roads classified as arterials, freeways, expressways, or interstates.

[4] Some minor roads (collectors and local roads) would also be grade separated. These include Old Richardson Highway, Old Valdez Trail, and Ruger Trail.

11.3.5 Grade Crossing Safety

The grade crossing safety analysis evaluates predicted accident frequencies at grade crossings under the proposed action and alternatives. Accident frequency is typically measured as the number of accidents per year.

The Applicant has proposed to avoid some at-grade crossings of the new rail line alternative segments either by grade separating the crossings, or relocating or closing the road to avoid the need for a crossing. These roads include Richardson Highway, Cold Foot Court, Boondox Drive, and Old Valdez Trail on Salcha Alternative Segment 2; Richardson, Old Richardson, and Alaska highways, Emmaus Road, and Tanana Loop Road on Delta Alternative Segment 2; and Richardson Highway, Hammond Road, and Bear Avenue on Delta Alternative Segment 1.

SEA evaluated grade crossing safety by estimating future accident frequency under the proposed action and alternatives with FRA's Personal Computer Accident Prediction System (PCAPS) (FRA, 2007). The analysis took into account the accident history and frequency of trains at grade crossings, volume of vehicle traffic, existing safety devices at grade crossings, and other factors to determine the potential impacts of an increase in rail traffic. The quantitative analysis of accident frequencies at existing public grade crossings took into consideration the existing rail traffic volumes included in Table 11-1. The analysis also considered the additional proposed rail traffic, including two daily freight trains and eight daily passenger trains. Estimates for annual average daily traffic for each road crossing were calculated for the year 2012[5] and used in the analysis. Further information on SEA's grade crossings analysis methods can be found in Appendix K.

Calculation of projected accident frequencies was limited to existing public grade crossings along the Eielson Branch. Because the proposed potential grade crossings along the new rail line lack historical accident data, it was not possible to apply FRA's methods to calculate projected accident frequencies for these crossings. Therefore, the transportation safety analysis for future grade crossings is qualitative.

Construction Impacts

Construction of the new rail line would potentially impact safety at grade crossings on the Eielson Branch to the extent that construction would increase rail or vehicle traffic. SEA anticipates that the increased rail traffic during the construction period would be less than during operation (i.e., less than ten trains per day), discussed below, and that potential safety impacts also would be less. SEA anticipates that increased vehicle traffic resulting from construction activities would be small in the context of existing traffic levels and the potential safety impacts would be minimal.

Operations Impacts

SEA's grade crossing safety analysis indicates that the predicted accident frequency at each of the existing public at-grade crossings that would be crossed by rail traffic from the proposed rail line extension ranged from a minimum rate per year of 0.0093 and a maximum of 0.413. This translates into one predicted accident every 2.4 to 108 years, depending on the crossing. The total estimated increase in predicted accident frequency of 0.54 accident per year (from 1.18 to

[5] The Applicant has estimated that construction of the proposed rail line would take 3 to 4 years.

1.72) for all existing crossings that would be used by proposed NRE traffic is independent of the route of the rail line extension because the same existing crossings would be used for all routes.

Table 11-3 shows the five crossings with the largest estimated increase in predicted accident frequency as a result of the proposed NRE. According to FHWA guidelines on grade separation (FHWA, 2002), none of the crossings evaluated in this analysis would have a predicted accident frequency above 0.5, which is the level at which FHWA recommends grade separation; however, Old Steese Highway would have an accident frequency near the 0.5 threshold.

Table 11-3
Five Grade Crossings With the Largest Estimated Increase in Predicted Accident Frequency

Road	Accident Frequency (accidents/year) [a]		
	Existing Conditions	Proposed NRE	Change
Old Steese Highway	0.2692	0.4131	0.1439
Steese Expressway	0.1113	0.1350	0.0237
3-Mile Gate	0.1702	0.2166	0.0464
Cross Way Road	0.0643	0.0863	0.0221
Laurence Road	0.0153	0.0492	0.0339
8th Avenue	0.0469	0.0648	0.0180

[a] Predicted accident frequencies were calculated using FRA's Personal Computer Accident Prediction System (PCAPS) (FRA, 2007).

For the new grade crossings along the new rail line, ADOT&PF would determine the appropriate level of protection based on Federal and state rules and guidelines. For the new grade crossings, accident frequency rates cannot be calculated using FRA's accident prediction formula because of an absence of accident history information. For the roads that would be crossed at-grade by the new rail line, predicted accident frequency would be expected to be much lower than for the existing grade crossings because total estimated vehicle traffic at the new crossings would be less than 2 percent of that for the existing crossings for any of the alternative routes from North Pole to Delta Junction.

Appendix K presents the segment location of each grade crossing, along with the change in predicted accident frequency between the existing and proposed action scenario conditions.

No-Action Alternative

Because no new construction or changes in rail operations would occur, no safety impacts are expected to result from the No-Action Alternative when compared to existing conditions. The predicted accident frequency for the existing Eielson Branch exhibits a minimum rate per year of 0.0046 and a maximum of 0.27 for all highway-rail public grade crossings. This translates to a range of one accident every 3.7 to 219 years.

12. NAVIGATION

This chapter examines the potential impact on navigation from bridges that would be constructed over navigable waters as part of the proposed Northern Rail Extension (NRE). This chapter includes descriptions of the applicable regulations and existing conditions for waterways in the project area that the United States Coast Guard (USCG) is likely to consider navigable. The USCG authorizes and permits the construction of bridges across navigable waters. In instances where the Alaska Department of Natural Resources (ADNR) is the landowner of one or both sides of a waterbody, ADNR is also responsible for authorizations required for crossing these waterbodies. This chapter also provides information on Bureau of Land Management (BLM), ADNR, and other Federal agency determinations of navigability.

12.1 Applicable Regulations

The USCG authorizes and permits the construction of bridges across navigable waters in accordance with the General Bridge Act of 1946 (33 United States Code [U.S.C.] 525 *et seq*.) and Section 9 of the Rivers and Harbors Act (22 U.S.C. 401). Navigable waters of the United States, as they pertain to the USCG permitting process, are defined in 33 Code of Federal Regulations (CFR), Subpart 2.05-25 as:

(1) Territorial seas of the United States;

(2) Internal waters of the United States that are subject to tidal influence; and

(3) Internal waters of the United States not subject to tidal influence that:

  (i) Are or have been used, or are or have been susceptible for use, by themselves or in connection with other waters, as highways for substantial interstate or foreign commerce, notwithstanding natural or man-made obstructions that require portage, or

  (ii) A governmental or non-governmental body, having expertise in waterway improvement, determines to be capable of improvement at a reasonable cost (a favorable balance between cost and need) to provide, by themselves or in connection with other waters, highways for substantial interstate or foreign commerce.

This regulatory definition of navigability has been expanded by legal precedent to include historic and modern use for recreation and tourism (*e.g.*, fishing or sightseeing) or by inflatable rafts (*Alaska v. United States*, 662 F. Supp. 455 [D. Alaska 1986]; *Alaska v. Ahtna, Inc.*, 892 F. 2d 1401 [9th Cir. 1989]).

Bridges over waterways meeting the definition of navigable cannot legally be constructed without prior USCG approval of the plans and location of the proposed bridge. The USCG, a cooperating agency in the preparation of the Environmental Impact Statement, has stated that all the crossings of waterways and their side channels described in Section 12.2, with the possible exception of Piledriver Slough, would require individual bridge permits (USCG, 2008). However, because only a small number of applications for USCG bridge permits have previously been filed in the area surrounding the proposed NRE, little in the way of official USCG navigability determinations have occurred near the project area. Therefore, to adequately describe the affected environment, the Surface Transportation Board Section of Environmental

Analysis (SEA) provides information from other Federal and state agencies regarding navigability determinations and waterway usage. The criteria for waterway navigability determinations used by these other agencies are described below. Federal Aviation Administration requirements might apply to bridge structures (*e.g.*, lighting). For example, under bad weather conditions, some pilots use the Tanana River to navigate back to Fairbanks. In time of severe fog, pilots might fly very low so they can see the river, and lighting could be appropriate.

In addition to the USCG, the United States Army Corps of Engineers (USACE), BLM, and ADNR issue determinations regarding the navigability of waterways. Alaska law (AS 38.05.965) defines navigable water as:

> … [A]ny water of the state forming a river, stream, lake, pond, slough, creek, bay, sound, estuary, inlet, strait, passage, canal, sea or ocean, or any other body of water or waterway within the territorial limits of the state or subject to its jurisdiction, that is navigable in fact for any useful public purpose, including but not limited to water suitable for commercial navigation, floating of logs, landing and takeoff of aircraft, and public boating, trapping, hunting waterfowl and aquatic animals, fishing, or other public recreational purposes.

Alaska law (AS 38.05.127) also mandates the circumstances under which navigability would be determined and safeguards public access to navigable waterways:

> Before the sale, lease, grant, or other disposal of any interest in state land adjacent to a body of water or waterway, the commissioner [of natural resources] shall… determine if the body of water or waterway is navigable water, public water... Upon finding that the body of water or waterway is navigable or public water, provide for the specific easements or rights-of-way necessary to ensure free access to and along the body of water, unless the commissioner finds that regulating or limiting access is necessary for other beneficial uses or public purposes.

The State of Alaska also plays a key role in the authorization of some structures that impact navigable waterbodies. Specifically, AS 38.05.128 mandates:

> A person may not obstruct or interfere with the free passage or use by a person of any navigable water unless the obstruction or interference is: authorized by a federal agency and a state agency; authorized under a federal or state law or permit; exempt under 33 U.S.C. 1344(f) (Clean Water Act); caused by the normal operation of freight barging that is otherwise consistent with law; or authorized by the commissioner after reasonable public notice.

USACE regulations define navigable waters of the United States for the purpose of regulating the discharge of dredge or fill material into these waters. USACE's definition of navigability is similar to that of the USCG, claiming as navigable "waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce" (33 CFR Part 329). BLM's administrative navigability determinations, which are made mostly in response to requests by the State of Alaska for the transfer of ownership of submerged lands below these waterways to the State, are based on an understanding of navigability similar to that defined under 33 CFR Part 329 and the consideration of contemporary and historical use of the waterway for commercial transport (ADNR, 2005; BLM, 2008). ADNR's definition of navigability is broader and includes any waterbody "suitable for commercial navigation, floating of logs, landing and takeoff of aircraft, and public boating, trapping, hunting waterfowl and aquatic animals, fishing, or other public recreational purposes" (ADNR, 2005). ADNR is also involved in authorizations required for crossings navigable waterbodies as described above. The ADNR and the Alaska Department of Fish and Game (ADF&G) are responsible for determining the need for and reviewing the designs of bridges.

12.2 Affected Environment

This section describes the potentially affected environment for waterways stated by the USCG as likely to be navigable and requiring bridge permits. These waterways include the Tanana River, Salcha River, Little Delta River, Delta Creek, Delta River, Piledriver Slough, and the side channels of these waterways (USCG, 2008). This section also includes a brief description of the numerous smaller streams and sloughs within the project area, which the USCG might or might not determine navigable upon detailed examination of the crossings as part of the bridge permitting process. The smaller waterways described here were identified as potentially navigable during surface water field investigations conducted during 2005, 2006, and 2007. For additional information about the methodologies employed during these field investigations, and information concerning channel morphology, water quality, drainage areas, and discharge regimes of all the surface waters in the project area, see Chapter 4 and Appendix E.

12.2.1 Tanana River

The Tanana River is a USACE- and ADNR-determined navigable waterway (USACE, 2006; ADNR, 2008). The types of boats currently used on the Tanana River near the project area include airboats, small fishing vessels, and tourist sternwheelers. Historic usage has included barges, steamboats, and trading vessels (ADNR, 2006c; CSU, 2007). River traffic in the project area largely consists of smaller recreational crafts and small, shallow draft barges due to the glaciated, braided nature of the channel upriver from Fairbanks. In the project area, the Tanana River includes numerous floodplain sloughs and overflow channels. The Parker Highway Bridge in Nenana (approximately 80 miles downriver from the project area) and the Richardson Highway Bridge in Big Delta present limits to the types of vessels that can be used on the Tanana River. The current clearance height at these bridges is set at 40 feet and 13.5 feet, respectively, for ordinary high water conditions in the designated navigation channels (ADOT&PF, 2007b).

12.2.2 Salcha River

The Salcha River has been determined navigable by the BLM and ADNR (BLM, 2005; ADNR, 2008). Most contemporary use on the river near the project area is by small, jet-powered boats, primarily used for fishing and transportation to cabins and hunting areas adjacent to the river. Historic use of this section of the Salcha River has included commercial navigation by hunters and trappers, logging interests, and prospectors (BLM, 2005). Alaska operates a public-use boat launch approximately 2 miles upriver from the proposed river crossing along Salcha Alternative Segment 2. The Richardson Highway Bridge, which is adjacent to the boat launch, sets the current clearance height (12.9 feet for ordinary high water conditions) for vessels entering the Salcha River from the Tanana River (ADOT&PF, 2007b). This bridge is upriver from the project area.

12.2.3 Little Delta River

The Little Delta River has not been determined navigable by the BLM, USACE, or ADNR. The river is heavily braided and glaciated near the areas of the potential river crossings along

Donnelly Alternative Segments 1 and 2. There is some recreational boating, transportation for hunting and other activities, and fishing on the river, though the type and draft of vessels capable of accessing the area is limited due to channel morphology.

12.2.4 Delta Creek

Delta Creek has not been determined navigable by the BLM, USACE, or ADNR. The creek's channel is braided near the potential creek crossings along Donnelly Alternative Segments 1 and 2. There is some recreational boating, transportation for hunting and other activities, and fishing on the river, though the type and draft of vessels capable of accessing the area is limited due to channel morphology.

12.2.5 Delta River

The portions of the Delta River that fall within the NRE project area have not been determined navigable by the BLM, USACE, or ADNR. The river is heavily braided and glaciated near the areas of the potential river crossings along Delta Alternative Segments 1 and 2. There is some recreational boating, transportation for hunting and other activities, and fishing on the river, though the type and draft of vessels capable of accessing the area is limited due to channel morphology.

12.2.6 Piledriver Slough

Piledriver Slough has not been determined navigable by the BLM, USACE, or ADNR. This small stream runs from the Tanana River to an area south of Eielson Air Force Base (ADF&G, 2007d). The shallowness of this waterbody generally limits accessibility to only small recreational craft (*e.g.*, canoes and inflatable boats). There are several existing culvert and bridge road crossings in the project area (ADF&G, 2007d).

12.2.7 Other Smaller Waterbodies

There are numerous small sloughs, streams, and side channels of larger rivers and creeks in the project area. Because of size, channel morphology, and other limiting features, these waterbodies receive only very limited small vessel traffic. None of these waterways have been determined navigable by the USCG, BLM, USACE, or ADNR, though side channels of USCG-navigable waterways would also require bridge permits (USCG, 2008). The need for bridge permits for other small waterways would be determined in coordination with the USCG and ADNR prior to the start of construction. If the Fivemile Clearwater River were crossed, the crossings would consist of small bridges. These bridges would facilitate the movement of small jet boats. Chapter 4 provides additional information about the characteristics of these waterways.

12.3 Environmental Consequences

This section describes potential impacts to navigation resulting from the proposed NRE project.

12.3.1 Methodology

SEA examined the location, waterway characteristics, and general use characteristics for potentially navigable waterways (as defined in Section 12.1.2) to determine potential impacts from the proposed action and alternatives.

12.3.2 Common Impacts

Construction Impacts

As required by the General Bridge Act of 1946, Alaska Railroad Corporation (ARRC) would need to submit final designs for all crossing structures and crossing locations to the USCG for review prior to the start of construction. Based on this information, the USCG would determine whether ARRC's proposed construction required a permit for particular crossings. No bridge construction could begin prior to permit determination.

The proposed construction of bridges and culverts over navigable waters could result in temporary effects to navigability. Temporary construction bridges would be needed in some areas and could result in temporary obstructions to the navigability of some waterways. In addition, normal bridge construction activities (*e.g.*, setting piers and construction equipment operation) have the potential to temporarily affect navigation.

Operations Impacts

Proposed NRE operations would not impact navigation.

12.3.3 Impacts by Alternative Segment

This section describes potential impacts specific to each alternative segment.

North Common Segment

North Common Segment would cross Piledriver Slough, which is the only potentially navigable waterway along this segment. The proposed bridge crossing would be approximately 100 feet long and would clear span the channel. ARRC would design this bridge to comply with applicable USCG permit conditions regarding navigation. SEA believes this crossing would have a negligible effect on navigation in the waterway, because the proposed crossing structures would be designed to allow the passage of the types of small vessels currently capable of using the slough (see Section 12.2.6).

Eielson Alternative Segment 1

Eielson Alternative Segment 1 would cross Twentythreemile Slough. The proposed bridge crossing would be approximately 100 feet across and would likely be a single-span bridge. This crossing would have negligible effects on navigation in this waterway, because the proposed crossing structures would be designed to allow the passage of small vessels currently capable of navigating the waterway (see Section 12.2.7).

Eielson Alternative Segment 2

Eielson Alternative Segment 2 would cross three potentially navigable waterways. These crossings would include an approximately 330-foot- long, multi-pier bridge over Piledriver Slough, and a shorter, 60-foot-long bridge over an unnamed slough (a common crossing with Eielson Alternative Segment 3). The third crossing would be a crossing of Twentythreemile Slough in common with Eielson Alternative Segment 1, as described above. SEA believes these crossings would have negligible effects on navigation in the waterways, because the proposed crossing structures would be designed to allow the passage of small vessels currently capable of navigating the waterway (see Section 12.2.6).

Eielson Alternative Segment 3

Eielson Alternative Segment 3 would cross two potentially navigable waterways. These crossings would include an approximately 300-foot-long, multi-pier bridge over Piledriver Slough, and a shorter, 60-foot-long bridge over an unnamed slough (a common crossing with Eielson Alternative Segment 2). SEA believes these crossings would have negligible effects on navigation in the waterways, because the proposed crossing structures would be designed to allow the passage of the types of small vessels currently capable of navigating the waterway (see Section 12.2.6).

Salcha Alternative Segment 1

Salcha Alternative Segment 1 would cross the Tanana River immediately after splitting from Eielson Alternative Segments 1, 2, or 3. The span for the proposed Salcha Alternative Segment 1 conveyance would be 3,600 feet. The Tanana River would not be clear spanned, and abutments would be placed at appropriate locations in the channel based on design considerations, including navigation (see Chapter 2 for additional information on bridge design). The potential for effects on commercial or personal navigation are limited by the types of crafts using this waterway and the existing crossing structures up and down river from the proposed crossing location. In addition, ARRC would need to design these bridges to comply with applicable USCG permit conditions regarding the maintenance of navigation.

Connector Segment B

Connector Segment B would cross the Fivemile Clearwater River, which is navigated by private property owners to reach their land parcels upstream. The proposed bridge would clear span the channel and would be approximately 160 feet long. ARRC would design this bridge to comply with USCG permit conditions regarding navigation. SEA believes the crossing would have a negligible effect on navigation in the waterway, because the proposed crossing structure would be designed to allow the passage of the types of small vessels currently capable of navigating the waterway (see Section 12.2.7).

Salcha Alternative Segment 2

Salcha Alternative Segment 2 would cross the Tanana River near its confluence with the Salcha River, and would cross the Salcha River west of the Richardson Highway Bridge. The span of the Tanana River conveyance would be 4,000 feet. The Salcha River crossing distance is still to be determined, but would be at least 2,500 feet, the minimum distance needed to clear the 100-year floodplains for the waterway. Neither of the river crossings would clear span the waterway, and abutments would be placed at appropriate locations in the channel based on design considerations, including navigation (see Chapter 2 for additional information on bridge design). ARRC would design these bridges to comply with USCG permit conditions regarding navigation. The potential for effects on commercial or personal navigation would be limited by the types of crafts using this waterway and the existing crossing structures up and down river from the proposed crossing locations, such as the Richardson Highway Bridge over the Salcha River (see Section 12.2.1).

The alternative segment would also cross the Little Salcha River, and three smaller, potentially navigable, sloughs. The proposed span of the Little Salcha River conveyance would be 160 feet. Two of the unnamed sloughs are near the Tanana River and would be spanned by the same 4,000-foot-long conveyance proposed for the Tanana River crossing. The span of the third unnamed slough conveyance would be 390 feet. All bridges would clear span the waterways at each location. ARRC would design these bridges to comply with applicable USCG permit conditions regarding navigation. SEA believes these crossings would have negligible effects on navigation in the waterways, because the proposed crossing structures would be designed to allow the passage of the types of small vessels currently capable of navigating the waterway (see Section 12.2.7).

Connector Segment C

Connector segment C would cross the Fivemile Clearwater River, which is navigated by private property owners to reach their land parcels upstream. The proposed bridge would be approximately 135 feet long. ARRC would design this bridge to comply with USCG permit conditions regarding navigation. SEA believes the crossing would have a negligible effect on navigation in the waterway, because the proposed crossing structure would be designed to allow the passage of the types of small vessels currently capable of navigating the waterway (see Section 12.2.7).

Donnelly Alternative Segment 1

Donnelly Alternative Segment 1 would cross the Little Delta River south of its confluence with the Tanana River, and would cross Delta Creek south of its confluence with the Tanana River. Depending on engineering and other considerations, the span for the Little Delta River crossing would be 800 to 1,100 feet and the span of the Delta Creek crossing would be at least 700 feet; these are the minimum distances needed to clear the 100-year floodplains for these waterways. Neither of the crossings would clear span the waterway, and abutments would be placed at appropriate locations in the channel based on design considerations, including navigation (see Chapter 2 for information on bridge design). ARRC would need to design these bridges to comply with USCG permit conditions regarding navigation. The types of watercraft that can use the Little Delta River are limited by the waterways' channel morphologies near the crossing locations (see Section 12.2.3).

Donnelly Alternative Segment 2

Donnelly Alternative Segment 2 would cross the Little Delta River south of its confluence with the Tanana River and would cross Delta Creek east of the Little Delta River and south of its confluence with the Tanana River. Depending on engineering and other considerations, the span for the Little Delta River crossing would be at least 900 feet and the span of the Delta Creek crossing would be at least 700 feet; these are the minimum distances needed to clear the 100-year floodplains for these waterways. Neither of the bridges would clear span the waterway, and abutments would be placed at appropriate locations in the channel based on design considerations, including navigation (see Chapter 2 for information on bridge design). ARRC would design these bridges to comply with USCG permit conditions regarding navigation. The types of watercraft that can use the Little Delta River are limited by the waterways' channel morphologies near the crossing locations (see Section 12.2.3).

Connector Segment E

Connector Segment E would also cross the Fivemile Clearwater River, which is navigated by private property owners to reach their land parcels upstream. The bridge over Fivemile Clearwater River would be a full-span bridge approximately 115 feet long. ARRC would design this bridge to comply with applicable USCG permit conditions regarding navigation. SEA believes the crossing would have a negligible effect on navigation in the waterway, because the proposed crossing structure would be designed to allow the passage of the types of small vessels currently capable of navigating the waterway (see Section 12.2.7).

Delta Alternative Segment 1

Delta Alternative Segment 1 would cross the Delta River west of the Town of Delta Junction. Depending on engineering and other considerations, the span of the bridge would be at least 2,000 feet, the minimum distance needed to clear the 100-year floodplain. The bridge would not clear span the waterway, and abutments would be placed at appropriate locations in the channel based on design considerations, including navigation (see Chapter 2 for information on bridge design). ARRC would design this bridge to comply with applicable USCG permit conditions regarding navigation. The types of watercraft that can use the Delta River are limited by the river's braided and glaciated channel at the crossing location.

Delta Alternative Segment 2

Delta Alternative Segment 2 would cross the Delta River north of Delta Junction. Depending on engineering and other considerations, the spans for the bridge would be at least 2,000 feet, the minimum distance needed to clear the 100-year floodplain. The bridge would not clear span the waterway, and abutments would be placed at appropriate locations in the channel based on design considerations, including navigation (see Chapter 2 for information on bridge design). ARRC would design this bridge to comply with USCG permit conditions regarding navigation. The types of watercraft that can use the Delta River are limited by the river's braided and glaciated channel at the crossing locations.

13. LAND USE

This chapter identifies and describes applicable regulations, describes the affected environment, and provides an analysis of the effects of the proposed action and alternatives on land use, recreation, and hazardous materials in the project area. Section 13.1 addresses land use resources, except recreation uses. Section 13.2 addresses recreation resources. Section 13.2 also summarizes considerations relating to Section 4(f) of the U.S. Department of Transportation Act of 1966 (49 United States Code [U.S.C.] Section 303 and 23 U.S.C. Section 138). Appendix M of the Environmental Impact Statement (EIS) provides a full analysis of such considerations. Section 13.3 describes potential impacts on hazardous materials and hazardous wastes sites.

13.1 Land Use Resources

13.1.1 Applicable Regulations

Federal Regulations

The Bureau of Land Management (BLM), under the authority of the Federal Land Policy and Management Act (FLPMA) 43 U.S.C. 1732, administers most of the Federal lands in the project area. Under FLPMA, the Secretary of the Department of the Interior (DOI) has the authority to regulate use, occupancy and development of public lands and prevent unnecessary or undue degradation of public lands.

Non-military uses of some military lands within the project area are regulated by BLM under FLPMA. Military concurrence is required for BLM to authorize non-military uses of military lands. Therefore, such uses of U.S. Army lands must also be in accordance with the Final Integrated Natural Resources Management Plan for the U.S. Army Garrison, Alaska (USAG-AK, 2007), and the BLM's Fort Greely Resource Management Plan (1994).

The U.S. Army Corps of Engineers (USACE) manages the Chena River Lakes Flood Control Project (CRLFCP), which includes the northern portions of the project area.

State Regulations

Alaska Statute (AS) 42.40.460, Extension of the Alaska Railroad, provides for the Alaska Railroad Corporation (ARRC) to delineate a proposed transportation rail line between North Pole and the Canadian border. Once delineated, the Alaska Department of Natural Resources (ADNR), after consultation with potentially affected parties and after addressing the provisions of AS 42.40.460, would reserve the transportation rail line and eventually convey the state's interest in the land when construction of the rail line extension was complete.

Local Regulations

The Fairbanks North Star Borough (FNSB) has comprehensive planning, zoning, and land use regulations applicable to the portion of the project area within the Borough. The City of Delta Junction has land use regulations that applicable within its city limits.

13.1.2 Affected Environment

The project area is within the Tanana and Big Delta River valleys in Interior Alaska. Richardson Highway is on the northeastern side of the rivers and extends through the project area from northwest to southeast. Most of the lands in the project area are undeveloped, although there are residential, agricultural, commercial, recreational, and military land uses throughout the project area.

Fairbanks North Star Borough

The northern portion of the proposed rail line is in the FNSB and is subject to land use planning requirements and regulations. The incorporated City of North Pole is immediately west of the northern extent of the proposed rail line. Land in the City of North Pole would not be affected by the rail line. The FNSB communities of Moose Creek, Harding-Birch Lakes, and Salcha are south of North Pole along Richardson Highway and in the vicinity of the proposed rail line. These communities are unincorporated and do not have land use restrictions other than those afforded by the FNSB.

Southeast Fairbanks Census Area

The Southeast Fairbanks Census Area encompasses the proposed rail line from the southern boundary of the FNSB near Delta Creek to the terminus of the proposed rail line in Delta Junction. The community of Big Delta is on Richardson Highway near the confluence of the Tanana River and Big Delta River. The Southeast Fairbanks Census Area is not within a Borough and is not subject to local land use regulations. The City of Delta Junction is incorporated and has land use regulations that apply within city boundaries.

U.S. Army Corps of Engineers

The USACE manages all lands within the CRLFCP boundaries in accordance with the CRLFCP Master Plan (USACE, 1984 and 1989). The Master Plan provides management guidelines for specific planning units in the CRLFCP. The proposed rail line would traverse planning units I2, I4, H1, and H2 of that plan. All areas are managed primarily for the flood control purposes of the project. These planning units are additionally managed for recreation, low-density use, and wildlife management.

U.S. Military Lands

Federal lands in the project area under the management of the U.S. Department of Defense for military purposes include Fort Wainwright, Eielson Air Force Base (AFB), and Fort Greely.

Fort Wainwright is home to U.S. Army units, including the Tanana Flats Training Area (655,000 acres, which includes the Blair Lakes Conventional Range); the Yukon Training Area (247,952 acres, which includes the Yukon Tactical and Electronic Warfare Range; and the Donnelly Training Area (624,000 acres, which includes the Oklahoma Range. The Training Areas continue to be administered by the BLM but have been withdrawn for military use.

Eielson AFB is southeast of the City of North Pole. Richardson Highway crosses the base near its southern boundary. The base occupies 19,789 acres. Eielson AFB is home to the 354th

Fighter Wing and the 353rd Combat Training Squadron. The Blair Lakes Conventional Range, the Yukon Tactical and Electronic Warfare Range, and the Oklahoma Range within Fort Wainwright are under the training supervision of the Air Force.

Fort Greely (U.S. Army) is within 5 miles of the City of Delta Junction near the junction of Richardson and Alaska Highways. Fort Greely encompasses 7,200 acres. The installation is comprised of three main areas: Allen Army Airfield, Cantonment Area, and Missile Defense Complex. The Missile Defense Agency's ground-based midcourse defense's Anti-Ballistic Missile Defense System is supported by the 49th Missile Defense Battalion (USAG-AK, 2006c).

Native Lands (Native Allotments)

The Tanana Chiefs Conference manages a trust service with the Bureau of Indian Affairs and acts as trustee for native allotment property owners. According to the Chief's Conference, there are two native allotments near Salcha and in the vicinity of the proposed rail project. These parcels of land along the Salcha River in the vicinity of Munson's Slough and the former Salchaket Indian Village, are in residential use or are vacant.

Alaska State Lands

State lands within the project area include state parks, recreation areas, the Tanana Valley State Forest, and lands managed by the ADNR Division of Mining, Land, and Water.

State parks and recreation areas in the project area include Big Delta State Historic Park, Clearwater State Recreation Site, Delta State Recreation Site, Quartz Lake State Recreation Area, Birch Lake State Recreation Site, Harding Lake State Recreation Area, and Salcha River State Recreation Site. These legislatively designated state lands are managed by the ADNR Division of Parks and Outdoor Recreation primarily for public access and recreation. Use of these lands is discussed in detail in Section 13.2, Recreational Resources.

The Tanana Valley State Forest encompasses 1.78 million acres and lies almost entirely in the Tanana River Basin. Almost 90 percent of the land in the State Forest is forested, chiefly with hardwood and hardwood-white spruce forest types. The forest is managed for multiple uses and its sustained yield of renewable resources. The Tanana Valley State Forest Management Plan, 2001 Update, establishes the management objectives and policies for the forest (ADNR, 2001). Forest lands in the vicinity of the project are located north of Richardson Highway, and would not be directly affected by any of the proposed rail line segments. As of March 2008, several parcels located between Fort Greely and the Tanana River near Flag Hill are still on the list of proposed additions to the Tanana Valley State Forest under SB 229, and could be affected by proposed rail line segments in the area. The parcels consist of productive white spruce stands and mixed white spruce/hardwood stands. Management goals for the parcels would emphasize wildlife, recreation and timber resources.

Other state lands in the project area are managed by the Division of Mining, Land, and Water. The Division of Mining, Land, and Water's Tanana Basin Area Plan—adopted in 1985 and updated in 1991—established land management direction for multiple uses of these lands including hunting, fishing, trapping, recreation, wood-cutting, subsistence activities, access, oil and gas exploration/production, and mining (ADNR, 1985, updated 1991). The Division of Forestry also manages forest classified lands in the Tanana Basin Area Plan unit. There are forest classified lands west of the Tanana River that are included in the Division of Forestry's sustainable yield.

Alaska Mental Health Trust Lands

The Alaska Mental Health Trust manages approximately 1 million acres of land in the state. Income derived from trust lands is used to fund a comprehensive integrated mental health program for the citizens of Alaska. Resource categories managed by the trust land office include coal, gas, materials, minerals, oil, real estate, and timber.

University of Alaska Lands

The University of Alaska currently owns and manages approximately 150,000 acres in Alaska. Some of this land is located in the project area. University “trust lands” owned and managed by the university are for the use and benefit of the university and are not considered state public domain land. The university develops, leases, and sells land and resources to generate funds for the University’s Land Grant Trust Fund.

Private Lands

Private lands in the Tanana River Valley are used for residential, commercial, and agricultural purposes. Residential and commercial sites are generally located along Richardson Highway or along secondary roads. Concentrations of agricultural lands are located near Eielson Farm Road, at Whitestone Farms near Big Delta, and in the vicinity of Delta Junction.

13.1.3 Environmental Consequences

Methodology

Land ownership maps, land management plans and regulations, and other information available in the public domain have been analyzed to identify potential consequences of the proposed action and alternatives on land uses in the project area.

For each segment of the rail line extension, information pertaining to existing and proposed land use has been presented to identify and disclose environmental consequences. Table 13-1 identifies the amount of land, by owner, that could be affected by the proposed alternative segments. The following discussion provides further information about the potential impacts to these lands. Impacts related to permanent facilities (roads, towers, terminals) are discussed under individual alternative segments where specific facilities are designated. Chapter 20 of the EIS discusses proposed mitigation for impacts to land use.

Common Impacts to Land Use

The majority of land that would be directly affected by the rail line is owned by the Federal Government, Alaska, and private owners. In general, the federally owned lands are used for military purposes (bases, ranges, or training areas). The ARRC would acquire the rail line right-of-way (ROW) from existing land owners. Lands that are within the proposed rail line ROW would then shift to management by ARRC for rail line operations and maintenance, and any non-rail uses of the

Table 13-1
Land Ownership within 200-Foot Rail Line ROW (acres)[a]

Segment	Military[b]	ADNR	Private	FNSB[c]	Alaska Mental Health Trust	USACE CRLFCP	University of Alaska	*Totals*
North Common	0	0	0	0	0	64	0	64
Eielson Alternative 1	118	46	52	<1	34	0	0	250
Eielson Alternative 2	133	3	78	<1	30	0	0	244
Eielson Alternative 3	178	5	55	<1	8	0	0	246
Salcha Alternative 1	236	35	14	0	0	0	0	285
Salcha Alternative 2	12	169	92	12	6	0	44	335
Central Alternative 1	22	101	0	0	0	0	0	123
Central Alternative 2	22	65	0	0	0	0	0	87
Central Connector A	106	0	0	0	0	0	0	106
Central Connector B	80	0	0	0	0	0	0	80
Central Connector C	56	0	0	0	0	0	0	56
Central Connector D	21	0	0	0	0	0	0	21
Central Connector E	0	52	6	0	0	0	0	58
Donnelly Alternative 1	183	439	0	0	0	0	0	622
Donnelly Alternative 2	0	635	4	0	0	0	0	639
South Common Segment	0	255	0	0	0	0	0	255
Delta Alternative 1	34	214	3	0	0	0	0	251
Delta Alternative 2	21	217	59	0	0	0	0	297

[a] Sources: FNSB, 2000; ADNR, 2007.
[b] Includes lands administered by the Bureau of Land Management but withdrawn for military use; for example, the Tanana Flats and Donnelly Training Areas.
[c] < means less than.

ROW would occur only as authorized by Entry Permits issued by ARRC. Once the ROW is legally established on Federal, state, and private lands, any occupancy, use, or crossing of the ROW without an Entry Permit from ARRC would be considered trespassing.

State of Alaska lands in the project area include state parks, state recreation areas, the Tanana Valley State Forest, other forest classified lands, and lands managed for multiple purposes by the Division of Mining, Land, and Water. These lands are used for recreation, hunting, and fishing. Mining and timber harvest are also allowed by permit. Impacts on recreation activities are discussed in Section 13.2; impacts on timber harvest are discussed below. Crossing of the proposed ROW to reach timber harvest areas or mining claims or land disposal areas could be allowed under the ARRC's Entry Permit Program discussed above.

Privately owned lands are primarily in agricultural and residential use. Existing land use for a small portion of the project area would be permanently changed, and any non-rail associated activities within the proposed ROW would also require an Entry Permit from ARRC. Lands outside the 200-foot ROW would maintain their existing ownership and uses, but could be changed by the landowner as allowed by building or zoning rules. The presence and operation of the rail line would not likely induce substantial changes in land use patterns in the project area.

Permanent ancillary facilities that would be constructed outside of the ROW include permanent access roads, communications towers, and a passenger terminal. Existing land ownership or control and use in these areas would be permanently changed to allow for these facilities associated with rail operations and maintenance. These impacts are discussed under individual alternative segments where specific permanent facilities (roads, towers, terminals) are designated.

Timber Resources

There are commercial timber resources within the needleleaf, broadleaf, and mixed forests of the project area. White spruce, black spruce, tamarack (larch), paper birch, balsam poplar and aspen within these forests have commercial value as saw logs, poles and fire wood.

Table 13-2 lists the acres of forest, by rail segment, that would be cleared for construction of the rail project. The volume of commercial timber within areas that would be cleared for the project ROW has not been quantified by a timber survey.

The ARRC has not developed specific plans for timber salvage from lands that would be cleared for the ROW. For the areas of rail ROW that would be located on state or Federal lands, applicable land management plans, policies and regulations require that timber with commercial or personal use values should be salvaged from lands that are to be cleared for other uses such as mining, transportation or utility corridors, and habitat enhancement projects, where feasible and prudent (ADNR, 1985, updated 1991; FLPMA, 43 U.S.C. 1732; USAG-AK, 2007; USACE, 1984 and 1989). Similar provisions for timber salvage within other non-Federal and non-state lands that would be cleared for rail ROW would assure that timber resources affected by the project are properly utilized. A mitigation measure addressing timber salvage in all areas of the rail ROW is presented in Chapter 20 of the EIS.

Table 13–2
Summary of Forest Impacts (acres) by Alternative Segment[a]

Alternative or Segment	Closed Needle Leaf Forest	Open Needle Leaf Forest	Closed Broad Leaf forest	Open Broad Leaf Forest	Closed Needle Leaf/Broad Leaf Forest	All Forests[b]
Common Facilities	80.9	192.9	75.8	35.1	126.8	511.4
North Common	1.0	7.2	7.5	6.1	14.3	36.1
Eielson 1	20.6	72.0	38.6	30.2	73.6	235.0
Eielson 2	13.7	104.9	30.5	18.1	54.0	221.2
Eielson 3	11.8	91.4	43.5	10.2	53.5	210.5
Salcha 1 + Extra	50.0	41.1	52.8	82.7	154.7	381.4
Salcha 2 + Extra	167.0	100.6	64.8	28.2	110.9	471.4
Central 1	16.5	40.0	1.8	9.2	21.1	88.6
Central 2	64.7	7.8	-	-	11.8	84.3
Connector A	29.4	30.7	0.4	3.6	26.2	90.2
Connector B	56.6	12.2	-	0.2	9.6	78.5
Connector C	30.6	8.6	0.1	2.0	3.6	44.9
Connector D	19.4	0.4	-	-	1.4	21.2
Connector E	8.2	8.0	1.3	0.1	6.8	24.3
Donnelly 1 + Extra	123.0	324.1	7.1	17.1	75.3	546.5
Donnelly 2 + Extra	209.4	149.7	36.1	8.4	157.4	561.0
South Common	57.8	99.1	18.7	8.5	60.1	244.2
Delta 1 + Extra	124.3	63.8	9.0	5.3	44.0	246.4
Delta 2 + Extra	44.8	53.1	21.5	6.6	80.8	206.9
Proposed Action[c]	578.3	847.6	215.6	165.3	556.9	2363.6
Minimum Area Alternative[d]	578.8	668.1	242.8	165.7	669.6	2325.0
Maximum Area Alternative[e]	621.7	908.2	223.2	141.6	529.7	2424.4

[a] Source: BLM *et al.*, 2002.
[b] Column and row totals may not sum exactly due to rounding, column subtotal for all forests cover is sum of the five forest cover types.
[c] Proposed Action includes North Common, Eielson 3, Salcha 1, Connector B, Central 2, Connector E, Donnelly 1, South Common, and Delta 1.
[d] Minimum Project Area includes North Common, Eielson 2, Salcha 1, Connector B, Central 2, Donnelly 2, South Common, and Delta 2.
[e] Maximum Project Area includes North Common, Eielson 1, Salcha 2, Connector C, Central 1, Donnelly 1, South Common, and Delta 1.

Construction Impacts to Land Use

As described in Chapter 2, Proposed Action and Alternatives, construction activities would occur in a designated 200-foot rail ROW. Existing land uses in the ROW would be changed, affected, or curtailed by construction and operation of the proposed rail line extension. The area in the ROW cleared for construction but not needed for permanent structures would be restored to natural conditions consistent with rail line maintenance requirements.

Operations Impacts to Land Use

Land use outside of the rail ROW would not be affected by the operation of the proposed project. It is not anticipated that introduction of new passenger and freight rail as part of Northern Rail Extension (NRE) would stimulate changes to existing land uses or shift development patterns along the project area. However the presence of the passenger rail service might serve to stimulate business activity in the vicinity of stations. This effect would be slight due to the proposed minimal capacity and frequency of service.

Construction Impacts to Land Use by Alternative Segment

North Common Segment

Construction activities would affect approximately 64 acres of land along North Common Segment (see Table 13-1 and Figure 2-6). The area that would be affected within the segment includes 64 acres of land within USACE-managed CRLFCP. At present, all land in this segment of the ROW is undeveloped and exists in a natural state. This undeveloped land would be converted into the 200-foot ROW if the rail line were constructed.

A new communication tower, the Moose Creek Bluff Tower, would be collocated in the Eielson Construction Staging Area. Construction of the tower would directly affect less than one quarter of an acre of presently undeveloped land.

Eielson Alternative Segment 1

Construction activities would affect approximately 250 acres of mostly undeveloped land in the 200-foot ROW along Eielson Alternative Segment 1 (see Table 13-1 and Figure 2-6). No construction staging areas or temporary access roads would be located outside the ROW.

Based on a review of aerial photography, a portion of the privately held land in the ROW is developed. Approximately 2 acres of privately owned land in agricultural use would be directly affected by construction of the rail line. The 200-foot ROW would either directly cross or would be close to agricultural or residential development on the remaining 50 acres of private or FNSB-owned lands. Eielson Alternative Segment 1 crosses through the middle of a residential area located to the west of Richardson Highway and southwest of Eielson AFB. Eielson Alternative Segment 1 would directly affect two to three residences. Approximately 25 additional residences are within 2,000 feet of the proposed ROW and would be indirectly affected by construction disturbance, and possibly changes to visual resources (see Chapters 9 and 14).

Eielson Alternative Segment 2

Construction activities would affect approximately 244 acres of mostly undeveloped land in the 200-foot ROW along Eielson Alternative Segment 2 (see Table 13-1 and Figure 2-6). There would be no construction staging areas or temporary access roads located outside the 200-foot ROW.

Based on a review of aerial photography, a portion of the privately held lands in the ROW is developed. Approximately 2 acres of privately owned agricultural land would be directly affected by construction of the rail line. The 200-foot ROW either directly crosses or is in proximity to residential development on the remaining 76 acres of private and FNSB land. Eielson Alternative Segment 2 parallels residential areas west of Richardson Highway. While it appears that no residences would be directly in the path of the rail line, as many as 75 residences would be within 2,000 feet of the ROW and would be indirectly affected by construction disturbance, such as noise, and changes to visual resources (see Chapters 9 and 14).

Eielson Alternative Segment 3

Military lands in Eielson Alternative Segment 3 are part of Eielson AFB, and are undeveloped. More military lands (178 acres) would be affected by Eielson Alternative Segment 3 than by the other Eielson alternative segments. The rail line would closely parallel Richardson Highway and Eielson AFB, coming within 1,200 feet of the base runway. A very small portion of the route would extend across the edge of the south clear zone for the runway. As defined by the Federal Aviation Administration, a runway clear zone is an area at ground level. It begins at the end of the primary surface and extends with the width of each approach surface. It terminates directly below each approach surface slope at the point where the slope reaches a height 50 feet above the elevation of the runway or 50 feet above the terrain at the outer extremity of the clear zone, whichever distance is shorter. The height limits for development where the segment would cross the approach/departure surface and transitional surface are 55 feet. Transportation is not a compatible land use in the clear zone; therefore, this segment would have to be moved slightly to the south to avoid the clear zone.

Based on aerial photography, a portion of the privately held land in the ROW for Eielson Alternative Segment 3 is developed. The ROW would either directly cross or would be close to residential developments on the approximately 55 acres of private and FNSB land situated south of Eielson AFB and west of Richardson Highway. Similar to Eielson Alternative Segment 2, Eielson Alternative Segment 3 parallels these residential areas west of Richardson Highway. While it appears that no residences would be directly affected, approximately 60 residential structures are within 2,000 feet of the ROW and would be indirectly affected by construction disturbance, and possibly changes to visual resources (see Chapters 9 and 14). Under this alternative segment, no private land would be crossed northwest of Eielson AFB.

Salcha Alternative Segment 1

During construction, a temporary access road encompassing approximately 5 acres of private land outside of the 200-foot ROW would be required. This access road would be on private land adjacent to the eastern bank of the Tanana River. In addition, two bridge staging areas, each covering approximately 5.7 acres on either side of the Tanana River, would be required. Land ownership of these areas is private on the east side of the river and military on the west side. Approximately 25 to 30 residences would be affected by the staging area and access road on the east side of the Tanana River. Although effects to some of these residences would be temporary because the area could be restored after construction and original land use could be reestablished, effects to several residences within the ROW would be permanent. The proposed staging area on the west bank of the Tanana River would be on undeveloped, relatively inaccessible land used by the military for training purposes. This use would be temporarily affected, because training exercises could be resumed after construction of the bridge.

This proposed alternative segment would bisect the Salcha airstrip, a privately owned airstrip at the north end of the Salcha alternative segments.

A new communication tower, the Site A Tower, would be constructed on military lands in the Tanana Training Area, approximately 1 mile west of the segment. Construction would directly affect less than one quarter of an acre of presently undeveloped, inaccessible land in the Tanana Flats Training Area.

Salcha Alternative Segment 2

Construction activities would affect approximately 335 acres of land in the 200-foot ROW along Salcha Alternative Segment 2 (see Table 13-1 and Figure 2-7). Existing land ownership in this segment's ROW includes lands of the Alaska Mental Health Trust (6 acres), FNSB (12 acres), University of Alaska (44 acres), ADNR (169 acres), military (12 acres), and privately owned (92 acres). Approximately 98 acres of ADNR lands are submerged areas associated with the Tanana River and other waterways.

Salcha Alternative Segment 2 mainly lies along the eastern bank of the Tanana River; it would traverse privately owned and partially developed land in the northern part of the segment in the vicinity of the Salcha community and undeveloped University of Alaska lands in the southern portion of the segment immediately north of the river crossing. Some undeveloped ADNR land parcels that would be affected are on the east side of the river. There are approximately 150 homes or businesses within approximately 2,000 feet of the proposed rail line and these would be directly affected by construction on or through their properties, or indirectly affected by construction disturbance near their properties. Construction of this alternative segment would require the relocation of a portion of Richardson Highway (see Figure 2-8). Consequently, highway use in this area would be affected by construction delays and possible detours.

As with Salcha Alternative Segment 1, Salcha Alternative Segment 2 would bisect the Salcha airstrip.

In addition, this alternative segment comes very close to the Salcha School building (within 300 feet, see Figure 2-8). Relocation of the highway in front of the school would necessitate moving the school building and grounds. This would affect students and other site users during the school relocation process.

The proposed ROW crosses the Tanana River at a location south of the Salcha community near Flag Hill. On the western bank of the river, the rail line would pass through undeveloped military lands associated with the Tanana Flats Training Area. Military use of the land in the immediate vicinity of the rail line could be temporarily affected during rail line construction. There are several parcels of land in the vicinity of Flag Hill that have been recommended for additions to the Tanana Valley State Forest. As of March 2008, the parcels are still on the proposed additions list. If added to the Tanana Valley State Forest, these parcels could be managed for timber resources, and rail line construction and operations could adversely impact access for forest management and timber harvest purposes. The existing Flag Hill Tower would be upgraded as part of this alternative segment, which would affect less than one quarter of an acre of private land to the east of the segment near the Tanana River crossing, close to residential development.

Central Alternative Segment 1

Military land use on the northern portion of the segment could be temporarily affected by the presence of construction equipment and crews both in and adjacent to the ROW as the rail line is constructed. This presence could curtail military training operations in the immediate vicinity of the ROW. Impacts would only occur during the active construction period, and it is likely that training activities could resume unaffected after construction. The ROW permit would likely stipulate coordination with the military during construction activities to ensure avoidance of conflicts. See Chapter 20 for proposed mitigation measures that would require the ARRC to conduct this coordination.

The southern portion of the segment would cross undeveloped, relatively inaccessible land owned by ADNR. Land use would be affected by rail line construction in the ROW. Land use outside of the ROW would not be affected.

Central Alternative Segment 2

Military land use on the northern portion of the segment would be temporarily affected, as described above for Central Alternative Segment 1. There are many small parcels of private land in three areas south of the military land boundaries. These private parcels would be adjacent to but not in the ROW. The southern portion of the segment would cross undeveloped, relatively inaccessible land owned by ADNR. Land use would be affected by rail line construction in the ROW. Land use outside of the ROW would not be affected.

Central Connector Segments A-E

Central Connector Segments A, B, C, and D are on military lands. Use of these lands would be affected as described above for Central Alternative Segment 1. Central Connector Segment E would cross undeveloped, relatively inaccessible land owned by ADNR. Approximately 6 acres of privately owned lands would also be affected by construction of the segment. Land use would be affected by rail line construction in the ROW. Land use outside of the ROW would not be affected.

Donnelly Alternative Segment 1

The northern portion of Donnelly Alternative Segment 1 traverses generally inaccessible, undeveloped ADNR lands, and military lands within Donnelly Training Area on the western side of the Tanana River. Use of lands in the rail ROW would be affected during rail line construction. State lands outside of the ROW would not be directly affected by construction. There could be indirect effects, such as construction disturbance due to noise, dust generation, or the presence or movement of construction equipment outside the ROW. Training activities on adjacent military lands could be curtailed during construction. An at-grade crossing is proposed for a winter-use trail on ADNR lands north of the Little Delta River crossing.

An existing communication tower, the Canyon Creek Tower, would be upgraded to support rail line operations in this area. The existing tower is situated on ADNR lands in a relatively undeveloped but highway-accessible area approximately 2 miles north of the Tanana River. Effects on existing land use due to tower improvements are not expected.

Donnelly Alternative Segment 2

This alternative segment lies closer to the Tanana River, compared to Donnelly Alternative Segment 1, and the majority of the land that would be crossed is undeveloped, relatively inaccessible land owned by ADNR (635 acres), with a minor amount of private land (4 acres) supporting several recreational cabins. Approximately 2 acres of the ADNR lands are submerged under the waters of the Little Delta River and Delta Creek. Recreational land use would be affected by rail line construction in the ROW. Land use outside of the ROW would not be affected.

After crossing the Little Delta River, the rail line traverses part of the Donnelly Training Area. Land use outside of the ROW would not be affected.

The Canyon Creek Tower, described under Donnelly Alternative Segment 1, would be upgraded to support rail operations in this area. As described in the previous section, there are no impacts to land use expected as a result of the tower improvements.

South Common Segment

All of the land this segment would cross is ADNR-owned undeveloped land. However, based on aerial photography, one parcel of land within approximately 2,000 feet of the ROW is presently being used for agricultural purposes. Use of ADNR lands in the ROW would be affected if the rail line were constructed. Land use outside of the ROW would not be affected. Agricultural use of the nearby parcel would not be affected by construction or operation of the proposed rail line.

A new communication tower, the Site B Tower, would be constructed on ADNR lands along South Common Segment. The tower would be situated on high ground near the siding, south of Delta Creek. This tower would have an access road connecting from an ADNR winter trail. Construction would directly affect less than one quarter of an acre of presently undeveloped, inaccessible land.

Delta Alternative Segment 1

Most of Delta Alternative Segment 1 would be on the western side of the Delta River and would not cross the river until a point south of the City of Delta Junction. This rail line segment would pass through generally inaccessible, undeveloped ADNR lands on the western side of the Delta River. After crossing to the eastern side of the river, the rail line would pass through military lands within Donnelly Training Area. There are a few acres of private land near the terminus of the proposed rail line. The undeveloped state lands in the ROW would change to rail use. Land use outside of the ROW would not be affected.

Based on a review of aerial photography, there are several facilities or buildings within 500 feet of the ROW on the military land. Near the terminus, the rail line would cross three parcels of private land, and approximately 50 houses or businesses are within 2,000 feet of the ROW. Use of these facilities and residences would likely be affected by disturbance during construction. A passenger terminal and 30-foot permanent access road would be built on approximately 4 acres near the terminus of the segment, on land presently owned by the military. The parcel to be used for the terminal is undeveloped and lies between the 200-foot ROW and Richardson Highway.

An existing communication tower, the Delta Tower, would be upgraded to support rail line operations in this area. The existing tower is situated on ADNR land in a relatively undeveloped but road-accessible area approximately 2 miles east of Richardson Highway. Approximately five nearby residences could be indirectly adversely affected by construction activities associated with the tower upgrade. River areas excavated for gravel removal are expected to refill with gravel due to materials transport by river flows from upstream areas. Therefore, effects within the river bed are expected to be of short duration.

Delta Alternative Segment 2

The majority of the land required for the ROW and permanent facilities is ADNR-owned undeveloped land, with minor amounts owned by the military. However, the segment would also cross privately owned land, mostly in or near the City of Delta Junction. The ROW would affect approximately 59 acres of private land presently used for agricultural and residential purposes within Delta Alternative Segment 2. Management of the ROW on these lands would be under ARRC jurisdiction, as described under common impacts. An additional 21 acres are within the Donnelly Training Area. These lands would shift to management by ARRC for rail line operations and maintenance, and any non-rail uses of the ROW would occur only by obtaining an Entry Permit from ARRC.

A passenger terminal and 30-foot permanent access road would be built on approximately 6 acres adjacent to the 200-foot ROW. The parcel to be used for the terminal is mostly privately owned (4 acres) with a small amount of ADNR-owned lands. While the actual site of the proposed terminal appears to be undeveloped at present, there are fewer than 10 residences or businesses in the vicinity that could experience temporary adverse effects from construction activities. An existing communication tower, the Delta Tower, described under Delta Alternative Segment 1, would be upgraded to support rail operations in this area. As described in the previous section, approximately five nearby residences could be indirectly affected by noise, dust, and disturbance generated by construction activities.

No-Action Alternative

The No-Action Alternative would have no effect on existing land ownership and uses because the rail extension would not be constructed.

13.2 Recreation Resources

This section discusses recreation resources and activities as they may be affected by the proposed action and alternatives. These activities include recreational boating, hunting, fishing, wildlife viewing, hiking, winter sports, and a variety of other activities. The section is organized in three main parts, as follows: discussion of the Federal, State of Alaska, and local regulatory environments for recreation activities in the area (Section 13.2.1), description of existing recreational resources in the vicinity of the project (Section 13.2.2), and potential environmental consequences to recreational resources (Section 13.2.3).

13.2.1 Applicable Regulations

Federal Regulations

Bureau of Land Management

The BLM oversees a wide variety of recreational activities on its public lands. The BLM is required under the FLPMA Act of 1976 to set guidelines for managing recreational visitors in a multiple-use setting. All BLM lands administered in the vicinity of the project have been withdrawn for use by the U.S. Department of Defense. Some of this land is physically within military training areas and military access regulations apply to recreational uses. Management of these lands for recreation is now the responsibility of the Department of Defense as described below. The remainder is within the CRLFCP and is managed by USACE, primarily for flood control; recreation is a secondary management objective.

U.S. Military Lands

Rail alternative segments would traverse sections of U.S. military lands at Eielson AFB, the Tanana Flats Training Area, Donnelly Training Area, and Fort Greely. The U.S. military permits recreational activities on government land, provided that the activity does not interfere with military training activities or missions. Public recreation access is guided by the *Final Integrated Natural Resources Management Plan for the U.S. Army Garrison, Alask*a (USAG-AK, 2007). Military lands include open use areas (open to all types of recreational activity), modified use areas (off-limits to off-road vehicles, except in the winter), limited use areas (open only to low-impact activities, such as hiking, bird watching, skiing, and berry picking), and off-limit areas (closed to all recreation).

Recreationists seeking entrance to military lands must obtain a free Recreation Access Permit, and sign in via telephone to the U.S. Army Recreation Tracking System. At Eielson AFB, individuals are required to obtain either a Recreational Access Permit or hunting or fishing license from the Base. Many recreational activities are limited within Tanana Flats Training Area and Donnelly Training Area; these areas are used primarily for military training purposes, and recreation cannot interfere with military training activities. Even though access could be improved by the proposed bridges, recreational activities in the Tanana Flats Training Area and Donnelly Training Area would still require recreation permits and would continue to be limited so that military training guidelines are met.

U.S. Army Corps of Engineers

USACE manages the CRLFCP, which includes the northern portions of the project area. Section 13.1.1 describes the management plan for the CRLFCP.

U.S. Department of Transportation

Section 4(f) refers to the statutory requirements that were originally enacted through the Department of Transportation Act of 1966 (49 U.S.C. Section 1653(f). As part of a 1983 rewriting of the Act, Section 4(f) was amended and recodified as Section 303 (49 U.S.C. Section 303). Tradition within the environmental field, however, has resulted in continued reference to the program as Section 4(f). Section 4(f) applies to agencies within the Department of Transportation, and applies to the proposed action through the involvement of the Federal Railroad Administration and the Federal Transit Administration, which are serving as cooperating agencies for the proposed project. The Federal Transit Administration is involved in the project because it has a commuter rail component of the proposed action. The Federal Railroad Administration is administering grant funding to ARRC for preliminary engineering and environmental analysis of the proposed rail line. The Federal Railroad Administration could also provide funding for rail line construction and would enforce rail safety regulations on the operating rail line. Section 4(f) mandates that the Secretary of Transportation not approve any transportation project requiring the use of publicly owned parks, recreation areas or wildlife and waterfowl refuge, or significant historic sites, regardless of ownership, unless (1) there is no prudent and feasible alternative to using that land and (2) the program or project includes all possible planning to minimize harm to the public park, recreation area, wildlife or waterfowl refuge, or significant site that would result.

Appendix M of the EIS provides the complete Section 4(f) evaluation, which is summarized later in this chapter.

State Regulations

Alaska Department of Natural Resources

ADNR manages a large amount of land outside of the military installations along the project route. Most of these non-park lands are to be managed for multiple uses—primarily fish and wildlife habitat, forestry, and public recreation. ADNR land management policies for these areas are outlined in the Tanana Basin Area Plan (ADNR, 1985, updated 1991). This document states that the recreation goals for the Tanana Basin include providing the full spectrum of recreational opportunities to visitors; protecting sensitive ecological, scenic, and other recreational resources; and managing resources to promote economic development. The following summary of guidelines specifies ADNR's roles and responsibilities pertaining to recreation for various management policies, as outlined in the Tanana Basin Area Plan.

Public Access: "Improve or maintain public access to areas with significant public resource values by retaining access sites and corridors in public ownership, by reserving rights of access when state land is sold or leased, by acquiring access, or by asserting rights-of-way through Revised Statutes Section 2477 (RS 2477). Generally, section line easements should not be vacated unless alternative, physically usable access can be established."

Recreation and Tourism: "The state's proper role is to retain and manage land supporting recreational opportunities of regional or statewide significance. The state and federal governments are particularly capable of providing recreational opportunities, such as hunting, dispersed wilderness hiking, or boating, that require large land areas."

Trails: Corridors for trails of regional or statewide significance (the majority of trails identified by ADNR) have a minimum buffer width of 100 feet to protect the quality of user experience and minimize potential adverse effects from adjacent land uses. Buffer widths for special trails (due to historical significance or unique values) may be wider than 100 feet. Local trails (not of regional or statewide significance) may be protected either through public ownership and management, or through establishment of an easement; in some cases local trails may be dedicated to the public or a local government. Prior to lease or disposal of land, ADNR Division of Land acts as the lead agency to identify trails that merit protection.

Trail Rerouting: "Rerouting trails for a short distance may be authorized to minimize land use conflicts or to facilitate use of a trail if alternate routes provide opportunities similar to the original. If trails are rerouted, provision should be made for construction of new trail segments if warranted by type of use. Rerouting trails should be done in consultation with affected divisions of Department of Natural Resources (DNR), Department of Transportation and Public Facilities (DOT&PF), Department of Fish & Game (DF&G), and local trail committees. Historic trails that follow well-established routes should not be rerouted unless necessary to maintain trail use."

Trail Crossing: If a utility line, pipeline, or roadway (or railroad) must cross a trail, the Tanana Basin Area Plan recommends the crossing be constructed at a 90-degree angle when feasible.

Fish and Wildlife Habitat: Maintain and protect publicly-owned habitat base. Ensure access to public lands and waters. Land use activities must be conducted with the appropriate planning and implementation to minimize adverse affects to fish and wildlife, or mitigation would be required to rectify adversely affected habitat.

Stream Corridors and Instream Flow: Provision of recreational opportunities within stream corridors is a goal, along with protection of fish and wildlife habitat, and preservation of water quality. ADNR should prioritize public over private uses along stream corridors, retain publicly-owned buffers along streams to provide for a variety of public access and recreation opportunities, and retain public access easements for travel along or across a stream when the primary management intent is to protect public access rather than to retain an area for public use. Easements for travel should establish the right of the public to travel by foot, dog sled, horseback, and snowmachine, and may reserve use of off-road or wheeled vehicles when in the public interest. These guidelines also set the minimum riparian buffer and easement widths, as well as allowable uses within buffers and easements.

Transportation: Minimize the number of stream crossings and cross at 90-degree angle when feasible. Design bridges and culverts to avoid alteration of stream velocity or flow, and to minimize impacts to migrating or spawning habits of fish and wildlife. Bridges should be designed to allow safe passage of boats, horses, pedestrians, and large game wherever these activities take place or are anticipated at significant levels. Important fish and wildlife habitat should be avoided in siting transportation routes unless no other feasible and prudent alternatives exist. Off-road use of vehicles such as snowmachines, jeeps, and small all-terrain vehicles are generally allowed activity on state land. Lands designated as “special use” may require a permit for off-road vehicle activity.

No fee is required to access general ADNR land, although ADNR charges a variety of access and use fees for state parks and recreation areas. There are several Alaska state parks and recreation areas near the proposed rail line, including the Tanana Valley State Forest (generally adjacent to Richardson Highway and north of the Tanana River), but none of the alternative segments would directly cross any of these resources.

Alaska Statute 42.40.460, authorizes the construction of the Northern Rail Extension. This statute directs ADNR to determine whether the location of the proposed rail line ROW and rail land minimizes adverse effects on existing and potential rights-of-way. The statute specifies that ADNR convey land to ARRC following construction of the rail line, and in doing so “shall reserve the right to authorize, by lease, permit, or other method, a person to cross or construct access across the transportation corridor and associated rail land,” subject to concurrence with ARRC regarding considerations of safety and efficient operation of the rail line.

ADNR regulation 11 AAC 96.020 allows individuals to construct and maintain trails up to 5 feet wide on state land. Individuals are not required to report the location or purpose of this type of trail to the ADNR, so there is no detailed record of them. Trails of this type are widespread, and many of them have a significant history of use.

Alaska Department of Fish and Game

The Alaska Board of Game sets hunting season means and bag limits for Game Management Units 20A and 20B (which include Tanana Flats Training Area, Donnelly Training Area, and Eielson AFB), and 20D (including Delta Junction and Fort Greely). The Alaska Board of Fisheries sets sport and personal use seasons, methods, and bag limits for the Tanana River Drainage, including the NRE project area. The ADF&G implements and administers the resulting regulations.

Borough Lands

Many of the alternative segments would pass through the FNSB. The FNSB Planning and Zoning regulations apply outside of incorporated areas within the Borough. The FNSB Regional Comprehensive Plan (FNSB, 2005) establishes goals, strategies and actions for the Borough's land uses including recreational lands.

The Comprehensive Plan provides land use guidance through its land use map and land use category designations. Comprehensive Plan land use categories that would be crossed by the alternative segments include lands designated for open space and recreational use.

The FNSB Zoning Map and Zoning Code are extensions of the Comprehensive Plan land use categories, and are the administrative tools for implementing land use policies and regulations. Zoning districts establish allowable uses for land, including recreational uses.

13.2.2 Affected Environment

The project area is southeast of Fairbanks, within a vast region of the Interior Alaska lowlands and is well suited for both winter- and non-winter outdoor recreation activities.

State Recreation Areas and Facilities

ADNR manages a number of parks and recreation areas in the vicinity of the project area. Recreation activities within these areas include boating, fishing, swimming, water skiing, historical tours, camping, picnicking, hiking, volleyball, and wildlife and botanical viewing. These state recreation areas are generally located adjacent to Richardson Highway, and none would be directly crossed by the alternative segments. Parks and recreation areas (and their distance from the nearest rail segment ROW) include:

- Big Delta State Historic Park (2.1 miles);
- Delta State Recreation Site (1.0 mile);
- Quartz Lake State Recreation Area (4.7 miles);
- Birch Lake State Recreation Site (3.9 miles);
- Harding Lake State Recreation Site (2.5 miles); and
- Salcha River State Recreation Site (1.2 miles).

ADNR also manages a large amount of general use land along the project route, on both sides of the Tanana River. This land is used for a variety of recreation purposes such as fishing, hunting, trapping, berry picking, plant collecting, boating, snowmachining, dog-sledding, and off-road vehicle use. Management of ADNR lands is governed by the Tanana Basin Area Plan, which divides the Tanana Basin into management units and subunits, designating primary and secondary land uses for subunits. All the alternative segments would pass through Tanana Basin Area Plan subunits, some of which have been designated for public recreation as a primary use (see Table 13-3). Dispersed use recreation activities take place widely throughout ADNR lands that are not designated for primary recreation use, as well.

Table 13-3
Tanana Basin Area Plan Management Subunits Crossed by the Proposed Project[a]

Subunit	Name	Alternative Segment(s)	Primary Surface Use	Secondary Surface Use
1Q1	Tanana River	Eielson 1, Eielson 2, Salcha 1, Salcha 2	Wildlife Habitat	Public Recreation
1Q2	Tanana River	North Common, Eielson 1, Eielson 3	Agricultural Settlement	Wildlife Habitat
1Z4	Harding/Birch Lake	Salcha 2	Forestry	None
4Q2	Lower Dry creek/Japan Hills	Salcha 1, Salcha 2, Connectors A-E, Central Common, Donnelly 1, Donnelly 2	Wildlife Habitat	None
4Q3	Lower Dry Creek/Japan Hills	Donnelly 1, Donnelly 2	Forestry/Wildlife Habitat	None
7F1	Tanana River	South Common, Delta 1, Delta 2	Forestry, Public Recreation, Wildlife Habitat	None
7G1	Delta Creek	Donnelly 1, Donnelly 2	Forestry, Wildlife Habitat	Public Recreation
7G2	Delta Creek	Donnelly 1, Donnelly 2, South Common, Delta 1	Forestry, Wildlife Habitat, Public Recreation, Agriculture	None
7G3	Delta Creek	South Common	Public Recreation, Watershed, Wildlife Habitat	None
7I2	Delta Junction	Delta 1	Public Recreation	None

[a] Source: ADNR, 1985, updated 1991.

Areas south and west of the Tanana River are accessible via watercourses or trail systems. The main water routes into ADNR areas are the Fivemile Clearwater River, Little Delta River, Kiana Creek, Delta Creek, Richardson Clearwater River, Providence Creek, North Creek, and Delta River. Major trail routes into ADNR areas include an ADNR trail beginning at the Silver Fox Lodge site (Alaska Division of Lands [ADL] #409488, south of Harding Lake on the Richardson Highway); a series of trails collocated from a trailhead near Birch Lake on Richardson Highway, with one leading south along the western bank of the Little Delta River (ADNR Winter Trail), one leading to Koole Lake within the Donnelly Training Area (Koole Lake Trail[1], ADL #415320), and one leading southeast into the Donnelly Training Area (Donnelly-Washburn Trail,

[1] To promote the settlement of the American West in the 1800s and provide access to mining deposits on Federal lands, Congress adopted Revised Statute 2477, or RS 2477, as part of the Mining Law of 1866. The provision granted rights-of-way for the construction of highways across public land not reserved for public uses. In FLPMA, enacted in 1976, Congress repealed RS 2477, but did not terminate valid rights-of-way that existed on the date of FLPMA's enactment.

RS 2477 Trail #0064). Major trails also include an ADF&G winter trail from the Delta River leading west to Rainbow Lake (Rainbow Lake Trail, ADL #415270); an ADNR Division of Forestry winter road also originating at the Delta River and leading northwest to Delta Creek (ADNR Forestry Winter Road, ADL #415868); and an ADNR winter trail (Phillips Road, ADL #400064) originating approximately 2.5 miles north of Delta Junction and leading northeast, where it joins a more extensive trail network. The U.S. Army also holds a permit for a route connecting the Donnelly Training Area and the Tanana Flats Training Area (Land Administration System [LAS] #20385), which is collocated with portions of the Koole Lake/Donnelly-Washburn/ADNR Winter Trail near the Delta River, and is open for public use.

Alaska state law (ADNR regulation 11 AAC 96.020) allows individuals to construct and maintain trails up to five feet in width. Individuals are not required to report the location or purpose of this type of trail to the ADNR, so no detailed record of them exists. These types of trails were visually identified at numerous points along the proposed alternative segments, most notably west of the City of Delta Junction (along Delta Alternative Segment 1 and South Common Segment) and north of Delta Junction (along the Delta Alternative Segment 2). It is likely that numerous other routes of this type may be found elsewhere in the proposed project area (these types of trails are also likely to be found on Federal lands, but do not have the same state-sanctioned status). Some of these trails have considerable history of public use for a variety of purposes (Durst, 2008; Taylor, 2008).

Lakes and Rivers

The project area and its surrounding vicinity have numerous, high-quality rivers and lakes. ADF&G stocks some of the lakes in the region. Anglers can find year-round fishing opportunities in the area. During winter, ice fishing primarily occurs in stocked lakes. Some ice fishing occurs on rivers, primarily for burbot and northern pike (ADF&G, 2007e).

Rainbow Lake, an ADF&G-stocked lake located on ADNR lands (Figure 13-7), is accessible by an approximately 10-mile-long winter trail, which is sometimes used by cross-country skiers (Young, 2007). The ADNR easement for this trail is held by the ADF&G (ADL #415270, issued March 12, 2002). ADF&G also stocks Koole Lake, which is located in Donnelly Training Area (Figure 13-6) and is accessible via a public trail (see Donnelly Training Area affected environment, below) (Parker, 2008).

Some lakes, ponds, and rivers are accessible to anglers directly from roads. Most road-accessible angling locations have a boat launch, sized as necessary for the characteristics of the particular waterbody. Less-accessible locations must be accessed through other means, such as hiking, boating, canoeing, flying in light aircraft, or by using off-road vehicles, snowmachines, cross-country skis, snowshoes, or dog sleds (ADF&G, 2007e). Outfitting firms, guides, and transporters service the area. Transportation to high quality fishing sites is usually by aircraft or boat. Some firms also operate lodging and rent boats.

The Tanana River is the main southern tributary to the Yukon River, and all of the high-quality streams listed below are part of the Tanana Watershed. The Tanana is a glacial-fed river, and the amount of silt in the river does not allow for a great deal of sport fishing. However, anglers are known to fish for burbot in the winter. Clear-running tributaries to the Tanana River are more highly valued as sport fisheries, and the Tanana is the main route (either via boat or snowmachine) to access many of these other rivers and lakes (Parker, 2007). The Tanana River also provides recreational boating opportunities, though estimating the amount of boating is difficult, because the state does not require registration of nonpowered boats and many launch points are not monitored (Brase, 2007).

The Tanana River and its tributaries serve an important function as access ways during ice-free and winter periods. Rivers provide routes to remote, backcountry areas by boat, dog sled, snowmachine, ski, and snowshoe. Most clearwater rivers and streams are spring-fed, and do not freeze at all or do not freeze solidly enough to support transportation by any vehicle other than boat (Durst, 2008).

Some of the potentially affected water bodies are listed below. Tributaries that are not clearwater provide important access to backcountry areas in both summer and winter. There are many other small lakes and tributaries to the Tanana; however, these are the major known sport fisheries in the vicinity of the project area:

Clearwater Rivers	**Lakes**
Piledriver Slough	Bathing Beauty Pond
Little Salcha River	Eielson AFB lakes adjacent to
Salcha River	Richardson Highway
Fivemile Clearwater River	Harding Lake
Richardson Clearwater River	Birch Lake
Other Rivers	Koole Lake
Little Delta River	Rainbow Lake
Delta Creek	Quartz Lake
Delta River	Backcountry lakes stocked by
Jarvis Creek	the ADF&G (more than 50)

Chena River Lakes Flood Project Area

The proposed rail extension would cross land managed by USACE for flood protection and public recreation in the CRLFPA. Areas south of the Chena Floodway are characterized as low-density and non-motorized (Schaake, 2008). The proposed route would cross USACE planning units I2, I4, H1, and H2 of the CRLFPA.

Unit I2 consists of the Diversion Dike Access Road (Chena Flood Road), and is managed to provide public recreation access to Piledriver Slough and the Tanana River, and low-density uses including canoeing, wildlife viewing, fishing, and sightseeing. A public parking area is currently available where the Old Richardson Highway previously crossed the Chena Floodway, approximately 350 feet west of the proposed ROW (USACE, 1989).

The site of the proposed Moose Creek grade separation between the existing ARRC rail line and Richardson Highway (at Milepost 345) would be approximately 0.25 mile west of the Chena Flood Road crossing, and would include recreational features. A tentative agreement has been negotiated between USACE, the Alaska Department of Transportation, and ARRC for USACE to provide gravel for construction of a grade separation. The resulting gravel pit would be filled with water, stocked by ADF&G with gamefish, and a boat launch would be constructed that would include access to Piledriver Slough and subsequently to the Tanana River. At this time it is not clear if the project will proceed, and its construction could depend partly on the development of the NRE (Schaake 2008).

Unit I4 is managed for recreation and low-density use, consisting of recreational access for fishing, boating, and other water-related activities. Unit H1 is managed for wildlife management, including low-density, dispersed recreation activities (including hunting and fishing). Unit H2 is also managed for wildlife management, although the ultimate land use objective is for recreation and intensive use, contingent on good public access to the southern side of Piledriver Slough. Intensive uses are hunting, fishing, snowmachining, dog-sledding, boating, and target shooting (USACE, 1989).

Military Lands

The proposed rail extension would cross several areas under military management and ownership—Eielson AFB, Tanana Flats Training Area, Donnelly Training Area, and Fort Greely, from north to south along the proposed route. All of the military lands that would be directly affected by the proposed alternative segments are open to public recreation.

Eielson AFB—Located at the northernmost portion of the project area, recreation taking place on Eielson AFB land includes hunting, fishing, berry picking, picnicking, camping, canoeing, trapping, dog-sledding, bird watching, and off-road vehicle and snowmachine use. Piledriver Slough and adjacent lakes are important, high-quality fisheries and hunting areas (Koenen, 2007). There is an outdoor recreation area between Piledriver Slough and Richardson Highway. This area has five lakes stocked by the ADF&G, campsites, picnic areas, a playground, parking areas and access roads to reach campsites and Piledriver Slough (Slater, 2008).

A series of high-quality, multi-use trails pass through the western portion of Eielson AFB, adjacent and west of Piledriver Slough. These trails are known alternatively as Twentythreemile Slough Dog Mushing Trails and Piledriver Slough Dog Mushing Trails. They are used primarily for dog-sledding, and are identified as “Class C” multi-use trails in the Fairbanks North Star Borough Comprehensive Trails Plan. Class C trails are defined as “neighborhood recreational trail systems” and are maintained by user groups, in this instance, the Salcha Dog Mushers Association. Some trails follow frozen watercourses, but most are upland of sloughs and streams (Hancock, 2007, 2008; Cox, 2008). Although some portions of Twentythreemile Slough and Piledriver Slough can freeze solidly enough during the winter to support vehicles such as dog sleds and teams and snowmachines, ice integrity is generally not reliable to support transportation other than by boat (Durst, 2008).

Access to Piledriver Slough is available directly from Richardson Highway, and via small roads between Piledriver Slough and the Tanana River.

Tanana Flats Training Area—This area is along the west side of roughly 30 miles of the Tanana River. It is vast and remote, with few direct access points. Accessibility is mainly by boat, small aircraft, off-road vehicle, or snowmachine. Tanana Flats Training Area is used primarily for military training purposes; recreational activities are considered secondary uses within the training area. Impact areas within Tanana Flats Training Area are permanently closed to recreation, while other areas are provisionally open to recreation when not in use for military training. All military training activities in the vicinity of the proposed rail line would be compatible with a rail line. Dog-sledders and numerous snowmachiners use the area in the winter. Recreation activities include hunting, trapping, fishing, recreational boating, off-road vehicle riding, snowmachining, dog-sledding, and bird watching. Moose hunting is the most popular activity in the area, and Tanana Flats provides high-quality, moose-rearing habitat

(Steinnerd, 2007). An unofficial trail exists approximately 4.3 miles west of Harding Lake and 2.6 miles northwest of the convergence point between the Salcha Alternative Segments 1 and 2. This trail leads west toward the Blair Lakes area.

Donnelly Training Area—This area is situated along approximately 35 miles of the proposed rail line route, also on the south and west side of the Tanana River. It is similar to the Tanana Flats Training Area. Rivers provide good access to both the western and eastern portions of the training area in winter (Little Delta River, Delta Creek, Delta River). Recreation activities include hunting, trapping, fishing, off-road vehicle use, snowmachining, dog-sledding, and dog walking (Haddix, 2007). As in Tanana Flats, moose hunting is popular. Koole Lake is a popular moose hunting, trapping, and fishing location (mostly in the winter). The lake is stocked by the ADF&G, and is accessible via the Koole Lake Trail (ADL #415320), which crosses the Tanana River from Birch Lake (Milepost 306.2 on Richardson Highway) and proceeds up the Little Delta River, then east to Koole Lake. The trail is collocated with the Donnelly-Washburn trail (RS 2477 Trail #0064), which continues southwest into the Donnelly Training Area at the point where the Koole Lake Trail turns east to Koole Lake.

Fort Greely—Fort Greely borders Delta Junction immediately to the south. The final southern segments of the proposed rail line would pass through a small portion of Fort Greely. There could be some recreation use in this area, including dog walking, grouse hunting, and moose hunting. However, reliable data regarding recreation use in this area is difficult to obtain, because individuals from nearby Delta Junction are likely to casually use the area without acquiring permits (Haddix, 2007).

Fairbanks North Star Borough Lands

The proposed project would cross a small amount of land managed by Fairbanks North Star Borough south of Eielson AFB. Eielson Alternative Segment 1 would cross a small corner of one parcel owned by FNSB Department of Land Management. This parcel is south of the southern border of Eielson AFB in the Piledriver Slough area, and includes several sections of the Piledriver Slough multi-use trail system. There are also trails serving neighborhoods in this area that are not designated in the FNSB Comprehensive Trails Plan. This parcel is zoned for general use, and FNSB has no specific plans at this time for future development, although it is currently used for recreational purposes (Shaw, 2008; Hancock, 2007).

The FNSB Department of Land Management owns the Salcha Ski Area, which is just north of the Village of Salcha on Salcha Bluff. The ski area includes approximately 15 miles of multi-use trails and a start/finish stadium area of approximately 2.2 acres. Salcha Ski Area is designated as a Borough Park, and the trails are included in the FNSB Comprehensive Trails Plan. The area is managed by the FNSB Department of Parks and Recreation to the extent that new improvements or funding must be facilitated through that department, but the area is otherwise managed by a volunteer group, the Salcha Ski Club. The Salcha Ski Area hosts a number of competitive cross-country running and ski races each year, and provides recreational opportunities to the general public (Hancock, 2008). The Salcha Ski Area would be affected directly and indirectly by construction of Salcha Alternative Segment 2, which would require the relocation of Richardson Highway through the ski area.

Salcha School is at the same site as Salcha Ski Area. The school includes a number of recreation facilities, including a playground, ballfield, basketball court, outbuildings that house recreational equipment, public parking area (which also serves the ski area), and the school building itself. The Salcha Ski Club, which manages and maintains the Salcha Ski Area, was founded as an activity and recreational training program for students of Salcha School. The FNSB Board of Education owns and operates the school (Hancock, 2008).

13.2.3 Environmental Consequences

Methodology

This analysis utilized recreational data available from ADNR, ADF&G, and the military. Plans and documents were reviewed to determine the location of site-specific recreation activities (such as parks and actively planned recreation areas), as well as dispersed use recreation activities (such as fishing or hunting). The review included conversations with land use managers for all of the aforementioned agencies, as well as with staff for the FNSB Parks and Recreation Department, FNSB Land Management Department, and members of the public.

Maps of the alternative segments were reviewed in coordination with land managers to identify potentially affected areas and key recreation access points and paths.

Potential impacts to recreation include both common consequences and segment-specific consequences. For instance, access to hunting areas would be an impact common to all potential alternative segments, while altered access of a particular trail would be specific to one area, and one or more alternative segments. This analysis of environmental consequences reviews common impacts, and then identifies segment-specific impacts in more detail as applicable. Recreational activities and assets identified in the Affected Environment section and not mentioned here would have no identified impact from construction and operation of any of the alternative segments. Chapter 20 of the EIS describes proposed mitigation for impacts to land use.

Common Impacts to Recreation

Because recreation activities are generally dispersed over a vast area, most potential impacts to recreation would be common to all alternative segments.

Construction Impacts to Recreation

Impacts during the construction period would include temporary closure of some roads, trails, navigable rivers, and other access routes. Closure would be necessary for construction of the rail line and crossings with passive warning devices. Construction activities would result in noise and dust, which could have a negative impact on the public’s enjoyment of recreational areas.

Prior to construction, to limit potential impacts to recreational users, ARRC would develop a plan to ensure construction activities occurred during the most appropriate time of year. The plan would be developed in consultation with appropriate agencies (see Chapter 20, Mitigation, for information on the process of crossing location determination).

Operations Impacts

Impacts that could result from train operations would be similar for all alternative segments. In-depth discussions related to noise, water quality, and wildlife are included in Chapters 9, 4, and 5, respectively, of this document.

Maintenance activities could result in temporary decreases in water quality in water bodies adjacent to the rail line, potentially affecting the quality of fishing.

Locomotive and vehicular traffic using the rail line and access roads would constitute a new source of noise that could decrease public enjoyment of recreation areas. Motor noise originating from both train and automobile traffic would be infrequent and of short duration. Locomotive horns would constitute a new, intermittent source of high-intensity noise at some locations. For safety reasons, ARRC locomotives sound their horns at all at-grade crossings.

Access to areas would be impeded primarily by prohibition of crossing or use of the rail line ROW. However, ARRC would allow limited use and crossing of the ROW though an Entry Permit Program. Pedestrians or vehicles crossing the rail line ROW where no designated crossing exists without an Entry Permit would be trespassing and prohibited by law. This legal prohibition would also extend to walking along the tracks. Though illegal ROW crossing would likely occur on occasion, enforcement of the ROW crossing prohibition would generally result in decreased or denied access to hunting and other recreation activities on public lands bisected by the rail line. Many of the alternative segments west and south of the Tanana River would include long stretches with no designated public crossing points. Without the creation of trail crossings along these long stretches, public access across the rail ROW would be significantly restricted or prohibited

Curtailed public access would contradict a number of ADNR's Tanana Basin Area Plan management guidelines. Guidelines including public access provisions that could be adversely affected include public access, fish and wildlife habitat and harvest, recreation and tourism, stream corridors and instream flow, trail management, and transportation.

The ADNR and BLM would determine the locations of the trail crossings conditions of the issuance of state and Federal land conveyance and ROW permits. In preliminary route details, ARRC has proposed two at-grade crossings for the ADNR Winter Trail in the vicinity of Little Delta River and at-grade crossings along Eielson Alternative Segment 3 for access to the Eielson AFB outdoor recreation area and along the Salcha alternative segments for access to the Twentythreemile Slough Dog Mushing Trails. At-grade crossings would allow for adequate access for pedestrian traffic. However, the ARRC has indicated that it does not favor vehicles (including dog sleds) crossing the ROW at grade, and that grade separation is preferable to allow vehicles safe passage.[2] One grade-separated crossing is proposed at the end of the Eielson alternative segments and the beginning of the Salcha alternative segments for access to the Twentythreemile Slough Dog Mushing Trails and Old Richardson Highway. Figure 13-1 is an illustration of a typical grade-separated trail crossing culvert, as provided by ARRC. However, ARRC has not proposed any specific grade-separated trail crossings.

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[2] Grade-separated crossings would accommodate all types of terrestrial traffic, but the design of a crossing can inhibit or facilitate access. A culvert crossing, as shown in Figure 13-1, would not have adequate snow cover to allow passage of snowmachines, dog sleds, cross-country skiers, and snowshoers. Bridging the ROW over a trail crossing (or vice versa) would provide better access.

ADNR regulations allow for the construction of trails up to 5 feet wide (unserialized trails) on state land. Individuals are not required to report the use or location of these trails to the ADNR. Trails of this type are quite common on state lands along many of the proposed alternative segments. The Alaska Division of Mining, Land & Water, has indicated that it would consider closure of these generally allowed trails to be an impact, would require further investigation to determine their location and use, and would require accommodation of these legal features (Proulx, 2008).

Access to areas west and south of the Tanana River (the majority of the proposed project route) is generally available via tributary river systems in both summer and winter. These river systems provide access for boats, and winter access for snowmachiners, dog-sledders, skiers, and snowshoers. Access up these river systems depends on clear passage, and the numerous bridges and culverts that would be required for the proposed rail line could result in an obstruction, depending on the amount of clearance available for passing under a bridge or through a culvert. Use of culverts on smaller waterways would likely block all access; however, it is generally assumed that most main river access routes to areas west of the Tanana River would be via larger rivers and streams (Fivemile Clearwater Creek, Little Delta River, Delta Creek), where bridges with ample clearance would be used. Major bridges at the Salcha River, Tanana River, and Delta River would also have adequate clearance for boats and other vehicles. In addition, ARRC has supplied conceptual design information pertaining to bridges on smaller streams (see impact analysis for individual segment alternatives), and not all small bridges would be passable by boats or other vehicles. ADNR's Tanana Basin Area Plan includes a management guideline to provide adequate clearance for passage of boats, pedestrians, horses, and large game whenever these uses occur or are anticipated to occur at significant levels. Water Quality Management Guideline E states that alternative public access must be provided if a structure would block access (ADNR, 1985, updated 1991).

Off-road vehicles provide an important mode of accessing areas west of the Tanana River. Routes for these vehicles may follow established trails and roadways. Riding snowmachines, jeeps, and small off-road vehicles on ADNR land is a generally allowed activity, though permits can be required in areas with special designations. ADNR and ARRC are encouraged to develop a negotiated agreement that would define rail line crossings for off-road vehicle access on existing roads and trails.

ARRC to provide for a systematic mitigation approach for existing public roads and trails. In roadless areas, off-road vehicles would be prohibited from crossing the rail line at non-designated points. Several stretches of alternative segments have long distances between crossable locations (at roads/trails or along waterways with adequate bridge clearance to allow an off-road vehicle to pass underneath). This would likely result in decreased off-road vehicle access to public lands west of the rail line.

ARRC has not designated vehicular or non-vehicular crossing points for most established trails and roadways known to ADNR, nor has a method been developed to date for identifying and mitigating the numerous unserialized trails developed by members of the public and allowed under Alaska state law. All trails and roads that have no existing mitigation proposed by ARRC could result in closure of the resource and commensurate decrease in public access. This would contradict the public access management guidelines as outlined in the Tanana Basin Area Plan, in which retention of existing public access constitutes the first goal (ADNR, 1985, updated 1991).

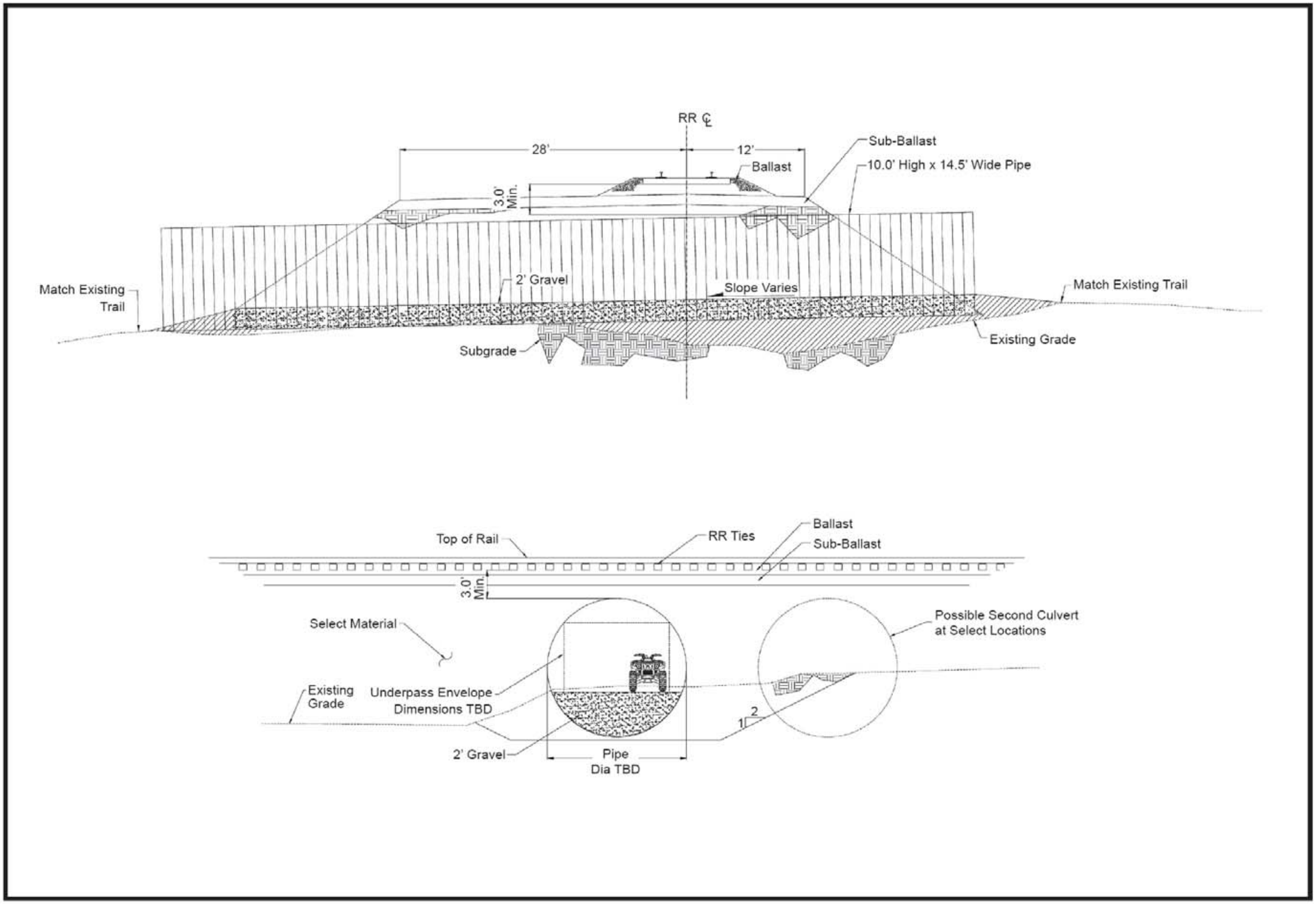

Figure 13-1 – Grade-Separated Recreational Trail Crossing

Impacts by Alternative Segment

North Common Segment

North Common Segment would cross portions of the CRLFCP, which is managed for flood control and public recreation use (Figure 13-2). Access to Chena Flood Road, which provides a route to the Tanana River, would be temporarily disrupted during construction. Access along Piledriver Slough and dispersed use areas south of the Chena Floodway would also be temporarily disrupted. ARRC has indicated that Chena River Flood Road would remain accessible via an at-grade crossing. ARRC would construct a navigable bridge across Piledriver Slough approximately 2,900 feet southeast of the northernmost point of the project. If constructed, North Common Segment and a proposed grade separation of the existing at-grade crossing of the Eielson Branch rail line and Richardson Highway could affect fishing resources at a new nearby lake, or affect access between this lake and Piledriver Slough.

Eielson Alternative Segments 1, 2, and 3

Some multi-use trails on all three Eielson alternative segments (maintained by the Salcha Dog Mushers Association and categorized as Class "C" trails by FNSB Parks and Recreation) would be closed during construction. Construction activities would also result in closure of, or limited access to, other trails and recreation access routes. Access via boat and other vehicles on Piledriver Slough would be temporarily disrupted during construction. Construction activities could result in temporary impacts to water quality in the Piledriver Slough fishery and ADF&G-stocked lakes within Eielson AFB.

Construction of Eielson Alternative Segment 3 would temporarily impact access to parking areas and campsites (Figure 13-3).

All Eielson alternative segments would cross segments of the Twentythreemile Slough Dog Mushing Trails. Eielson Alternative Segment 1, on the west side of Piledriver Slough and farthest west from Richardson Highway, would cross approximately 11 trail segments; Eielson Alternative Segment 2 would cross approximately 8 trail segments. Eielson Alternative

Segment 3 (closest to Richardson Highway) would cross one segment of this trail system. There could be other trail crossing locations along these alternative segments that are upland from sloughs and would not be associated with planned bridges or culverts. Access on the main stream of Piledriver Slough would be preserved through the construction of navigable bridges for all alternative segments. No designated crossings have been planned for any segments of the Twentythreemile Slough Dog Mushing Trail system.

Eielson Alternative Segment 1 would cross one east-west access road (sometimes known as Bailey Bridge Road) on Eielson AFB, south of Grayling Lake. The crossing would occur west of Piledriver Slough. ARRC has not designated a crossing for this road, which provides access from the Eielson Farm area to the west side of Piledriver Slough. Overall, Eielson Alternative Segment 1 would be passable via boat or dog sled under a navigable bridge over a Piledriver Slough tributary (west of Scout Lake), and via an at-grade road crossing of the Old Valdez Trail. All other watercourse crossings would be via non-navigable culvert. Eielson Alternative Segment 1 would cross the southwest corner of the parcel owned by FNSB Department of Land Management, and includes portions of the Twentythreemile Slough multi-use trail system.

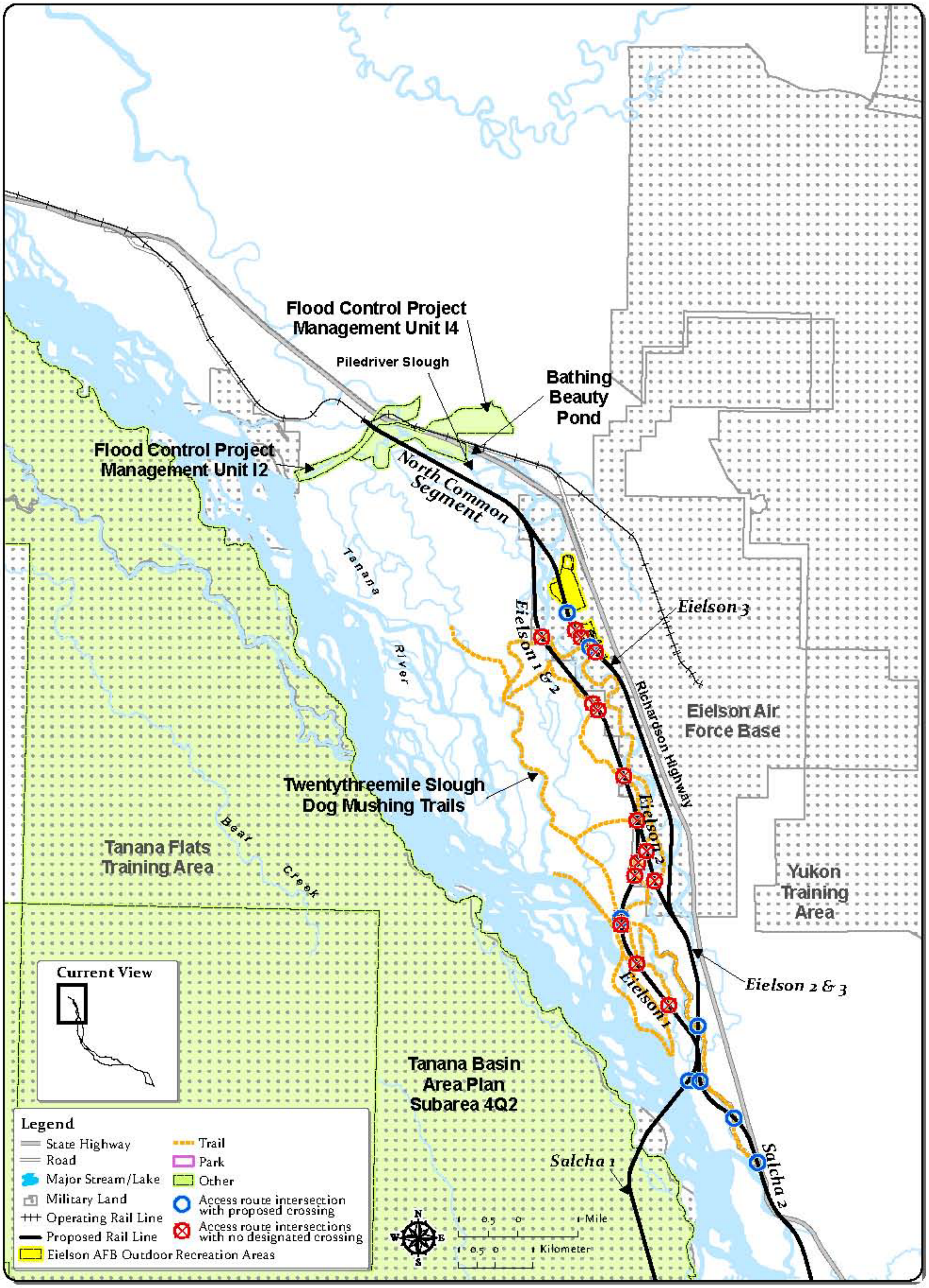

Figure 13-2 - Map of Recreational Facilities along North Common and Eielson Alternative Segments

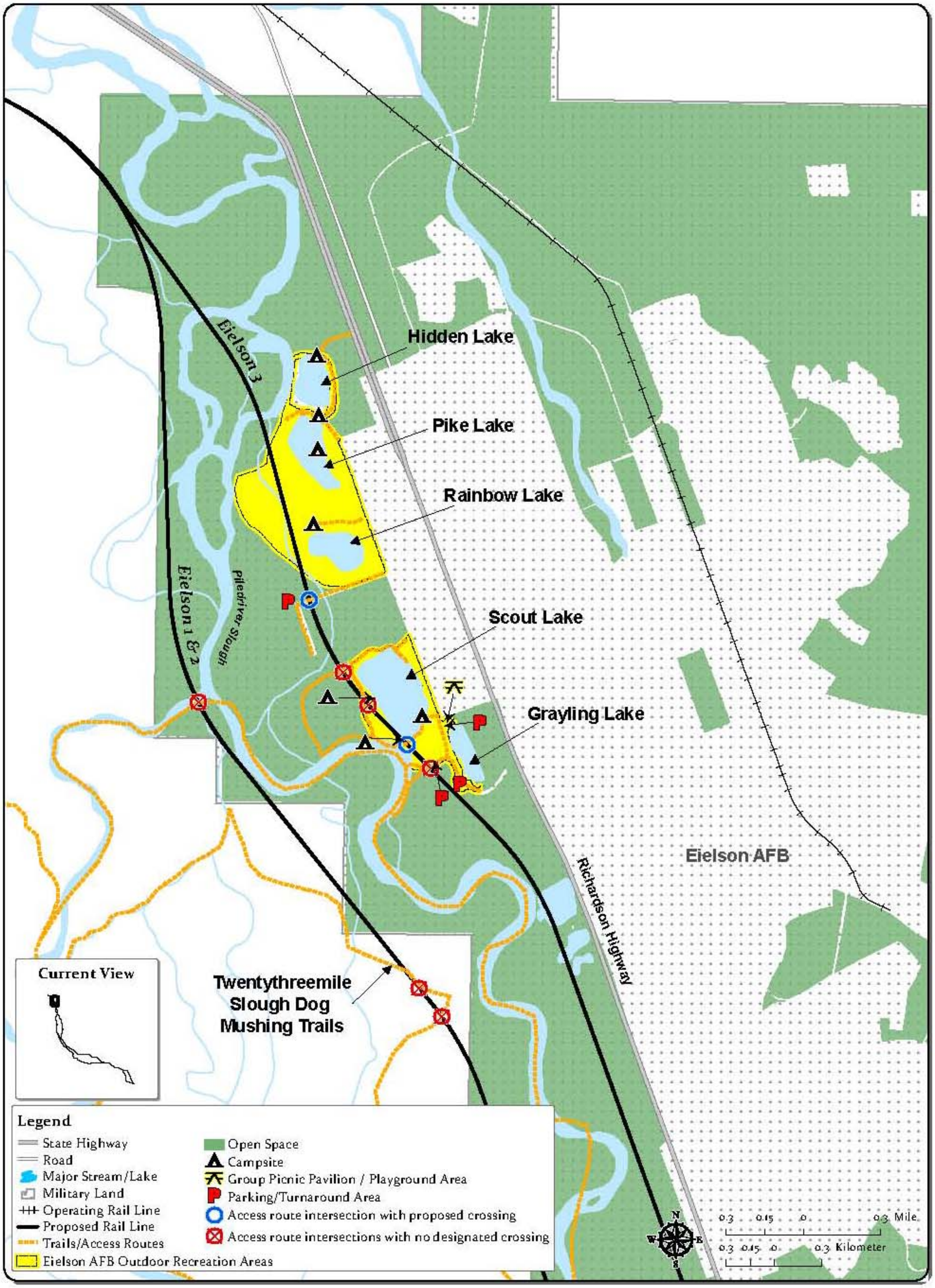

Figure 13-3 - Map of Recreational Facilities along the Eielson Alternative Segments

Eielson Alternative Segments 2 and 3 would be near Richardson Highway, and could act as an access barrier between the highway and Piledriver Slough. Eielson Alternative Segment 3 would include a navigable bridge where it would cross the Twentythreemile Slough Trail and at five at-grade road crossings west and south of Eielson AFB (two unnamed roads near Scout Lake, Bailey Bridge Road [east of Piledriver Slough], Stringer Road, and the Old Richardson Highway). All other points where Eielson Alternative Segment 3 would cross various sloughs are via non-navigable bridges or culverts. ARRC has not proposed any additional designated trail crossings along Eielson Alternative Segment 3. Eielson Alternative Segment 2 would be passable under two navigable bridges where it would cross Piledriver Slough (southwest of Eielson AFB) and a tributary to Piledriver Slough (west of Scout Lake), and again at two at-grade road crossings (Stringer Road and the Old Richardson Highway) All other watercourse crossings would be via non-navigable culvert.

Eielson Alternative Segment 3 would affect campsites in the Eielson AFB Outdoor Recreation Area. The entrances to two campsites on the southern and western sides of Scout Lake are within the proposed ROW. Access to these campsites could require crossing the rail ROW following construction; ARRC has proposed a crossing for the entrance to the campsite on the south side of Scout Lake, and one for the parking area on the south side of Rainbow Lake. Campsites are also likely to experience acute noise-related impacts from the intense new source of noise from nearby trains.

Eielson Alternative Segment 3 would affect a parking area west of Grayling Lake that leads to a trail providing access to Piledriver Slough. A portion of the parking area is within the proposed ROW. If the entirety of the proposed ROW were used following construction, available parking space would be diminished.

Salcha Alternative Segments 1 and 2

Construction of bridges and the rail line ROW would temporarily restrict boating and fishing access to Little Salcha River (Salcha Alternative Segment 2) and Salcha River (Salcha Alternative Segment 2) (Figures 13-4 and 13-5) resulting in adverse impacts to recreational fishing. Navigable bridges would allow for boat passage on the Little Salcha and Salcha Rivers during rail line operation; however, many side channels and sloughs along both Salcha Alternative Segments 1 and 2 would not be accessible via boat due to non-navigable culverts and bridges.

Salcha Alternative Segment 2 would require the rerouting of Richardson Highway through the Salcha School grounds and building, and also through the Salcha Ski Area. The highway relocation would likely require the relocation of the school facilities and ski area, resulting in temporary closure of all facilities during construction of the highway and any reconstruction of the school and ski area recreation facilities. The highway relocation would also result in the closure of the Salcha School parking lot, which provides access to the recreational facilities of the school and ski area. Salcha Alternative Segment 2 and relocation of Richardson Highway would affect approximately 0.93 acre of school property and 1,254 feet of multi-use trails. Access across Salcha Alternative Segment 1 on the east side of the Tanana River would be via one designated at-grade crossing and access across Salcha Alternative Segment 2 would be via three designated at-grade crossings.

Public access across Salcha Alternative Segment 1 would be limited west of the Tanana River. Tanana Flats Training Area is provisionally open to recreation activities and public access, but might be entirely closed to the public at times. It would be desirable to ensure public access across the rail line within Tanana Flats Training Area; however, allowed public use is subject to approval by the U.S. Military and BLM. Salcha Alternative Segment 1 would include a stretch of approximately 11 miles (between the Tanana River crossing point and the beginning of Central Alternative Segment; see Figure 13-4) with no designated public crossing. Without the creation of trail crossings along these long stretches, public access across the rail ROW would be significantly restricted or prohibited.

Most of Salcha Alternative Segment 1, and a much smaller southern portion of Salcha Alternative Segment 2, would pass through an area considered prime habitat for moose and fur-bearing species, and important habitat for many other species (ADNR, 1985, updated 1991). Both Salcha Alternative Segments 1 and 2 would also cross the Tanana River, an area considered important habitat for moose, fish, and fur-bearing species that ADNR notes has experienced an intensive amount of big and small game hunting and trapping (ADNR, 1985, updated 1991). The rail line could adverse impact game hunting and trapping.

Connector Segments A through E

Boating and fishing access would be restricted at bridge sites on the Fivemile Clearwater River (Connectors B and E) (Figures 13-4 and 13-6), resulting in temporary adverse impacts to recreational fishing during construction. Construction activities would also necessitate the closure of a trail leading from the mouth of the Fivemile Clearwater River to the Blair Lakes Area (Connectors A and B); ARRC has not proposed any crossings of this trail at this time. According to the Tanana Basin Area Plan, all of the connector segments would pass through an area considered prime habitat for moose and fur-bearing species, and important habitat for many other species. The rail line could adversely impact game hunting and trapping (ADNR, 1985, updated 1991).

Central Alternative Segments 1 and 2

Under Central Alternative Segments 1 and 2, there could be impacts to access to state lands west of the proposed NRE (Figures 13-4 and 13-6). ADNR indicated that the area between the Tanana Flats Training Area and the Little Delta River (Central Common Segment crosses approximately 0.75 mile of this area) serves a critical purpose in providing public access to vast public lands to the west. At present, public access to military lands is provisionally available in some areas, but can be entirely restricted at times.

Both alternative segments would cross the Tanana Basin Area Plan subunit described under Connector Segments A through E above (Subunit 4Q2 – Lower Dry Creek/Japan Hills); there would likely be effects to hunting and trapping. Without the creation of trail crossings, Central Alternative Segment 1 would include stretches ranging from approximately 14.9 miles (including portions of Connector C and Donnelly Alternative Segment 1) to 16.1 miles (including portions of Connector A and Donnelly Alternative Segment 1) without a crossing or navigable bridge. Central Alternative Segment 2 would include stretches ranging from approximately 7.4 miles (including portions of Connector B and Connector E) to 11.6 miles (including portions of Connector D and Donnelly Alternative Segment 2) without a crossing or navigable bridge. Without the creation of trail crossings along these long stretches, public access across the rail

ROW would be significantly restricted or prohibited. Public access across the Central alternative segments is desirable within Tanana Flats Training Area, but allowed public use is subject to approval by the U.S. Army and BLM.

Donnelly Alternative Segments 1 and 2

Construction activities would result in the closure of Silver Fox Lodge Trail, Koole Lake/Donnelly-Washburn Trails, ADNR Winter Trail, U.S. Army Permit Route, and the ADNR Forestry Winter Road (Figures 13-6 and 13-7). There could be temporary impacts to access during construction of bridges at the Little Delta River and Delta Creek, which both segments would cross.

Both Donnelly alternative segments would cross ADNR's established and recognized Silver Fox Lodge Trail (ADL #409488) several miles northwest of the Little Delta River. The trail provides access to ADNR land disposals along Fivemile Clearwater River, and is used primarily in winter. ARRC has not proposed crossings of this trail at this time.

Donnelly Alternative Segment 1 would cross trails near the Little Delta River at four points. The main trail begins at Birch Lake on the east side of the Tanana River, crossing the Tanana and following the Little Delta River to the southwest. West of the Little Delta River, the segment would cross two trails – ADNR Winter Trail and U.S. Army Permit Route. East of the Little Delta River, the segment would cross two trails – the collocated Koole Lake/Donnelly-Washburn Trail, and Koole Lake Trail.

Donnelly Alternative Segment 2 would cross the ADNR Winter Trail on the west side of the Little Delta River, closer to the Tanana River. Donnelly Alternative Segment 1 would also cross an ADNR Division of Forestry winter road, approximately 0.6 mile west of the meeting point between the two Donnelly alternative segments and South Common Segment. ARRC has proposed crossings for the ADNR Winter Trail, but no other crossings have been designated at this time.

Crossings of the Little Delta River and Delta Creek would be bridged by navigable structures for both segments. Without the creation of trail crossings or navigable crossing structures, distances of approximately 7.4 and 12.1 miles for Donnelly Alternative Segment 1, and 12 and 14.1 miles for Donnelly Alternative Segment 2, would not have designated rail line crossing points. Without the creation of trail crossings along these long stretches, public access across the rail ROW would be significantly restricted or prohibited. Moreover, several mapped and recognized public trails on ADNR lands that have long histories and are regularly used would have no designated crossings. The ADNR indicated that the area between the Tanana Flats Training Area and the Little Delta River (both Donnelly Alternative Segments 1 and 2 would cross several miles of this area) serves a critical purpose in providing public access to vast state lands farther west. The Tanana Flats Training Area and Donnelly Training Area bracket this area on the north and south. Public access through military lands is provisionally open in some areas, but can be entirely restricted at times. Public access across the Donnelly Alternative Segments is desirable within Donnelly Training Area, but allowed public use is subject to approval by the U.S. Army and BLM. Portions of both Donnelly Alternative Segments 1 and 2 would affect Tanana Basin

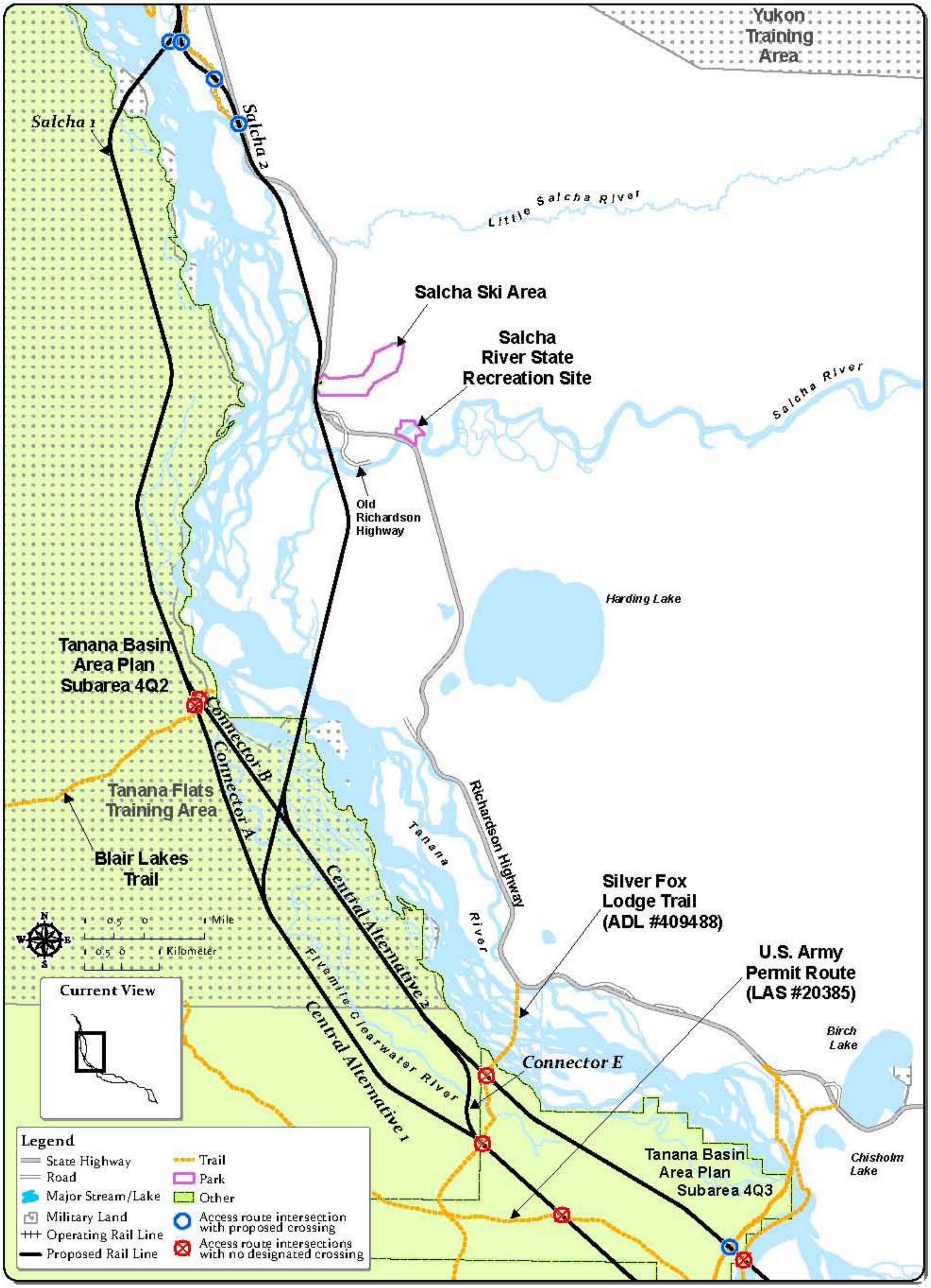

Figure 13-4 – Map of Recreational Facilities along the Salcha, Connector, and Central Alternative Segments

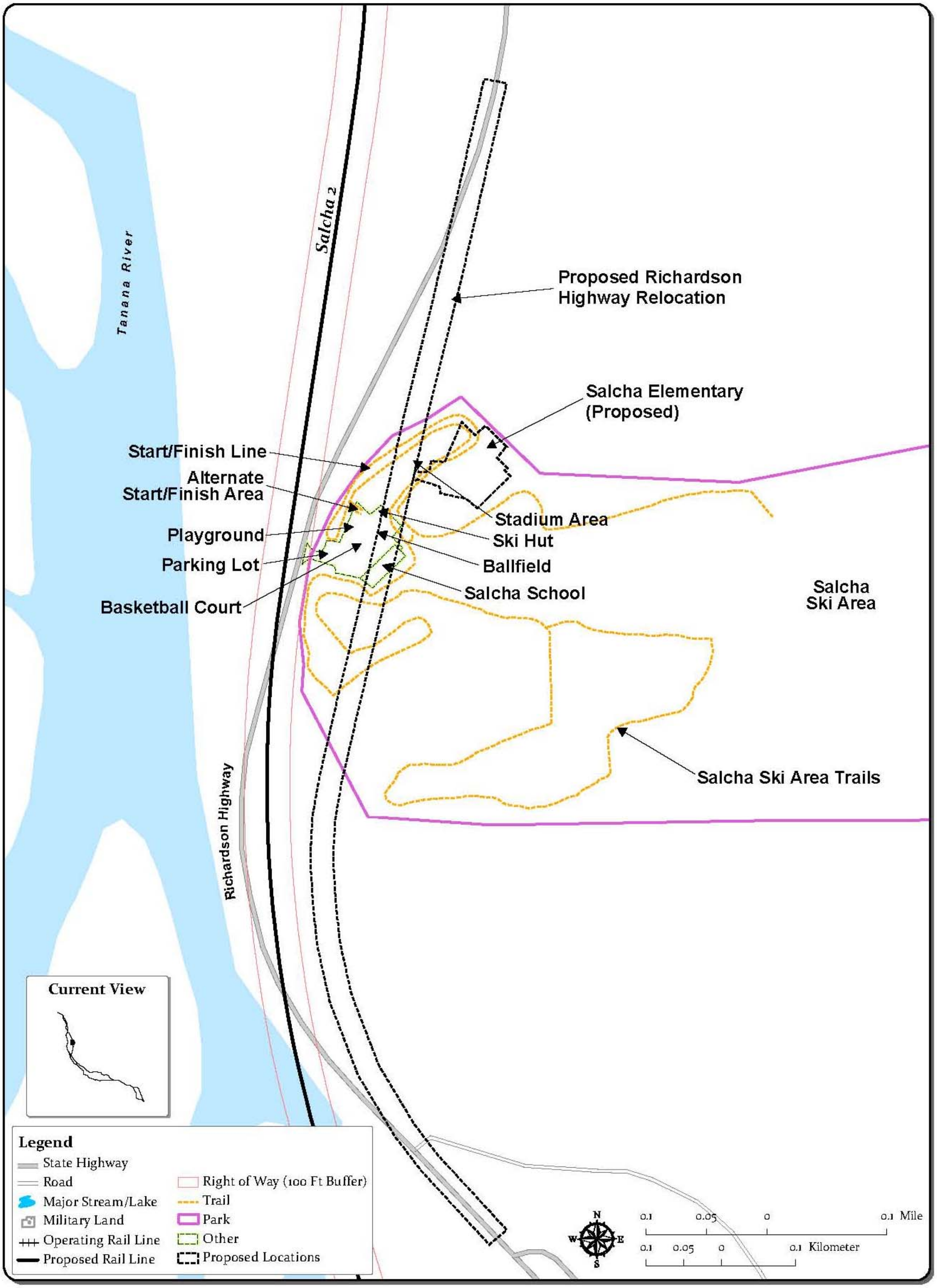

Figure 13-5 – Map of the Salcha Elementary School and Skiing Area

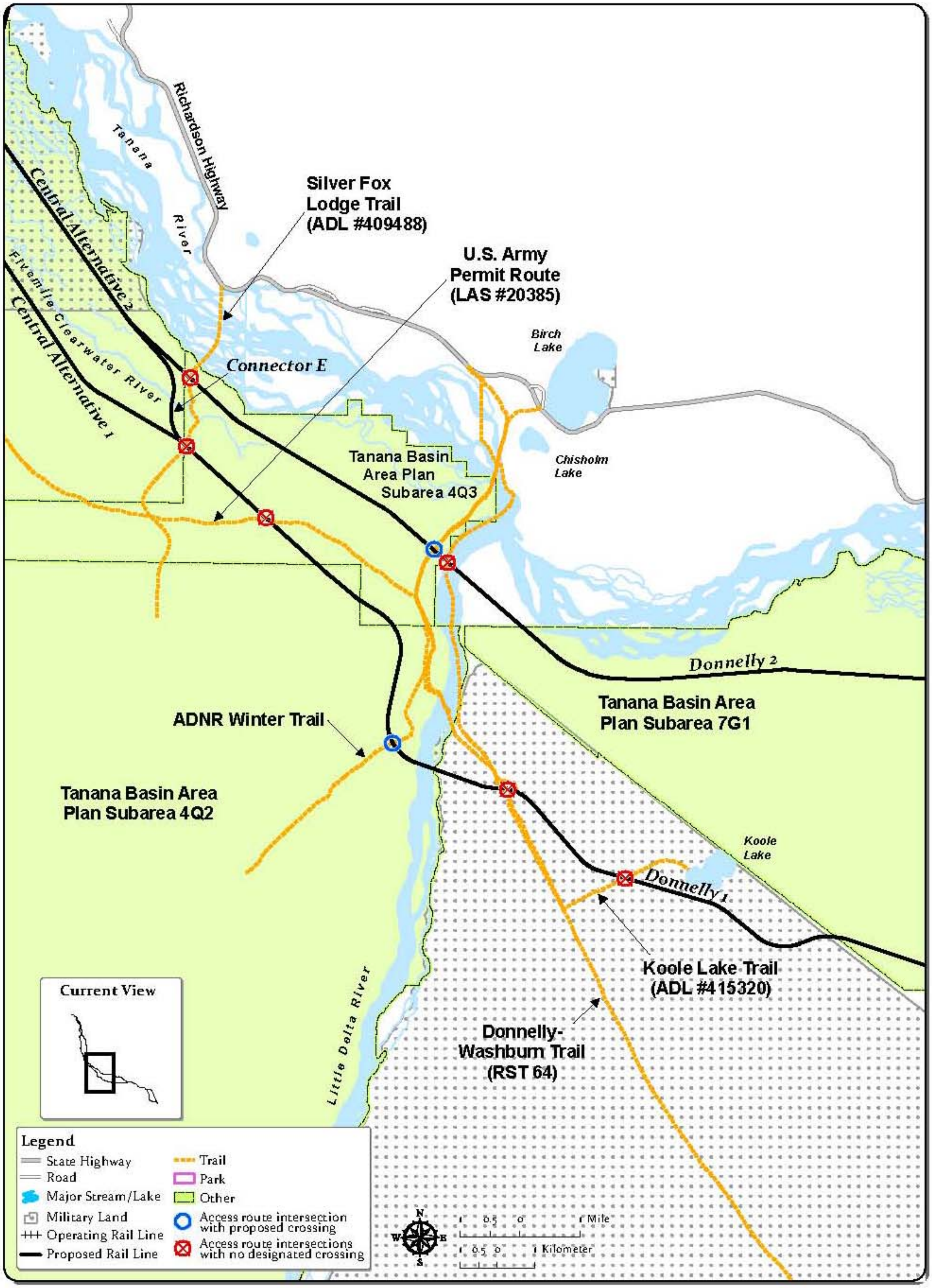

Figure 13-6 – Map of Recreational Facilities along the Donnelly Alternative Segments

Area Plan subunit 7G3, which designates public recreation as a primary surface use. This area is also considered prime habitat for moose and fur-bearing species, and important habitat for many other species; the rail line could adversely impact game hunting and trapping (ADNR, 1985, updated 1991).

South Common Segment

Possible impacts would include construction-related impacts to water, temporary access restrictions to dispersed-use areas, and temporary closure of the Rainbow Lake Trail, ADNR Forestry winter road, unserialized trails, and access routes for the Richardson Clearwater River during construction (Figure 13-7 and 13-8).

South Common Segment would cross an ADF&G trail to Rainbow Lake (ADL #415270). This trail is also used for cross-country skiing. The crossing would be approximately 1 mile west of the Delta River, several miles northwest of Delta Junction. South Common Segment would also cross an ADNR Division of Forestry winter road that provides access to the northwest across ADNR lands to Delta Creek, and would cross several other unserialized trails and blazed section lines on state land (see State Regulations, ADNR, in Section 13.1.1).

There could be impacts to access on three tributaries to the Richardson Clearwater River crossed by non-navigable culverts and bridges. Without the creation of designated trail crossings, South Common Segment would have stretches of 24.7 miles (including portions of Donnelly Alternative Segment 1 and Delta Alternative Segment 1, from Delta Creek to the Delta River) and 16.3 miles (including parts of Donnelly Alternative Segment 2 and Delta Alternative Segment 2, from Delta Creek to the Delta River) with no crossings or navigable bridges. Without the creation of trail crossings along these long stretches, public access across the rail ROW would be significantly restricted or prohibited. Rail line operations activities could result in adverse impacts to recreational fishing in the Richardson Clearwater River tributaries by restricting access across the ROW. Portions of South Common Segment would affect Tanana Basin Area Plan subunits 7G2 and 7G3, which designate public recreation as a primary surface use. These Tanana Basin Area Plan subunits are also areas where fish and wildlife habitat is a designated primary or important use (ADNR, 1985, updated 1991).

Delta Alternative Segments 1 and 2

Construction of the Delta alternative segments would result in impacts to access to the Delta River (both rail segments), the Phillips Road Winter Trail (ADL #400064; Delta Alternative Segment 2), and unserialized trails to the north and west of the City of Delta Junction (both rail segments) (Figure 13-8). Delta Alternative Segment 1 would cross such trails west and south of Delta Junction, and Delta Alternative Segment 2 would make numerous crossings north of Delta Junction. Delta Alternative Segment 1 would cross an ADNR parcel designated primarily for public recreation use near the confluence of Jarvis Creek and the Delta River. Access to existing trails, ADNR parcels, and access across the proposed rail line would be temporarily restricted during construction of the rail line. Access on the Delta River would be temporarily restricted during construction of a major bridge. The Alaska Division of Mining, Land and Water has indicated that it would consider closure of these generally allowed trails to be an impact, would require further investigation to determine their location and use, and would require accommodation of these legal features (Proulx, 2008). ARRC has not proposed any trail crossings along either alternative segment at this time.

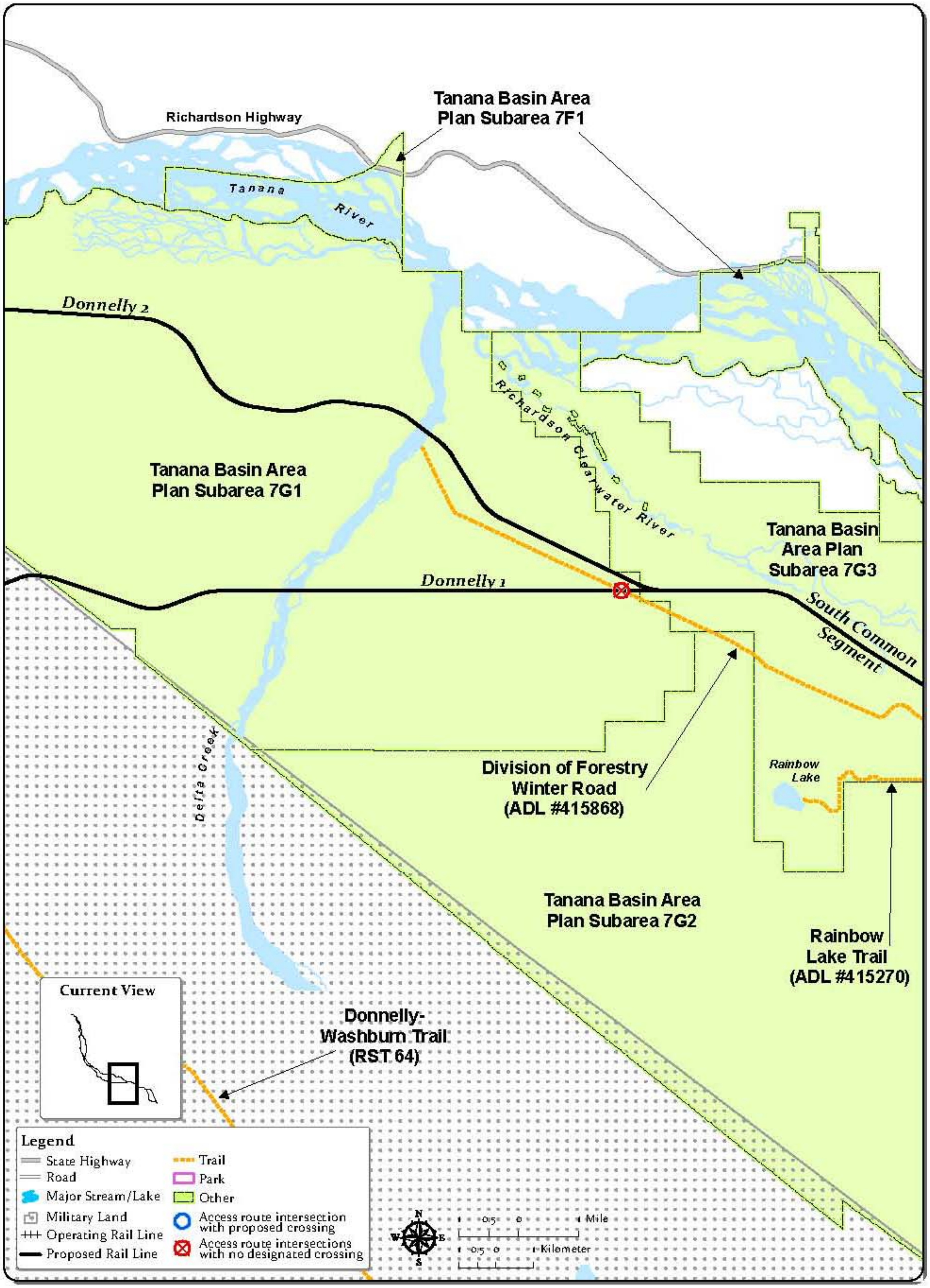

Figure 13-7 – Map of Recreational Facilities along the Donnelly Alternative Segments and South Common Segment

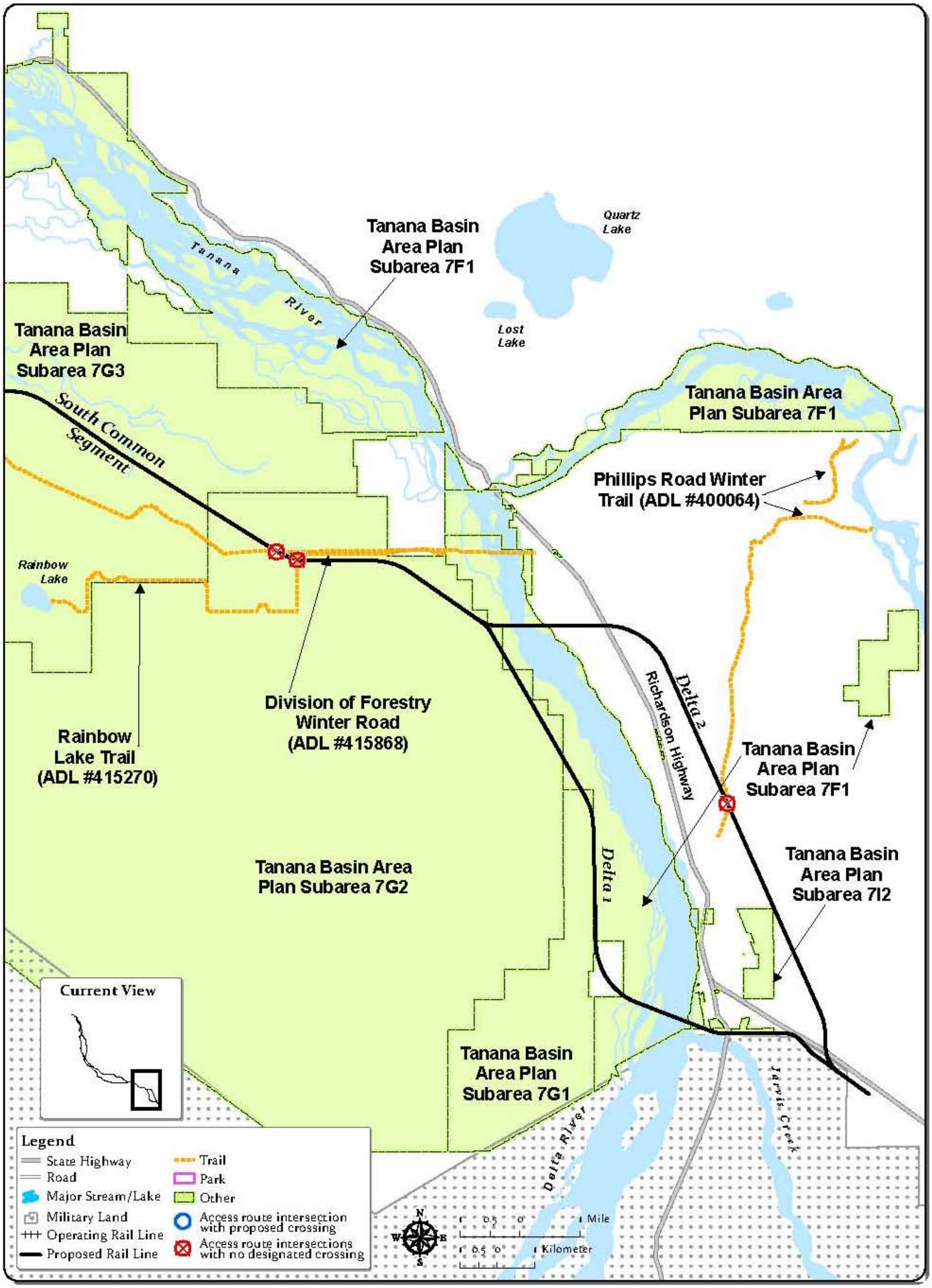

Figure 13-8 – Map of Recreational Facilities along South Common Segment and Delta Alternative Segments

Without the creation of trail crossings, access to the ADNR parcel designated for public recreation would remain available from surface streets; however, access to the parcel on a legal, informal trail following Jarvis Creek would be prohibited or closed. In addition, without the creation of trail crossings, long stretches of the rail line ROW would not have any designated crossing points west of the Delta River (both Delta alternative segments), and public access across the ROW would be prohibited. Portions of both Delta Alternative Segments 1 and 2 would affect Tanana Basin Area Plan subunits 7F1, 7G2 and 7I2, which designate public recreation as a primary surface use. A small portion of Delta Alternative Segment 2 and most of Delta Alternative Segment 1 also would cross through areas designated in the Tanana Basin Area Plan as primary fish and wildlife habitat. The rail line could adversely impact fishing and hunting in these areas. (See Chapter 5 for additional detail on impacts to game mammals and fisheries.)

No-Action Alternative

Under the No-Action Alternative, recreational access would be preserved in its present state, and there would be no impacts to existing recreational resources.

13.2.4 Section 4(f) Resources

The proposed project has the potential to affect Section 4(f) properties. The Section 4(f) Evaluation is included as Appendix M of the EIS, and contains a detailed analysis of these potential impacts and avoidance alternatives. For recreation properties, impacts would include (from north to south) the Chena River Lakes Flood Control Project area, the Twentythreemile Slough area multi-use trails, Eielson AFB Outdoor Recreation Area, Salcha School and Salcha Ski Area, the Silver Fox Lodge Trail, the U.S. Army Permit Route, the Koole Lake Trail, the Donnelly–Washburn Trail, the ADNR Forestry Winter Road, the Rainbow Lake Trail, the Phillips Road/Delta Junction area trail network, and dispersed-use areas designated for public recreation in the Tanana Basin Area Plan. Potential temporary and permanent impacts could include closure of some existing trails and other access routes; relocation of recreation facilities; decreased user enjoyment arising from vegetation clearance; increased dust and noise; decreased water quality and fishery quality; decreased availability of parking; and decreased habitat for game species.

The project alternatives could impact cultural resources protected under Section 4(f) at sites along Salcha Alternative Segment 2. In the case of archaeological or historic sites, Section 4(f) applies to those sites that are on or eligible for inclusion in the *National Register of Historic Places* that warrant preservation in place. It does not apply to sites that are eligible only for their research potential. The National Register eligibility of specific resources is established through a consultation process outlined in Section 106 of the National Historic Preservation Act. Determinations of eligibility are made by the lead Federal agency (Federal Railroad Administration and Federal Transit Administration), and concurrence is sought from the Alaska State Historic Preservation Officer. Two sites were identified in the area of potential effect (APE) that could be eligible under National Register criteria A and B and that could warrant preservation in place (sites XBD-293 and XBD-294). The precise nature of all potential impacts is unknown, at present, because the existing known sites consist of small discovery areas, and excavation/preparation of a railbed could impact an unknown number of sites that have not yet been discovered.

Direct impacts would include removal of surface artifacts, surface disturbance (resulting in artifact and feature dislocations), subsurface disturbance, and contamination of organic residues such as hearths and fauna. Indirect impacts would include access-related impacts (including other uses of the proposed access routes), and erosion. Direct and indirect impacts would result from construction and maintenance activities.

13.3 Hazardous Materials/Waste Sites

This section identifies sites in the project area that have potentially been contaminated by hazardous materials and sites that are regulated hazardous waste facilities. The project area includes lands within 1 mile of each alternative segment (Figure 13-9). Hazardous material sites more than 1 mile from the proposed alternative segment would not be likely to be directly affected by rail construction and operations. Potential impacts that could result from rail line construction and operations on and near known sites are also identified and discussed.

A contaminated site is an area that has been affected by spills of oil or other hazardous substances, by the migration of hazardous substances from a separate source, or by disposal of hazardous substances in a manner once considered acceptable practice. Disposal could also have been conducted illegally or in an unauthorized manner. A regulated hazardous waste facility is a facility approved for handling (generating, transporting, treating, storing, disposing) hazardous wastes in accordance with Federal and state regulations. Combined, these sites are where known hazardous substances or petroleum products are present under conditions that indicate an existing release, past release, or a potential release into soil, groundwater or surface water.

There would be impacts resulting in environmental consequences during project construction if contaminated soils or groundwater are removed and relocated or used elsewhere as fill. Removal by excavation or dewatering could expose contaminants and increase risks to human health or the environment. Similar risks from exposure to contaminated soil or groundwater also are possible during transport followed by disposal or use as fill material.

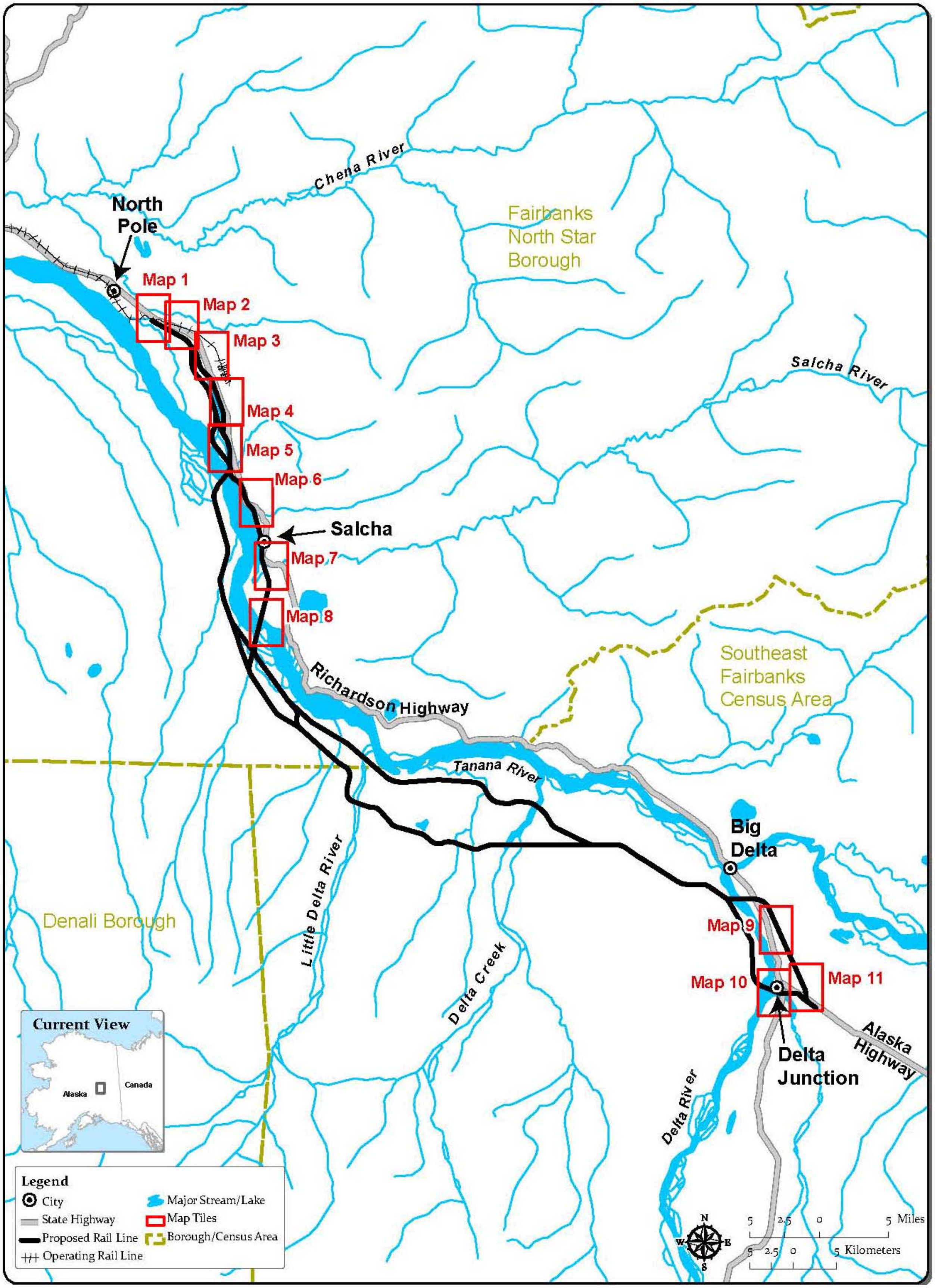

Figure 13-9 – Project Area Overview and Guide to Potentially Contaminated Sites

13.3.1 Applicable Regulations

Table 13-4 summarizes relevant regulatory requirements concerning hazardous material sites and regulated facilities at the Federal, state, and local levels. This information is summarized by regulation, regulatory agency jurisdiction, and related oversight program.

Table 13-4
Applicable Environmental Regulations, Agencies, and Oversight Programs

Regulation or Law	Agency	Oversight Program
Federal		
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1976 and Superfund Amendments and Reauthorization Act (SARA) of 1986	U.S. Environmental Protection Agency (USEPA)	Superfund program compels responsible parties to clean up or reimburse government for USEPA-led cleanups of abandoned hazardous waste sites
The Resource Conservation and Recovery Act (RCRA) of 1976	USEPA	RCRA program focuses on active facilities containing or handling (generating, transporting, treating, storing, disposing) hazardous waste
Amendments to RCRA in 1984	USEPA	RCRA amendments address environmental problems resulting from petroleum underground storage tanks (USTs). Also creates a comprehensive UST program
Safe Drinking Water Act (SDWA) and National Primary Drinking Water Regulations (40 Code of Federal Regulations [CFR] 141)	USEPA	Under SDWA, USEPA Region 10 Drinking Water Program sets standards for drinking water quality and oversees the states, localities, and water suppliers.
Federal Water Pollution Control Act Amendments (Clean Water Act) of 1972, 1977, and 1984; and National Pollutant Discharge Elimination System (NPDES)	USEPA	NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States.
Summary of the Emergency Planning & Community Right-to-Know Act (EPRCA) of 1986	USEPA	Alaska State Emergency Response Commission (SERC) helps local communities protect public health, safety, and the environment from chemical hazards.
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1996	USEPA	FIFRA mandates Federal control of pesticide distribution, sale, and use.
The Toxic Substances Control Act (TSCA) of 1976	USEPA	TSCA gives USEPA the ability to track the 75,000 industrial chemicals currently produced or imported into the United States.

Table 13-4
Applicable Environmental Regulations, Agencies, and Oversight Programs (continued)

Regulation or Law	Agency	Oversight Program
State of Alaska		
Alaska Water Quality Standards (18 AAC 70)	Alaska Department of Environmental Conservation, Division of Water Quality (ADEC/WQ)	Water Quality Standards Assessment & Reporting Program establishes criteria for protected classes of water use for groundwater and surface water.
Oil and Hazardous Substances Pollution Control (18 AAC 75)	ADEC, Division of Spill Prevention and Response (SPAR)	Contaminated Sites Program (CSP) protects human health and the environment by managing the cleanup of contaminated soil and groundwater in Alaska.
Underground Storage Tanks (18 AAC 78)	ADEC/SPAR	CSP UST staff of the Industry Preparedness Program (IPP) provides technical/regulatory assistance on UST systems.
Alaska Solid Waste Management Regulations (18 AAC 60)	ADEC, Division of Environmental Health (EH)	Solid Waste Program manages solid waste (including hazardous waste) to prevent violation of the Alaska water quality standards (18 AAC 70).
Alaska Hazardous Waste Management Regulations (18 AAC 62)	USEPA	Regulations apply to hazardous waste generators, transporters, owners/operators of treatment, storage, and disposal facilities. Although hazardous waste regulations are promulgated for Alaska, USEPA is the primary enforcement agency for hazardous waste management in Alaska under the Federal RCRA regulations.
Defense State Memorandum of Agreement (DSMOA) in 1991	USEPA CERCLA and ADEC/SPAR CSP	In 1991, Alaska and the U.S. Department of Defense agreed to cooperatively work on cleaning up Department of Defense-contaminated sites (1,200 individual sites located on approximately 200 facilities).
Eielson AFB Federal Facilities Agreement (FFA) of 1990	USEPA and ADEC/SPAR CSP	In 1990, Eielson signed a 3-party FFA with USEPA and Alaska that specified the framework and schedule for environmental clean-up efforts at 66 areas of concern at Eielson AFB.

13.3.2 Affected Environment

Known contaminated sites and regulated hazardous waste facilities within 1 mile of each alternative segment were identified by searching site records in Federal and state databases and interviewing regulatory program staff. A total of 92 known sites were identified for further evaluation of risks and potential impacts that could result from proposed rail line construction and operations. Environmental Data Resources, Inc. (EDR), supplied initial data and facilities information about the contaminated sites. EDR also provided a list of 250 “orphan sites” that also might be within 1 mile of the alternative segments. An orphan site is a contaminated site with inadequate information regarding its exact location. Additional records were also reviewed and several regulatory program managers interviewed to assist in estimating the locations of orphan sites of concern. Appendix L, Table L-2, lists the Federal and state databases searched and the appendix provides notes from interviews with regulatory program managers.

Figures 13-10 through 13-20 show the locations of the 92 known sites. Appendix L, Table L-1, provides detailed descriptions of the identified sites.

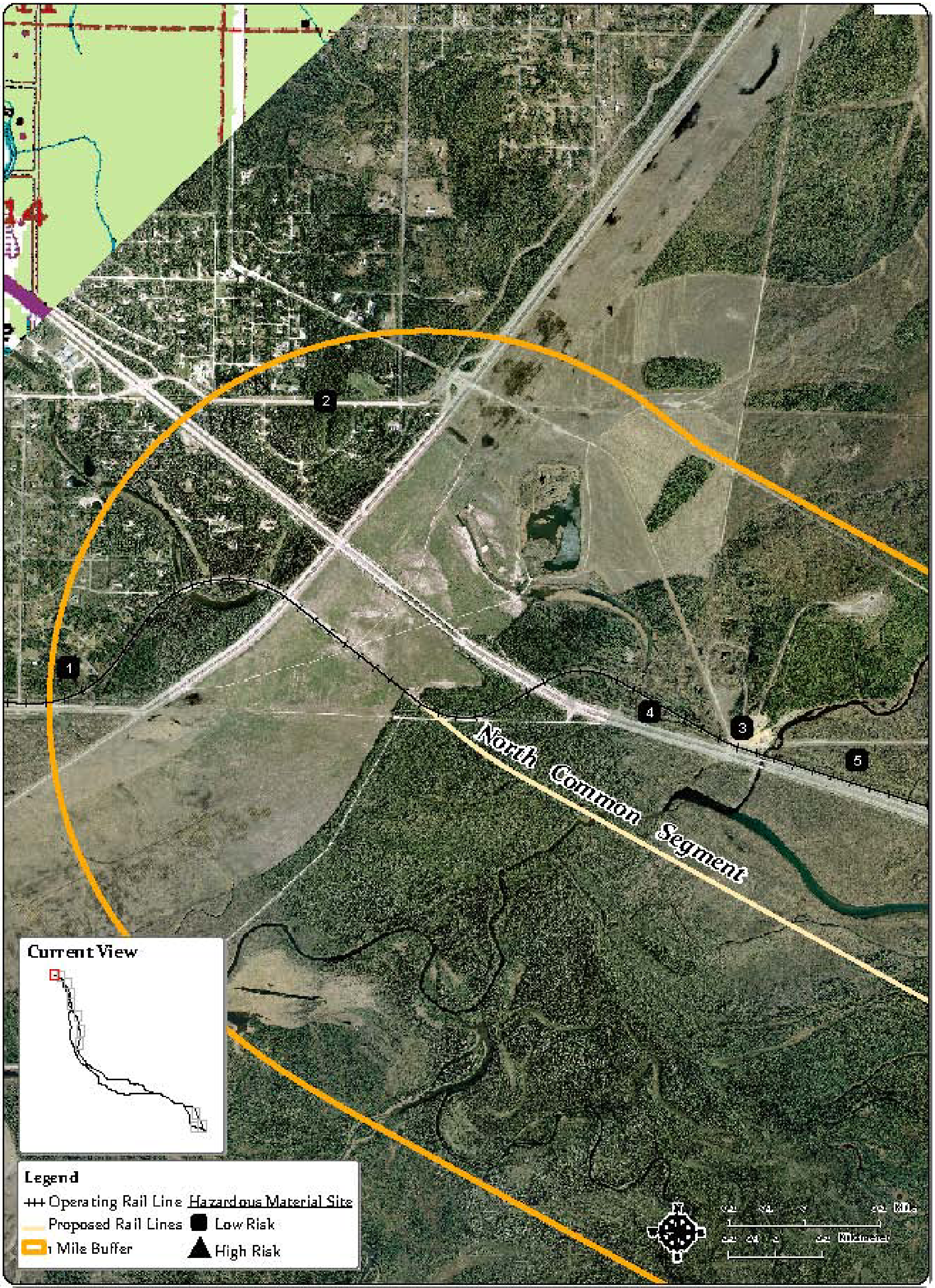

Figure 13-10 – Hazardous Materials/Waste Sites along the Northern Section of North Common Segment

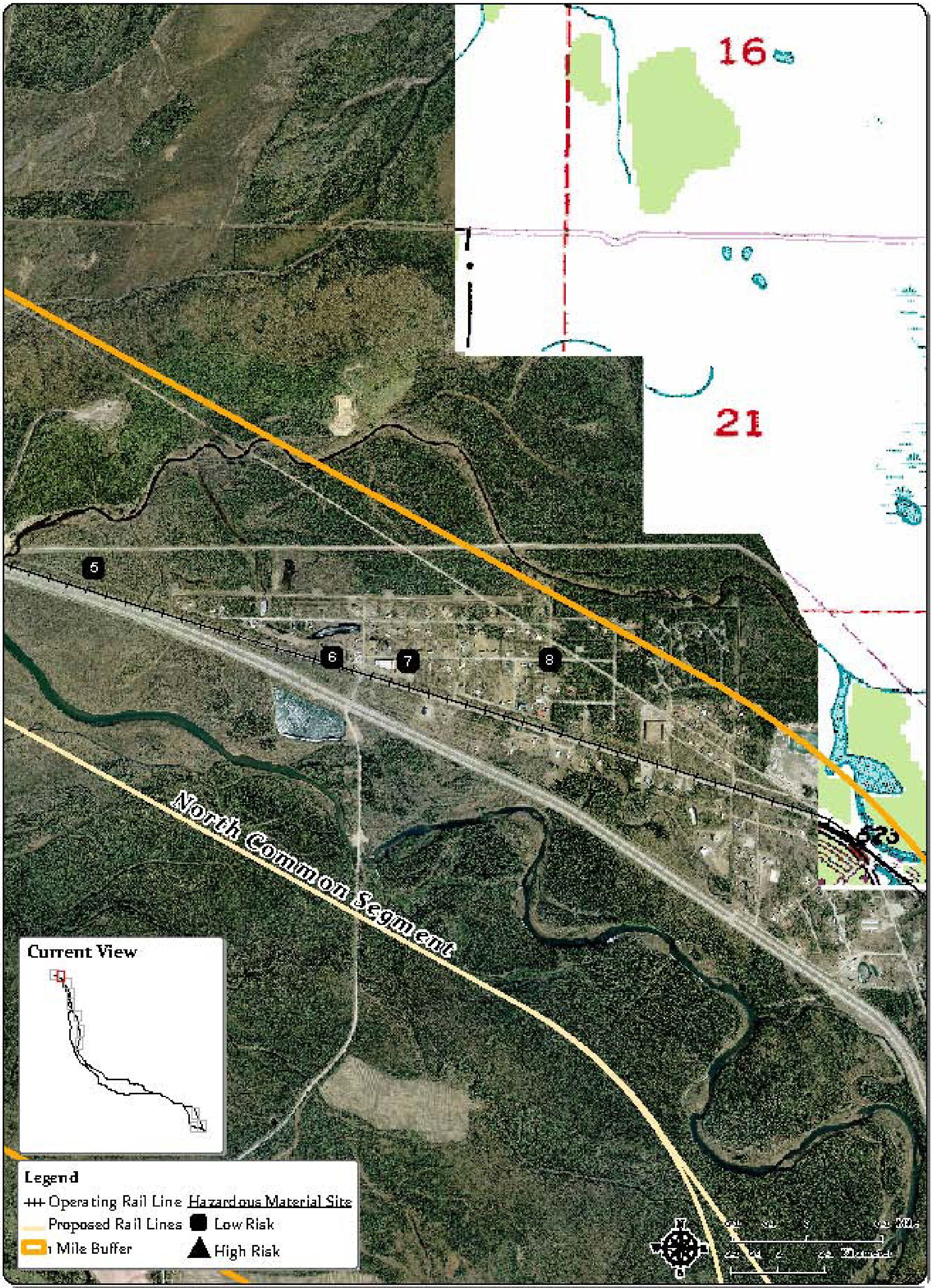

Figure 13-11 – Hazardous Materials/Waste Sites along the Southern Section of North Common Segment

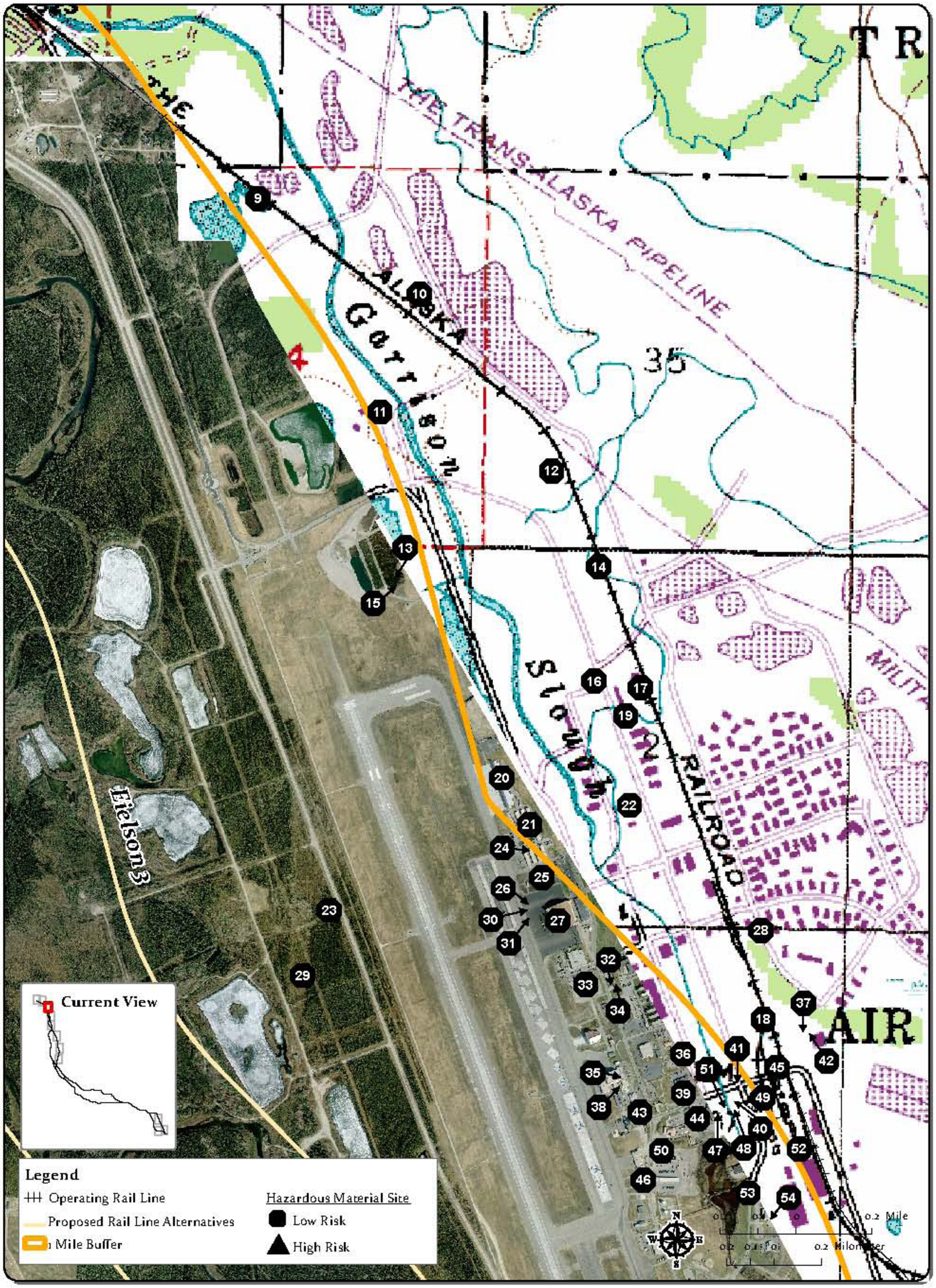

Figure 13-12 – Hazardous Materials/Waste Sites along the Northern Section of the Eielson Alternative Segments

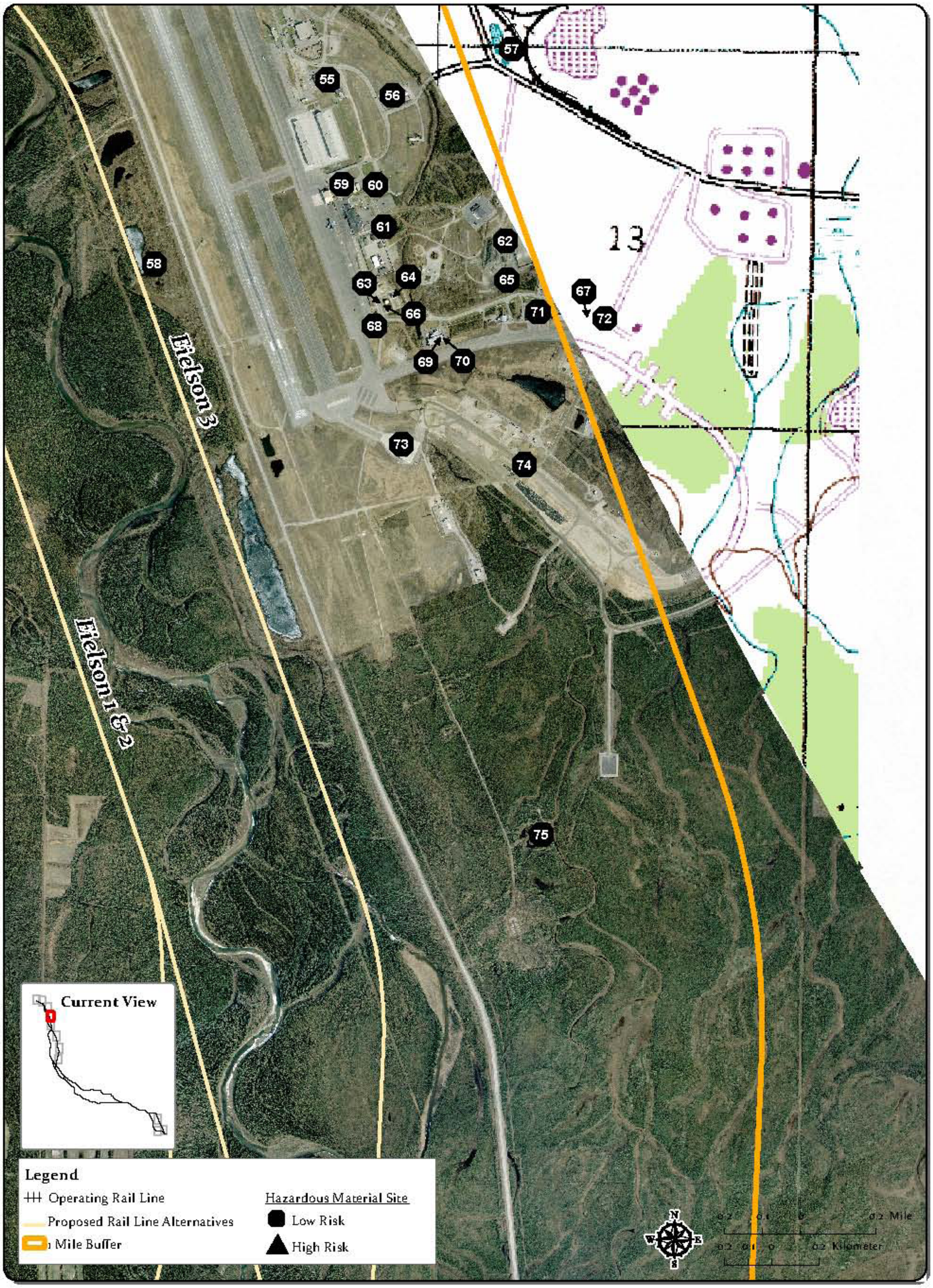

Figure 13-13 – Hazardous Materials/Waste Sites along the Middle Section of the Eielson Alternative Segments

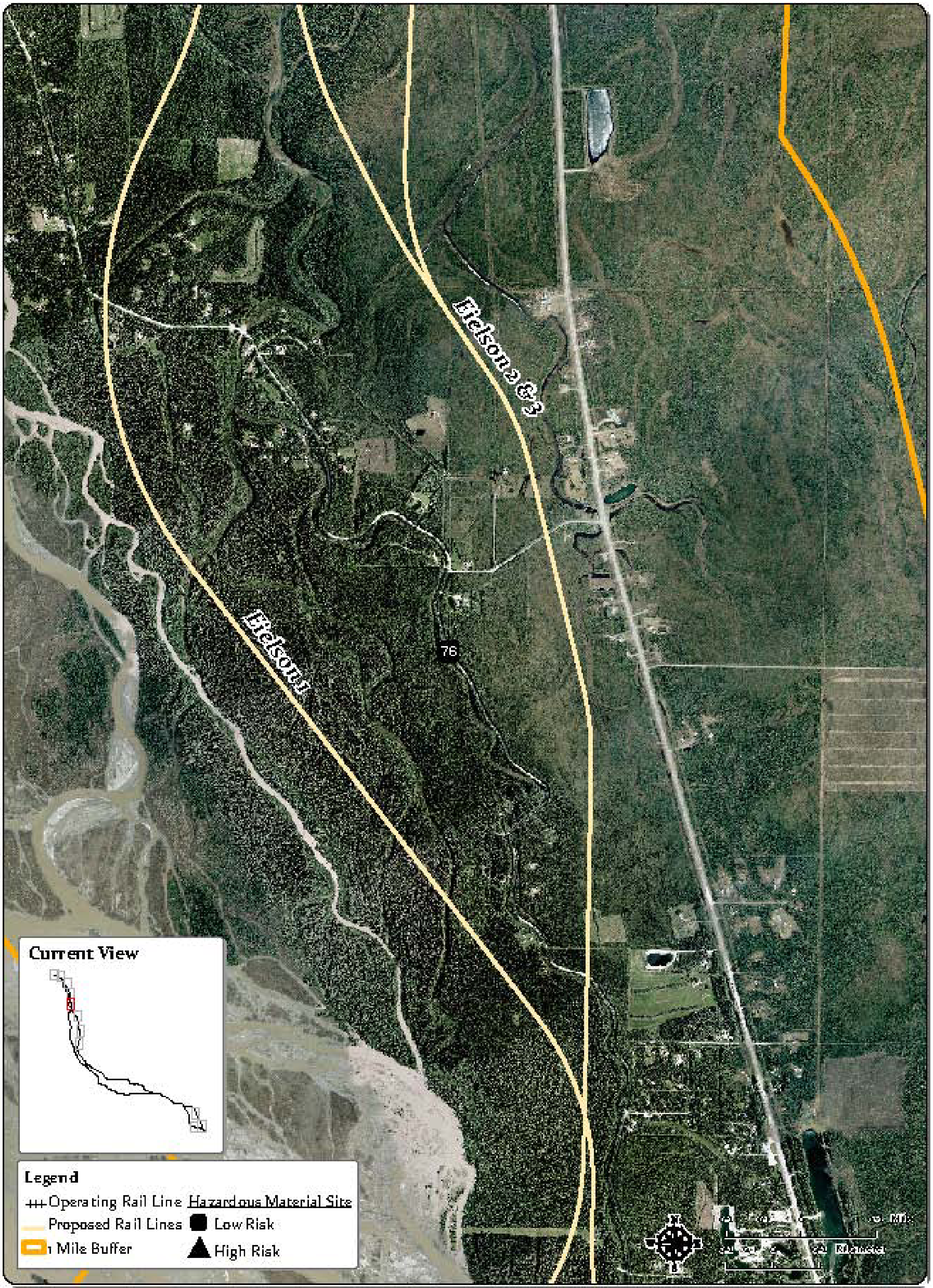

Figure 13-14 – Hazardous Materials/Waste Sites along the Southern Section of the Eielson Alternative Segments

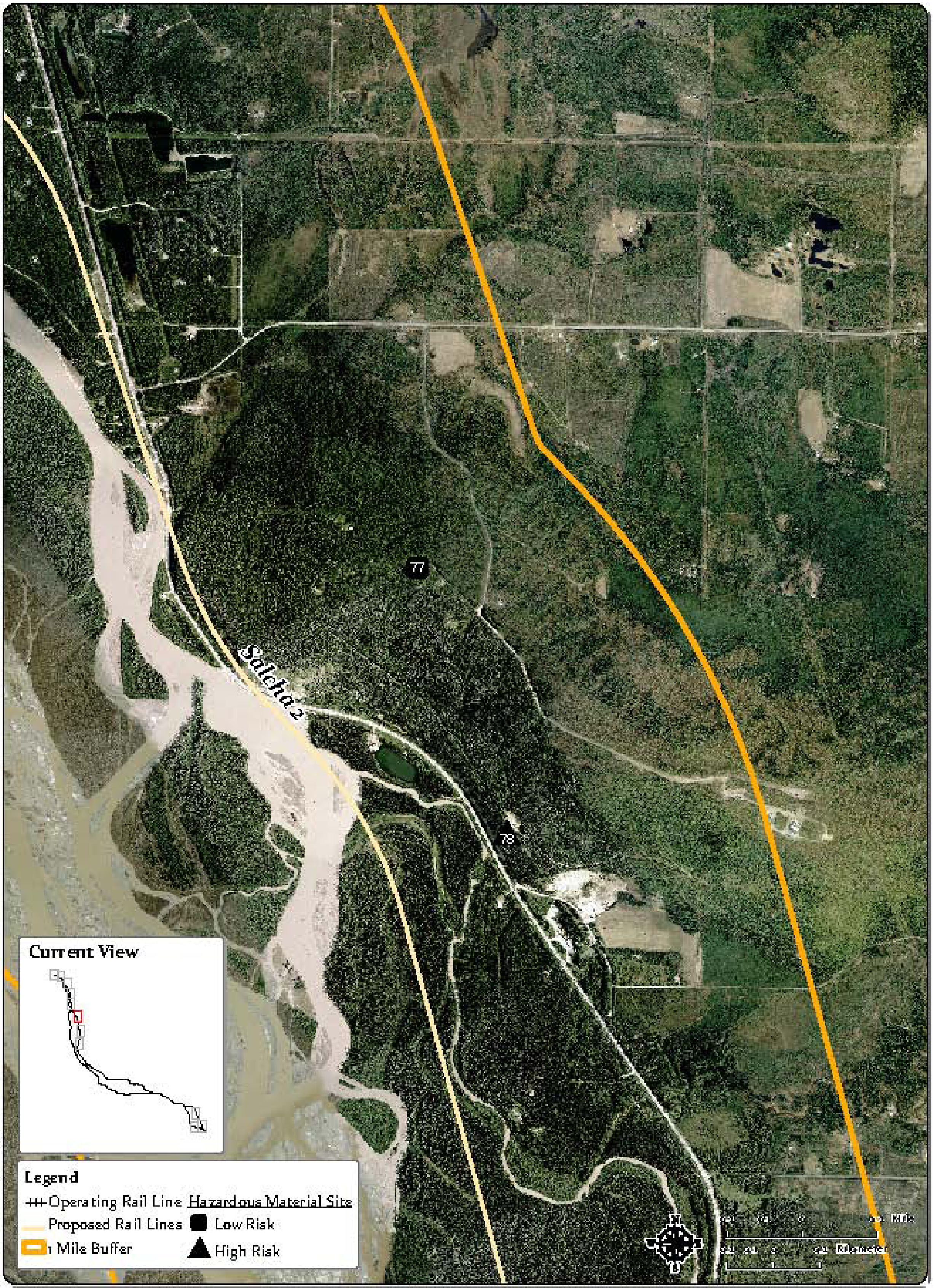

Figure 13-15 – Hazardous Materials/Waste Sites along the Northern Section of the Salcha Alternative Segments

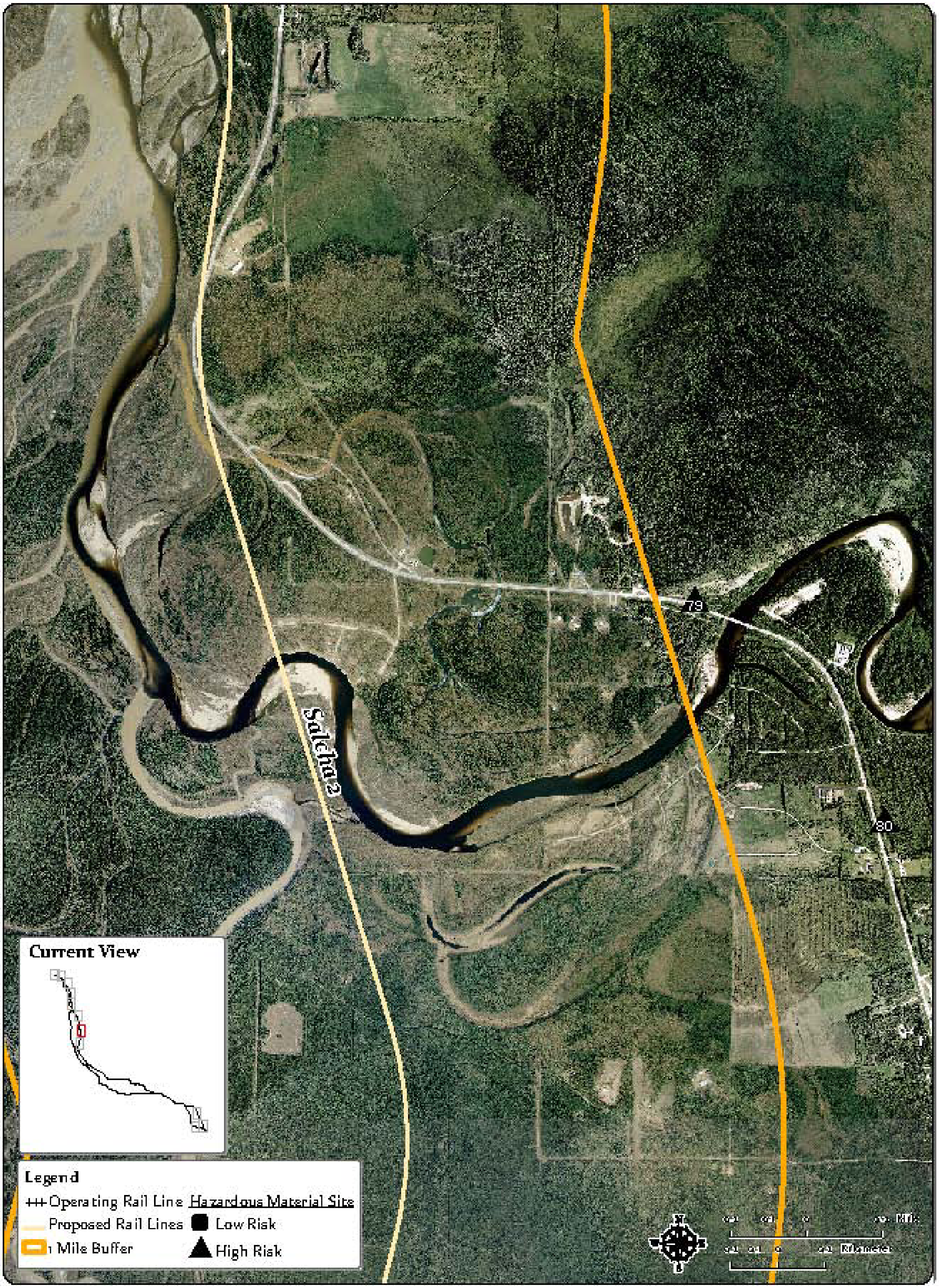

Figure 13-16 – Hazardous Materials/Waste Sites along the Middle Section of the Salcha Alternative Segments

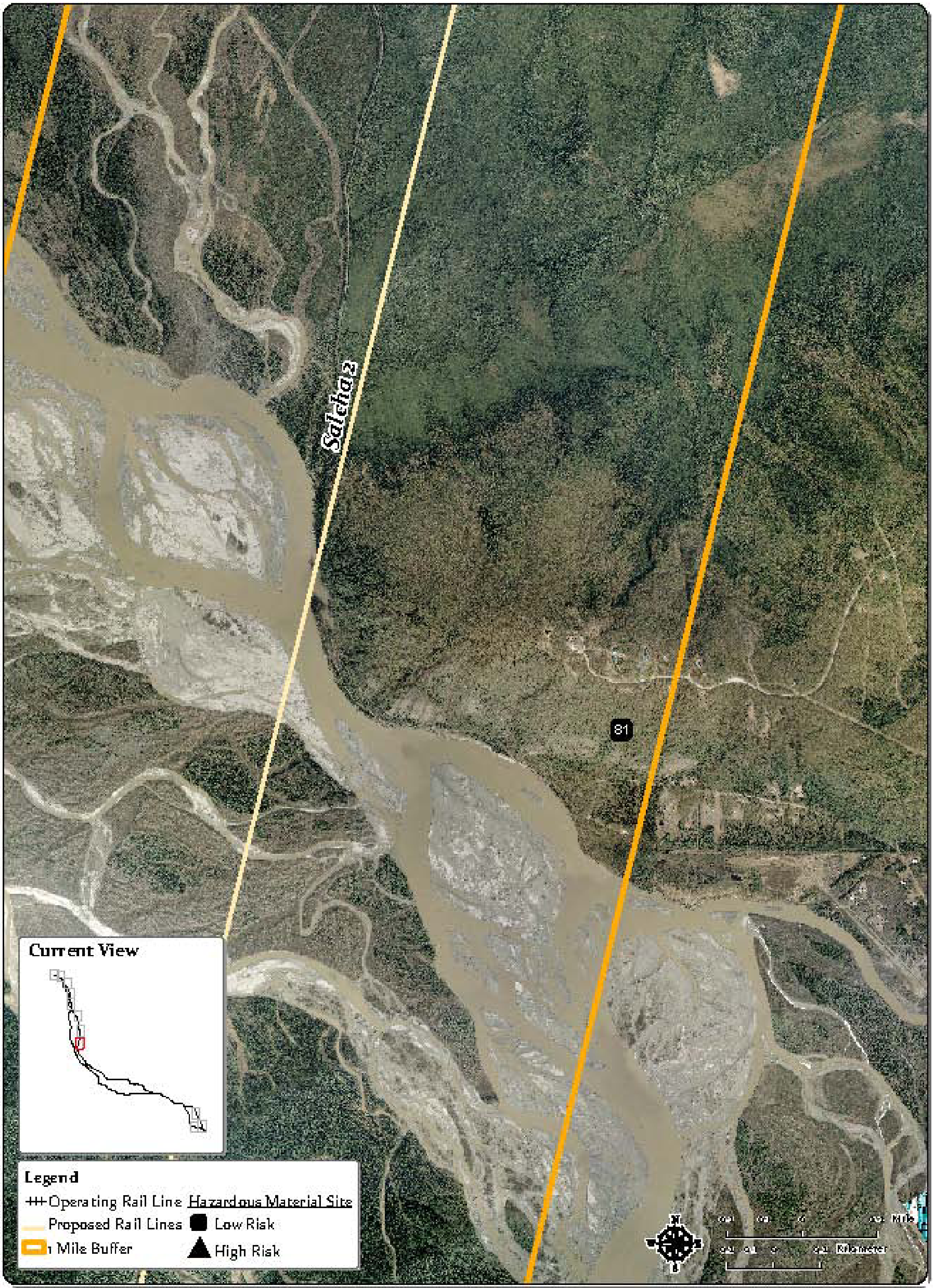

Figure 13-17 – Hazardous Materials/Waste Sites along the Southern Section of the Salcha Alternative Segments

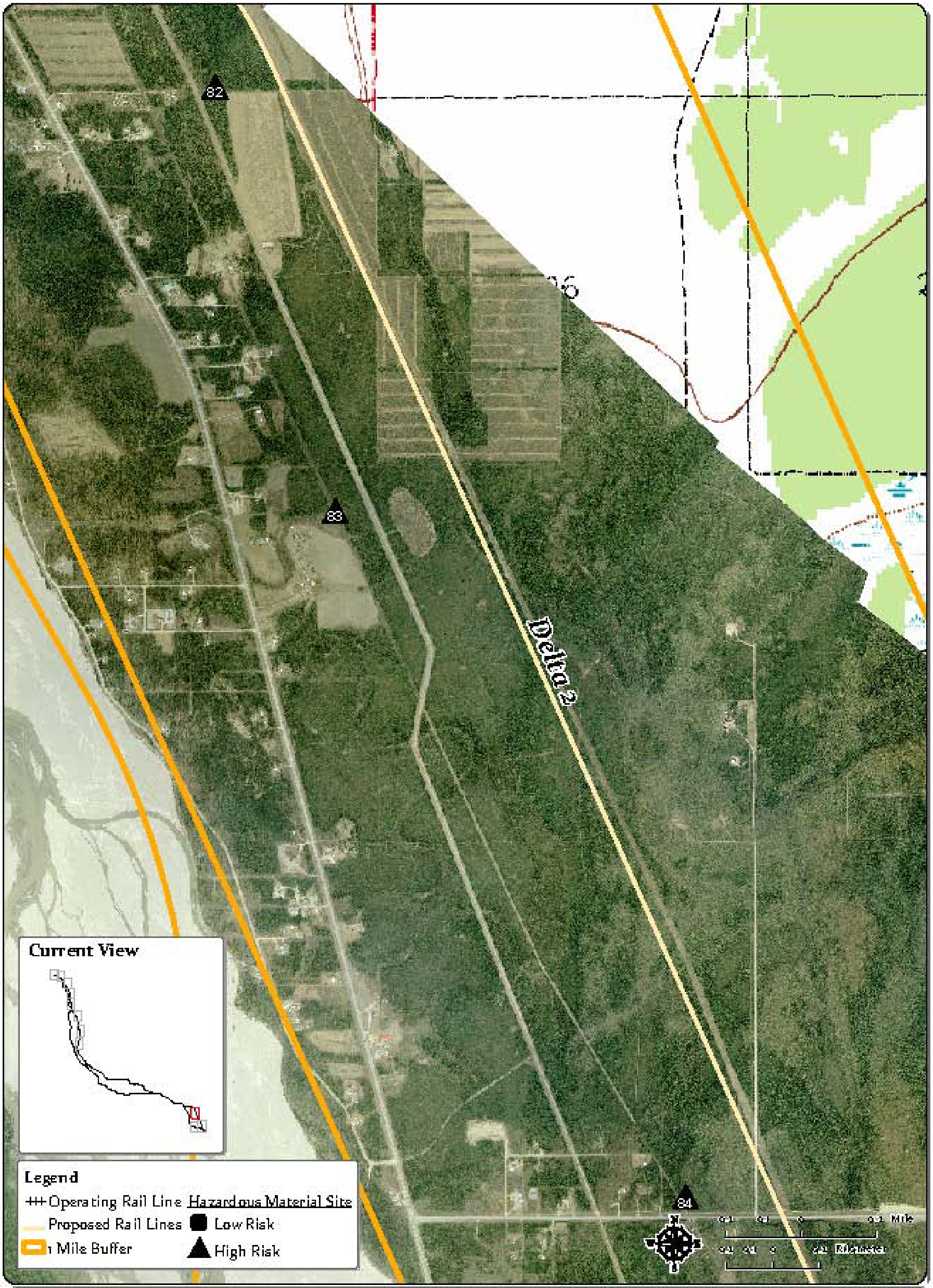

Figure 13-18 – Hazardous Materials/Waste Sites along the Northern Section of the Delta Alternative Segments

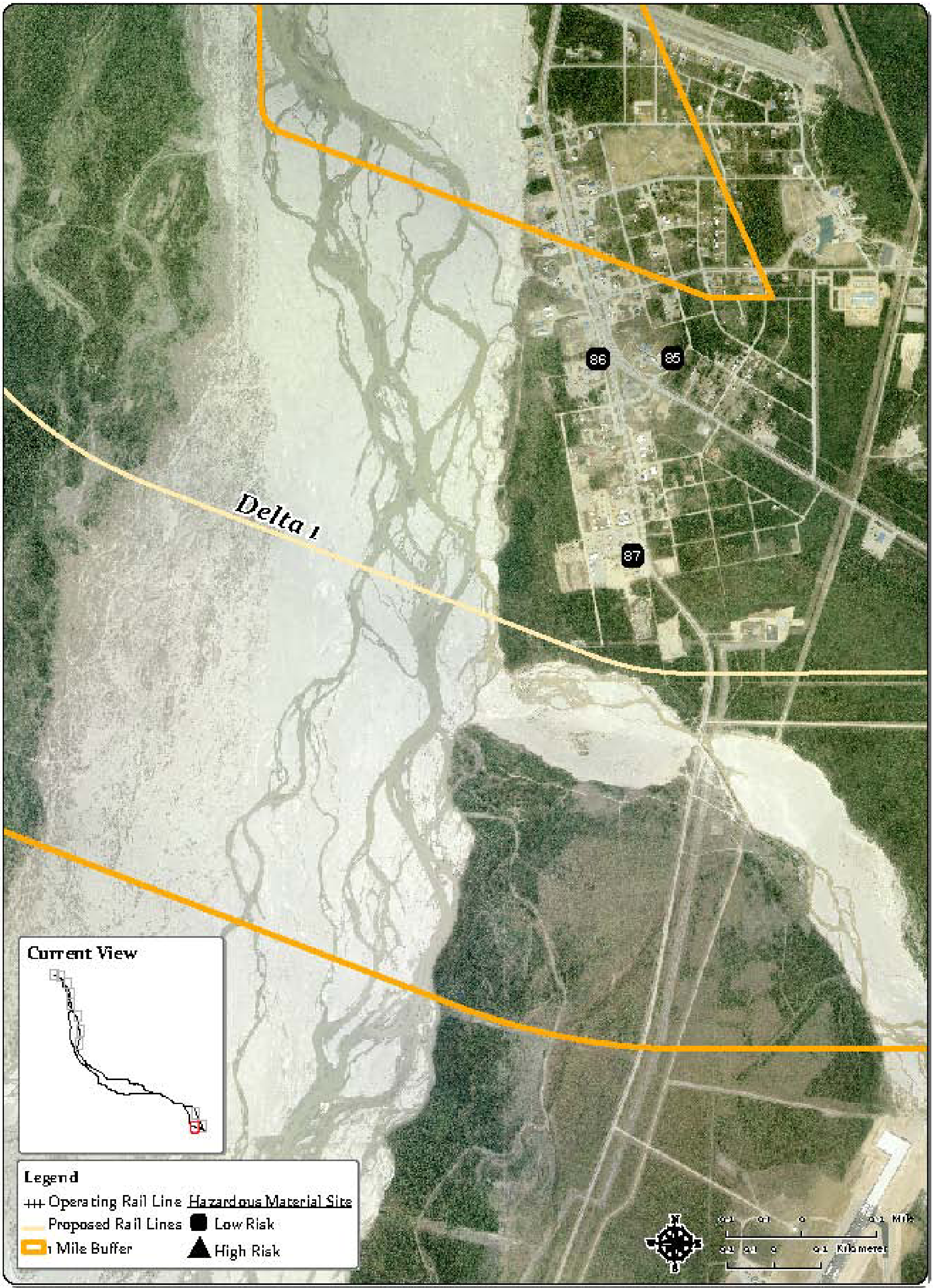

Figure 13-19 – Hazardous Materials/Waste Sites along the Middle Section of the Delta Alternative Segments

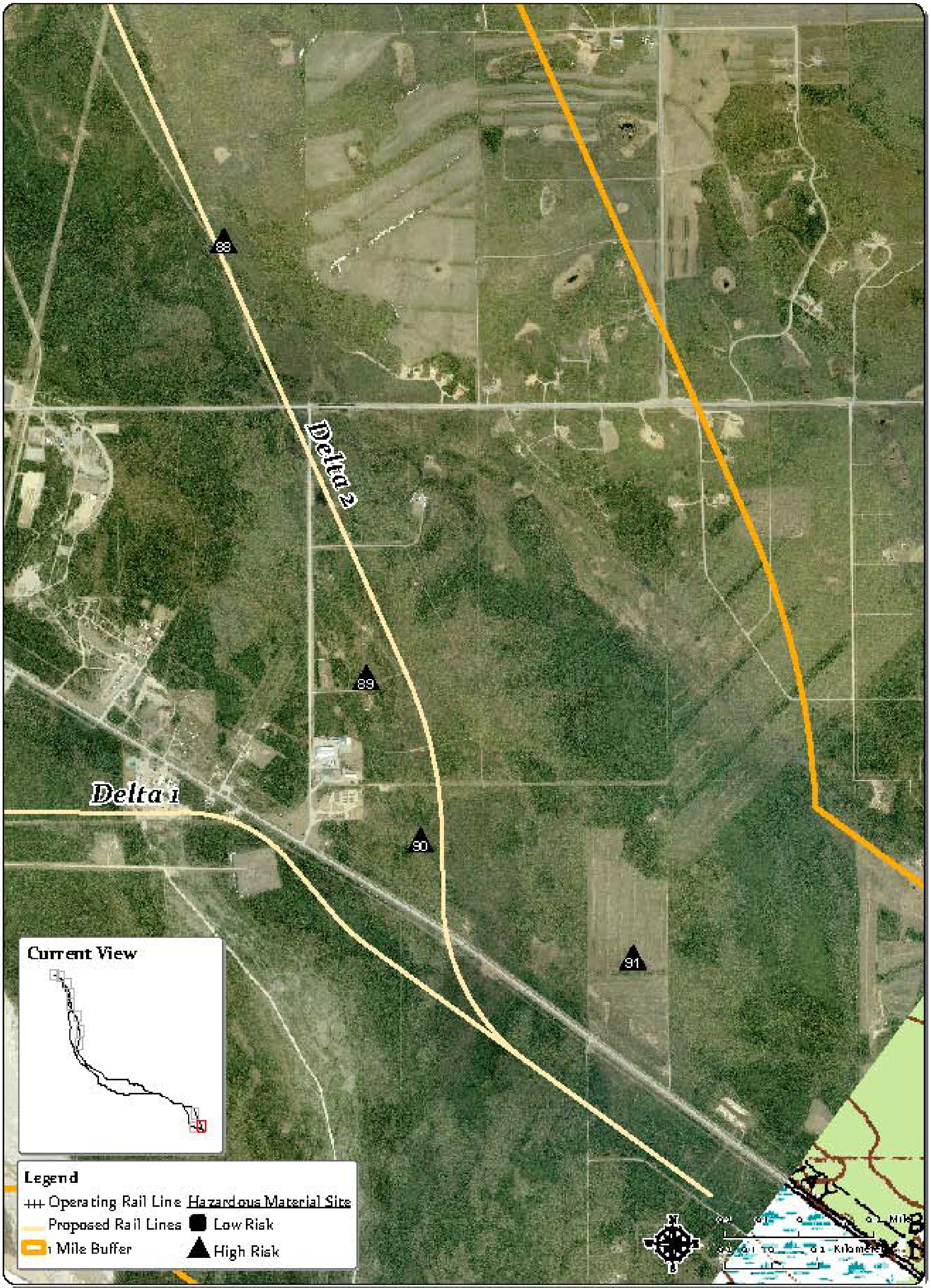

Figure 13-20 – Hazardous Materials/Waste Sites along the Southern Section of the Delta Alternative Segments

13.3.3 Environment Consequences

Methodology

Known sites within 1 mile of either side of each alternative segment were identified and then evaluated to assess the potential environmental consequences to lands, surface water, and groundwater that could result from construction of the proposed rail line.

Each identified contaminated site was evaluated based on the available information regarding location, proximity to the proposed rail line ROW, contaminant characteristics, and regulatory status (*e.g.*, "open" or "active" sites and sites approved for "conditional closure"). Closed sites where completed remediation activities included removal of contaminated soil or groundwater were considered to present negligible risk for contaminants that could affect the proposed rail project.

The list of sites of concern that could present a greater risk for exposure or spread of contaminants as a result of the proposed rail line was further refined to include the following:

- **Sites within 500 feet of the rail line ROW** that could be excavated or otherwise disturbed by intrusive actions associated with proposed rail line construction; and
- **Sites within 1 mile of the rail line ROW** where land use, local zoning and/or institutional controls (deed and/or regulatory restrictions) do not prohibit borrow-pit development.

Construction work is not considered likely to result in adverse environmental consequences on or near negligible risk hazardous material sites or regulated facilities.

The analysis of environmental consequences for hazardous materials/ waste sites is presented by common impacts briefly, and then by site-specific effects in more detail as applicable. These assessments are preliminary and are not intended to take the place of more detailed studies of subsurface soils and groundwater, if warranted, at a later date. Furthermore, prior to construction, site conditions would be thoroughly assessed to ensure that no hazardous materials or waste sites would be encountered. Chapter 20 of the EIS identifies proposed mitigation for impacts to land use.

Common Impacts

Construction Impacts

Environmental impacts or consequences could occur as a result of excavating contaminated sites during construction of road and rail grades, cuts, grade separations and retaining walls. Borrow pits developed for fill and ballast materials could also result in the disturbance and movement of contaminated materials and groundwater.

Based on the stated evaluation criteria, 11 of the 92 sites identified present a potential for environmental consequences that could result from construction activities in contaminated areas. These sites are listed and described in Table 13-5 and their locations are depicted in Figures 13-15, 13-16, 13-18, and 13-20. Section-wide orphan sites could be located anywhere within the listed section(s) of land detailed in the address column of the table.

All 11 of the sites of concern warrant further evaluation and study prior to construction. The investigations should focus specifically on areas where planned construction activities would involve soil excavation and/or related dewatering operations. These investigations would provide a basis for determining construction health and safety specifications, contaminated soil and groundwater remediation, and disposal procedures. Additionally, preparation and implementation of any remediation plans for excavated soil or affected groundwater shall be coordinated with the ADEC Contaminated Site Solid Waste Programs.

If unanticipated sources of hazardous or regulated materials are encountered during construction activities (such as along the Haines Fairbanks Pipeline ROW in the Delta Junction area), the construction manager shall immediately notify the ADEC and ARRC's health, safety and environment staff, and stop all work in the area until a corrective action plan has been approved by ADEC. The plan shall contain specific actions to address the type, level, and quantity of contamination encountered. The handling, treatment, and disposal of any hazardous materials must occur in full compliance with all Federal, state, and local requirements.

Operations Impacts

Adverse impacts from contaminated sites are not expected to result from typical rail operations. Spill or hazardous materials issues related to rail line operations (*i.e.*, spills or leaks from railcars or incidents related to materials carried by the railcars) are discussed in Chapter 11, Transportation Safety and Delay.

Construction Impacts by Alternative Segment

North Common Segment

The only known sites of concern along North Common Segment are the orphan sites associated with ALCAN Highway construction camps. These sites are considered orphan sites because they have not yet been located, but are historically known for petroleum spills and other releases. The former camp sites were situated along the existing Richardson Highway and Old Richardson Highway rail lines and were used during construction of the highway in the 1940s. Contaminated areas could be inadvertently excavated during development of borrow pits within 1 mile of portions of North Common Segment.

Eielson Alternative Segments 1, 2, and 3

There are no known sites of concern that present a potential for environmental consequences resulting from construction activities along Eielson Alternative Segment 1. The only known sites of concern along Eielson Alternative Segments 2 and 3 are the orphan sites associated with ALCAN Highway construction camps, as described for North Common Segment.

Salcha Alternative Segment 1

There are no known sites of concern that present a potential for environmental consequences resulting from construction activities along Salcha Alternative Segment 1.

Table 13-5
Known Hazardous Material Sites and Regulated Facilities of Concern

Map No.	Name	Address	Longitude	Latitude	Notes	Status
Figure 13-15 (Hazardous materials/waste sites along the northern section of the Salcha alternative segments.)						
78	Residence 6432 Richardson Highway Heating Oil Tank (located within 1850 feet of the rail ROW)	6432 Richardson Highway	64°31'34.93"N	146°59'22.37"W	Confirmed 1,200-gallon heating oil release from corroded leaking UST that was removed at the residence. Contaminated soil removal limited at western end of excavation by structures. Soil confirmation sample at western end of excavation had Benzene, Toluene, Ethylbenzene, Xylene (BTEX), Gasoline Range Organics (GRO) and Diesel Range Organics (DRO) above clean-up levels. Over 500 gallons of product was removed from the culvert recovery well. Four soil stockpiles left onsite were thermally treated. ADEC Institutional Controls (ICs) in place.	Active
Figure 13-16 (Hazardous materials/waste sites along the middle section of the Salcha alternative segments.)						
79	Haines Fairbanks Pipeline (HFP) Mile 541.5 (located within 4750 feet of the rail ROW)	Salcha River Crossing Gate Valve #67	64°28'11.38"N	146°56'8.85"W	HFP valve area on north side of Salcha River; contamination found in 2007. Extent unknown.	Active
80	HFP Mile 539 to Mile 538.5 (section-wide orphan site)	Section 21, Township 9 South/Range 10 East (T9S/ R10E), FM	64°28'11.38"N	145°45'52.40"W	Delta Alternative Segment 2 railbed ROW parallels HFP in area with documented herbicide use in 1960s and undocumented releases.	Active
Figure 13-18 (Hazardous materials/waste sites along the northern section of the Delta alternative segments.)						
82	HFP Mile 538.5 to Mile 536.5 (section-wide orphan site)	Sections 22 and 27, T9S/ R10E, FM	64° 6'47.84" N	145°45'43.99"W	Delta Alternative Segment 2 railbed ROW parallels HFP in area with 1960s herbicide use and undocumented releases.	Active
83	HFP Mile 536.5 to Mile 535 (section-wide orphan site)	Sections 26 and 35, T9S/R10E, FM	64° 5'49.11" N	145°45'6.44"W	Delta Alternative Segment 2 railbed ROW parallels HFP in area with documented herbicide use in 1960s and undocumented releases.	Active
84	HFP Mile 535 to Mile 534 (section-wide orphan site)	Sections 34 and 35 T10S/R10, FM	64° 4'14.10" N	145°43'16.28"W	Delta Alternative Segment 2 railbed ROW parallels HFP. 1960s documented herbicide use and undocumented POL releases.	Active
Figure 13-20 (Hazardous materials/waste sites along the southern section of the Delta alternative segments.)						
88	HFP Mile 534 to Mile 531.8 (section-wide orphan site)	Sections 11, 12 and 15, T10S/ R10E, FM	64° 2'50.47" N	145°41'21.49"W	Delta Alternative Segment 2 railbed ROW parallels HFP in area with documented herbicide use in 1960s and undocumented releases.	Active

Table 13-5
Known Hazardous Material Sites and Regulated Facilities of Concern (continued)

Map No.	Name	Address	Longitude	Latitude	Notes	Status
89	HFP Mile 531.8 to Mile 530.5 (section-wide orphan site)	Section 19 T10S/R10E and Section 24, T10S/ R11E, FM	64° 1'50.00"N	145°40'37.04"W	Delta Alternative Segment 2 railbed ROW parallels HFP in area with documented herbicide use in 1960s and undocumented releases.	Active
90	HFP Ft. Greely Pump Station and Terminal Mile 528.5 (located within 265 feet of the rail ROW)	Sections 25 T10S/R10E and Section 30 T10S/R11E, FM	64° 1'27.42"N	145°40'20.00"W	Investigation of terminal and pump station underway by U.S. Army as an active Department of Defense installation. Documented past practices for purging fuels between different runs and documented releases indicate extensive soil and groundwater contamination.	Active
91	HFP Mile 530 to Mile 529 (section-wide orphan site)	Section 29, 30 and 32, T10S/R11E, FM	64° 1'11.12"N	145°39'12.91"W	Delta Alternative Segment 1 railbed ROW parallels HFP in area with documented herbicide use in 1960s and undocumented releases.	Active
Project-wide (Along North Common, Eielson 2, Eielson 3, Salcha 2, Delta 1 and Delta 2 Alternative Segments)						
92	Alaska-Canadian (ALCAN) Highway construction camps (Project-wide orphan site[s])	Project-wide	NA	NA	Formerly Used Defense Sites (FUDS) investigation of ALCAN Highway construction camps from 1940's underway. Anecdotal information on disposal practices suggests potential for contaminated sites	Active

Eielson AFB Institutional Controls (ICs) include:

- Prohibition on the installation or use of drinking water wells
- All monitoring wells are secured with locks
- Any activity that may result in exposure to contaminated soil and groundwater requires approval of Civil Engineering Squadron's Environmental Flight (CES/CEV)
- Contaminated soil/groundwater removed from the source must be disposed of or treated in accordance with regulation
- Any activity disturbing a remedial action requires approval of CES/CEV
- Notify ADEC and USEPA of any proposal to change the existing land use or land use controls at the site.

ADEC Institutional Controls include:

- Site added ADEC Contaminated Sites Database identifying the nature and extent of contamination remaining onsite.
- In accordance with 18 AAC 78.274(b) OR 18 AAC 75.370(b), ADEC approval must be obtained prior to removal and/or disposal of soil or groundwater from this site to an offsite location.

Active Risk sites include:

- Sites within the ROW where potential contamination remains or is suspected and where excavations for railbed cuts, separated crossing, retaining walls and embankments may occur.
- Sites within 1 mile of route alternatives where contamination remains or is suspected and there are no land restrictions or ICs for borrow pit development.

Salcha Alternative Segment 2

Three known sites of concern were identified along Salcha Alternative Segment 2. Two sites, Site 78 (Figure 13-15) and Site 79 (Figure 13-16) are known to contain contaminated soils. Site 80 (Figure 13-16) is related to the Haines Fairbanks Pipeline and is considered a "section-wide orphan site" stemming from the abandoned pipeline ROW parallel to the Salcha Alternative Segment 2 railbed. There are documented and undocumented spills and releases that occurred during pipeline operations in this area, which could cause exposure to contaminated soil during excavation and development of borrow pits.

In addition, orphan sites associated with the ALCAN Highway construction camps could be encountered along this segment, as described above for North Common Segment.

Central Alternative Segments 1 and 2; Central Connector Segments A, B, C, D, and E

There are no known sites of concern that present a potential for environmental consequences resulting from construction activities along Central Alternative Segment 1, Central Alternative Segment 2, or Central Connector Segments A, B, C, D and E.

Donnelly Alternative Segments 1 and 2

There are no known sites of concern that present a potential for environmental consequences resulting from construction activities along either Donnelly Alternative Segment 1 or 2.

Delta Alternative Segments 1 and 2

There are seven sites of concern along Delta Alternative Segments 1 and 2. All of the sites are related to the abandoned Haines Fairbanks Pipeline in the Delta Junction area, where Delta Alternative Segments 1 and 2 parallel the former Haines Fairbanks Pipeline ROW (Figure 13-18 and Figure 13-20). Six of these are also section-wide orphan sites. Starting at approximately "Mile 3" of Delta Alternative Segment 2 and "Mile 5" of Delta Alternative Segment 1 and continuing to the southeastern terminus of the rail line extension, documented and undocumented spills and releases occurred during pipeline operations. If encountered during excavation for project construction, including the proposed terminal facilities, spill areas could cause exposure to petroleum contaminants. Construction of borrow pits in these areas could also lead to exposure to contaminants.

Site 90 (Figure 13-20) was a former Haines Fairbanks Pipeline pump station with known and located surface spills of petroleum products. This former pump station is now being investigated under the Formerly Used Defense Site program. Site 90 also encompasses a large area in which there may be unknown releases. If encountered during excavation for construction of the railbed, terminal facilities, and/or development of borrow pits, the former pump station could cause exposure to contaminants. In addition, orphan sites associated with the ALCAN Highway construction camps could be encountered along this segment as described for the North Common Segment.

No-Action Alternative

The only hazardous materials effects under the No-Action Alternative would be from other projects or natural processes such as flooding, soil erosion, or landslides that disturb contaminated sites.

14. VISUAL RESOURCES

This chapter discusses the existing visual resources in the vicinity of the proposed Northern Rail Extension (NRE) and analyzes the potential for construction of the alternative segments to impact visual resources. Proposed rail operations are also reviewed in relation to visual resources. The analytical approach is based on Bureau of Land Management (BLM) Visual Resource Management (VRM) methodology.

14.1 Applicable Regulations

This visual resources analysis applies the BLM VRM methodology to evaluate the potential visual impacts of the project. As a Federal land-management agency, BLM is charged with managing the scenic resources of public lands through the Federal Land Policy and Management Act of 1976 (FLPMA) (BLM, 2007). FLPMA states that the scenic quality of Federal lands should be protected for the enjoyment of all Americans. To meet this objective, BLM developed the VRM methodology, which is a systematic way to evaluate and compare the potential visual impacts of the different alternative components of a proposed action. The VRM system is used by the BLM to analyze potential visual impacts and apply visual design techniques to ensure that surface-disturbing activities are in harmony with their surroundings. BLM has certain management authorities for Federal public lands in the project area that have been withdrawn for military use, including the authority to issue a linear right-of-way grant. The project area also includes Alaska state lands and private lands; however, none of these entities has a system or methodology to assess the visual impacts to the existing landscape. While BLM methodology does not apply to non-Federal lands, the VRM methodology was used—for consistency—to assess potential visual impacts for the entire length of the proposed NRE.

14.2 Affected Environment

The proposed rail line would extend from the vicinity of North Pole to Delta Junction. Depending on the route, the rail line would also be near other small communities along Richardson Highway, including Salcha and Delta Junction.

Much of the proposed rail line would parallel the Tanana River (see Figure 14-1), which is a large tributary of the Yukon River. There is recreational boating traffic on this stretch of the river in the summer, and in the winter there is snowmachining along certain sections. The proposed rail line would also roughly parallel Richardson Highway, one of the major highways in Interior Alaska. Richardson Highway has several scenic overlooks and is classified by Alaska Department of Transportation and Public Facilities as a State Scenic Byway with natural, scenic, historic and archeological values.

There are four state recreational areas within 5 miles of the project area. The Birch Lake State Recreation Site and Quartz Lake State Recreation Area are both within 10 miles of Delta Junction and each have campground and boat launch facilities. Salcha River State Recreation Site is 40 miles south of Fairbanks and has camping facilities, a boat ramp, and public use cabins. Harding Lake State Recreation Area is 45 miles south of Fairbanks and has a large campground, picnic areas, and a boat launch.

Figure 14-1 – Aerial View of the Tanana River

Most of the project area falls within the Tanana River Basin, which is composed of flat to nearly flat bottomlands, with some hills. Variation in elevation is generally limited to a slope gradient of less than one degree. Riparian features, such as meandering rivers, side sloughs, and oxbow lakes, are prevalent. Vegetation communities are dominated by spruce (white and black) and hardwood species, with tall scrub thickets occurring on floodplains and wetlands throughout wetter sites.

Outside of the river corridors, the generally flat terrain and prevalence of the spruce forests result in little visual contrast in texture. Within the river corridors, water is the dominant visual element; however, there is visual contrast between vegetated and non-vegetated areas along rivers and streams, as well as some variation in form and texture due to some local hills. Visual contrast to the natural landscape in form, line, color, and texture is created throughout the study area by human settlements and infrastructure such as roads, utility lines, and bridges. These settlements and developments are primarily along the Tanana River and its tributaries.

14.3 Environmental Consequences

Environmental consequences are measured using the VRM methodology which is summarized below. Following an overview of the methodology, impacts on visual resources are assessed by alternative segments. Appendix N provides more information about the methodology, the visual inventory and the visual impact analysis results.

14.3.1 Methodology

The VRM system involves "inventorying scenic values and establishing management objectives for those values through the resource management planning process, and then evaluating proposed activities to determine whether they conform to the management objectives" (BLM, 2007). Specifically, the VRM system is a two-step process that establishes a Visual Resources Inventory and Visual Contrast Ratings. The Visual Resources Inventory is a system developed by BLM to establish the visual resources management objectives of a region. Through the inventory evaluation process, the region's scenic value, the sensitivity of public concern for scenic quality of the landscape, and distance zones based on relative visibility from travel routes or observation points are assessed. Based on these three visual criteria, each location is placed into one of four VRM objective classes. BLM National VRM Coordinators are responsible for the visual inventory process and establishment of the VRM class objective of the region. However, in a region where no VRM Class has been established, an Interim VRM Class may be established using the Visual Resources Inventory System (BLM, 2007).

The project area for the proposed NRE had no VRM Class rating, so an Interim VRM Class was established, which is Class II—High Value—for most of the project area (see Appendix N). The Visual Contrast Rating system compares the degree of the contrast with the current landscapes and then evaluates if the class objectives, established with the Visual Resources Inventory, are met. Key observation points (KOPs)—locations selected to be representative of the critical locations from which the project would be seen—were established and used for this evaluation. The goal of the VRM Class rating system is to maintain the rating. Appendix N presents the Visual Resources Inventory establishing the Interim VRM Class.

14.3.2 Impacts by Alternative Segment

This section describes the visual impacts of the common segments and alternative segments of the proposed NRE. Table 14-1 summarizes information on the common types of visible features for each of the common and alternative segments. In addition, communication towers, work camps and construction staging areas would be constructed at locations that would be independent of the rail line route.

North Common Segment

The North Common Segment would be 2.7 miles long and run parallel to Richardson Highway approximately 0.5 mile to the south. This segment would not cross any rivers, but would cross Eielson Farm Road. There are existing electricity and utility corridors running through the same area.

Although the segment runs parallel to Richardson Highway, the rail line would not likely be visible to Richardson Highway travelers due to vegetation, distance, and viewing angle, except possibly when trains are passing by. Therefore, the Section of Environmental Analysis (SEA) expects that the North Common Segment would meet VRM Class II management objectives.

Eielson Alternative Segments

The three Eielson alternative segments would be between Richardson Highway and the Tanana River, starting at the southern end of the North Common Segment west of the Moose Creek community and ending at the start of the Salcha alternative segments south of Eielson Air Force Base (AFB).

Table 14-1
Selected Features of each Segment
(Shaded segments are part of the proposed action)

		Eielson			Salcha		Central		Donnelly			Delta	
Viewing Feature	**North Common**	**1**	**2**	**3**	**1**	**2**	**1**	**2**	**1**	**2**	**South Common**	**1**	**2**
Segment Length (in miles)	2.7	10.3	10.0	10.1	11.8	13.8	5.1	3.6	25.8	26.2	10.5	11.5	11.5
Grade Separated Crossings	0	0	0	0	0	0	0	0	0	0	0	1	2
At-Grade Paved Crossings	1	1	3	3	0	2	0	0	0	0	0	0	2
Bridges Over Tanana River	0	0	0	0	1	1	0	0	0	0	0	0	0
Bridges Over Other Major Rivers[a]	0	0	0	0	0	1	0	0	2	2	0	1	1
Alternative Mileage within 0.25 mile of Travel Corridor[b]	2.7	10.3	10.0	10.1	4.8	11.5	0	1.7	1.8	2.5	0	4.3	3.1
Passenger Facilities	0	0	0	0	0	0	0	0	0	0	0	1	1
Communication Towers	1	0	0	0	0	1	0	0	1	1	1	0	1
Small Bridges	1	1	3	3	0	2	1	2	4	2	3	0	0

[a] Other major rivers include the primary tributaries to the Tanana River in the project area: Delta River, Little Delta River, Delta Creek, and Salcha River.
[b] Travel corridors are defined as the rivers listed in footnote a and paved roads.

All three Eielson alternative segments include at-grade road crossings and bridged crossings of small streams, but do not include any major bridged river crossings. The primary differences between the three Eielson alternative segments that would impact visual resources are their relative proximity to the Eielson Farm Community and farmland east of the Tanana River and their crossing of Piledriver Slough, an area with recreational use. Eielson Alternative Segments 1 and 2 would both be on the western side of Piledriver Slough and would cross through some Eielson Farm Community property, but Eielson Alternative Segment 2 would cross Piledriver Slough with a small bridge south of Eielson AFB thereby avoiding the residential area near Old Richardson Highway and Stripes Avenue. By keeping closer to Richardson Highway, Eielson Alternative Segment 3 would cross Piledriver Slough with a small bridge to the north of Eielson AFB and avoid the Eielson Farm Community.

KOP 4 analyzed the impacts of a rail crossing of a road in the Piledriver Slough area and found a weak contrast rating. Figure 14-2 shows a view near Piledriver Slough and Scout Lake on Eielson AFB, west of Richardson Highway. It is expected that a rail line in this area would generally result in a weak contrast rating as there are several roads and a high voltage transmission line also running through the area. Therefore, although Eielson Alternative Segment 3 would pass over Piledriver Slough and would cross more minor roads than the other two Eielson alternative segments, it is unclear which alternative segment would have the least visual impact. Regardless, SEA anticipates that any of the Eielson alternative segments would meet VRM Class II management objectives.

Figure 14-2 – Eielson Alternative Segment 3, Near Piledriver Slough and Scout Lake on Eielson Farm Road

Salcha Alternative Segments

Either of the two Salcha alternative segments would start at the southern end of Eielson Alternative Segment 1, 2, or 3 north of the Town of Salcha on the northeastern bank of the Tanana River and would end at the beginning of the connector to one of the Central alternative segments on the southwestern bank of the Tanana River. Both Salcha alternative segments would cross the Tanana River at points not visible from Richardson Highway or other land-based KOPs. Salcha Alternative Segment 1 would cross to the southwestern side of the Tanana River almost immediately; Salcha Alternative Segment 2 would remain on the northeastern side of the Tanana River for several miles before crossing.

Salcha Alternative Segment 2 would cross four roads compared to one road crossing for Salcha Alternative Segment 1. Salcha Alternative Segment 2 also would cross the Salcha River (the only segment to do so) creating strong visual contrast at this site (see Figure 14-3). In addition to these visual impacts, Salcha Alternative Segment 2 would create several hill cuts in the terrain to accommodate the 200-foot-wide right-of-way, creating strong visual contrast (see Figure 14-4). Salcha Alternative Segment 2 would require relocation of Richardson Highway and Salcha Elementary school. Finally, Salcha Alternative Segment 2 would go through the Salcha community, which as a residential area is generally considered to be sensitive to visual changes. Based on these features of Salcha Alternative Segment 2, impacts to visual resources would be less with Salcha Alternative Segment 1. Salcha Alternative Segment 2 would not meet VRM Class II management objectives without mitigation for the hill cut and the crossings of the Tanana and Salcha rivers, and proximity to the Salcha community (see Chapter 20 for proposed mitigation measures). Salcha Alternative Segment 1 would meet VRM Class II management objectives except for the crossing of the Tanana River which results in strong contrast to some landscape elements.

Figure 14-3 – Salcha Alternative Segment 2, View Looking West along Salcha River

Figure 14-4 – Salcha Alternative Segment 2, View Looking Southeast from the Western Bank of the Salcha River, South of the Confluence with the Tanana River

Connector Segments A through E

The connector segments are rail alignments between 0.9 and 4.4 miles long that would connect the Central alternative segments to the Salcha and Donnelly alternative segments. Each of the five connector segments is on the west side of the Tanana River. The segments used for the project would depend upon the selection of the Salcha, Central and Donnelly alternative segments. These segments would have no major river crossings or road crossings, but would cross winter recreation trails and streams. These segments are isolated from viewpoints along the Tanana River and Richardson Highway. The visual contrast of this segment is therefore weak, so SEA anticipates that the connector segments would meet the VRM Class II management objectives.

Central Alternative Segments

The Central alternative segments would run parallel to the southwestern shore of the Tanana River between the connector/Salcha alternative segments and the connector/Donnelly alternative segments. SEA expects that the visual contrast would be similar for the two Central alternative segments. Although Central Alternative Segment 2 would be closer to the Tanana River, SEA does not expect that it would be visible from Richardson Highway or other viewing locations on the northeastern side of the Tanana River (due to the dense vegetation and flat terrain in the area). Neither Central alternative segment would have a major river crossing or road crossing, but each would cross winter recreation trails and streams. Both Central alternative segments would be isolated from viewpoints along the Tanana River and Richardson Highway. The visual contrast of this segment is therefore weak, so SEA anticipates that the Central alternative segments would meet the VRM Class II management objectives.

Donnelly Alternative Segments

The Donnelly alternative segments would start at the south end of the Central alternative segments northwest of the Little Delta River and roughly parallel the southwestern side of the Tanana River to the start of the South Common Segment. In terms of visual contrast, SEA anticipates that Donnelly Alternative Segment 1 and Donnelly Alternative Segment 2 would be very similar. Both would cross Delta Creek and Little Delta River and would cross an Alaska Department of Natural Resources (ADNR) winter trail at-grade. Although Donnelly Alternative Segment 2 would be closer to the Tanana River, SEA does not expect that it would be visible from Richardson Highway or other viewing locations on the northeastern side of the Tanana River (due to the dense vegetation and flat terrain in the area). However, due to the proximity to the Tanana River, boaters on the Tanana River would be more likely to view Donnelly Alternative Segment 2 bridges over Delta Creek and Little Delta River (Figure 14-5). Therefore, SEA anticipates that Donnelly Alternative Segment 1 would have the least visual impact of the Donnelly alternative segments. SEA anticipates that the Donnelly alternative segments would meet VRM Class II management objectives except for the crossings of Delta Creek and Little Delta River, which result in strong contrast to existing structural landscape elements.

Figure 14-5 – Donnelly Alternative Segments, View Looking North along the Little Delta River

South Common Segment

The South Common Segment would start at the southern end of the Donnelly alternative segments east of Delta Creek and continue towards the southeast to the Tanana River. This segment would cross four winter travel routes, but would not include any major river or paved road crossings. This segment would be isolated from viewpoints along the Tanana River, Richardson Highway, and other primary travel areas and KOPs (Figure 14-6). The visual contrast of this segment would be generally weak to none; therefore, SEA anticipates that the South Common Segment would meet the VRM Class II management objectives.

Figure 14-6 – South Common Segment, View from Recreational Trail

Delta Alternative Segments

The Delta alternative segments connect the southern end of the South Common Segment to the terminus south of Delta Junction. The two Delta alternative segments differ regarding visual impacts in that Delta Alternative Segment 2 would cross the Delta River much farther north than Delta Alternative Segment 1. Due to the longer extent of Delta Alternative Segment 2 on the populated east side of the Delta River, Delta Alternative Segment 2 would cross several more roads as well as farmland prior to reaching the southern terminus than does Delta Alternative Segment 1. Delta Alternative Segment 2 would include two grade separated crossings of Richardson and Alaska highways and one at-grade crossing of Old Richardson Highway as well as two additional at-grade crossings of less frequently traveled public roadways (Figure 14-7). Therefore, Delta Alternative Segment 1 would have less visual impact than Delta Alternative Segment 2. SEA anticipates that Delta Alternative Segment 2 and Delta Alternative Segment 1 would meet VRM Class II management objectives except for the Delta River and highway crossings, which both alternatives would have, resulting in strong contrast to some landscape elements.

14.3.3 Temporary Facilities

Temporary construction facilities or operations common to all alternatives include borrow areas, riprap and ballast sources, as well as temporary construction bridges, construction staging areas, and construction camps. Many of these temporary facilities would be positioned away from travel corridors, urban areas, or other frequently visited sites or would likely be hidden from

Figure 14-7 – Delta Alternative Segment 2, View Looking East along Jack Warren Road in Delta Junction

view at KOP sites because of screening by vegetation. While the temporary facilities would likely have a strong visual impact during construction if they were visible from KOPs, these facilities would be removed and the sites restored after construction is completed. The Applicant has stated that areas disturbed during construction would be returned to their preconstruction contours to the extent practicable, reseeded or replanted within one growing season following construction, and that seed mixtures would not contain known invasive plant species. SEA anticipates that the temporary facilities would meet VRM Class II management objectives following post-construction restoration.

14.3.4 No-Action Alternative

Under the No-Action Alternative, the proposed NRE would not be undertaken and there would be no project-related changes to the present conditions. Because there would be no changes, there would be no contrast with the existing landscape; therefore, visual management objectives would be met.

15. SOCIOECONOMICS

This section characterizes the socioeconomic resources within the project area that would be potentially affected by construction and operation of the proposed Northern Rail Extension (NRE). The description of socioeconomic baseline conditions and impacts focuses on the following specific resources:

- Demographic characteristics;
- Economy;
- Public facilities and services; and
- Communities and neighborhoods.

15.1 Applicable Regulations

The Council on Environmental Quality regulations for implementing National Environmental Policy Act of 1969 state that effects to be taken into account are “ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health” (40 Code of Federal Regulations (CFR) 1508.8). The regulations state that “economic or social effects are not intended by themselves to require preparation of an environmental impact statement” (40 CFR 1508.14). However, when “an environmental impact statement is prepared and economics or social and natural or physical environmental effects are interrelated, then the environmental impact statement will discuss all of these effects on the human environment” (40 CFR 1508.14).

15.2 Affected Environment

From a socioeconomic perspective, the project area encompasses the communities within the potential rail line and the potentially affected communities outside the rail line (Figure 15-1). To fully describe this broad area, three different geographic levels are used: (1) the communities directly along the proposed rail line, including North Pole, Eielson Air Force Base (AFB), Harding-Birch Lakes, Salcha, Delta Junction, and Fort Greely; (2) the Delta region, an unorganized area within the Southeast Fairbanks Census Area which includes Delta Junction, Fort Greely, Big Delta, Deltana, Dot Lake, Dry Creek, and Healy Lake as well as some communities along the proposed rail extension; and (3) the Fairbanks North Star Borough (FNSB).

15.2.1 Demographic Characteristics

Table 15-1 provides an overview of population trends in the project area. The populations of the Delta region and FNSB have been relatively stable in recent years. Fort Greely’s population has rebounded following redevelopment of the military base as a missile site for the National Missile Defense Program. Housing scarcity in the Delta region has accompanied the population growth at Fort Greely.

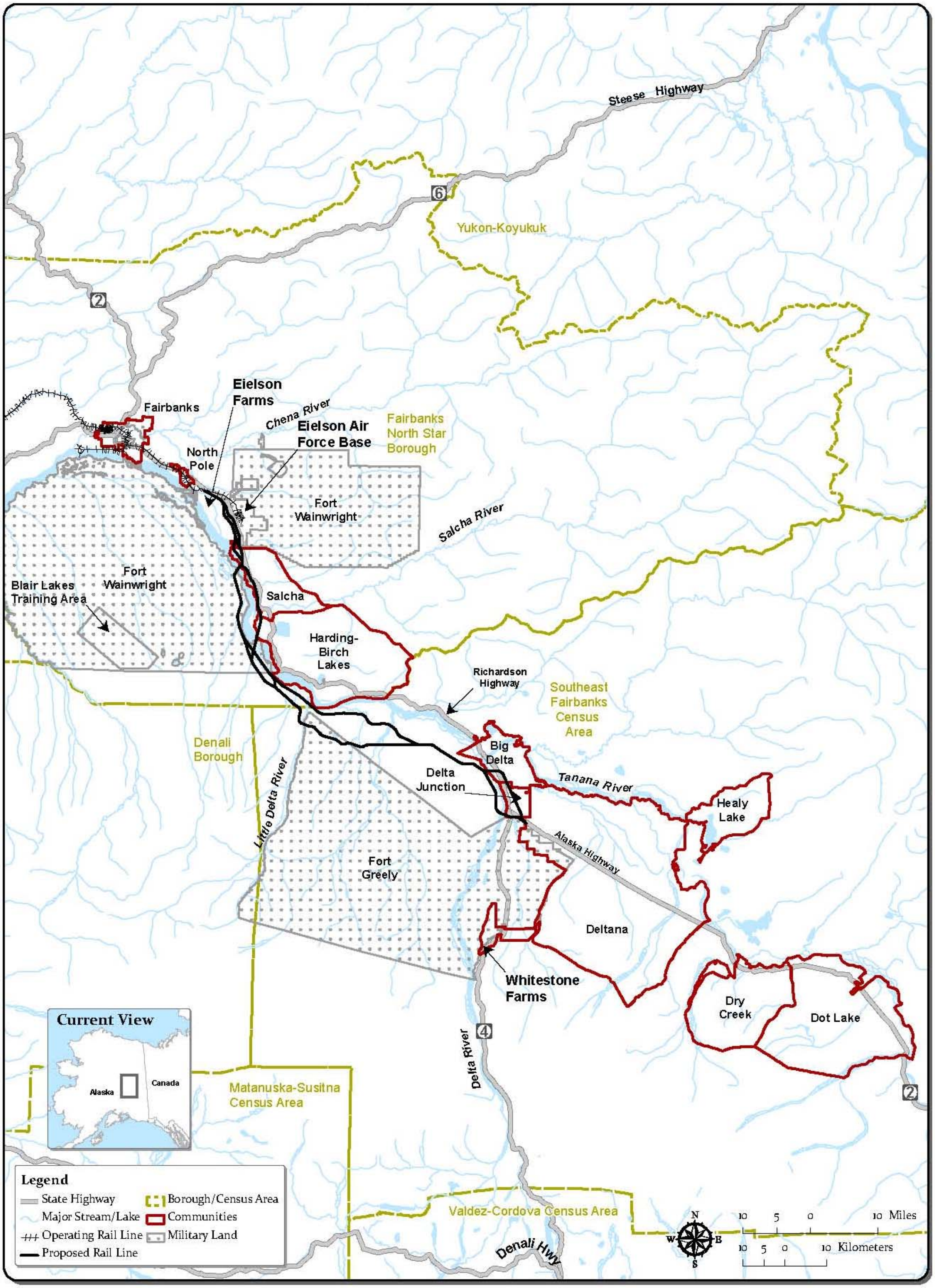

Figure 15-1 – Map of Socioeconomic Project Area

Table 15-1
Population in the Project Area, 2000–2006

	2006	2005	2004	2003	2002	2001	2000
Southeast Fairbanks Census Area	6,772	6,464	6,139	5,922	5,944	5,907	6,174
Delta Region	4,613	4,181	3,886	3,608	3,564	3,569	3,887
Big Delta	728	731	734	726	782	791	749
Delta Junction	1,039	988	947	961	886	876	885
Deltana	1,896	1,900	1,739	1,706	1,668	1,652	1,570
Dot Lake	32	25	28	29	18	25	19
Fort Greely	756	376	271	5	11	23	461
Healy Lake	46	28	33	33	42	39	37
Village of Dot Lake	22	32	32	39	34	31	38
Dry Creek	94	101	102	109	123	132	128
FNSB	87,849	87,608	85,398	82,160	84,753	83,282	82,840
Eielson AFB	4,447	4,548	4,676	4,433	5,840	5,152	5,400
Fairbanks	30,552	31,071	30,083	28,924	29,774	29,523	30,224
North Pole	1,710	1,599	1,528	1,602	1,601	1,469	1,570
Harding-Birch Lakes	245	241	244	218	206	196	216
Salcha	946	949	919	867	923	905	854

Source: Alaska Department of Labor and Workforce Development, Research and Analysis Section.

15.2.2 Economy

Over the past several decades the Alaska Highway, which connects Alaska to Canada and the continental U.S., and ends in Delta Junction, has helped the Delta region’s economy become more diversified in the military, oil transportation, highway tourism, and agriculture sectors. Currently, Fort Greely is the largest employer in the Delta region, followed by Teck-Pogo, Inc.—the operator of a large gold mine northeast of Delta Junction—and by the Delta/Greely School District. In addition, for more than 20 years the Delta region has been Alaska's second most productive agricultural region.

Fairbanks is inland Alaska’s largest urban and commercial center. In addition to serving as the region's transportation hub, Fairbanks is the economic, medical, educational, and cultural center. The economies of Fairbanks and surrounding communities have benefited from the strong military presence of Fort Wainwright and Eielson AFB, and also from the University of Alaska, Fairbanks. The economic role of the tourism industry continues to increase as Fairbanks grows as a tourism and business destination. Oil refineries in North Pole are major employers in the city and provide aviation fuel to Eielson AFB, Fort Wainwright, and Fort Greely, and diesel fuel to the central heat and power plant at Fort Greely.

15.2.3 Public Facilities and Services

Delta Junction is the only city government jurisdiction in the Delta region. Public services provided by the city extend to residents beyond the city’s boundaries and include solid waste collection, library, community center, and fire and rescue services. Police services are provided by Alaska State Troopers. Households in the Delta region have individual wells and septic systems. Electricity is provided by Golden Valley Electric Association, Inc., a nonprofit, member-owned cooperative that provides electrical service to FNSB, the Denali Borough, unincorporated areas within these two boroughs, and along Richardson Highway to Fort Greely. Health care services in the Delta region are limited to a small medical clinic, dental practice, and chiropractor. The Delta/Greely School District provides pre-kindergarten through grade 12 public education. The district currently operates seven schools. A private, K-12 school is operated by the local Whitestone Farms, a religious communal group near Big Delta, with a total enrollment of approximately 54 students.

Two incorporated cities are located within the FNSB, Fairbanks and North Pole. The cities provide police, fire, and emergency medical services to their residents and maintain streets and roads within city limits. Public services provided by FNSB are landfills, public transportation, libraries, parks and recreational and emergency services. The Borough also maintains, upgrades, and builds public works facilities, including schools in the Borough and roads within service areas. Two privately-held, publicly-regulated subsidiaries of Fairbanks Sewer & Water, Inc.—College Utilities Corp. and Golden Utilities Corp.—provide water and wastewater treatment services in the greater Fairbanks area. Fort Wainwright and North Pole have their own water systems and North Pole also has its own sewage treatment plant. Fairbanks is the location of Fairbanks Memorial Hospital and the Denali Center medical facilities. Fort Wainwright operates Bassett Army Community Hospital. The FNSB School District operates 33 schools throughout the Borough.

15.2.4 Communities and Neighborhoods

The Delta region is characterized by small communities, some with strong ties to the region. As in many rural towns in Alaska, the residents of the communities in the Delta region are dispersed over a wide area. A number of social groups based on religious affiliation are also present in the Delta region, including Whitestone Farms. The Fairbanks area can be characterized as a dense urban area rimmed by lower density suburban and semi-rural areas and communities that have close interaction with the urban center. Included in the FNSB portion of the project area is the Eielson Farm Community, which has evolved into a mixed agricultural, individual homestead and subdivision community.

15.3 Environmental Consequences

15.3.1 Methodology

The discussion of socioeconomic impacts addresses the potential direct and indirect effects of the proposed NRE and No-Action Alternative on selected demographic characteristics (housing), public facilities and services, economic activity, and communities and neighborhoods in the project area.

Direct effects on housing are assessed on the basis of whether or not an alternative affects housing availability or prices. Direct effects on public facilities and services are evaluated on the basis of changes in demand for education, public safety, utilities, or health care. The discussion of direct effects on economic activity includes changes in interregional accessibility; the ability to attract new and more intense development; changes in employment and gross economic output; and costs and benefits to transportation users and nonusers. Direct effects on communities and neighborhoods are assessed on the basis of whether an alternative changes existing patterns of travel or community interaction. Indirect effects on the socioeconomic environment are examined in terms of induced economic and residential development resulting from changes in access.

Data sources used in the analysis include construction cost and employment estimates for the Port MacKenzie Rail Extension prepared by Northern Economics Inc. (2007) for Alaska

Railroad Corporation (ARRC); the 2000 U.S. Census; freight tariffs published by ARRC (2006c); and personal communications with industry and government representatives. In addition, the socioeconomic analysis draws on effects described in Chapter 9, Noise; Chapter 11, Transportation Safety and Delay; Chapter 13, Land Use; and Chapter 14, Visual Resources in this environmental impact statement (EIS).

15.3.2 Common Impacts

In general, analysis of the socioeconomic effects of the proposed NRE differs from other resource analyses in this EIS because there are few measurable differences in effects among the build alternatives. This is because most socioeconomic effects would result from whether the project as a whole proceeds, and not from which specific build alternative may ultimately be authorized by the Surface Transportation Board. However, there are some socioeconomic impacts that do differ across alternative segments, including effects on communities and neighborhoods. These impacts are described for each alternative segment or group of alternative segments in Section 15.3.3.

For the purposes of this socioeconomic analysis, the proposed NRE would have two phases likely to result in impacts: construction and operations. This analysis assumes that the operations phase immediately follows the construction phase.

Construction Impacts

Effects on Employment and Gross Output

According to ARRC, the differences in construction costs across the build alternatives would not be significant. However, the timing of construction activities would differ depending on the construction scenario. Under a full construction scenario, construction would begin at both ends of the rail line, North Pole and Delta Junction and around the Delta River or Delta Creek crossing. ARRC anticipates that the project would be finished in 3 to 4 years. With a phased construction scenario, construction on the Tanana River bridge could start prior to rail line construction due to the long lead time needed for bridge spans and logistically because of the need to complete the bridge before construction on the west side of the Tanana River rail line could begin. Under this scenario, the Tanana River bridge could be constructed several months or years before the rail line would be constructed. With either a full construction scenario or a phased construction scenario, construction would be conducted throughout the year. Severe winters would limit winter-time construction to land-clearing activities, most bridge construction, and interior work associated with facility buildings.

An estimate of project construction costs was unavailable; therefore, Section of Environmental Analysis (SEA) based project construction costs on ARRC's conceptual cost estimate for the Port MacKenzie Rail Extension prepared by Northern Economics, Inc. (2007). This estimate translates to $6.43 million on a cost per rail mile basis, including construction management and engineering costs; right-of-way (ROW) costs; the costs of constructing the railbed, tracks, bridges, culverts, and grade crossings; and the costs of installing signal and safety devices. Applying this cost per rail mile estimate to the approximately 80-mile long proposed NRE yields a cost estimate of $514.3 million. The construction of a passenger depot facility would increase the estimated total expenditures to $518.8 million, assuming the cost of the facility is comparable to that of the Denali National Park Rail Station (Parmalee, 2002). The total expenditures would be lower if a smaller scale passenger station is constructed.

An estimate of employment during the construction phase of the project was unavailable; therefore, SEA based the number of temporary jobs created by onsite construction activities on an economic study of the Port MacKenzie Rail Extension (Northern Economics, Inc., 2007).[1] Assuming that the number of construction jobs created is proportional to the construction cost of the rail extension, it is anticipated that the Northern Rail Extension would generate from 3,200 to 3,600 direct full-time and part-time jobs during the 3 to 4 year construction period.[2]

The geographic distribution of project expenditures and employment creation would depend on the location of firms supplying the labor and materials needed on the project. While some of the design and engineering services could be performed at offices outside Alaska, and materials such as steel rails, rail line ties, and signal and safety devices could be sourced outside of Alaska, the majority of expenditures would be made in Alaska. Based on the estimated percentage of in-state expenditures for the Port MacKenzie Rail Extension presented in Northern Economics Inc. (2007), it is assumed that 70 percent, or $363.2 million, of the total project construction expenditures would be made in Alaska.[3]

The concentration of major engineering, construction, and manufacturing firms in Fairbanks makes it probable that this city would benefit from some of these construction period expenditures. However, given the limited pool of labor in the project area, the majority of the construction workers would likely move to the project area on a temporary basis from other regions of Alaska. Some workers from outside Alaska may also be employed, but this number would likely be low because the size and diverse skill set of Alaska's workforce is sufficient to minimize the need for workers from outside the state.

The direct in-state project expenditures on labor, goods and services would initiate subsequent rounds of income creation, spending and re-spending, producing a multiplier effect on Alaska's economy. Contractors, vendors, and manufacturers receiving payment for goods or services required by the project would, in turn, be able to pay others who support their businesses. In addition, persons directly and indirectly employed by the project would generate additional jobs and income in the economy as they purchase consumer goods and services to meet household needs. SEA estimated the multiplier effect of in-state construction expenditures of the proposed NRE using output and employment multipliers calculated for the Port MacKenzie Rail Extension by Northern Economics Inc. (2007).[4] Based on an output multiplier of 1.85, it is estimated that the total impact of project construction expenditures on gross output (total sales) in the Alaska economy would be approximately $670 million. Based on an employment multiplier of 1.83, the

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[1] According to Northern Economics Inc. (2007), the estimates of expenditures and jobs for the Port MacKenzie Rail Extension were based on information from previous studies, personal interviews, rule-of-thumb engineering estimates, IMPLAN data, and cost data from other similar facilities.

[2] Because jobs are generated by project expenditures, the number of jobs created each year would be roughly proportional to the dollar amount spent each year.

[3] The estimated percentage of in-State expenditures for the Port MacKenzie Rail Extension was based on information regarding the cost of steel rail, culverts, and other materials and equipment that would be needed to be imported into the State for the project. These same construction cost items would be imported for the Northern Rail Extension.

[4] Multipliers reflect changes in the State's economy resulting from project construction and operation costs. If it is assumed that the percentage of expenditures made within the State is the same for the two rail extension projects, the multipliers should be similar. According to Northern Economics Inc. (2007), the multiplier economic effects of the Port MacKenzie Rail Extension were evaluated using 2004 IMPLAN data. The aggregate coefficients and multipliers used for that project are applicable for the Northern Rail Extension, as these values tend to change slowly over time.

estimated total number of full-time and part-time jobs created during the construction phase of the project, including direct and secondary jobs, would be between 5,900 and 6,600.

The proportion of the total output and employment that would accrue to businesses in the project area would be small. As noted above, most of the firms supplying the labor and materials that would be needed on the project are located outside the project area. In addition, the majority of construction workers would be housed in construction camps. These camps would be self-sustaining, with their own sleeping quarters and cooking areas, and therefore the direct interaction between workers in camps and local businesses would be minimal. To the extent that construction crews spend money in local hotels, restaurants, and shops, the effect of these expenditures on retailers would be concentrated in the Fairbanks area because there are few retail outlets in the Delta region communities. The effect on business activity in the Fairbanks area would be positive, though low in relation to the overall economy of the area.

Effects on Housing

The effects of project construction on housing in the project area would be minimal because the majority of construction workers would be housed in construction camps. Moreover, a portion of the workforce would be composed of people who already live in the area. They would place no additional demands on local housing.

While a project of this scale might be expected to attract some dependent family members, as well as the construction workers themselves, it is likely that that the ratio of dependents to workers would be low. Those outside workers bringing dependents with them would likely house them in Fairbanks. To the extent that there is an increase in the local population arising from the in-migration of construction personnel and their families, there would be increased demand in the local housing market. The housing demand spike created by the construction-related population would be temporary and would ease after 3 or 4 years. The availability of housing in the Fairbanks area as well as construction camp housing would determine the effect on the local housing market as employment scales up. The number of housing units in the Fairbanks area is large compared to any potential increase in demand that would occur during the construction phase of the proposed NRE. With a population of approximately 87,000 residents, the FNSB has a housing stock of over 33,000 units according to the U.S. Census statistics for 2000.

Effects on Public Facilities and Services

The effects of project construction on public services in the project area would be minimal. Ongoing coordination with utility providers would need to be conducted by ARRC during the preliminary engineering, final design, and construction phases of the proposed NRE to identify any potential conflicts and formulate strategies to overcome potential problems. To the extent that any utility effects could occur, they would need to be scheduled by ARRC to minimize disruptions in duration and geographic expanse. Adjacent properties would need to be notified by either ARRC or the utility prior to any temporary changes to utility service.

Most of the construction labor force would be housed onsite in construction camp housing. Moreover, a portion of the workforce would place no additional demands on local public services because it would be composed of people who already live in the area.

Only a very small number of dependents of construction workers drawn from outside the region would likely relocate to the project area. Therefore, there would be only a small additional enrollment in the local school district as a result of the construction phase of the project. The additional enrollment would not have a significant effect on the resources of the local school district. The medical facilities in the Fairbanks area are adequate to handle any increased demand that could result from population growth during the construction phase of the project.

The main fiscal effect arising from the construction phase would be from the bed tax generated by construction workers staying at hotels in Fairbanks. Delta Junction, the only municipality in the Delta region with tax-raising powers, does not levy a bed tax. Negative fiscal effects arising from construction activities would be limited to the potential for increased demands on the public safety services of fire, police, and ambulance. Given that the population growth resulting from the construction phase of the proposed project is expected to be small, the fiscal effects would be negligible.

Operations Impacts

Effects on Employment and Gross Output

An estimate of project operation and maintenance costs was unavailable; therefore, SEA based the annual cost of operating and maintaining the proposed NRE on the cost estimate for the Port MacKenzie Rail Extension presented in Northern Economics Inc. (2007). Assuming that the operation and maintenance costs are proportional to the length of the rail extension, it is anticipated that the annual in-state operation and maintenance costs for the proposed NRE would be about $2.8 million to $3.7 million including the maintenance costs for track, bridge structures, and the railbed.

According to ARRC, operation and maintenance for the proposed NRE would increase ARRC employment by six to ten full-time employees. There are existing maintenance facilities in the area that could accommodate the new line, so the majority of new employment created during the operations phase would likely be drawn from the labor pool in the Fairbanks area. Given the large size of the Fairbanks labor pool, the impact of the additional jobs created by project on this pool would be negligible.

SEA estimated the multiplier effect of in-state operation and maintenance expenditures using output and employment multipliers calculated for the Port MacKenzie Rail Extension by Northern Economics Inc. (2007).[5] Based on an output multiplier of 1.83, it is estimated that the total impact of the operation and maintenance expenditures of the NRE on gross output (total sales) in the Alaska economy would be $2.7 to $3.7 million per year. Based on an employment multiplier of 1.87, the estimated total number of jobs created during the operations phase of the project, including direct and secondary jobs, would be between four and seven per year.

Effects on Housing

The majority of the new employment created during the operations phase is likely to be drawn from the labor pool in the Fairbanks area. Therefore, there would not be an influx of workers that would require additional housing.

Effects on Public Facilities and Services

Since the majority of the new employment created during the operations phase would likely be drawn from the labor pool in the Fairbanks area, the new employment would place a negligible additional demand on public facilities and services.

[5] See Footnote 4.

Effects on Transportation System Users and Nonusers

Transportation investments can have a direct effect on economic activity by reducing travel time or cost and improving accessibility within or among regions. The proposed NRE would introduce a new mode of transportation into the Delta region and thereby provide the prospect of a higher level of transportation service for those businesses and travelers who would use the rail extension. The proposed NRE could also potentially reduce congestion on Richardson Highway by removing some military convoys.

While difficult to predict, the changes in travel costs and accessibility attributable to the proposed NRE could, in turn, contribute to economic growth and development by allowing time and money previously spent on travel to be used for other purposes, attracting businesses and residents to places with increased accessibility or improved quality of life, and reducing overall costs to society. The population and employment growth that result, together with the effects of that growth, comprise the induced or indirect effects of transportation investments. These effects, which are beyond those directly attributable to the changes in the transportation system, are considered indirect effects and are discussed in the section on regional effects.

Regional Development Effects

Industry representatives were contacted by SEA and asked how they thought changes in access resulting from the proposed NRE might affect economic growth in the Delta region, especially in the agriculture, mining, and tourism sectors. The strong consensus was that the proposed NRE is not likely to be a determining factor in the decision to move forward with initiatives in these sectors. While the improved accessibility provided by the rail extension could in some measure facilitate additional industrial and commercial activity in the Delta region, other factors would likely be key determinants of future economic growth in the region.

With respect to agricultural development, rail service to the Delta region could supply a lower-cost alternative for transporting some types of agricultural commodities, such as feed grains. Between 2007 and 2009, about 10,000 acres of private land in the Delta region are expected to be removed from the Natural Resource Conservation Service/U.S. Department of Agriculture (NRCS/USDA) Conservation Reserve Program and possibly be returned to production (Hadley, 2007). Farmers have the option of reenrolling the land in the program. However, it is uncertain if the in-state market would support additional grain production, especially given the doubtful future of the Matanuska Maid Creamery (Hadley, 2007; Hamilton, 2007; Kaspari, 2007). The State of Alaska operated this state-owned processing plant from the mid 1980s until the creamery was closed in November of 2007. After its closure, the creamery was transferred to private hands and resumed operation in early 2008; however, the long-term sustainability of the creamery is not certain. A potential future closure of Matanuska Maid would jeopardize the economic viability of the major in-state buyers of Delta-grown grain such as the Port MacKenzie dairy farms (Kaspari, 2007). On the other hand, the prospect of a shrinking Alaska market, combined with current strong prices for barley and oats, has led to renewed interest in exporting Delta-grown grain to outside markets via railcar-barge service (Geier, 2007; Kaspari, 2007). The profitability of exporting grain from Alaska will depend on whether current high grain prices continue and whether Alaska grain production increases to achieve economies of scale (Geier, 2007). Use of the proposed NRE to transport large quantities of grain would require the construction of adequate handling and loading/offloading facilities at the Delta Junction terminus.

The rail extension could provide an alternative travel experience for tourists, thereby possibly enhancing Delta Junction's position as a tourism destination. However, it is difficult to predict whether the visitor services, tours, and accommodations required for expansion of Delta Junction's tourism industry would materialize (Hickok, 2007; Lane, 2007).

It is possible that future mining operations for base minerals (*e.g.*, zinc, coal) that are transported in bulk to smelters outside Alaska for processing might benefit from the proposed NRE. It is unlikely that future mining operations for precious metals such as gold and silver would benefit from the rail extension because the amount of product transported from these mine sites is relatively small (Hanneman, 2007).

The indirect effect of rail line operations on population growth and demand for public services in the Delta region is difficult to predict. The improved accessibility that would result from the proposed NRE, in combination with the significant difference in the price of housing in the Delta region compared to the Fairbanks area, could induce some households to move to the Delta region while continuing to work in Fairbanks. However, the increase in commuters is limited by the number of Fairbanks jobs that pay enough to support the cost of a commute. To the extent that the proposed NRE increases the attractiveness of living in the Delta region, an increase in the region's population would increase demand for public services. Offsetting the costs associated with the increase in demand, a higher population would also bring with it some increase in revenue from user fees and population-based revenue sources such as municipal assistance. In addition, school funding is based in part on enrollment; therefore, additional school-age children would bring with them additional state foundation formula funding.

No-Action Alternative

Under the No-Action Alternative, ARRC would not construct an extension of the existing rail line or construct the dual-modal bridge over the Tanana River to transport commercial freight, military supplies, or passengers. Consequently, the No-Action Alternative would have no effect on socioeconomic resources in the project area.

15.3.3 Impacts by Alternative Segment

Effects of Displacement and Relocation

All displacement and relocation activities that occur as a result of the proposed action would be conducted in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Uniform Act). The Uniform Act ensures the fair and equitable treatment of persons whose real property is acquired or who are displaced as a result of a Federal or federally-assisted project. Government-wide regulations provide procedural and other requirements (appraisals, payment of fair market value, notice to owners, etc.) in the acquisition of real property, permanent easements, and temporary easements and provide for relocation payments and advisory assistance in the relocation of persons and businesses.

Construction of Salcha Alternative Segment 2 would require the relocation of the Salcha Elementary School in Salcha. This is the smallest school in the FNSB School District, with an average enrollment for the 2006-2007 school year of 100 in grades K–6 and a regular staff of five certified teachers and three full-time classified employees (Fairbanks North Star Borough School District, 2007). The cost of building a new school of comparable size is estimated to be $7 million to $10 million, not including the cost of land purchase (Kito, 2007). Along Salcha Alternative Segment 1, several residences within the ROW would likely be permanently displaced. This segment would also cross the Salcha Airstrip east of the Tanana River. SEA currently assumes that construction of the rail line would prevent continued use of the airstrip in its present location. See Chapter 13 for estimates of general land use and property impacts for each alternative.

Effects on Communities and Neighborhoods

Eielson Alternative Segment 1 would result in the loss of approximately 2 acres of farming surface area from the Eielson Farm Community, but this small amount of commercial displacement would not change existing patterns of travel or social interaction within the Eielson Farm Community and would have a negligible effect on agricultural output, the livelihoods of the affected farmers, and the economy of the Eielson Farm Community as a whole.

Salcha Alternative Segment 1 and the staging area and access road on the east side of the Tanana River would affect approximately 25 to 30 residences. Most of these effects would be temporary because the area could be restored after construction and original land use could be re-established, but effects on several residences within the ROW would be permanent. Salcha Alternative Segment 2 would temporarily affect approximately 150 homes or businesses. Salcha Alternative Segment 2 would also require relocation of Richardson Highway. As more fully described in Chapter 11, the new segment of road would be built first, then the switch would take place, and traffic would be rerouted with minimal disruption to existing travel patterns.

The effects of all alternatives on community cohesion would be minimal. As more fully described in Chapter 11, the proposed NRE would not interfere with the accessibility of facilities and services within any of the communities along the rail line, and would only have limited and minimal delays on grade crossings, roadway transportation, and rail traffic. In addition, nearly all segments near residential areas are in or adjacent to an existing transportation alignment (roadway), reducing the potential for creating new divisions of existing communities.

16. ENVIRONMENTAL JUSTICE

This chapter presents the Section of Environmental Analysis (SEA) analysis of the effects of potential environmental impacts on low income and minority populations that would be expected from construction and operation of the proposed Northern Rail Extension (NRE). Section 16.1 describes applicable regulations. Section 16.2 describes the affected environment. Section 16.3 describes the impact assessment methodology and impact conclusions.

16.1 Applicable Regulations

Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*, directs Federal agencies to:

> [P]romote nondiscrimination in Federal programs substantially affecting human health and the environment, and provide minority and low income communities access to public information on, and an opportunity for public participation in, matters relating to human health or the environment.

EO 12898 also directs agencies to identify and consider "disproportionately high and adverse" human health or environmental effects of their actions on minority and low income communities, and provide opportunities for community input in the National Environmental Policy Act (NEPA) process, including input on potential effects.

After the issuance of EO 12898, the Council on Environmental Quality (CEQ) prepared *Environmental Justice Guidance Under the National Environmental Policy Act* to assist Federal agencies in meeting their environmental justice commitments under NEPA (CEQ, 1997). This guidance provides the following definitions of the terms "minority" and "low income community" in the context of environmental justice analysis. Minority individuals are members of the following population groups: American Indian or Alaska Native, Asian or Pacific Islander, Black, and Hispanic. A low income community is one found to be below the poverty thresholds from the Bureau of the Census. CEQ has oversight for the Federal Government's compliance with EO 12898 and the NEPA process, with the U.S. Environmental Protection Agency (USEPA) serving as the lead agency responsible for implementation of the EO.

The Surface Transportation Board (STB or the Board) has not issued rules or guidance specifically addressing environmental justice.

While EO 12898 applies to agencies such as the Bureau of Land Management (BLM), it technically does not apply to independent agencies like the Board. Nonetheless, SEA has evaluated the potential for high and adverse impacts to determine if they would be borne disproportionately by minority or low income communities.

16.2 Affected Environment

The region of influence for environmental justice encompasses the regions of influence for the other resource areas that could potentially affect minority and low income populations. The administrative areas that contain these populations are the Southeast Fairbanks census area, the Fairbanks North Star Borough, and more specifically the communities along the alternative rail segments (see Figure 15-1 for a visual representation of communities within the region of influence).

16.2.1 General Population Characteristics for the Project Area

Under the proposed action, the Alaska Railroad Corporation (ARRC) would build and operate a new rail line south of the community of North Pole and ending south of the community of Delta Junction. Tables 16-1 and 16-2 list year 2000 demographic data for Alaska, the Southeast Fairbanks census area, the Fairbanks North Star Borough, and nine communities that are crossed by or directly adjacent to the proposed NRE. The communities and residences in the Fairbanks North Star Borough portion of the project area are low density, suburban areas rimming the communities of Fairbanks, North Pole, and Eielson Air Force Base (AFB), or rural agricultural and subdivision communities. These areas have smaller than state or Borough average minority populations and higher than state average low-income populations (see Tables 16-1 and 16-2). The communities in the Southeast Fairbanks census area portion of the project area are small, sparsely populated communities with residences dispersed over a wide area. These communities generally have lower than state or Census Area percentages of minorities and higher than state percentages of low-income residents.

16.3 Environmental Consequences

16.3.1 Methodology

SEA established a sequential five-step methodology to evaluate environmental justice impacts. Some of these steps were not triggered because the conditions for further analysis were not met.

- Step 1: SEA would identify the high and adverse health and environmental impacts of the proposed action and alternatives.
- Step 2: If high and adverse health and environmental impacts were identified, SEA would identify the environmental justice populations located in the project area.
- Step 3: SEA would assess whether the high and adverse health and environmental impacts would affect environmental justice populations.
- Step 4: If high and adverse health and environmental impacts would occur to environmental justice populations, SEA would define the spatial distribution of these populations relative to the area of effect for the identified impact.
- Step 5: SEA would assess environmental justice populations relative to the identified area of effect to determine whether the high and adverse impacts would be disproportionately borne by these populations.

16.3.2 Analysis of Impacts

For Step 1, SEA assessed whether any high and adverse health or environmental impacts to human populations would occur as a result of the proposed NRE. SEA identified no potential high and adverse impacts to human populations in the project area. Chapters 3 through 15 and 17 through 19 of the EIS contain the analyses SEA used to reach this conclusion.

Table 16-1
Demographics in the Project Area by Location, 2000

		Percent of Total Population								
	Total Population	**White**	**Black or African American**	**Alaska Native or American Indian**	**Asian**	**Native Hawaiian & Other Pacific Islander**	**Some Other Race**	**Two or More Races**	**Hispanic or Latino[a]**	**Minority Population[b]**
Alaska	626,932	69.3	3.5	15.6	4.0	0.5	1.6	5.6	4.1	32.4
Southeast Fairbanks Census Area	6,174	79.0	2.0	12.7	0.7	0.1	0.7	4.8	2.7	22.6
Delta Region										
Big Delta	749	95.5	0.1	1.5	0.5	-	-	2.4	2.5	7.1
Delta Junction	840	91.4	1.1	4.0	1.0	-	0.1	2.4	0.8	9.3
Fort Greely	461	65.7	19.7	1.3	1.3	2	3.7	6.3	15.4	42.3
Fairbanks North Star Borough	82,840	77.8	5.8	6.9	2.1	0.3	1.7	5.4	4.2	24.0
Fairbanks	30,224	66.7	11.2	9.9	2.7	0.5	2.4	6.6	6.1	35.8
Eielson AFB	5,400	81.7	9.4	0.6	2.1	0.2	2.1	3.9	5.8	20.5
Harding-Birch Lakes	216	93.5	-	-	-	-	1.4	5.1	0.5	6.9
Moose Creek	542	88.4	3.7	2.2	1.3	0.4	0.9	3.1	3.0	12.9
North Pole	1,570	81.0	5.7	3.6	2.6	0.4	1.1	5.6	3.8	20.6
Salcha	854	87.8	1.6	3.9	0.9	0.2	1.3	3.9	2.8	13.3

Source: U.S. Census Bureau, 2000.

[a] Individuals who identify as Hispanic, Latino, or Spanish may be of any race; the sum of the other percentages under the "Percent of Total Population" columns plus the "Hispanic or Latino" column therefore do not equal 100 percent.

[b] Minority population, for the purposes of this analysis, is the total population for the U.S. Census designated place minus the non-Latino/Spanish/Hispanic white population.

Table 16-2
Individuals and Families below the Poverty Level in the Project Area: Number and Percentage of Population by Location, 1999

	Families		Individuals	
	Number in Poverty	Percentage of Total Population	Number in Poverty	Percentage of Total Population
Alaska	10,270	6.7	57,602	9.4
Southeast Fairbanks Census Area	183	12.4	1140	18.9
Delta Region				
Big Delta	10	7.9	197	30.0
Delta Junction	23	12.3	163	19.4
Fort Greely	14	11.6	45	10.4
Fairbanks North Star Borough	1,137	5.5	6,206	7.8
Fairbanks	538	7.4	3,002	10.5
Eielson AFB	72	5.1	310	6.0
Harding-Birch Lakes	-	-	-	-
Moose Creek	20	11.0	54	9.4
North Pole	23	6.2	139	8.7
Salcha	-	-	31	3.9

Source: U.S. Census Bureau, 2000.

As a result of this absence of high and adverse impacts to human populations, Steps 2 through 5 of SEA's impact assessment methodology were not conducted.

16.3.3 No-Action Alternative

The No-Action Alternative would involve the continued use of existing rail lines at current levels and the continued transport of people and cargo via road (see Chapter 2). This alternative would result in no change to health or environmental conditions and would, therefore, cause no new impacts to environmental justice populations.

17. CUMULATIVE IMPACTS

This chapter describes potential cumulative effects of the Northern Rail Extension (NRE) project. This cumulative effects analysis was based on findings from the environmental and community resources analyzed in the Environmental Impact Statement (EIS).

The Surface Transportation Board (STB or the Board) Section of Environmental Analysis (SEA) collected and reviewed information on relevant past, present, and reasonably foreseeable future projects and actions that could result in impacts in the same area as the proposed rail extension. For those identified relevant projects, SEA identified where there could be cumulative impacts.

17.1 Applicable Regulations

The Council on Environmental Quality (CEQ) regulations that implement the National Environmental Policy Act (NEPA) define cumulative effects as "the impact on the environment which results from the incremental consequences of an action when added to the past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions" (40 CFR 1508.7). To assist Federal agencies in assessing cumulative impacts under NEPA, CEQ developed a handbook entitled *Considering Cumulative Effects under the National Environmental Policy Act*. SEA followed these guidelines in its evaluation of whether past, present, and reasonably foreseeable future projects in the area of the proposed action would, when combined with the potential impacts of the construction and operation of the proposed rail line, cumulatively result in environmental impacts.

17.2 Affected Environment

The project area is in the Fairbanks North Star Borough (FNSB) of Alaska and the adjacent Southeast Fairbanks Census Area. The proposed rail line would extend between the towns of North Pole and Delta Junction. The area is relatively rural, with several large military facilities nearby. Much of the proposed rail line would parallel the Tanana River, a large tributary of the Yukon River, and would also roughly parallel Richardson Highway, one of the major highways in Interior Alaska. Eielson Air Force Base (AFB) is in the northern portion of the project area and Fort Greely is adjacent to Delta Junction at the southern end of the project area. On the western side of the Tanana and Delta Rivers are two military training areas, the Tanana Flats and the Donnelly West training areas (TAs). The Tanana River Basin is composed of generally flat bottomlands and a prevalence of spruce and hardwood forests, with riparian features such as meandering rivers, side sloughs, and oxbow lakes. There is recreational boating on the river in the summer, snowmachining and dog-sledding along certain sections in the winter, and there are state recreation areas nearby.

Existing conditions reflect past and present projects. The area around the proposed NRE has been experiencing gradual incremental development. Activities such as military activity, resource extraction and transportation, population growth and supporting infrastructure development have all contributed to the current environmental conditions.

17.3 Methodology

The cumulative effects of an action might be undetectable when viewed in the individual context of general impacts, but they can add to other disturbances and eventually lead to a measurable environmental change. Cumulative effects should be evaluated along with the overall impacts analysis of each alternative. The range of alternatives considered should include the No-Action Alternative as a baseline against which to evaluate cumulative effects. CEQ recommends that an agency's analysis accomplish the following:

- Focus on the effects and resources within the context of the proposed action.
- Present a concise list of issues that have relevance to the anticipated effects of the proposed action or eventual decision.
- Reach conclusions based on the best available data at the time of the analysis.
- Rely on information from other agencies and organizations on reasonably foreseeable projects or activities that are beyond the scope of the analyzing agencies purview.
- Relate to the geographic scope of the proposed project.
- Relate to the temporal period of the proposed project.

In general, a cumulative effects analysis involves assumptions and uncertainties.

17.3.1 Collect and Screen Project Data

SEA researched and collected information on other future projects/actions that could have effects that coincide in time and space with the potential effects from the proposed NRE. SEA conducted interviews of appropriate personnel (key personnel from project proponent offices and/or agencies) to identify various past, present and reasonably foreseeable future projects. SEA then reviewed analyses and information about those projects to identify which projects should be included in the cumulative impacts analysis and/or as part of each resource analysis. SEA then applied a screening process to determine if projects were reasonable, foreseeable, and could be associated with potential cumulative impacts. Section 17.4 identifies those projects.

17.3.2 Evaluate Potential Cumulative Impacts

SEA evaluated the cumulative impacts for situations where planned or reasonably foreseeable future projects would overlap with the proposed NRE in terms of geographic area and/or timeframe. A discussion of potential cumulative impacts, by resource, is included later in this chapter.

17.4 Potential and Relevant Projects

The following section describes projects SEA reviewed for potential inclusion in this cumulative effects analysis. Projects are categorized into two groups—projects that are relevant and should be included in this analysis, and projects that were reviewed but were deemed inappropriate for this cumulative effects analysis. Brief explanations of those projects and/or actions are included below, including the rationale for why some projects were excluded from analysis.

17.4.1 Projects Considered in this Analysis

The projects listed below could have common potential actions and impacts and would occur within or near the proposed NRE project area and during a similar period. Also included are references to identified environmental analyses for those projects.

Military Activities

The proposed NRE would run from near North Pole and Eielson AFB to Delta Junction and would go through the Tanana Flats and the Donnelly West TAs.

At present, access to the Donnelly West TA and Tanana Flats TA is restricted by the Tanana River and Delta River. There are no permanent bridges across these rivers in the area of the proposed rail extension. In the winter, the U.S. Army and U.S. Air Force construct ice bridges to transport vehicles, troops, and supplies to the training areas. The U.S. Army and U.S. Air Force also access these training areas by helicopters, planes, or boats when ice bridges are not available (USARAK, 2004).

U.S. Army Alaska (USARAK) has experienced more than 120-percent growth in assigned troop strength since fiscal year 2003 and is projected to continue to expand through fiscal year 2013 (Shutt, 2007). As USARAK grows the force in both numbers and capabilities, increases in collective training requirements are anticipated to result in additional training area usage. Gaining year-round ground access to the more than 1 million acres of training land in the Tanana Flats and Donnelly West TAs could contribute to providing safe and multi-spectrum training for forces training in Alaska.

The Tanana Flats and Donnelly West TAs are notable components of the ongoing growth in training infrastructure in the Pacific Alaska Range Complex. A combined vehicle and rail bridge providing access across the Tanana River could facilitate continuing range, trail, and training area infrastructure and maintenance improvements. The U.S. Department of Defense (DoD) Alaska Command (ALCOM) (Joint Headquarters) supports this requirement as a Joint Initiative (Shutt, 2007). As changes in force structure necessitate planning for increased training in the Tanana Flats and Donnelly West TAs, ALCOM will ensure that an assessment is prepared of the potential environmental impacts of future expansion of DoD training requirements.

Other military-related projects that could have an effect on the environment in the area of the proposed NRE include:

- Construction of new range complexes[1] at Donnelly East TA to enhance training capabilities: The U.S. Army's Record of Decision (ROD) documents selection of the Eddy Drop Zone alternative, located approximately 1.8 miles southeast of the terminus of the proposed NRE. The ROD identified significant environmental impacts for fire management/fire risk hazard; cultural resources, and public access and recreation. Positive impacts to socioeconomics were also identified.
- Construction of new facilities at Donnelly West TA; and
- Replacement and upgrade and upgrade of a rail loading facility at Fort Wainwright. The U.S. Army Garrison Alaska (USAG Alaska) published an Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) in August 2007, concluding that there would be minor impacts to air quality, soils, water resources, biological resources and transportation and minor cumulative impacts to those resources as well as hazardous materials, waste and socioeconomics. With mitigation, a FONSI was issued.

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[1] The new range facilities are a Battle Area Complex (BAX) and a Combined Arms Collective Training Facility (CACTF). These facilities will enable the U.S. Army units to be trained to higher skill levels than can be attained with current facilities. Environmental impacts caused by the construction and use of these facilities are described and analyzed in a Supplemental EIS prepared by the Army in April 2006.

Alaska Natural Gas Pipeline

Federal Energy Regulatory Commission (FERC), the regulatory and licensing agency for a natural gas pipeline in Alaska, cited substantial progress in its Sixth Report to Congress on development of that pipeline. As of August 2008, two groups are moving forward through development stages.

- In August 2008, TransCanada Alaska was issued a license by the state under the Alaska Gasline Inducement Act (AGIA).
- In June 2008, the Alaska Gas Pipeline, LLC, pre-application filing with FERC was accepted. Alaska Gas Pipeline, LLC, a British Petroleum/ConocoPhillips consortium, expects to file a completed application in August 2011.

If completed, this natural gas pipeline could follow a portion of the TransAlaska petroleum pipeline and run nearly 3,500 miles to Tok and possibly to Calgary. The exact route is under consideration, but may run through North Pole to Delta Junction (ConocoPhillips, 2007). In its AGIA license application, TransCanada indicated that the gas pipeline route could generally follow the TransAlaska Pipeline System (TAPS). While all parties currently involved in competing for this project indicate that a natural gas pipeline could run through the area of the proposed NRE within or near the existing TAPS right-of-way at this time, the exact location is not known. In their November 2002 Final EIS on *Renewal of the Federal Grant for the Trans-Alaska Pipeline System Right-of-Way*, the BLM concluded that no major synergistic effects were identified in their cumulative impacts analysis (BLM, 2002).

Richardson Highway Upgrades

The Alaska Department of Transportation and Public Facilities (ADOT&PF) continually performs upgrades to segments of Richardson Highway, including roadway resurfacing and projects to add access and passing lanes. Substantial upgrades are likely to continue along the length of Richardson Highway to accommodate development and substantial infrastructure projects such as the Alaska Natural Gas Pipeline (ADOT&PF, 2008b). In addition, under the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), the Fairbanks-Yukon International Corridor, consisting of portions of the Alaska Highway and Richardson Highway from the international border with Canada to Fairbanks, was designated a High Priority Corridor (Corridor 67) (FHWA, 2006). This designation is likely to be associated with investments in improving the Richardson Highway over the long-term.

Specific projects in the 2006- 2009 Statewide Transportation Improvement Program (ADOT&PF, 2008d), and their environmental review status if known, include:

- MP 357 Fairbanks New Weigh Station (environmental review in progress);
- MP 350 Badger Interchange ramps and improvements (categorically excluded from detailed environmental analysis);
- MP 348 North Pole Interchange improvements (environmental assessment completed with resulting Finding of No Significant Impact); and
- Northern Region Pavement and Bridge Rehabilitation program.

For construction beyond 2009, ADOT&PF has four projects with an estimated cost of $30 million under design for the portion of the Richardson Highway between Delta Junction and

Fairbanks. These projects involve bridge replacements at Jarvis and Shaw creeks and roadway reconstruction and improvements at other locations (ADOT&PF, 2008a).

Typically, Richardson Highway upgrade projects occur within the footprint of the existing highway and are categorically excluded from detailed environmental impacts analysis because of limited environmental impacts (AKDOT&PF, 2008).

17.4.2 Projects Considered but not Analyzed in Detail

The following projects and activities were considered for their potential for cumulative impacts; however, the relationship and synergy among them and the proposed NRE and any resultant cumulative impacts are so limited or are non-existent at this time that no further analysis was considered useful or necessary. SEA believes that the projects listed could happen in the future and should be noted, but that these projects are not considered reasonably foreseeable at this time and are considered speculative due to uncertain or lack of funding, or are supported only by non-specific or conceptual plans.

Alaska-Canada Rail Link

This proposed rail link would involve approximately 1,600 miles of new rail line to connect ARRC's rail network to the existing Canadian railroad system to facilitate increased mining development, visitor and resident travel, and open a new trade route to Asia (Government of Canada and Anchorage Consulate, 2008). An initial feasibility study was completed in June of 2007 and it is likely that additional studies will be conducted (State of Alaska and Yukon Government, 2007). Although the State of Alaska and Yukon territorial governments continue to explore the concept of extending Alaska's railroad track (including from Delta Junction), this project has been discussed for decades, is in the early planning phases, and is currently unfunded. Therefore, near-term progress is not anticipated.

Closure of Agrium's Kenai Peninsula Nitrogen Operations

By September 2008, this fertilizer production facility south of Anchorage will be closed with only a small caretaker and security staff remaining. The closure was attributed to a shortage of local natural gas on the Kenai Peninsula. The fertilizer was previously trucked from Kenai to Fairbanks for use by farmers in Delta Junction. The alternatives for fertilizer transport include:

- Train to Fairbanks, truck to Delta Junction;
- Truck to Delta Junction from a port; and
- Future: Train to Delta Junction (an identified potential commercial use of the proposed NRE).

If a new source of natural gas is identified, the facility could be reopened. Potential alternatives under consideration include coal to natural gas technology.

Fairbanks Area Rail Line Relocation (FARLR)

This FARLR project would relocate portions of the existing rail line in and around Fairbanks and North Pole. The Fort Wainwright segment was separated from the FARLR into its own project in 2006 (ARRC, 2007d). In 2007, several smaller projects and studies were combined into the Fairbanks Area Rail Realignment project. Until funding is identified, this project will move forward with an alternatives analysis that incorporates the findings of previous studies (ARRC, 2008b). At this time, funding for preliminary engineering, environmental documentation, final design and construction has not been identified. Therefore, SEA does not consider the FARLR project to be reasonably foreseeable.

Mining Operations

Various future mining operations could become economically viable with the long-haul option that the proposed NRE could provide, although there are no proposals to do so at this time. If any of these operations were to be carried forward in the future in the vicinity of the proposed NRE, they could contribute to the overall cumulative impacts.

Oil and Gas Exploration and Extraction

Future exploration and extraction projects could include the opening of the National Petroleum Reserve to exploration; the Shell Offshore Oil Development in the North Arctic Sea (although held up in litigation, this has the potential for an additional 2,000 people based in Fairbanks); and the opening of the Arctic National Wildlife Reserve to oil exploration. Fairbanks could experience a population increase with the resurgence of oil and gas exploration on the North Slope.

Potential Changes in Population and Development

Population and development patterns in Alaska and the Fairbanks area could continue to shift in the future and may have implications for cumulative impacts. Chapter 15, Socioeconomics, includes analysis of these and other related socioeconomic trends.

17.5 Environmental Consequences

This section builds on the results of resource-specific analyses. The environmental consequences discussion is a compilation of potential impacts; that is, the cumulative result of impacts of the proposed action and alternatives when added to the potential impacts of other actions. SEA analyzed the cumulative impacts for situations where planned or reasonably foreseeable projects overlapped with the proposed NRE in terms of geographic area and timeframe. Section 17.4 describes these projects.

SEA identified the combined interaction of the proposed NRE and other planned or reasonably foreseeable future projects. SEA then identified the potential cumulative impacts for all of the environmental resource categories described in Chapters 3 through 16 of the EIS. Each of the environmental resource categories is described below.

17.5.1 Topography, Geology and Soils

Impacts from the proposed NRE include elimination of the existing soil profile in areas subject to excavation or filling required to construct the railbed with the desired grade and elevation or with removal of soils unsuitable for railbed construction; thawing of permafrost, potentially leading to irregular subsidence of the surrounding soil; and potential mass wasting events such as landslides, rockslides, or slump. Because the proposed NRE would be in an area of seismic activity, there would be a potential for train derailment resulting from a seismic event.

Construction-related activities associated with various potential military expansion activities, roadway projects, and the proposed natural gas pipeline could cause minor adverse effects to topography, geology, and soils that would cumulatively contribute to the impacts caused by the proposed NRE. These activities could include actions such as removing and transporting dirt and fill and establishing and using construction staging areas. The proposed action, in addition to past, present, and future actions, is predicted to result in minor cumulative impacts to topography, geology and soils.

17.5.2 Water Resources

Impacts to water resources from construction of the proposed NRE could result from the building of unpaved access roads, excavation of gravel, construction of bridges and culverts, use of ice roads and ice bridges, water supply extraction, transportation, and staging areas. Construction and operations-related activities associated with various potential military expansion activities, roadway projects, and the proposed natural gas pipeline could cause adverse effects to water resources and thus would cumulatively contribute to the impacts caused by the proposed NRE. These activities could include actions such as removing and transporting dirt and fill and establishing and using construction staging areas.

The cumulative impact of past, present, and future actions is predicted to have a minor to moderate cumulative impact on surface water, a minor impact on groundwater, and a minor to moderate impact on wetlands. A critical factor in the extent of cumulative impacts would be the exact location and extent of impacts of the proposed Alaska natural gas pipeline, which could be located in the existing TAPS right-of-way. The cumulative effect of these actions, in combination with the proposed action, is anticipated to have a moderate impact on surface water and floodplains from changes to hydrology, stormwater drainage, erosion and sedimentation resulting from construction as discussed. The cumulative impact of the proposed action on groundwater is predicted to be minor from changes to permafrost and ponding. The cumulative impact of the proposed action on wetlands is predicted to be minor to moderate (proposed action 1,000 to 1,500 acres in addition to other actions).

17.5.3 Biological Resources

Impacts to biological resources as a result of the proposed NRE would include habitat disturbance, loss, and fragmentation; degradation of water quality; loss and alteration of fish spawning and rearing habitat through direct modification and changes in surface and subsurface water flow; direct collision mortality from construction and operations; reduced winter survival and lowered breeding success from exposure to construction noise/human activity; and reduced survival or mortality from exposure to fuel or oil spills.

Construction and operations-related activities associated with various potential military expansion activities, roadway projects, and the proposed natural gas pipeline could cause moderate adverse effects to biological resources and, thus, would cumulatively contribute to the impacts caused by the proposed NRE. These activities could include actions that would affect wildlife habitat through ground disturbance or changes in wildland fire patterns, increased or decreased access, noise, and potential transportation-related collisions with wildlife. The severity of these impacts would vary depending on the potential location and impact of the Alaska liquefied natural gas pipeline on fish and mammal populations and habitat.

The proposed action, in addition to past, present, and future actions, is predicted to result in moderate cumulative impacts to biological resources.

17.5.4 Cultural Resources

The proposed NRE could result in destruction, contamination of organic residues of a cultural resource site, exposure of archaeological resources, impacts to the aesthetics and visual site setting (depending on proximity), and changes to groundwater that affect soil pH level and harm preservation of buried artifacts. Indirect project effects could result from increased erosion and watershed changes. Potential impacts to historic properties in the project's area of potential effect would be further identified and evaluated under a Programmatic Agreement if the STB licensed construction and operation of the proposed NRE.

Construction-related activities associated with various potential military expansion activities, roadway projects, and the proposed natural gas pipeline could cause moderate adverse effects to cultural resources and, thus, would cumulatively contribute to the impacts caused by the proposed NRE. These activities could include actions such as removing and transporting dirt and fill and establishing and using construction staging areas. The proposed action, in addition to past, present, and future actions, is predicted to result in moderate cumulative impacts.

17.5.5 Subsistence

Subsistence use impacts associated with the proposed NRE would result from restrictions on user access to use areas and resource availability in those areas. The cleared right-of-way (ROW) could result in more train-moose collisions and potentially affect overall moose resource availability in the area. Competition due to changes in the accessibility of the area could cause harvesters to utilize other communities' use areas, increasing the number of harvesters competing for resources in those places.

Construction and operations-related activities associated with various potential military expansion activities, roadway projects, and the proposed natural gas pipeline could cause moderate adverse effects to subsistence resources and, thus, would cumulatively contribute to the impacts caused by the proposed NRE. The proposed action, in addition to past, present, and future actions, is predicted to result in moderate cumulative impacts.

17.5.6 Climate and Air Quality

SEA has concluded that the increases in emissions from construction and operation of the proposed NRE would be minimal in the context of existing conditions. Greenhouse gas emissions associated with the proposed NRE would be comprised mostly of carbon dioxide (CO_2), and the increase in CO_2 emissions from the current CO_2 level would be less than 0.02 percent for the state as a whole (ADEC, 2008b). While any of the other projects have the potential to generate some impacts to climate and air quality, factors affecting air emissions and air quality, such as possible influx of persons, vehicle and construction equipment for a possible Alaska natural gas pipeline, vary widely.

Although the emissions generated from the proposed project would be small, they would contribute to a cumulatively significant adverse impact. The Intergovernmental Panel on Climate Change (IPCC) has assessed the potential consequences of global climate change (IPCC, 2007). Specific to Alaska and the project study area, trends have shown that the average annual surface temperature in Alaska has been rising at the rate of about 1.5 degrees Fahrenheit (ºF) (1 degree Celsius [ºC]) per decade over the last 3 decades, with the largest warming occurring in the interior and arctic regions (Alaska Regional Assessment Group, 1999). The temperature increases are larger in winter. Precipitation has increased by about 30 percent overall, but there is more spatial variability. The two general circulation models used in a National Assessment (NAST, 2000) predict an increase in the mean temperature in Alaska of 3 to 6 ºF (1.5 to 3.5 ºC) by the year 2030. Annual snowfall has increased by about 11 percent over Alaska, but annual snow cover has decreased due to more rapid melting in spring and summer (Alaska Regional

Assessment Group, 1999). Along a transect following the Trans-Alaska Pipeline route, permafrost temperatures at 49.2- to 65.6-foot (15- to 20-meter) depths have increased between 33.1 and 34.7 °F (0.6 and 1.5 °C) over the past 20 years. Borehole measurements have shown an increase of the mean annual ground surface temperatures of 36.5 ºF (2.5 °C) since the 1960s, while discontinuous permafrost has begun thawing downward at a rate of 0.3 foot (0.1 meter) per year at some locations (ACIA, 2005). Current scientific literature predicts that these trends will continue in particularly vulnerable areas, including Alaska, because warming is more pronounced closer to the poles (U.S. Climate Change Science Program, 2008).

17.5.7 Noise

SEA has concluded that there would be an increase in the number of sensitive receptors exposed to adverse noise levels resulting from operation of the proposed NRE. Assuming daytime construction only, there would be no adverse noise impacts from construction. Four receptors along one alternative segment would experience vibration impacts during construction. Vehicle traffic on Richardson Highway related to possible roadway improvement projects and natural gas pipeline activities, including construction-related traffic, could result in noise impacts in some areas that also would be affected by operation of the proposed NRE. Similarly, an increase in military use of Richardson Highway as a result of either construction-or operations-related activities could also result in minor additive noise effects and, thus, would cumulatively contribute to the impacts caused by the proposed NRE.

17.5.8 Energy Resources

SEA has concluded that the proposed NRE would result in no change or a slight decrease in fuel usage; rail operations would not decrease overall energy efficiency; there would be no effect on the transportation of energy resources or recyclable commodities; and there would be negligible effects on electrical transmission lines and pipelines in the project area. Construction and operations-related activities associated with various potential military expansion activities, roadway projects, and the proposed natural gas pipeline could cause increased use (and for the pipeline, increased supply) of these resources and, thus, would cumulatively contribute to the very minor impacts caused by the proposed NRE.

17.5.9 Navigation

SEA has concluded that small temporary effects to navigability of designated waterways could result during construction of the proposed NRE; no long-term adverse impacts are expected during operations. As currently proposed, it is unlikely that the potential military expansion activities, roadway projects, and the proposed natural gas pipeline would cause adverse impacts to these resources other than potential temporary effects during construction. Thus, no long-term cumulative adverse impacts are expected on navigation resources.

17.5.10 Transportation Safety and Delay

Where new crossings on the proposed NRE would be grade separated, there would be no increase in the number of accidents and no change in vehicle delay. Where crossings would not be grade separated (at-grade crossings), SEA's analysis indicates that some accidents could occur and an increase in some vehicle delay would occur. SEA's analysis indicates that no change in level of service is anticipated at any grade crossing as a result of proposed NRE operations. Similarly, SEA anticipates minimal change in rail delay or safety as a result of proposed NRE rail traffic. SEA anticipates that temporary delay for vehicles would occur during construction of the proposed NRE at new grade crossings and where roads would be improved or relocated.

Vehicle traffic on Richardson Highway related to possible natural gas pipeline activities, including construction-related traffic, could result in increased vehicle delay or accidents on area roadways and at some at-grade crossings that would be used by rail traffic associated with the proposed NRE. An increase in military use of Richardson Highway could also result in additive delay and in increased numbers of accidents. Moderate increases in vehicle traffic could occur on roads in the project area and at some of the grade crossings that would be crossed by the proposed NRE. However, roadway improvements along Richardson Highway could offset some of the potential cumulative impacts associated with the proposed NRE and natural gas pipeline construction activities.

17.5.11 Land Use

Impacts to land use as a result of the proposed NRE include permanently changing land use within the ROW and requiring a permit for any non-rail activities conducted within the ROW. Military training activities that occur in the ROW would be limited to transit over the access road. Permanent ancillary facilities for the proposed NRE would be constructed beyond a 200-foot ROW. Lands affected by the project are generally undeveloped, away from residences and businesses, and predominantly in public ownership. These lands are used for military training, recreation (such as hunting and fishing), and mining and timber harvest. Privately owned lands are primarily in agricultural and residential use or in a natural state.

The Federal Railroad Administration and Federal Transit Administration are cooperating agencies in the preparation of the EIS and are required to conduct a Section 4(f) evaluation under the U. S. Department of Transportation Act of 1966. SEA identified potential 4(f) resources that would be affected by the proposed NRE. Most of these properties are recreational trails used for dog-sledding, snowmachining, and skiing; two are cultural resources. Ten alternative segments would require use of Section 4(f) resources.

Construction and operations-related activities associated with various potential military expansion activities and the proposed natural gas pipeline could cause moderate adverse effects to Section 4(f) resources and, thus, would cumulatively contribute to the moderate potential impacts caused by the proposed NRE.

17.5.12 Visual Resources

SEA's analysis indicated that six alternative segments would not meet the Bureau of Land Management's visual resource management (VRM) objectives. The visual contrast of structures over dominant waterways is the primary reason the project would fail to meet the VRM objectives at sites along these segments. Temporary facilities could have an adverse visual impact during construction where they are visible. Temporary facilities would be removed after construction and the sites would be restored and meet VRM objectives in the long term. Depending on their location, some of the permanent communications towers could have a moderate to strong contrast with the surrounding landscape. If possible future actions such as the military activities, roadway projects, or the proposed natural gas pipeline construction and operation occur in the same viewsheds as those affected by the proposed NRE, they could cumulatively contribute to the adverse impacts caused by the proposed NRE. Based on review of existing environmental analyses for projects included in this cumulative impacts analysis, minor cumulative impacts are expected.

17.5.13 Socioeconomics

SEA estimates that any of the alternatives would generate 2,600 to 3,200 direct full-time and part-time jobs during construction, and direct in-state project expenditures on labor, goods and services would initiate subsequent rounds of income creation, spending and re-spending, producing a multiplier effect on Alaska's economy, thereby creating 5,900 to 6,600 direct and secondary full-time and part-time jobs during construction. A small positive proportion of that output and employment would accrue to businesses in the project area. Effects of project construction on public services and housing in the project area would be minimal. One alternative segment would require the relocation of Salcha Elementary School and a section of Richardson Highway. The effects of all alternatives on community cohesion would be minimal.

During rail line operations, smaller annual expenditures would be made, and between 11 and 19 direct and secondary jobs could result and the effects on demands for housing and public facilities and services would be negligible. Use of the proposed NRE would not likely be a determining factor in economic growth of the regional economy, though the improved accessibility provided by the rail extension could in some measure facilitate additional industrial and commercial activity in the Tanana River Basin, including Delta Junction.

Construction and operation of the various potential military expansion activities and the proposed natural gas pipeline could lead to additional job creation, an economic multiplier effect, and demands for housing and public services could result. Nearly all projects included in this cumulative impacts analysis could result in additional jobs. Thus, moderate beneficial cumulative socioeconomic impacts could occur.

17.5.14 Environmental Justice

With the selection of the proposed action or any of the alternatives, there would be no high and adverse impacts to human populations in the project area. Therefore, there would be no high and adverse impacts to environmental justice populations as a result of the proposed NRE. The other projects included in this cumulative impacts analysis reported no or insignificant impacts to environmental justice populations. Thus, there would be no cumulative environmental justice impacts.

18. SHORT-TERM USE VERSUS LONG-TERM PRODUCTIVITY OF THE ENVIRONMENT

Construction and operation of the proposed Northern Rail Extension (NRE) would require short-term uses of land and other resources. This chapter examines and compares the potential short-term impacts of the project on the environment with the maintenance and enhancement of long-term environmental productivity.

18.1 Applicable Regulations

The National Environmental Policy Act (NEPA) states in Section 102 [42 United States Code (U.S.C.) 4332] that all agencies of the Federal Government shall:

> (C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on --
>
> > (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity,…

This portion of the NEPA regulations recognizes that short-term uses and long-term productivity of the environment are linked, and that opportunities that are acted upon have corollary opportunity costs in terms of foregone options and productivity that could have continuing effects well into the future. The following discussion examines short-term uses and long-term productivity together, according to resource categories. Specific impacts of the proposed project on resources are described in Chapters 3 through 17.

18.2 Short-Term Uses and Long-Term Productivity

The relationships between short-term uses and long-term productivity would not be appreciably different from one alternative segment to another, but instead, come largely from whether the project is constructed.

18.2.1 Land Use

Construction of the NRE would convert mostly undeveloped lands into industrial rail operation. Productivity loss for soils would be limited to the disturbed areas affected by land clearing, grading, and construction. It is unlikely that the proposed railbed would ever be dismantled, and effects on soils and some land uses would be permanent. It is estimated, however, that only 2 acres of the route is currently used for agricultural purposes. This minimal loss would not affect long-term agricultural productivity.

Construction of the NRE would likely restrict access to State of Alaska resources west of the Tanana River, including fish, wildlife, wild plants and berries, timber, minerals, and gravel. Specifically, there could be long-term changes in hunting patterns in the area because construction of the rail line would create a limited number of crossing points, thereby limiting access to some hunting areas. Increased and potentially differential mortality rates of migratory versus resident moose populations from moose-train collisions could result in reduced moose productivity in the area, which could eventually lead to changes in hunter activity.

18.2.2 Water Resources

Construction of the proposed NRE would result in short-term disturbances to surface water and groundwater resources, and to the floodplain. Wetlands and waters that would be filled would not recover in the short term, and long-term productivity related to those resources would be lost. Construction of the project would adversely affect an estimated 185 acres of wetlands resulting from borrow pit excavation for all proposed alignments, and a maximum of approximately 946 acres for construction of the rail segments. Wetlands that are excavated for fill material would likely be converted to surface waters, but could eventually return to wetlands. Wetlands that are filled during construction would likely not return to wetlands without restoration efforts.

Surface water and groundwater would be used in the construction process. The project area contains significant water resources, and the short-term impacts on water resources from the proposed NRE would have minimal long-term effects on productivity. Potential long-term effects on productivity could result from railbeds or access roads diverting, impounding, or impeding surface and shallow subsurface water movement. No estimates of water uses (rates and volumes) have been generated, but water withdrawal for construction would likely have moderate short-term (seasonal) impacts on the stage (water level) of smaller streams, with a lesser short-term effect on larger watercourses, and no long-term effects. The features of the rail line would have other minor impacts on surface waters and groundwater, as described in Chapter 4, Water Resources.

The project would include the construction of bridge footers, embankments, revetments, and other facilities within the floodplain of the Tanana River. These features would reduce the cross-sectional area available for flood storage and conveyance of flood flows, but the amounts would be extremely small in relation to the overall floodplain area and would not affect long-term productivity of the area.

18.2.3 Biological Resources

Construction of the proposed rail line would result in some short-term and long-term impacts to plant communities and fish and wildlife resources. There are no Federal or state protected threatened, endangered, or candidate plant or animal species in the project area. There are no rare plants or vegetation communities of conservation concern in the project area.

During construction, vegetation would be removed in the 200-foot right-of-way and workspaces, and plant communities in those areas would be considerably altered. Vegetation loss would be short term in some areas and long term in others, depending on the type of vegetative cover. For example, vegetation loss would be short term in edge habitats between the road and rail embankments owing to natural post-construction revegetation. Natural recovery and assisted restoration of vegetation would take place in some areas in the project area after construction activities had ceased. However, some areas stripped of vegetation, such as forest and riparian vegetation, would require from 70 to 200 years to regenerate, which would be considered long-term habitat loss, even with restoration. Impacts on the longest potential route would include approximately 3,570 acres of vegetation cleared for the right-of-way, of which approximately 2,330 acres is forest vegetation. The shortest possible route would involve clearing approximately 3,080 acres of vegetation, of which approximately 2,320 is forest.

Construction of the rail line and facilities would result in short-term disturbance along the approximately 80-mile alignment in the Alaska Department of Fish and Game's Game Management Units 20A, 20B and 20D. In general, construction-related impacts on wildlife would include habitat loss, alteration, and fragmentation; decrease in breeding success from exposure to construction noise and from increased human activity; and direct mortality from project construction. There would be additional short-term disturbance and intentional harassment for the protection of workers and equipment during construction. In rare events, some animals, most likely bears and moose, could be killed to defend workers and property. Habitat impacts, including loss, alteration, and fragmentation, initiated with project construction would continue through project operations and maintenance. Specific impacts to wildlife would include direct mortality from collisions with trains, power lines, and communication towers. Construction of the project would have localized impacts on fish populations during the construction period. None of these impacts is expected to affect long-term productivity of the environment.

18.2.4 Air Quality

Chapter 8, Climate and Air Quality, describes estimated construction emissions (see Table 8-4), and shows that volatile organic compounds carbon monoxide, particulate matter less than 10 or 2.5 microns would all have slightly elevated levels during the construction phase while machinery is operating. Table 8-5 lists estimated annual average emissions from rail line operations and shows that nitrogen oxides and sulfur dioxide would have slightly elevated levels compared to that of construction emissions. These emission totals for each of the pollutants are well below the *de minimis* conformity thresholds of 100 tons per year for each pollutant, and these estimated increases in emissions from rail line construction and operations would be minimal in the context of existing conditions. The project could have a beneficial impact on air quality over the long term by reducing the number of vehicles using Richardson Highway.

19. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

To facilitate comparison of project alternatives, the National Environmental Policy Act (NEPA) requires a consolidated discussion of environmental consequences to focus on any irreversible and irretrievable commitments of resources. This chapter discusses the effects of the proposed Northern Rail Extension (NRE) with regard to irreversible and irretrievable resources. Irreversible resource commitments represent a loss of future options. It applies primarily to the use of nonrenewable resources, such as cultural resources or fossil fuels, and to factors that are renewable only over long time spans. An irretrievable commitment of resources represents opportunities that are foregone for the period of the proposed action. It relates to the use of renewable resources, such as timber or human effort, as well as other utilization opportunities that are foregone in favor of the proposed action.

19.1 Applicable Regulations

NEPA Section 102 (42 United States Code 4332) and Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations 1502.16) require that all agencies of the Federal Government—

> (C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on --
>
> > (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

19.2 Resource Commitments

Implementation of the proposed action would result in the commitment of natural and man-made resources to the construction and operation of the NRE. The primary commitment of resources would come from the construction phase, but there would be some commitment of resources for operation of the rail line. The discussion below presents a combined discussion of resource commitments for the construction and operation phases, beginning with the physical materials and then discussing specific resource types as appropriate. In general, the commitment of resources would be common for all alternatives. The No-Action Alternative is not discussed, because it would not commit any resources.

19.2.1 Construction Materials and Labor

If the proposed action is implemented, large amounts of construction materials would be committed to the project. The track structure would require approximately 600,000 cubic yards of subballast, 491,000 cubic yards of ballast, and large quantities of tie plates, spikes, and anchors. The rail line would be constructed with steel rails upon ties, using enough materials for approximately 490,000 track feet. The roadbed for the access road would require approximately 380,000 cubic yards of fill material. Construction of the rail line and associated structures would also require approximately 215,000 tons of riprap and 8,000,000 cubic yards of fill to create embankments.

Access road bridges would require approximately 7,100 linear feet of semi-fabricated spans, made of concrete, steel, or a combination of the two, on pile piers and abutments. Construction of culverts would require approximately 5,000 linear feet of culvert pipe.

Human effort would be irretrievably committed during the planning, construction and operation phases of the project. The commitment of time and available labor in the construction of the proposed action would represent an irretrievable commitment of resources.

19.2.2 Physical Setting

Construction of the proposed rail line would lead to permanent alterations in topography through the largely undeveloped areas of the Tanana River Valley. Grading and filling could be reversed if the rail line was abandoned, but blasting of bedrock deposits would be an irreversible process. Salcha Alternative Segment 2 and Donnelly Alternative Segment 2 are the segments that are believed to require removal of bedrock but this would be unknown until construction began.

19.2.3 Groundwater

It is anticipated that water will be pumped from wells for both construction and operation of the rail line (see Chapter 4). This water would be replenished through the natural water cycle following the rail construction process. The use of groundwater could be considered an irretrievable commitment of resources during the construction phase, but no estimates of water uses (rates and volumes) have been generated.

19.2.4 Biological Resources

The areas that would be occupied by the rail line, rail construction and operation support facilities, and access roads would be irreversibly removed from natural habitat for the life of the proposed project.

In addition, the disturbances of areas for temporary construction activity could result in changes that would be irreversible over the long term. The permanent conversion of vegetation resources and wildlife habitat along the rail line and at construction and operation support facilities could represent an irreversible commitment of biological resources for the life of the proposed project and beyond if areas were not restored following abandonment, or if former vegetation cover and composition did not recover. Losses of wildlife during railroad construction and operations would represent an irretrievable commitment of biological resources. Impacts to wetlands and riparian habitats from construction of the project could represent an irreversible rather than irretrievable commitment of resources if these resources were not restored following abandonment.

Much of the proposed right-of-way is currently covered with timber. As a renewable resource, clearing of this vegetation would constitute an irretrievable commitment of resources.

19.2.5 Cultural Resources

Cultural resources (archeological, historical, and ethnographic) are nonrenewable resources and any loss would be irreversible. Most identified cultural resources associated with the proposed NRE are buried archeological sites, so the extent of potential effects cannot be fully characterized at this time. If the Surface Transportation Board (STB or the Board) authorizes the construction and operation of the proposed rail line, the Programmatic Agreement would be followed to minimize the impact of the proposed NRE on the cultural resources found within the project area.

19.2.6 Land Use and Ownership

Construction and operation of the approximately 80-mile NRE would require the commitment of land for the rail line, construction and operational support facilities, and access roads. It is estimated that the project would require a minimum of 3,020 acres and a maximum of 3,140 acres of land. These lands would be utilized for the 200-foot rail right-of-way (ROW), ancillary facilities, extra work spaces and staging areas, and borrow areas. Land owners within the project area include the military; Alaska Department of Natural Resources; private parties; Fairbanks North Star Borough; Alaska Mental Health Trust; U.S. Army Corps of Engineers, Chena River Lakes Flood Control Project; and the University of Alaska. Table 19-1 identifies by land owner the maximum amount of acreage within the 200-foot ROW that could be affected by implementation of the project.

If at a future date Alaska Railroad Corporation (ARRC) were to abandon the railroad, although much of the construction material could be removed, it is not likely that all of the natural landscape would be restored, and some of the land commitment would remain irreversible. Following abandonment of the rail line, any lands for which ARRC obtained lease would presumably revert back to management by the lessor listed in Table 19-1. Private lands, if purchased, would probably stay in the possession of ARRC. If ARRC operated on any land by easement, it is presumed that these easements would be extinguished upon rail line abandonment.

Table 19-1
Maximum Acreage of Land Within the 200-foot ROW by Ownership Affected by Project Implementation

Land Owner	Acreage
Alaska Department of Natural Resources	1,224
Military	425
Private	147
U.S. Army Corps of Engineers, Chena River Lakes Flood Control Project	64
University of Alaska	44
Alaska Mental Health Trust	40
Fairbanks North Star Borough	12
Total	**1,956**

Loss of recreational land uses would be irretrievable. Eielson Alternative Segment 1 would cross through some property in the Eielson Farm Community, thereby decreasing farming surface area. The agricultural use value of land reflects the discounted present value of the stream of all future expected net cash flows arising from farming the land.

19.2.7 Visual Resources

The visual impacts of constructing and operating trains along the NRE would range from no visual contrast to strong visual contrast, and the long-term visual impacts from the cleared vegetation, cuts, fills, and access roads would range from weak to strong (Chapter 14). Where land commitments are irreversible, the visual impacts would generally remain irreversible.

19.2.8 Energy Resources

All construction activities supporting the implementation of the proposed action would consume fuel, mostly in the form of diesel. This would be an irreversible use of nonrenewable fossil fuels. Operation of trains on the proposed rail line would also require an irreversible commitment of fuel resources. To the extent that any bio-fuels were used, it would be an irretrievable use of resources. Fuel usage estimates were based on the assumption that one round trip freight train and eight one-way passenger trains per day would operate on the rail line. Using these conservative assumptions, total diesel fuel usage per week would be approximately 7,400 gallons for freight trains and 2,800 gallons for passenger trains. The conservative projected annual fuel consumption for round-trip operation of a train on the proposed approximately 80-mile rail line is approximately 387,000 gallons (see Chapter 10).

19.2.9 Financial Resources

The commitment of financial resources differs slightly depending on which series of alternative segments may be authorized by the STB for construction and operation, if any, but it is estimated that the cost per rail mile is $6.43 million. Therefore, the approximately 80-mile long proposed NRE and a passenger depot facility yield a cost estimate of $518.8 million.

20. MITIGATION

This chapter describes mitigation measures that, if imposed in any Board decision granting Alaska Railroad Corporation (ARRC or the Applicant) the authority to construct and operate the rail line, would avoid, minimize, or compensate for potential adverse environmental impacts. For each resource area, ARRC has proposed voluntary mitigation measures, which include regulatory-related requirements and associated best management practices. In addition, the Surface Transportation Board's (STB) Section of Environmental Analysis (SEA) has recommended preliminary mitigation measures.

20.1 Overview of SEA's Approach to Recommended Mitigation

In conducting the environmental review process, SEA has taken the "hard look" at the environmental consequences of the proposed Northern Rail Extension (NRE), as required by the National Environmental Policy Act (NEPA). SEA's review included both construction of the new rail line and associated facilities, and rail operations over the proposed NRE and the existing line between Fairbanks and the proposed NRE. In its environmental review, SEA conducted a thorough and comprehensive analysis of the potential environmental effects associated with the proposed action alternatives. Chapter 1 and Appendices B and C provide information on SEA's agency consultation activities.

20.1.1 Limits of the Board's Conditioning Power

The Board has limited authority to impose conditions to mitigate potential environmental impacts. As a government agency, the Board can only impose conditions that are consistent with its statutory authority. Accordingly, any conditions the Board imposes must relate directly to the transaction before it, must be reasonable, and must be supported by the record before the Board. Thus, the Board's practice consistently has been to mitigate only those impacts that result directly from the proposed action. The Board typically does not require mitigation for pre-existing environmental conditions, such as the effects of existing rail operations.

SEA notes, however, that the Council on Environmental Quality (CEQ), which oversees the implementation of NEPA, has stated in *Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations* (46 *Federal Register* [*FR*] 18026, March 23, 1981) that:

> All relevant, reasonable mitigation measures that could improve the project are to be identified, even if they are outside the jurisdiction of the lead agency or the cooperating agencies, and thus would not be committed as part of the RODs [Records of Decision] of these agencies. Sections 1502.16(h), 1505.2(c). This will serve to…alert agencies or officials who can implement these extra measures, and will encourage them to do so. Because the EIS [Environmental Impact Statement] is the most comprehensive environmental document, it is an ideal vehicle in which to lay out not only the full range of environmental impacts but also the full spectrum of appropriate mitigation.

Agencies participating as cooperating agencies may issue individual decisions concerning the proposed NRE and intend to use information in this EIS for decisionmaking purposes. They could require additional mitigation measures in their RODs and permits.

20.1.2 Voluntary Mitigation and Negotiated Agreements

SEA encourages applicants to propose voluntary mitigation. In some situations, voluntary mitigation might replace mitigation measures the STB might otherwise impose, or it could supplement mitigation the STB might impose. Because applicants gain a substantial amount of knowledge about the issues associated with a proposed right-of-way during project planning, and because they consult with regulatory agencies during the permitting process, they are often in a position to offer relevant voluntary mitigation. In January 2008, the Applicant submitted its proposed voluntary mitigation measures to SEA.

Since the announcement of the NRE project in 2005, the Applicant has been working with local communities and interested agencies to learn about concerns they have about the project. Based on those consultations, the Applicant has worked with a team of technical specialists from various disciplines to develop voluntary mitigation in an effort to address many of the concerns that have been raised.

As an alternative to mitigation measures the Board could unilaterally impose on applicants (notwithstanding mitigation required by other regulatory agencies that may have jurisdiction over potentially affected resources), SEA encourages applicants to negotiate mutually acceptable agreements with affected communities and other government entities to address potential environmental impacts, if appropriate. Negotiated agreements could be with neighborhoods, communities, counties, cities, regional coalitions, states, and other entities. In particular, SEA encourages ARRC and the Alaska Department of Natural Resources (ADNR) to discuss potential negotiated agreements on the subjects of mitigating and monitoring train-moose collisions on the proposed rail line and on selecting and designing potential rail line crossings for various types of recreational and other trails on ADNR-managed lands.

If applicants submit to the Board any negotiated agreements with communities or other entities, the Board would require compliance with the terms of any such agreements as environmental conditions in any final decision approving the proposed action or alternatives. These negotiated agreements would supersede any environmental conditions for that particular community or other entity that the Board might otherwise impose.

20.1.3 Preliminary Nature of Mitigation

SEA’s preliminary mitigation measures are based on the information available to date, consultations with appropriate agencies, and the environmental analysis presented in this document.

SEA emphasizes that the recommended mitigation measures are preliminary and invites public and agency comments on these proposed mitigation measures. For SEA to assess the comments effectively, it is critical that the public be specific regarding any desired mitigation and the reasons why the suggested mitigation would be appropriate.

SEA will make its final recommendations on mitigation to the Board in the Final EIS after considering all public comments on the Draft EIS. SEA intends to include all of the voluntary mitigation measures submitted by the Applicant in its recommendations to the Board. The Board will then make its final decision regarding this project and any conditions it might impose. In making its decision, the Board will consider the Draft EIS, the Final EIS, public comments, and SEA’s final mitigation recommendations.

20.2 Mitigation Measures

For the environmental resource areas discussed in the EIS, if SEA concluded that the impacts would be negligible, no mitigation would be warranted. For this reason, this chapter does not discuss energy resources, socioeconomics, or environmental justice. The following discussion does not address the No-Action Alternative, because that alternative would result in no change in impacts from those already occurring.

20.2.1 Topography, Geology, and Soils

Applicant's Voluntary Mitigation Measures

The Applicant identified the following voluntary measures as potential mitigation for impacts to topography, geology, and soils:

VM-1 The Applicant shall be subject to U.S. Environmental Protection Agency jurisdiction under the National Pollutant Discharge Elimination System (NPDES) for stormwater discharges resulting from construction activities. Requirements that are commonly part of a Stormwater Pollution Prevention Plan associated with a NPDES Stormwater Construction Permit include the following:

- Ground disturbance shall be limited to only the areas necessary for project-related construction activities.
- During earthmoving activities, topsoil shall be reused wherever practicable and stockpiled for later application during reclamation of disturbed areas.
- Appropriate erosion control measures shall be employed to minimize the potential for erosion of soil stockpiles until they are removed and the area is restored.
- Disturbed areas shall be restored as soon as practicable after construction ends along a particular stretch of rail line, and the goal of restoration shall be the rapid and permanent reestablishment of native ground cover on disturbed areas to prevent soil erosion.
- The bottom and sides of drainage ditches shall be revegetated using natural recruitment from the native seed sources in the stockpiled topsoil or a seed mix free of invasive plant species.
- If weather or season precludes the prompt reestablishment of vegetation, temporary erosion control measures shall be implemented.

VM-2 Project facilities shall be designed in accordance with engineering criteria related to permafrost, seismic events, and other geologic hazards to comply with applicable design codes. For example, the project shall be designed in accordance with the latest applicable seismic codes, taking into account the region's potential for earthquake activity, to mitigate potential damage to bridges and tracks.

SEA's Preliminary Mitigation Measures

SEA identified the following preliminary measures as potential mitigation for impacts to topography, geology, and soils:

1) The Applicant shall not place bridge piers or abutments in known areas of permafrost.

2) Features of the rail line project that would occupy areas of permafrost shall be constructed to minimize thaw and subsidence. Construction methods might include insulate/fill methods in permafrost areas that could not be avoided during excavation.

3) Any material source development and rehabilitation within floodplains shall follow the general procedures and guidelines outlined in *North Slope gravel pit performance guidelines* (Mclean, 1993).

20.2.2 Water Resources

Applicant's Voluntary Mitigation Measures

The Applicant identified the following voluntary measures as potential mitigation for impacts to water resources:

VM-3 Prior to initiating any project-related construction activities, a spill prevention, control, and countermeasure plan for petroleum products or other hazardous materials, as required by Federal and state regulations, shall be developed. The plan shall prevent discharges and contain such discharges if they occur. The plan shall include a requirement to conduct weekly inspections of equipment of any fuel, lube oil, hydraulic, or antifreeze leaks. If leaks are found, the Applicant shall require the contractor(s) to immediately remove the equipment from service and repair or replace it.

VM-4 Federal permits, including those required by Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act, shall be obtained from the U.S. Army Corps of Engineers prior to initiation of construction. The Applicant shall also obtain necessary state permits and authorizations (*e.g.*, Alaska Department of Fish & Game Fish Habitat Permit, Alaska Department of Natural Resources Land Use Permit, and an Alaska Department of Environmental Conservation Section 401 water quality certification). Permit stipulations shall be incorporated into construction contract specifications.

VM-5 Compensatory mitigation for unavoidable impacts to wetlands shall be implemented as part of the U.S. Army Corps of Engineers Section 404 permit.

VM-6 The new rail line shall be designed and constructed in such a way as to maintain natural water flow and drainage patterns to the extent practicable. This shall include placing equalization culverts through the embankment as necessary, preventing impoundment of water or excessive drainage, and maintaining the connectivity of floodplains and wetlands.

VM-7 The smallest area practicable around any streams shall be disturbed and, as soon as practicable following construction activities, disturbed areas shall be revegetated using native vegetation.

VM-8 Bridges and culverts shall be designed, constructed, and operated to maintain existing water patterns and flow conditions as practicable.

VM-9 Culverts shall be designed and constructed for new fish-stream crossings with a width greater than or equal to 125 percent of the width of the stream at the ordinary high water stage. The culvert grade shall approximate the surrounding slope of the stream channel. Whenever possible, new culverts shall be buried to approximately 40 percent of their diameter with substrate material that would remain stable at expected flood discharge rates. This shall not apply to any water crossing more than 15 feet in bank-to-bank width due to span length limitations. Alternative design measures shall be required to meet the same design goals on streams more than 15 feet wide at ordinary high water.

VM-10 When project-related construction activities, such as culvert and bridgework, shall require work in streambeds, these activities shall be conducted during low-flow conditions or as otherwise permitted.

VM-11 During construction, project-related construction vehicles shall be directed to avoid driving in or crossing streams at other than established crossing points.

VM-12 Temporary stream crossings shall be placed across waterways during construction to provide access for contractors, work crews, and heavy equipment.

VM-13 Temporary structures shall avoid overly constricting active channels and shall be removed as soon as practicable after the crossing is no longer needed.

VM-14 As part of the National Pollutant Discharge Elimination System Stormwater Construction Permit and Stormwater Pollution Prevention Plan, during construction:

- Temporary barricades, fencing, and/or flagging shall be used to contain project-related impacts to the construction area and avoid impacts beyond the project footprint.
- Areas disturbed, except for the rail line embankment, shall be returned to their preconstruction contours to the extent practicable, and reseeded or replanted with native vegetation within one growing season following construction to provide permanent stabilization and minimize the potential for erosion.
- Contaminant-free embankment and surface materials shall be used.
- Appropriate best management practices shall be used within parallel drainage ditches that are within 1,000 feet of perennial waters to provide stormwater retention and filtration. Drainage ditches shall be maintained as necessary (e.g., by removing accumulated sediments to maintain stormwater retention capacity and function).

VM-15 For the portions of the project within the Fairbanks North Star Borough (FNSB), the Applicant shall coordinate with the local FNSB Floodplain Administrator to ensure that new project-related stream and floodplain crossings were appropriately designed. For crossings within the mapped 100-year floodplain, drainage crossing structures shall be designed to pass a 100-year flood.

SEA's Preliminary Mitigation Measures

SEA identified the following preliminary measures as potential mitigation for impacts to water resources:

4) During the final design process and facility siting, the Applicant shall conduct pre-siting investigations of potential borrow areas, staging areas, camps, and access roads to:

- Identify the highly sensitive areas within the project area (in consultation with U.S. Fish and Wildlife Service and Alaska Department of Fish and Game) and locate facilities in previously disturbed sites and not in sensitive habitat areas, to the extent practicable.

- Avoid to the extent practicable areas that could affect or be affected by flooding (especially with frequent recurrence intervals during the construction window); areas that have moderate to high densities of fine-grained permafrost soils, especially if the permafrost area is adjacent to or nearby a waterbody; and areas that are otherwise sensitive.
- Minimize to the extent practicable the total number and footprint area of facilities (*e.g.*, for borrow areas, by hauling material longer distances to avoid environmentally sensitive areas adjacent to water bodies; and for access roads, by minimizing width).
- During construction, minimize the duration and extent of activity to develop the facilities and provide surface treatments to minimize soil compaction (*e.g.*, scarify compacted soils through the compacted zone during reclamation to promote infiltration) and promote vegetation regrowth, including a reclamation plan that addresses rehabilitating recharge characteristics to maintain long-term hydrologic stability, habitat, and final usage (*e.g.*, recreation, aquatic habitat). Plans for excavation depths shall be developed in cooperation with appropriate agency staff to both minimize areal extent (by maximizing depth) and maximize post-project function (through such measures as leaving shelves or gently sloping littoral areas).

5) For conveyance structures located in active braided channels, the Applicant shall examine the seasonal and annual stages and extent of flooding for the braided rivers to determine the optimum construction window and to estimate heights for protective berms or dikes necessary to minimize flooding during the construction period and to minimize the effect on drainage patterns during flooding.

6) The Applicant shall avoid potential ice-jam locations and permafrost areas, fine-grained sediments, and steep, high streambanks when locating ice bridges and approaches. Specially adapted best management practices shall be applied for construction activities within these types of areas. For example, the Applicant shall slot ice bridges in several areas to accommodate faster disintegration of the bridge during the spring breakup period.

7) The Applicant shall evaluate construction water needs in relation to streamflow rates and minimize effects of water supply extraction from watercourses. If the Applicant uses groundwater as a water supply source, the Applicant shall evaluate estimated groundwater withdrawal rates in relation to annual and seasonal recharge rates and minimize effects of water withdrawal on surface water and groundwater.

8) The Applicant shall conduct detailed site-specific hydraulic analyses and modeling (*e.g.*, as indicated in Roach, 2007, and Zufelt, 2007), including examination of potential ice-jam and scour effects, for the Tanana River crossings to predict changes to flow paths, velocity profiles, and scour at high-flow discharges.

9) The Applicant shall conduct site-specific analyses of seasonal variations in sediment transport mechanisms before the bridge construction work proposed in the two large braided streams (Delta Creek and the Little Delta River) to minimize the potential for disturbance.

10) As previously discussed, bridges and culverts shall be designed, constructed, and operated to maintain existing water patterns and flow conditions as practicable. At a minimum, large rail bridges shall be designed for a 100-year flood to pass through with less than 1 foot of rise in the tail-water elevation. The designs shall also consider local and broad backwater effects associated with large flood events on major tributaries, including potential flooding scenarios associated with the Chena River Flood Control project.

11) During final design, rail line and access roads located in floodplains shall allow for the flow of floodwaters to floodplain storage areas by incorporating a sufficient number and size of culverts or bridges. The Applicant shall conduct site-specific analyses that incorporate flood conveyance and hydraulics and flood storage requirements of the 100-year flood as part of the design. For crossings within the mapped 100-year floodplain, the Applicant shall design drainage crossing structures to pass a 100-year flood without increasing the surface water elevation of the base flood by more than 1 foot, consistent with Federal Emergency Management Agency regulations (44 Code of Federal Regulations Part 9).

12) Impacts to all waters of the United States, including wetlands, shall be avoided and minimized to the extent practicable.

13) Jurisdictional delineations of wetlands and other surface waters that are subject to Section 404 of the Clean Water Act shall be completed for all ancillary facilities proposed outside of the right-of-way.

14) As suggested in the U.S. Environmental Protection Agency 1996 report on the functional profile of black spruce wetlands in Alaska, the Applicant shall protect water quality functions of adjacent wetlands by using calcareous fill to buffer acid deposition; manipulating warm, aerobic fill surfaces to degrade organic contaminants; and creating constructed wetlands for uptake of metals (Post, 1996).

15) The impact of development on key wetlands, including fens, shall be minimized. Key wetlands are those that are important to fish, waterfowl, shorebirds, and other wildlife species because of their high value or scarcity in the region.

16) As specified in the U.S. Army Corps of Engineers Alaska District's Nationwide Permits General Best Management Practice guide (USACE, 2007b):

- Sediment and turbidity at the work site shall be contained by installing diversion or containment structures.
- Dredge spoils or unusable excavated material not used as backfill at upland disposal sites shall be disposed of in a manner that minimizes impacts to wetlands.
- Wetlands shall be revegetated as soon as possible, preferably in the same growing season, by systematically removing vegetation, storing it in a manner to retain viability, and replacing it after construction to restore the site.
- Stream banks shall be restored and revegetated using techniques such as brush layering, brush mattressing, and use of jute matting and coir logs to stabilize soil and reestablish native vegetation.

- Topsoil and organic surface material, such as root mats, shall be stockpiled separately from overburden and returned to the surface of the restored site.
- Fill materials that are free from fine material shall be used.
- The load of heavy equipment shall be dispersed such that the bearing strength of the soil shall not be exceeded, either by using mats when working in wetlands or by using tracked rather than wheeled vehicles.

17) Stream channels and existing culvert locations shall be marked before snowfall to avoid damage to these areas.

18) Road and track crossings of water bodies shall be aligned perpendicular or near perpendicular to watercourses to minimize crossing length and potential bank disturbance.

19) All construction debris (including construction materials, soil, or woody debris) shall be removed from surface waters immediately upon placement during the open-water period, or prior to break-up for debris on top of or within ice or snow crossings.

20) Except at approved crossing or other approved work locations, riparian vegetation shall not be cleared within 100 feet of fish-bearing water bodies.

21) Construction of temporary crossings shall be minimized by installing bridge piers during the winter and initially constructing permanent crossing structures when practical.

22) All surface travel and clearing shall be performed in a manner that maintains existing surface and subsurface hydrology and water quality. Except for approved off-road travel, construction activities beyond the 200-foot right-of-way (ROW) shall be supported only by ice roads, winter trails, existing or temporary roads, or air or boat service. Wintertime off-road travel beyond the ROW shall be approved only for areas where snow and ice depth are sufficient to protect the ground surface and vegetative mat. Summertime off-road travel beyond the ROW shall be authorized only if it could be accomplished without damaging vegetation or the ground surface, including stream banks that may be crossed.

23) Winter roads shall be designed, constructed, and used to avoid degradation of water quality and to protect the roadbed from significant rutting, ground disturbance, or thermal erosion. Where feasible and prudent, if the surface organic mat was removed or excessively reduced over thaw-unstable permafrost terrain, that area shall be stabilized by re-covering it with insulating material, revegetating, or water-barring the area; soil cuts or fills in thaw-unstable permafrost terrain must be avoided; all cuts shall be stabilized; and routes selected that shall be less likely to be used or damaged by off-road vehicle traffic when the soil was not frozen or snow-covered.

24) Gravel mining required for construction or operations shall be restricted to the minimum necessary to develop and operate the rail line efficiently and with minimal environmental damage. Gravel mine sites shall not be located within the active floodplain of a watercourse unless the Alaska Department of Natural Resources Division of Mining, Land, and Water, after consultation with Alaska Department of Fish and Game, determines that there would be no feasible and prudent alternative, or that a floodplain mine site would enhance fish and/or wildlife habitat after mining operations were completed and the site was appropriately closed. Mine site

development and rehabilitation within floodplains shall follow the general procedures and guidelines outlined in *North Slope gravel pit performance guidelines* (Mclean, 1993).

25) Geotechnical boreholes can allow communication or comingling of waters between surface water and groundwater and between subsurface aquifers if the boreholes are deep enough, which could result in the contamination of groundwater. Geotechnical boreholes shall be abandoned in compliance with the requirements of Alaska Department of Environmental Conservation 18 Alaska Administrative Code 80.015(e).

26) Spill barriers or absorbent material shall be provided at the down-gradient ends of staging areas and camp sites to contain any potentially contaminated surface runoff. Erosion and sediment controls shall also be required as needed at these locations.

27) Standard protocols for transporting hazardous substances and other deleterious compounds to minimize the potential for a spill occurrence near or adjacent to water bodies shall be followed.

28) Tank storage facilities shall be placed at the farthest practical locations away from any streams or rivers, and standard protocols (*i.e.*, lined and bermed pits for secondary containment) for storing chemical and petroleum products shall be implemented. The Applicant shall consult with Alaska Department of Environmental Conservation to determine appropriate measures and distances.

20.2.3 Biological Resources

Applicant's Voluntary Mitigation Measures

The Applicant identified the following voluntary measures as potential mitigation for impacts to biological resources:

VM-16 The Applicant shall restrict workers from hunting or fishing while stationed at work camps.

VM-17 State permits and authorizations, like the Alaska Department of Fish and Game Fish Habitat Permit, shall be obtained. Permit stipulations shall be incorporated into the construction contract specifications.

VM-18 Construction in anadromous streams shall be timed where practicable to minimize adverse effects to salmon during critical life stages. Timing windows, as specified by Alaska Department of Fish and Game's Division of Habitat, shall be incorporated into construction contract specifications for instream work. Stream crossings shall be designed and constructed so as not to impede fish passage or impair the hydrologic functioning of the waterbody.

VM-19 When project-related construction activities, such as culvert and bridgework, require work in streambeds, activities shall be conducted, to the extent practicable, during either summer or winter low-flow conditions.

VM-20 Essential Fish Habitat (EFH) conservation measures shall be implemented as agreed upon with the National Marine Fisheries Service during the EFH consultation process.

VM-21 Clearing of vegetation in preparation for construction shall occur before or after the typical migratory bird nesting season as identified by the U.S. Fish and Wildlife Service (USFWS), typically May 1 to July 15, to the extent possible to ensure compliance with the Migratory Bird Treaty Act. If clearing would be required during the nesting season, a nest survey shall be conducted and the USFWS shall be consulted, as necessary, to identify additional compliance measures. This shall also mitigate potential impacts to moose and many other mammals, because it encompasses the period when young are born.

VM-22 During the bald eagle nesting season (typically March through August), the Applicant and its contractor(s) shall use their best efforts to avoid bald eagle disturbance during construction. Nests shall be protected in accordance with USFWS guidelines.

VM-23 Subject to consultation with Alaska Department of Fish and Game and Alaska Department of Natural Resources, the Applicant shall work with adjacent land managers to develop alternative preferred habitat located away from the proposed rail line and construct a widened embankment to allow moose a place to retreat on one side when a train passes in an effort to reduce the potential for moose strikes.

SEA's Preliminary Mitigation Measures

SEA identified the following preliminary measures as potential mitigation for impacts to biological resources:

29) The Applicant shall accommodate the restoration efforts underway by U.S. Fish and Wildlife Service for Piledriver Slough and other sloughs occurring within the Piledriver Slough drainage during rail line construction and operations. Crossings shall be consistent with ongoing and planned fish habitat restoration efforts.

30) The proposed rock revetment of the Salcha Alternative Segment 1 crossing would restrict or eliminate the current flushing flows that reduce beaver dams along Piledriver and Twentythreemile Sloughs. To mitigate for permanent habitat alteration, the Applicant shall provide for removal of large beaver dams that would otherwise become permanent.

31) Where practicable, the Applicant shall make minor refinements to the proposed alternatives to avoid destruction or fragmentation of sensitive vegetation communities if they are encountered during surveying and preconstruction activities. Sensitive habitats include high-functioning wetland communities, fens, and late-succession forests.

32) To reduce collision and electrocution impacts to birds resulting from powerlines and communication towers, the Applicant shall:

- Consult with the U.S. Fish and Wildlife Service for current guidelines on tower siting, marking, and guy lines.
- Incorporate standard, safe designs, as outlined in Suggested Practice for Avian Protection on Power Lines (APLIC, 2006), into the design of electrical distribution lines in areas of identified bird concerns to avoid electrocution of eagles, owls, and other smaller raptors, including:
  - Design communication towers without guy lines.

- Use marking techniques such as balls or flappers to increase transmission line visibility, especially in areas where sandhill cranes and bald eagles are likely to roost, forage, or nest.
- Maintain a minimum 60-inch separation between conductors and/or grounded hardware and potentially use insulation materials and other applicable measures, depending on line configuration, to avoid electrocution of eagles, owls, and other smaller raptors.
- Incorporate standard raptor-proof designs as outlined in Avian Protection Plan Guidelines (APLIC and USFWS, 2005) into the design of the electrical distribution lines to reduce bird collisions.

33) The Applicant shall locate the access road immediately adjacent to the railbed to the extent feasible and prudent to minimize the project footprint, amount of ground disturbance, clearing of established vegetation, removal of wildlife habitats and riparian vegetation, and establishment of vegetation near the railbed that is attractive to moose.

34) As part of the National Pollutant Discharge Elimination System Stormwater Construction Permit and Stormwater Pollution Prevention Plan, standard best management practices that minimize impacts to vegetation shall include:

- Minimizing the removal or disturbance of vegetation within the right-of-way (ROW);
- Minimizing contact with roadside sources of weed seed that could be transported to other areas;
- Using low ground pressure equipment to minimize disruption to vegetation and soil;
- Developing and implementing aggressive management programs to limit colonization by invasive species plants and eradicate any invasive species within the rail ROW and support facilities;
- Using only certified weed-free straw and mulch for erosion control;
- Ensuring that adequate topsoil depth (minimum 4 inches) and textures are in place and promptly reseeding or revegetating using only plant species native to Interior Alaska;
- Using only seed meeting certified standards pursuant to 11 Alaska Administrative Code 34.075;
- Implementing dust control measures to stabilize soils from wind erosion and to reduce dust from construction activities; and
- Restoring temporarily cleared construction areas to previous conditions, including topography and vegetation communities.

35) Similarly, standard best management practices to minimize impacts to vegetation during forest clearing shall include:

- Avoiding operating equipment where excessive soil compaction and rutting would cause erosion that affects water quality; and

- Using low ground pressure equipment to minimize disruption to soil.

36) U.S. Department of Defense Alaska Command, Bureau of Land Management, and Alaska Department of Natural Resources shall be consulted with to develop mitigation to address the spread and control of nonnative invasive plants (NIPs), which shall include a monitoring and control plan for NIPs during rail line construction and operations. In addition to specifying that only seed mixes containing native or nonsustaining seed (such as annual rye) that are free of invasive plant species shall be used, this plan may include:

- Pressure washing of the wheels, tracks, undercarriages, buckets, etc., of all equipment at staging areas before they are allowed into the construction area; and
- Procedures to prevent, control, and monitor any NIPs that might germinate as a result of a spill of grain or animal feeds (*e.g.*, hay, pellets) during rail line operations.

37) Any restoration/revegetation on or adjacent to BLM managed lands shall be developed with a BLM authorizing officer (including species used, sources, etc.).

38) Under Title 16 of the Alaska Statutes, the measures listed below shall be imposed by the Alaska Department of Fish and Game for all activities below the ordinary high water mark in specified anadromous water bodies and in fish-bearing waters that could block fish passage. Exceptions to these requirements, including the use of spill containment and recovery equipment or material source development, may be allowed on a case-by-case basis.

- All ice crossings shall be drilled before equipment crossing to determine the ice thickness.
- Alteration of river, stream, or lake banks or beds, except for approved permanent crossings, shall be prohibited.
- The operation of equipment, excluding boats, in open water areas of rivers and streams shall be prohibited. Exceptions for water withdrawal shall be permitted on a site-specific basis.
- Ice or snow bridges and approach ramps constructed at river, slough, or stream crossings shall be substantially free of extraneous materials (for example, soil, rock, wood, or vegetation) and shall be removed or breached before spring breakup.
- Bridges are the preferred watercourse crossings in fish spawning and important rearing habitats. In areas where culverts are used, they shall be designed, installed, and maintained to provide efficient passage of fish.

39) Detonation of explosives within, beneath, or in proximity to fish-bearing waters shall not result in overpressures exceeding 2.7 pounds per square inch unless the water body, including its substrate, was frozen solid. Peak particle velocity stemming from explosive detonation shall not exceed 0.5 inch per second during the early stages of egg incubation.

40) Winter ice bridge crossings and summer ford crossings of all anadromous and resident fish streams shall require prior Alaska Department of Fish and Game permit

authorization under Alaska Statute 16.05.841 and Alaska Statute 16.05.871. If necessary, natural ice thickness may generally be augmented (through removing snow, adding ice or water, or other technique) if site-specific conditions, including water depth, are sufficient to protect fish habitat and maintain fish passage.

41) An anadromous water body shall not be narrowed between its ordinary high water marks, unless specifically authorized in writing by Alaska Department of Fish and Game prior to construction.

42) Water withdrawal from fish-bearing waters shall be subject to prior written approval by the Alaska Department of Natural Resources Division of Mining, Land and Water and the Alaska Department of Fish and Game Division of Habitat and shall reserve adequate flow to support indigenous aquatic life. The watercourse shall not be blocked to the passage of fish. Each water intake directly accessible by fish shall be designed to prevent the intake, impingement, or entrapment of fish.

43) The Applicant, Alaska Department of Fish and Game, and Alaska Department of Natural Resources shall review and discuss potential methods of both rail design and warning systems to reduce moose-train mortality, such as:

- Maintaining vegetation along the right-of-way (ROW) in primary (e.g., grasses/sedges) or late (e.g., old-growth spruce) successional stages. If vegetation was allowed to progress to the secondary successional stage (i.e., shrubs), it shall be maintained at the shortest possible height, not to exceed 0.5 meter. Preferably, shrubs shall be of non-preferred moose browse species (e.g., alder, dwarf birch). Every effort shall be made to minimize re-growth of willow, paper birch, and aspen. Vegetation shall be mowed in late summer prior to energy stores being sent to the root systems.
- In winter, plowing snow back from the track to the outer edge of the trackside clearing to allow moose easy access away from the tracks when a train approaches.
- Not seeding grasses after approximately July 15, because fresh green growth has been noted to attract moose to ROWs during early fall, resulting in high rates of moose/train collisions.
- Developing a plan in conjunction with Alaska Department of Fish and Game to catalog all strikes (not just confirmed or suspected deaths) in a timely manner that shall include, but is not necessarily limited to: precise location (latitude and longitude), date and time, sex and age of moose; weather and other environmental conditions at time and location of strike; and attributes associated with the train, such as horn use, speed, and track characteristics.
- Designing, constructing, and operating all aspects of the rail line to minimize significant alteration of moose and other wildlife movement and migration patterns.

44) The most appropriate and efficient methods to achieve the goal of proper handling, storage, and disposal of human food, garbage, and waste that may become putrid shall be used. Food and garbage shall be secured and disposed of during construction and operations in a manner to prevent bears from becoming habituated to such materials.

45) A bear interaction plan to minimize conflicts between bears and humans shall be prepared and implemented. The Alaska Department of Fish and Game shall assist the Applicant in developing educational programs and camp layout and management plans as the Applicant prepares its construction and operations plans.

46) Construction and land clearing activities shall not be conducted within 0.5 mile of known occupied grizzly and black bear dens, unless alternative mitigation measures were approved by Alaska Department of Fish and Game. The Applicant shall obtain a list of known den sites from Alaska Department of Fish and Game's Division of Wildlife Conservation prior to commencement of any activities and shall report occupied dens encountered in the field to Alaska Department of Fish and Game.

47) Harassment of wildlife, including winter or calving concentrations of moose (cows with yearling calves can be particularly defensive) and known occupied bear dens, shall be prohibited. Workers shall be instructed not to feed wildlife.

48) The Applicant shall coordinate with U.S. Department of Defense Alaska Command and Bureau of Land Management regarding fire suppression for potential rail-ignited fires.

20.2.4 Cultural Resources

Applicant's Voluntary Mitigation Measures

The Applicant identified the following voluntary measures as potential mitigation for impacts to cultural resources:

VM-24 The Applicant shall develop protocols to inform and prepare construction supervisors of the importance of protecting archaeological resources, graves, and other cultural resources and how to recognize and treat the resources.

VM-25 The Programmatic Agreement (PA) being developed by SEA, the Alaska State Historic Preservation Office, cooperating agencies, and consulting parties requires that areas within the limits of project disturbance that have not been surveyed be surveyed. Potential stipulations include:

- The PA shall detail procedures and methodologies for identification of resources and reporting, reviewing, and implementing appropriate treatment measures for any cultural resources found within the project area.
- The PA shall identify appropriate actions should previously undiscovered archaeological or cultural resource sites be unearthed during construction activities.

SEA's Preliminary Mitigation Measures

SEA identified the following preliminary measure as potential mitigation for impacts to cultural resources:

49) If a determination of Adverse Effect is made for the project, a mitigation program for affected historic properties shall be developed in consultation with the Alaska State Historic Preservation Office, as described in the Programmatic Agreement. Mitigation for affected historic properties may involve stabilization/ preservation, or archaeological excavation to recover data, or, as in the case of historic architecture, it

may involve Historic American Building Survey/Historic American Engineering Record documentation and other data-recording strategies.

20.2.5 Subsistence

Applicant's Voluntary Mitigation Measures

The Applicant did not identify voluntary mitigation measures for impacts to subsistence.

SEA's Preliminary Mitigation Measures

In addition to the preliminary measures related to public access identified in Section 20.2.10, SEA identified the following measure as potential mitigation for impacts to subsistence:

50) The Applicant shall schedule certain construction activities that could temporarily block access trails and waterways to occur during the winter to the extent practicable, especially activities related to bridge construction and near access points in the right-of-way, because travel is less restricted and use of the area is at lower levels during this season.

20.2.6 Climate and Air Quality

Applicant's Voluntary Mitigation Measures

The Applicant identified the following voluntary measures as potential mitigation for impacts to climate and air quality:

VM-26 To minimize fugitive dust emissions created during project-related construction activities, the Applicant shall implement appropriate fugitive dust suppression controls, such as spraying water or other approved measures. The Applicant shall also operate water trucks on haul roads as necessary to reduce dust.

VM-27 To limit construction-related emissions, the Applicant shall work with its contractor(s) to ensure that construction equipment is properly maintained and that required pollution-control devices are in working condition.

SEA's Preliminary Mitigation Measures

SEA did not identify preliminary mitigation measures for impacts to climate and air quality.

20.2.7 Noise and Vibration

All of the receptors that SEA estimates would experience adverse noise impacts from the proposed rail line operations would result from locomotive horn sounding. The Federal Railroad Administration (FRA) requires horn sounding at public grade crossings as a safety measure. As a further safety measure, the Applicant elects to sound locomotive horns at private grade crossings.

SEA considers safety to be of paramount importance when evaluating rail projects and potential mitigation. Congress directed FRA to develop and issue regulations requiring the use of locomotive horns at public grade crossings. Congress also provided FRA with the authority to allow exceptions to the horn sounding requirement. FRA's Use of Locomotive Horns at Highway-Rail Grade Crossings: Final Rule and amendments (70 *FR* 21844-21920, April 27, 2005, as amended at 71 *FR* 47614-47667, August 17, 2006; 71 *FR* 14850, March 29, 2007; 72 *FR* 44790-44792, August 9, 2007; 73 *FR* 30661-30662, May 28, 2008) requires the sounding of locomotive horns at public grade crossings and addresses issues such as horn loudness, sounding time, and sounding distance from a grade crossing. The final rule also includes procedures through which communities can develop quiet zones (in which locomotive horns are not sounded) when alternative safety measures fully compensate for the absence of the warning provided by locomotive horn sounding. Examples of such safety measures include four-quadrant gates, median barriers, and the closing of selected grade crossings within the quiet zone.

FRA's final rule establishes that the community or public authority ("the public entity responsible for traffic control or law enforcement at the public highway-rail grade or pedestrian crossing"; 49 CFR 222.37) alone has the authority to pursue establishment of a quiet zone. While the community must notify the railroad and provide the railroad an opportunity to participate, it is the community's responsibility to fund and establish a quiet zone in consultation with the FRA. SEA is not proposing to require that the Applicant establish or fund quiet zones as a mitigation measure because locomotive horn sounding is a safety-related activity under the jurisdiction of FRA, not the Board, and FRA's regulations clearly state that establishment of a quiet zone is up to the community, in consultation with FRA.

The exposure of receptors to vibration resulting from rail line operations can be reduced through the use of resilient fasteners and ballast mats. Resilient rail fasteners can be used to reduce vibration, but typically the attenuated frequency range is higher than the frequency range of vibration induced by freight rail operations. That is, the frequency range of the mitigation method must match the frequency range of the train-induced vibration to be effective. Ground-borne vibration produced by freight rail operations is typically at lower frequencies than the vibration that can be effectively reduced by resilient rail fasteners. Ballast mats can also be used to attenuate vibration, and ballast mats can reduce vibration levels at lower frequencies; however, even with careful design of the mat and underlying bed support, performance can be uncertain because of the dependence of ground-borne vibration propagation on actual soil conditions.

Applicant's Voluntary Mitigation Measures

The Applicant identified the following voluntary measure as potential mitigation for noise impacts:

VM-28 The Applicant shall work with its construction contractor(s) to minimize, to the extent practicable, construction-related noise disturbances near residential areas. Construction and maintenance vehicles shall be in good working order with properly functioning mufflers to control noise.

SEA's Preliminary Mitigation Measures

SEA identified the following preliminary measures as potential mitigation for noise impacts:

51) The Applicant shall consult with affected communities regarding the construction schedule to minimize, to the extent practical, construction-related vibration disturbances in residential areas during evenings and weekends.

52) Prior to initiating construction activities related to the proposed rail line, the Applicant shall establish a Community Liaison to consult with affected communities, landowners, and agencies. Among other responsibilities, the Community Liaison shall assist communities or other entities with the process of establishing quiet zones, if requested.

20.2.8 Transportation

Applicant's Voluntary Mitigation Measures

The Applicant identified the following voluntary measures as potential mitigation for transportation impacts.

VM-29 The Applicant shall establish a Diagnostic Team comprised of ARRC staff, community members, Alaska Department of Transportation and Public Facilities, and others to apply Federal and state regulations regarding roadway/rail line crossings in consultation with Federal Railroad Administration safety officials. This process shall result in appropriate safety measures for every roadway/rail line crossing.

VM-30 The Applicant shall continue its ongoing efforts with community officials to identify the public emergency response teams in the project area and shall provide, upon request, hazardous-materials training. Before the start of operations, the Applicant shall contact the appropriate departments and agencies to provide them with information concerning the proposed operations to allow the departments and agencies to incorporate the information into local response plans.

VM-31 During construction of tracks across existing roads, road users shall be notified of temporary road closings and other construction-related activities. The Applicant shall provide for detours and associated signage, as appropriate, or maintain at least one open lane of traffic at all times to allow for the quick passage of emergency and other vehicles. Signs providing the name, address, and telephone number of a contact person shall be displayed onsite to assist the public in obtaining immediate responses to questions and concerns about project activities.

VM-32 To the extent practicable, the Applicant shall confine all project-related construction traffic to project-specific roads within the right-of-way (ROW) or established public roads. Where traffic cannot be confined to these roads, the Applicant shall make necessary arrangements with landowners to gain access. Any temporary access roads constructed outside the rail line ROW shall be removed and restored upon completion of construction unless otherwise agreed to with the landowners.

VM-33 The Applicant shall coordinate with U.S. Department of Defense Alaska Command and Bureau of Land Management personnel, as appropriate, regarding activities occurring within military base and training areas.

VM-34 Appropriate state and local transportation agencies shall be consulted with to determine the final design and other details of grade crossings and warning devices.

VM-35 For each of the public grade crossings on the new and existing rail line, permanent signs prominently displaying both a toll-free telephone number and a unique grade crossing identification number in compliance with Federal Highway Administration (23 Code of Federal Regulations Part 655) shall be provided. Applicant's personnel shall answer the toll-free number 24 hours a day.

SEA's Preliminary Mitigation Measures

SEA did not identify preliminary mitigation measures for impacts to transportation.

20.2.9 Navigation

Applicant's Voluntary Mitigation Measures

The Applicant identified the following voluntary measures as potential mitigation for impacts to navigation:

VM-36 A Section 9 Bridge Permit shall be obtained from the U.S. Coast Guard for construction of bridges over navigable rivers (*e.g.*, Tanana River, Little Delta River, Delta River, and Delta Creek). Permit stipulations shall be incorporated into the construction contract specifications.

VM-37 In coordination with the U.S. Coast Guard, adequate clearances for navigation of recreational boats on navigable rivers shall be provided.

SEA's Preliminary Mitigation Measures

SEA identified the following preliminary measure as potential mitigation for impacts to navigation:

53) The Applicant shall set bridge foundations and operate construction equipment during the winter when practicable.

54) The Applicant shall coordinate with Alaska Department of Natural Resources to ensure that bridges and culverts on secondary streams (those not within the jurisdiction of U.S. Coast Guard) are designed to accommodate navigation by recreational boat users in a manner that shall not impede existing ongoing uses, to the extent possible.

20.2.10 Land Use

Applicant's Voluntary Mitigation Measures

The Applicant identified the following voluntary measures as potential mitigation for impacts to land use:

VM-38 Prior to initiation of construction activities related to this project, and for 1 year following start-up of operations on the new rail line, the Applicant shall provide a Community Liaison to consult with affected communities, businesses, and agencies; develop cooperative solutions to local concerns; be available for public meetings; and conduct periodic public outreach. The Applicant shall provide the name and telephone number of the Community Liaison to mayors and other appropriate local officials in each community through which the new rail line passes.

VM-39 The Applicant shall continue its ongoing community outreach efforts by maintaining a web site about the project throughout the construction period of the proposed rail line.

VM-40 In the event of any damage caused by project-related construction activities, the Applicant shall work with affected landowners to appropriately redress any damage to each landowner's property.

VM-41 The Applicant shall address concerns about fragmentation of neighborhoods and farm properties by maintaining the connectivity of major roadways and working with local residents on specific right-of-way acquisition issues.

VM-42 The Applicant shall work with affected businesses or farms to appropriately address project-related construction activity issues affecting any business or farm.

VM-43 To the extent practicable, the Applicant shall ensure that entrances and exits for businesses are not obstructed by project-related construction activities, except as required to move equipment.

VM-44 The Applicant shall consider fencing on a case-by-case basis for agricultural areas.

VM-45 Depending on the alternative selected, during construction of the crossings over navigable rivers, some short-term temporary restrictions of watercraft traffic could occur for safety purposes. The Applicant shall install warning devices to notify boaters of project-related bridge construction activities. Signs providing the name, address, and telephone number of a contact person shall be displayed onsite to help waterway users obtain immediate responses to questions and concerns about project activities.

VM-46 The Applicant shall make reasonable efforts to minimize disruptions to utilities by scheduling construction work and outages to low-use periods. The Applicant shall notify residents and other utility customers in advance of construction activities requiring temporary service interruptions.

VM-47 As part of the National Pollutant Discharge Elimination System Stormwater Construction Permit and Stormwater Pollution Prevention Plan:

- Land used for temporary staging areas shall be restored to natural conditions if occurring on undeveloped Alaska Department of Natural Resources land or restored to its former uses if occurring on military or private land.
- Public land areas that were directly disturbed by project-related construction and were not owned by the Applicant (such as temporary access roads, haul roads, and crane pads) shall be restored to their original condition, as reasonable and practicable, upon completion of construction.
- In business and industrial areas, project-related equipment and materials shall be stored in established storage areas or on the Applicant's property. Parking of equipment or vehicles, or storage of materials along driveways or in parking lots, shall be prohibited unless agreed to by the property owner.
- Project-related construction vehicles, equipment, and workers shall not access work areas by crossing business or agricultural areas, including parking areas or driveways, without advance notice to/permission from the owner.

VM-48 Reasonable efforts shall be made to identify all utilities that are reasonably expected to be materially affected by the proposed construction within the right-of-way (ROW) or that cross the ROW. The Applicant shall consult with utility owners during design and construction so that utilities are protected during project-related construction activities. The Applicant shall notify the owner of each such utility identified prior to project-related construction activities and shall coordinate with the owner to minimize damage to utilities.

VM-49 Contractor(s) shall be required to dispose of waste generated during project-related construction activities in accordance with applicable Federal, state, and local regulations.

VM-50 In accordance with the Applicant's Oil Spill Contingency Plan and Emergency Response Plan, the required notifications to the appropriate Federal and state environmental agencies in the event of a reportable hazardous materials release shall be made. The Applicant shall work with the appropriate agencies, such as Alaska Department of Environmental Conservation, U.S. Environmental Protection Agency, and U.S. Fish and Wildlife Service, to respond to and remediate releases.

VM-51 Before the start of operations, the appropriate departments and agencies shall be contacted and provided with information concerning the proposed operations to allow the departments and agencies to incorporate the information into local response plans.

VM-52 At least 1 month before initiating construction activities in the area, the information described below regarding project-related construction of the new rail line, and any additional information, as appropriate, shall be provided to fire departments within the project area, Federal Emergency Management Administration, the Fairbanks North Star Borough Emergency Operations Department, and the Delta Greely Local Emergency Planning Committee, including:

- The schedule for construction throughout the project area, including the sequence of construction of public grade crossings and approximate schedule for these activities at each crossing;
- A telephone number for the Applicant's contact, who shall be available to answer questions or attend meetings for the purpose of informing emergency-service providers about the project construction and operations; and
- Revisions to this information, including changes in construction schedule, as appropriate.

SEA's Preliminary Mitigation Measures

SEA identified the following preliminary measures as potential mitigation for impacts to land use:

55) Prior to construction, the Applicant shall develop a plan to ensure construction activities occur during the most appropriate timeframe to limit potential impacts on recreation activities. The Applicant shall observe the following measures:

- The plan shall be developed prior to completion of final engineering plans in consultation with Alaska Department of Natural Resources, Alaska Department of Fish and Game, other appropriate government agencies, and user groups to determine the location of all established and recognized state trails, including a discussion of informal, legal trails on state land, and the pattern of recreation activities (time and location of most frequented recreation areas).
- The plan shall designate temporary access points if main access routes must be obstructed during construction and include an agreed-upon number and location of access points as determined during consultation with applicable agencies.

56) The Applicant shall consult with U.S. Army Corps of Engineers, Alaska Department of Natural Resources Division of Mining, Land and Water, and Alaska Department of Fish and Game land managers regarding possible impacts to and mitigation for the lake, boat ramp, and water accessway that might be built as part of the proposed

Moose Creek grade separation between the existing Alaska Railroad Corporation rail line and Richardson Highway.

57) If Salcha Alternative Segment 2 is included in a license issued by the Board, the Applicant shall consult with the Alaska Department of Transportation and Public Facilities, Fairbanks North Star Borough Department of Parks and Recreation, Fairbanks North Star Borough School Board, Salcha School, and the Salcha Ski Club to determine the precise extent of potential effects to the Salcha School and the Salcha Ski Area. Mitigation could include, but is not limited to, full relocation and reconstruction of affected recreation facilities, parking lots, and recreation-support facilities of all types for both the school and ski area. The Applicant shall use caution to select a construction period of least disturbance to recreational activities at the school and ski area and to the cross-country ski season, in particular.

58) If Eielson Alternative Segment 3 is included in any license issued by the Board, the Applicant shall consult with Eielson Air Force Base and Alaska Department of Fish and Game to determine the degree of impact to parking areas and campsites. Mitigation could include, but is not limited to, construction of alternative access roads to existing campsites, creating grade-separated crossings (thus negating the necessity of using locomotive horns for at-grade crossings), or moving campsites to locations outside the affected area.

59) If Eielson Alternative Segment 3 is included in any license issued by the Board, the Applicant shall consult with Eielson Air Force Base and Alaska Department of Fish and Game to determine the degree of impact on the parking area west of Grayling Lake. If the parking area would be reduced in size as a result of its proximity to the proposed rail centerline, the Applicant shall ensure adequate parking space outside of the right-of-way, which could include expansion of the parking area at its eastern end.

60) The Applicant shall consult with the appropriate management agencies to provide enough bridge clearance for passage of recreational watercraft (of a size appropriate to the particular waterbody) and other uses under bridges on major recreation access streams and rivers. Rivers of particular note include Piledriver Slough, the Little Salcha River, the Fivemile Clearwater River, and the Richardson Clearwater River.

61) The Applicant shall consult with resource management agencies, such as the Fairbanks North Star Borough, Alaska Department of Natural Resources, and Bureau of Land Management, and appropriate trail user groups regarding provision, access, and design of crossings for legal trail easements that intersect with the proposed rail line. Consultation shall include discussion of general dispersed-use access, informal public trails on state land, blazed section lines, and long stretches of rail line without designated public crossings.

62) The Applicant shall provide crossings for the following: the trail to the Blair Lakes Area; Silver Fox Lodge Trail; Alaska Department of Natural Resources (ADNR) Winter Trail (ARRC has included two crossings of this trail as part of the proposed action); Koole Lake Trail; Donnelly-Washburn Trail; ADNR Forestry Winter Road; and Rainbow Lake Trail.

63) The Applicant shall consider, in collaboration with applicable resource management agencies, the provision of trail crossings for the following: Piledriver Slough Dog Mushing Trails; Phillips Road/Delta Junction Area Trail Network; existing trails

designated on the Fairbanks North Star Borough Recreational Trails Map, including those used for dog mushing; and potentially a subset of "Important Trails in the Planning Area" listed in the Tanana Basin Area Plan.

64) The Applicant shall consult with appropriate agencies and user groups (which could include Fairbanks North Star Borough Department of Parks and Recreation, Alaska Department of Natural Resources, Alaska Department of Fish and Game, Bureau of Land Management, Eielson Air Force Base, Fort Greely, Fort Wainwright, and the Salcha Dog Mushers Association) to determine a construction period of least disturbance to recreation activities associated with waterways and the trail system.

65) The Applicant shall consult with appropriate agencies and user groups to identify and designate temporary access points if main access routes must be obstructed during construction and such temporary points are deemed necessary in consultation with area land managers and user groups. Crossings shall preserve access for a variety of motorized and non-motorized uses. To the extent possible, without increasing resource use conflicts among subsistence, commercial, sport, and recreational users, proposed rail line construction and operations shall make full, nonexclusive use of existing winter roads, trails, and clearings to minimize additional clearing and habitat disturbance in the project area.

66) Where feasible and prudent, timber with commercial or personal use values from lands that would be cleared for the rail line right-of-way shall be salvaged.

67) When performing construction activities anywhere on military lands, the Applicant shall coordinate with the Fort Wainwright contaminant specialists.

68) Coordination with Bureau of Land Management (BLM)/ U.S. Department of Defense Alaska Command (ALCOM) shall occur during the right-of-way (ROW) permitting process, and the ROW instrument issued by BLM/ALCOM shall include stipulations to ensure military training is not adversely affected.

20.2.11 Visual Resources

Applicant's Voluntary Mitigation Measures

The Applicant did not identify voluntary mitigation measures for impacts to visual resources.

SEA's Preliminary Mitigation Measures

SEA identified the following preliminary measures as potential mitigation for impacts to visual resources where the rail line would be located on Bureau of Land Management-administered land:

69) To minimize the visual impact of the cleared right-of-way:

- Structures (excluding safety-related devices) associated with the build alternatives shall be located as far from crossings as practicable to avoid attracting visual attention and, in heavily vegetated areas, shall be painted to blend with the surrounding vegetation to the extent consistent with safety considerations.
- Clearing at road crossings shall be minimized, which could be accomplished by leaving a few larger trees and some smaller trees and shrubs untouched, to reduce visual contrast and mimic natural clearings in the landscape, where consistent with safety measures.

- Native trees and bushes shall be planted densely around the base of bridge supports located on land to break up the uniform lines, colors, and smooth textures of the bridge supports.
- Bridges shall be painted a color to match the surrounding landscape. Where these bridges continue into the vegetation and for bridges over small streams and rivers, structures shall be painted a uniform dark color, such as dark green or black, to match the existing landscape.

70) To reduce visual impact in areas of high visibility (such as residential areas):

- Native vegetation shall be planted along the right-of-way to reduce the contrast with line, color, and texture.
- In areas with hillcuts, slopes shall be shaped to reflect the natural landscape, where practicable, and planted with native materials to provide an amorphous and irregular form and rough texture.
- Excess material shall be disposed of in a suitable fill location and not cast on downhill slopes.
- To the extent consistent with safety considerations, structures shall be painted a color that blends with the existing vegetation, or self-weathering steel shall be used.

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22. LIST OF PREPARERS

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Contractors

ICF International (ICF) and its subcontractors were responsible for supporting the Section of Environmental Analysis in conducting its environmental analyses and in the preparation of the EIS.

Name, Firm, Project Function	Qualifications
Project Management	
Alan Summerville, ICF Project Manager	M.A. City Planning, B.A. Economics and Political Science. 18 years of experience participating in and managing the preparation of NEPA documents.
David Bauer, ICF Deputy Project Manager, Column Leader of Rail Environment Section	M.S. Environmental Engineering Sciences, B.A. Chemistry. 30 years of environmental assessment and management experience, including 7 years on rail projects.
Technical and Other Expertise (alphabetically)	
Linda Amato, ICF Document Production	M.U.R.P. Community Planning & Design, B.A. Art History, Certificate, Technical Writing & Communication. 23 years of experience in managing and preparing environmental documentation.
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Name, Firm, Project Function	Qualifications
Lynette Bontrager, ENTRIX Biological Resources	B.S. Computer Information Systems, B.S. Environmental Biology. 1 year of experience assessing environmental impacts, performing literature reviews, and conducting field surveys. 2 years of experience using GPS units and GIS applications. 3 years of experience performing academic and field research. 5 years of experience writing and preparing technical documents for publication.
Pete Bowers, Northern Land Use Research Cultural Resources	M.A. Anthropology, B.A. Anthropology. Over 30 years experience performing research as principal investigator or primary researcher throughout Alaska for projects covering all aspects of cultural resource management including environmental planning documents.
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Sarah Jenniges, ENTRIX GIS Lead	M.S. Geography, Specializing on Environmental GIS and Remote Sensing, B.A. Geography, Certified GISP (Geographic Information Systems Professional). 10 years of GIS experience working in public and private sector, 2 years in environmental GIS analysis application.
David Johnson, ICF Biological Resources, Water Resources	B.S. Biology, Minors in Geology and Chemistry. 9 years of experience assessing aquatic resources, resource inventory and classification, impact assessment, permitting assistance, and regulatory compliance.
Don Jones, ICF Graphics	A.A.S. Computer Graphic Design, M.S. General Studies. 16 years of experience in graphic design including 7 years of experience in environmental planning document production.
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Name, Firm, Project Function	Qualifications
Mike Nagy, ENTRIX Agency Consultation, Tribal and Government-to-Government Coordination Column Leader of Natural and Physical Environment Section, Land Use	Graduate Studies Natural Resources, B.S. Natural Resources. 31 years of experience in environmental impact assessment and documentation.
Lynn Noel, ENTRIX Biological Resources	M.S. Natural Resources-Fisheries, B.S. Biology. 22 years experience conducting fish and wildlife research, monitoring, and affects assessment projects. 15 years experience completing impact assessments, wildlife and wetland habitat mapping in Alaska. 15 years experience conducting spatial analyses for impact assessments in Alaska.
Melissa Pauley, ICF Mitigation	M.S. Environmental Science and Management, Duquesne University; B.S. Environmental Studies, Bucknell University. 5 years of experience in regulatory compliance, permitting, and impact assessment.
David Peterson, ENTRIX Recreational Resources, Section 4(f)	M.A. Urban & Regional Planning, B.A. Sociology/Anthropology and Religion. 2 years of experience participating in and managing the preparation of CEQA and NEPA documents. 5 years of urban planning experience in the regional planning, economic development, environmental impact analysis, redevelopment, and transportation sub-fields.
Ben Potter, Northern Land Use Research Cultural Resources	Ph.D. Anthropology, M.A. Anthropology, B.A. Anthropology. 13 years of experience in Alaskan archaeology, CRM, predictive modeling, and intersite analysis.
Molly Proue, Northern Land Use Research Cultural Resources	M.A. Anthropology, B.A. Anthropology. 6 years archaeological experience, 3 years in Alaska; experience in ceramic analysis, GIS, historical archaeology, ethnohistory, archival research, and cultural resource management.
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Name, Firm, Project Function	Qualifications
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Steve Wilbur, Jacques Whitford Water Resources	Ph.D. Geology/Fluvial and Hillslope Geomorphology, M.S. Geology/Glaciology, B.A. Geology/Quaternary Studies/Ocean Resources. 19 years of experience participating in and managing the preparation of NEPA documents, particularly in the areas of physical sciences and water resources.
Hova Woods, ICF Document Manager	M.P.A. Environmental Policy and Management, B.S. Finance. 8 years of experience in environmental policy and impact assessment.
Stephen Wrenn, MACTEC Topography, Geology, and Soils	B.S. Geology. 2 years participating in the preparation of NEPA documents. 8 years experience analyzing geological and geotechnical conditions throughout Alaska. 28 years experience performing environmental site assessments primarily in Alaska.
Barbara Wyse, ENTRIX Visual Resources	M.S. Environmental and Natural Resource Economics, B.A. Environmental Sciences and Policy. 4 years of experience analyzing environmental policies, planning, and programs for NEPA documents.

23. LIST OF AGENCIES, ORGANIZATIONS, TRIBES AND PERSONS TO WHOM COPIES OF EIS ARE SENT

The Surface Transportation Board's regulations identify the types of agencies and officials to receive environmental documentation (49 Code of Federal Regulations [CFR] Part 1105.7). Additionally, National Environmental Policy Act (NEPA) regulations identify appropriate distribution (40 CFR Part 1500 to 1508). This section lists the agencies, officials, and other interested persons receiving the Draft Environmental Impact Statement (EIS) on the proposed Northern Rail Extension. The Section of Environmental Analysis (SEA) also provided specific information about how to comment on this Draft EIS to those on the notification list.

SEA published in the *Federal Register* a Notice Availability of the Draft EIS and also distributed it widely to maximize public awareness of the availability of the document and to provide instructions on how to comment on the Draft EIS. SEA concurrently mailed the Draft EIS to Federal, state and local agencies, elected officials, and other interested persons as listed below.

23.1 Federal Agencies

- Federal Aviation Administration
- Federal Energy Regulatory Commission
- Federal Railroad Administration
- Federal Transit Administration
- National Marine Fisheries Service
- Natural Resource Conservation Service
- U.S. Air Force
- U.S. Army
- U.S. Army Corps of Engineers
- U.S. Coast Guard
- U.S. Department of the Interior, Bureau of Land Management
- U.S. Department of the Interior, Bureau of Indian Affairs
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- U.S. Minerals Management Service
- U.S. Missile Defense Agency, Ground-Based Midcourse Defense

23.2 State Agencies

- Alaska Department of Commerce, Community and Economic Development
- Alaska Department of Environmental Conservation
- Alaska Department of Fish and Game
- Alaska Department of Labor and Workforce Development
- Alaska Department of Law
- Alaska Department of Military and Veterans Affairs
- Alaska Department of Natural Resources
- Alaska Department of Public Safety

- Alaska Department of Transportation and Public Facilities
- Alaska Department of Revenue
- Alaska Division of Homeland Security and Emergency Management
- Alaska Industrial Development and Export Authority
- Alaska Office of Management and Budget
- Alaska State Chamber of Commerce
- Alaska State Community Service Commission
- Alaska State Parks
- Regulatory Commission of Alaska

23.3 County and Local Governments

- City of Delta Junction
- City of Fairbanks
- City of Nenana
- City of North Pole
- Delta Fish and Game Advisory Commission
- Delta Junction Chamber of Commerce
- Fairbanks Chamber of Commerce
- Fairbanks District Office
- Fairbanks North Star Borough
- Fairbanks North Star Borough Commission on Historic Preservation
- Fairbanks North Star Borough Department of Land Management
- Fairbanks North Star Borough Inspection and Maintenance and Air Pollution Control Commission
- Fairbanks North Star Borough Land Management Advisory Commission
- Fairbanks North Star Borough Land Management
- Fairbanks North Star Borough Parks and Recreation
- Fairbanks North Star Borough Planning Commission
- Nenana Valley Chamber of Commerce
- North Pole Chamber of Commerce
- Salcha-Delta Soil and Water Conservation District

23.4 Tribal Contacts

- Ahtna, Inc.
- Alaska Federation of Natives
- Circle Native Community (IRA)
- Cook Inlet Region, Inc.
- Council of Athabascan Tribal Governments
- Dinyee Corporation
- Dot Lake Village
- Doyon, Limited
- Fairbanks Native Association
- Healy Lake Traditional Council
- Manley Hot Springs Village

- Mentasta Lake Tribal Council
- Native Village of Cantwell
- Native Village of Chistochina
- Native Village of Eagle (IRA)
- Native Village of Kotzebue
- Native Village of Minto (IRA)
- Native Village of Stevens
- Native Village of Tanana
- Native Village of Tetlin (IRA)
- Nenana Native Council
- Northway Tribal Council
- Northway Village
- Rampart Village
- Tanacross Village
- Tanana Chiefs Conference
- Tetlin Village
- Tok Native Association
- Yukon River Inter-Tribal Watershed Council

23.5 Elected Officials

- Alan Baker, City of Nenana
- Tim Beck, Assembly Member, Fairbanks North Star Borough
- Tonya L. Brown, Council Member, City of Fairbanks
- Kelly Brown, Assembly Member, Fairbanks North Star Borough
- John Coghill Jr., Representative, District 11, Alaska State Legislature
- John Eberhart, Council Member, City of Fairbanks
- Leslie Feilner, Council Member, City of Delta Junction
- Torie Foote, Assembly Member, Fairbanks North Star Borough
- Randy Frank, Assembly Member, Fairbanks North Star Borough
- David Guttenberg, Representative, District 8, Alaska State Legislature
- Pete Hallgren, Council Member, City of Delta Junction
- John Harris, Representative, District 12, Alaska State Legislature
- Louis Heinbockel, Council Member, City of Delta Junction
- Lloyd Hilling, Council Member, City of Fairbanks
- Luke Hopkins, Assembly Member, Fairbanks North Star Borough
- Sharron Hunter, Council Member, City of North Pole
- Dough Isaacson, Mayor, City of North Pole
- Jeff Jacobson, Council Member, City of North Pole
- Michael Jenkins, Council Member, City of Delta Junction
- Kyle Johansen, Representative, Alaska State Legislature Transportation Committee
- Scott Kawasaki, Representative, District 9, Alaska State Legislature
- Mike Kelly, Representative, District 7, Alaska State Legislature
- Albert Kookesh, Senator, District C, Alaska State Legislature
- Mary Leith-Dowling, Mayor, City of Delta Junction

- Dianna Lindhag, Council Member, City of North Pole
- Pablo Martinez, Council Member, City of Delta Junction
- Jason Mayrand, Mayor, City of Nenana
- Lisa Murkowski, Senator, U.S. Senate
- JW Musgrove, Council Member, City of Delta Junction
- Mike Musick, Assembly Member, Fairbanks North Star Borough
- Sarah Palin, Governor, State of Alaska
- Sean Parnell, Lieutenant Governor, State of Alaska
- James Ramras, Representative, District 10, Alaska State Legislature
- Chad Roberts, Council Member, City of Fairbanks
- Woodie Salmon, Representative, District 6, Alaska State Legislature
- Guy Sattley, Assembly Member, Fairbanks North Star Borough
- Micahel Schmetzer, City of Fairbanks
- Dennis Small, Assembly Member, Fairbanks North Star Borough
- Ted Stevens, Senator, U.S. Senate
- Vivian Stiver, Council Member, City of Fairbanks
- Bill Stringer, Assembly Member, Fairbanks North Star Borough
- Terry Strle, Mayor, City of Fairbanks
- Gene Therriault, Senator, Alaska State Legislature
- Joe Thomas, Senator, Alaska State Legislature
- Steve M. Thompson, Council Member, City of Fairbanks
- Mike Tibbles, Chief of Staff, Alaska Governor's Office
- Michael Welch, Council Member, City of North Pole
- Jim Whitaker, Mayor, Fairbanks North Star Borough
- Gary Wilken, Senator, Alaska State Legislature
- Doug Wilson, Council Member, city of North Pole
- Nadine Winters, Assembly Member, Fairbanks North Star Borough
- Donald Young, Representative, U.S. House of Representatives

23.6 Organizations

- 5-Plex Farwell
- 9 Lives Recreation
- A&L Outdoor Enterprises
- ABR, Inc.
- Alaska Arctic Wildlife Guides
- Alaska Bird Observatory
- Alaska Boaters Association
- Alaska Caberet, Hotel, Restaurant and Retailers Association
- Alaska Center for the Environment
- Alaska Conservation Alliance
- Alaska Dog Mushers Association
- Alaska Farm Bureau
- Alaska Farmers Co-Op
- Alaska Horseback Guides

- Alaska Hunting Adventures
- Alaska Junjik Safaris
- Alaska Miners Association
- Alaska Motor Coaches
- Alaska Newspapers
- Alaska Oil & Gas Association
- Alaska Oil and Gas Conservation Commission
- Alaska Outdoor Council
- Alaska Painting Contractors, Inc.
- Alaska Power Association
- Alaska Railroad Workers
- Alaska Recreational Dog Mushers
- Alaska Skijor and Pulk Association
- Alaska State American Federation of Labor and Congress of Industrial Organizations
- Alaska State Muzzle Loading Association
- Alaska State Snowmobile Association
- Alaska Support Industry Alliance
- Alaska Travel Industry Association
- Alaska Trucking Association
- Alaska Vehicle Transport
- Alaska Waterfowl Association
- Alaska Wilderness Recreation & Tourism Association
- Alaska Worldclass Adventures
- Alaskan Perimeter Expeditions
- Alaskan Sled Dog Racing Association
- All West Freight, Inc.
- Alyeska Pipeline Service Co.
- American Train Dispatchers/Brotherhood of Locomotive Engineers
- Anchorage Economic Development Corporation
- Associated Builders and Contractors
- Associated Design Consultants, Inc.
- Associated General Contractors of AK
- Audubon Alaska
- Aurora Aviation
- Bible Baptist Church of Fairbanks
- Black Sheep Showmen
- Boys and Girls Club Foundation
- Cater-Burgess
- Catholic Social Services Refugee Assistance Program
- Citizens for a Cleaner, Quieter, and Safer Fairbanks
- Commonwealth North
- Cooperative Extension Service
- Crying Time Inc
- Delta Community Library
- Delta Concrete Products

- Delta Greely School District
- Delta Industries
- Delta Sportsmen’s Association
- Denali Pipeline Consortium
- Denver Signal Design
- Duane Miller and Associates
- Fairbanks Bed and Breakfast
- Fairbanks International Airport
- Fairbanks Junior Dog Musher’s Association
- Fairbanks Retriever Club
- Fairbanks Snow Travelers
- Fleet Reserve Association
- Flint Hills Refinery
- Friends of Delta Junction Agriculture
- Gavora Inc.
- GJD Properties LLC
- Gold King Creek Lodge
- Golden Heart Utilities
- Golden North Archery Association
- Goldstream Valley Trail Users Association
- Hachez Rentals LLC
- Hasz Consulting Co.
- HDR
- Hompesch and Evans
- Horizon Lines
- Hunt Alaska
- Interior Alaska Airboat Association
- Interior Alaska Gun Dog Association
- Interior Alaska Land Trust
- Interior Issues Council
- Interior Regional Housing Authority
- John Reilly Associates, Inc.
- Kanza Construction, Inc.
- Knotty Shop
- Kolar Bear Inc.
- Korean Presbyterian Church of Fairbanks
- Landco Inc
- Lanser Builders, Inc
- Liberty Homes Inc
- Local 995/996
- Lockheed Martin Space Operations
- Long Creek Trading Post
- Machinists & Aerospace Workers
- Marybeth Harele House Foundation
- Middle Tanana Tours and Transport

- Midnight Sun Muzzleloaders
- Midway Lodge
- Moose Creek Lodge
- Noel Wein Public Library
- North Country River Charters
- North Pole Branch Library
- North Pole Elementary School
- North Pole Middle School
- North Star Terminal and Stevedore Co.
- Northern Alaska Environmental Center
- Northern Alaska Tour Co.
- Off The Lip LLC
- Pearl Creek Nordic Park Citizens Committee
- Perkins Consulting
- Peter’s Fishing Charters
- Pioneer Outfitters
- Plumber and Steamfitters
- Polaris Junction
- Port of Anchorage
- Princess Tours
- Ratlaff Properties LLC
- Resource Development Council for Alaska, Inc
- Rolling Stone, Inc
- Ruffed Grouse Society
- Salcha Baptist Church
- Salcha Dog Mushers Association
- Salcha Elementary School
- Salcha Hardware
- Salcha Latter Day Saints Church
- Salcha Marine
- Salcha Rescue
- Salcha River Lodge
- Salcha Search and Rescue
- Salcha Senior Center
- Salcha Ski Club
- Salcha Store
- Second Chance League
- Shannon & Wilson, Inc.
- Sierra Club
- Smith’s Green Acres RV Park
- State of Alaska Mental Health Trust Authority
- Stillmeyet Corporation
- Tanana Adventure Sports
- Tanana Middle School
- Tanana Valley Sportsmen’s Rifle and Pistol Club

- Test the Waters Adventure Sports
- The Boat Shop
- The Conservation Fund
- The Nature Conservancy of Alaska
- The SnowShu Inn
- The Wilderness Society
- TNH-Hanson, LLC
- Tok Shooters Association
- Totem Ocean Trailer Express
- Trustees for Alaska
- Two Rivers Dog Mushers Association
- University of Alaska
- Westmark Hotel and Conference Center
- Whitestone Community Association
- Whitestone Farms
- Whittier Ports and Harbor
- Wild River Guides
- Wilderness Watch
- Zach's Restaurant

23.7 Private Citizens and Landowners

- Ainley David H Revocable Trust
- Vern Aiton
- Beau Allen
- Clay Amberg
- Judith Anderson
- Robert Baker
- Jeff and Marina Ball
- Valerie Baxter
- Jeffery Baxter
- Barry Beck
- Jim Beget
- Thomas Behan
- Al and Sheran Benerth
- Benerth Trust
- Donald Benish
- John & Yvonne Betters
- Robert Bird
- John Black
- William Black
- John Blankenship
- Blockcolsky Willima E Living Trust
- Kells Boland
- Richard Borsetti
- Bradbury Family Trust
- Robert Bradley
- Gary Brockman
- Tim Brooks
- Allen Burt
- Allen Busby
- Busby Estate Trust
- Donald Callahan
- Nathan Callis
- Edward Chacho
- Ellen Clark
- Tammy Cobb
- Terry Cochrane
- Thomas Connelly
- Mary Corcoran
- Virginia Damron
- Daro Edward Henry Revocable Living Trust
- Stuart & Robyn Davies
- Douglas Diem
- Larry Dorshorst
- Harvey Drake

- Michael and Eileen Dubowski
- Pete Dunham
- Kim & Lisa Ellard
- Daniel Emerick
- Karen Erickson
- Darrel Eversman
- Jackson Fox
- Fox Robert P Keogh Plan
- Donald Fry
- Doyle Gass
- Ann Geise
- Paul Glavinovich
- Robert Goldsmith
- James Gray
- Pat Gross
- Robert Groseclose
- Amy Grothe
- Keith Hardenbrook
- James Helgeson
- Robert Hiller
- Paul Hinkle
- Thomas Hobrle
- Judy Holiday Toliver
- Dorothy Hottinger
- Karl Hough
- Willis Howard
- Steve Howdeshell
- Mary Illingworth
- Ronald Illingworth
- Sabrina Jackson
- Cindy Jeffries
- Mollie Jensen
- John Johansen
- Roy Johnson
- Matthew Johnson
- Shaun Johnson
- Kelly Catherine Trust
- Anne Kerin
- Mark & Carmela Kern
- Richard King
- Charles Knight
- Jerry Koerner
- Keith Koontz
- Jan Kreischer
- Joseph Kuntz
- Carel Lane
- William Langley
- Brian Lawhead
- William Lefferson
- Matt Leistico
- Marty Lester
- Charles Lovejoy
- Chris Luth
- Michael & Cynthia Luts
- John Manley
- Markgraf Trust
- Lisa Masheff
- Stephen Matthew
- Kristy McCumby
- Thomas McGhee
- Donald McPherson
- Dan Miller
- Endil Moore
- Audrey Murphy
- Alice Musick
- Audrey Muzzillo
- Stewart & Mary Anne Nutter
- Donna Olesen
- Jim Ostlind
- Clifford Pananen
- Lars Petersen
- Linda Pett
- Russ Pinkelman
- Michael Pochop
- Ralph Powell
- Judith Pulsifer
- Ray Tony Gene Trust
- Margaret Randolph
- Paul Ratcliff
- Michael Reed
- Dan Rees
- Gerald Richards
- Katharine Richardson
- Robert Riddle
- Mary E. Wagner Riddle
- Donald Ritter
- RK Trust
- Sullivan Robert Living Trust
- Jerry Rubert

- Caroline Sanz
- Todd Schallock
- Nancy Schupp
- Don Seeliger
- Kenneth Severin
- William Sewell
- Kathy and Mike Shelland
- William Shelland
- Larry Shier
- Wendell Shiffler
- Shari Sims
- John Sloan
- Warren Smith
- Stanley Solski
- Eric Stenberg
- Geraldine Stern
- Ann Stone
- James Stone
- Charles Tanner
- Brian Tansky
- Kenneth Therriault
- Bob Thierolf
- Doran Thomas
- John Tobin
- William Tompkins
- Fred Tuttle
- Betty Underwood
- Valentime Craig A Living Trust
- Robert Valdetta
- Teri Venable
- Kathy Vincent
- Catherine Voigt
- Bob and Pat Vroman
- Kent Wegener
- Tammie Wegener
- Richard Weibel
- Whipple William Family Trust
- Trevor White
- Brenda Wilbur
- Bonnie Williams
- Ross Williams
- Jack Windsor
- James Wolverton
- Allyn Yanish
- Brenden Yakoubian
- Thomas Young
- Randy Zarnke

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