APPENDIX O
CUMULATIVE IMPACTS

O. CUMULATIVE IMPACTS

The Surface Transportation Board's (STB or the Board) Section of Environmental Analysis (SEA) researched and collected information about other future projects and actions that could result in impacts that would coincide in time and space with potential impacts of the proposed Port MacKenzie Rail Extension. SEA interviewed key personnel from project proponent and/or permitting offices and agencies to identify various past, present, and reasonably foreseeable future projects and actions, and reviewed analyses and information about those projects and actions to identify which to include in the cumulative impacts analysis and/or as part of each resource area analysis. SEA then applied a screening process to determine if projects were reasonable, foreseeable, and could be associated with potential cumulative impacts. This appendix describes projects and actions SEA considered for inclusion in the cumulative impacts analysis. Section O.1 describes projects and actions SEA included in the analysis; Section O.2 lists projects SEA did not include in the analysis and provides an explanation for their exclusion; and, lastly, Section O.3 describes potential cumulative impacts of the proposed rail line when added to the impacts of projects and actions described in Section O.1.

O.1 Projects and Actions Included in the Analysis

O.1.1 Beluga to Fairbanks Natural Gas Pipeline

The Alaska Natural Gas Development Authority (ANGDA) has proposed a 20- to 24-inch high-pressure, bi-directional, buried steel natural gas pipeline project between Beluga and Fairbanks (B2F) to bring Cook Inlet natural gas to North Pole/Fairbanks, Alaska. The B2F pipeline would consist of a total of four segments (ANGDA, 2008); however, this cumulative impacts analysis includes only the Beluga Fields to Palmer segment of the pipeline. This segment would follow one of two routes, both of which are located in the southern half of the Port MacKenzie Rail Extension project area. The Enstar Route option would cross the Connector 1, Connector 3, and Big Lake segments, while the Chugach Route option would cross the Mac East and Mac West segments. Approximately 90 percent of the proposed 480 miles of pipeline would be in existing right-of-ways (ROWs) and easements. In the longer term, ANGDA expects to build feeder lines and take-off points as the system grows to meet Alaska's needs.

O.1.2 Cook Inlet Areawide Oil and Gas Lease Sale

The Alaska Department of Natural Resources (ADNR) made a final best interest finding for the Cook Inlet areawide oil and gas lease sale (applicable to sales from 2009 through 2018) and released a notice of sale on April 3, 2009. The ADNR sold four tracts (totaling 7,685 acres) at the May 20, 2009 sale. Three of the tracts and most of the total acreage leased are offshore (ADNR, 2009). Additional authorizations are required for subsequent exploration, development, and production phases. Though impacts from the May 2009 sale would be focused in the Cook Inlet, most of the Port MacKenzie Rail Extension project area could be included in future lease sales.

O.1.3 Cook Inlet Ferry

Matanuska-Susitna Borough (MSB) is proposing a year-round commuter ferry system that would provide transportation across the 2 miles of Knik Arm that separates the MSB and Anchorage, Alaska. This project would involve the construction of a ferry landing located more than 1 mile from the Mac West Terminal Reserve of the Port MacKenzie Rail Extension. The terminal building and parking area for the ferry have already been constructed. The MSB plans to submit an application for dock construction after it finds a design agreeable to the U.S. Coast Guard, Cook Inlet Tug and Barge, and the Municipality of Anchorage. Pending funding, the MSB anticipates constructing a dock at Port MacKenzie in summer 2010 (ADN, 2009) and the ferry would go into service the following year (Maritime News, 2009).

O.1.4 Cook Inlet OCGen™ Power Project

Ocean Renewable Power Company Alaska has developed a proprietary ocean current electrical generation technology (OCGen™) to generate renewable electricity from open-ocean and tidal currents with minimal impact to the environment (ORPC, 2006). The OCGen™ Tidal Turbine-Generator Unit (TGU) utilizes advanced design cross flow turbines on either side of a single underwater permanent magnet generator and has no gears. TGUs can be stacked to create larger OCGen™ modules. Ocean Renewable Power Company plans to install the prototype OCGen™ module in the Cook Inlet in mid-2010, operate it until at least mid-2011, and begin installation of the first phase of the ultimate tidal energy project in mid-2012 (ORPC, 2009). Project impacts would be focused on the specified installation location within the Cook Inlet, and to-be-determined onshore locations where transmission lines would be constructed. As of September 2009, the technology had been developed to the point of field testing; feasibility tests and other studies were in progress. On June 29, 2009, the Federal Energy Regulatory Commission (FERC) requested additional information from Ocean Renewable Power Company to be submitted by January 31, 2010, so FERC could conclude the pre-filing process (FERC, 2009). Ocean Renewable Power Company submitted additional information to FERC in January 2010 and FERC accepted that information for filing (FERC, 2010).

O.1.5 Knik Arm Crossing

The Knik Arm Crossing project would involve constructing 2.5-mile-long bridge crossing the Knik Arm of Upper Cook Inlet in order to connect the Municipality of Anchorage with the MSB. The project would include a toll plaza, a rural principle artery, and phased construction to meet anticipated future travel demand (KABATA and ADOT&PF, 2007). The roadway connection on the MSB side of Knik Arm would be Point MacKenzie Road near the Port MacKenzie District. The crossing landfall would be located approximately 1 mile from the Mac West Terminal Reserve and approximately 3 miles from the Mac East Terminal Reserve. Impacts resulting from the crossing would be focused at the southern end of the Port MacKenzie Rail Extension project area. On September 18, 2007, the Federal Highway Administration issued the *Final Environmental Impact Statement and Final Section 4(f) Evaluation Summary for the Knik Arm Crossing*. A Record of Decision is pending consultation with the National Marine Fisheries Service on the beluga whale (KABATA, 2009).

O.1.6 Knik-Willow Transmission Line Upgrade

The Alaska Energy Authority (AEA) Knik-Willow (Teeland-Douglas) transmission line upgrade project would replace an older segment of the Anchorage-Fairbanks Intertie with 25 miles of new 230 kilovolt transmission line between the Teeland (Knik) and Willow (Douglas) substations in Alaska. The transmission line route would be located in the northern part of the Port MacKenzie Rail Extension project area and would likely cross the Houston North, Houston South, and Big Lake segments. As of February 2009, AEA anticipated that an additional route from the Lake Lorraine area near Point MacKenzie to Willow would be studied and possibly could include a new switchyard about 3 miles northwest of Port MacKenzie. The AEA published a Draft Alaska Railbelt Regional Integrated Resource Plan (RIRP) Study in December 2009. That Draft RIRP includes a Lake Lorraine to Douglas route for a possible new transmission line. SEA did not include that possible Lake Lorraine to Douglas route area in this analysis because there are no specific routes or alternative routes defined. The Draft RIRP indicates that detailed engineering and permitting activity plans are not finalized or funded, and, if finalized and funded, would begin in the 2011 through 2016 timeframe (Black & Veatch, 2009).

O.1.7 Goose Creek Correctional Center

The Goose Creek Correctional Center, a joint project between the MSB and the State of Alaska, is an approximately 450,000 square foot, 1,536 bed medium-security prison at the corner of Alsop Road and Point MacKenzie Road. The facility will be on a 300-acre lot, 150 acres of which have already been cleared as of June 2009 (ADOC and MSB, 2009a). As part of this and other projects, Point MacKenzie Road and Alsop Road would be upgraded to meet applicable standards. As of September 2009, it was anticipated that the facility will be commissioned in late 2011 or early 2012 and will begin operations in early to mid-2012. Impacts from the correctional center would be focused in the area of the Mac East Segment of the Port MacKenzie Rail Extension.

O.1.8 MSB Regional Aviation System Plan

The MSB Regional Aviation System Plan (RASP) includes a basic inventory of airports and improvements needed at public airports; a forecast of aviation growth; locations for new public airports and/or floatplane bases; and preliminary plans for layout of the highest priority new airports and floatplane bases. New or upgraded airport facilities identified in the RASP include locations at Big Lake, Goose Bay, and Seven-Mile Lake. The closest Port MacKenzie Rail Extension segment would be the Big Lake Segment. Additionally, as a corollary to the RASP, the MSB Assembly approved a Float Plane Facility Location study, but a future reconnaissance and environmental study will be needed to identify the preferred location of this facility (Sworts, 2008).

O.1.9 Port MacKenzie Development Projects

The MSB owns Port MacKenzie and continues to explore commercial ventures for the port, as highlighted by the projects listed below. Impacts from the projects below would be focused at the southern end of the Port MacKenzie Rail Extension project area and would be located closest

to the Mac East and Mac West Terminal Reserves. In addition to the projects listed here, the MSB is considering other projects not included in this cumulative impacts analysis because SEA considers them speculative (see Section O.2) (Zartman, 2008).

O.1.9.1 Bulk Materials Facility

In a verified statement submitted to the STB on December 16, 2008, the MSB indicated that they are pursuing development of a bi-modal bulk materials facility at Port MacKenzie. The facility plan would include upgrades to roads, storage, and storage areas at the Port (ARRC, 2009a). Construction started on the access road and the stock-pile pad in September 2009 (Sworts, 2009).

O.1.9.2 Gravel Mining

As part of an ongoing port expansion project, the MSB and Quality Asphalt and Paving are moving gravel by dump scow from an excavation site in Port MacKenzie to the Port of Anchorage to provide the foundation for the marine terminal development north expansion (White, 2008). Approximately 451,000 tons were excavated in the summer of 2008 (Zartman, 2008), no gravel was excavated in the summer of 2009 for the Port of Anchorage project, and approximately 450,000 tons are planned for excavation in the summer of 2010 (Zartman, 2009).

Another mining project at the Alsop pit located approximately 10 miles north of the port involved the mining of less than 100,000 tons of Class A gravel to be used for the Point MacKenzie Road Upgrades and Paving project (Sworts, 2009).

O.1.9.3 Deep-Draft Dock Expansion

In July 2008, the U.S. Army Corps of Engineers permitted expansion plans for a deep-draft dock at Port MacKenzie. Although the preliminary designs have been completed for this expansion, as of October 2009, Port MacKenzie had not secured funding for the project (Zartman, 2009). In December 2004, the berth depth of the dock proposed for expansion was increased to 60 feet in order to accommodate vessels such as panamax and cape-sized vessels, state ferries, and cruise ships to dock. After the dock was completed, a private company constructed a conveyor system, road, and 18-acre pad to allow for the import and export of commodities.

O.1.9.4 Port MacKenzie-Barge Dock Expansion

A Port MacKenzie barge dock constructed in 2000 and expanded in 2003 (Port MacKenzie, 2008) is expected to be further expanded by almost 8 acres. The Port received a permit for the expansion in January 2007, funding was received in 2009, and construction is anticipated to begin in winter 2009-2010 (Zartman, 2009).

O.1.10 Port of Anchorage Marine Terminal Redevelopment Project

The Port of Anchorage Marine Terminal Redevelopment Project will expand, reorganize, and improve the Port of Anchorage over a 7-year period by adding 135 acres of land (doubling the size of the marine terminal) and providing approximately 8,880 linear feet of waterfront structures near the existing Port of Anchorage marine terminal. The project is located across the Cook Inlet from the southern end of the Port MacKenzie Rail Extension project area.

Construction began in 2005 and is expected to continue through 2014, primarily in summer field seasons. The U.S. Department of Transportation Maritime Administration, in cooperation with the Port of Anchorage, published an Environmental Assessment and a Finding of No Significant Impact in March 2005 (Port of Anchorage Intermodal Project, 2008).

O.1.11 Road Projects

A number of road projects are planned throughout the Port MacKenzie Rail Extension project area, including areas near the Big Lake, Willow, Mac East, and Mac West segments. SEA included those road projects listed below in the cumulative impacts analysis as reasonably foreseeable because they are funded; their designs are almost complete and would be ready for implementation upon receiving or being assigned funding; or they have been designated as a recipient of American Reinvestment and Recovery Act funding.

O.1.11.1 Parks Highway: Lucas Road (Wasilla) to Big Lake Cutoff Improvements (State Transportation Improvement Program [STIP] #11961)

This project would widen Parks Highway to four lanes as well as perform traffic and safety improvements between Wasilla and the Big Lake Cutoff (ADOT&PF, 2006). The improvements would include work at Bridge No. 1922 Wasilla Railroad Crossing (ADOT&PF, 2008a). As of July 2009, the Alaska Department of Transportation & Public Facilities (ADOT&PF) was in the environmental assessment phase of the project. Design is scheduled for 2010, clearing the right-of-way is scheduled for 2012, and construction of the roadway is scheduled for 2013 (ADOT&PF, 2009b).

O.1.11.2 Parks Highway: Willow Creek Bridge to Kashwitna River Bridge Rehabilitation, Mile Posts 72 to 83

This ADOT&PF project involves Federal funding for rehabilitation and necessary safety improvements to Parks Highway. In April 2009, a categorical exclusion was completed for the project, indicating that the project does not generally result in adverse environmental impacts (ADOT&PF, 2003). Construction has begun and is anticipated to be completed in October 2010 (ADOT&PF, 2009b).

O.1.11.3 Point MacKenzie Road Upgrades and Paving (STIP #20254)

This realignment and paving project upgrades 12.2 miles of Point MacKenzie Road from the intersection of South Burma Road to a point 0.5 mile before the intersection with Lu Young Lane (Koski, 2009), as noted in the 2006-2009 STIP. In addition to widening, this project includes straightening 13 curves in the lower 9 miles of Point MacKenzie Road and installing culverts to cross drainages along the alignment (MSB, 2009a). A geotechnical report was used to develop three alternatives to complete the final 0.5 mile of upgrades (Koski, 2009). Construction on this segment began in June 2009 (MSB, 2009a).

O.1.11.4 Point MacKenzie Road Improvements: Don Young Road Upgrades

The MSB, in cooperation with the ADOT&PF and the Alaska Division of Federal Highway Administration, is proposing repairs to Point MacKenzie Road between Mile Posts 21.8 and 23.0

– a segment also known as Don Young Road (Jackson, 2009) – to improve vehicle safety and increase access to the Port MacKenzie dock. This project would reduce the grade of Don Young Road from 10 percent to 5 percent and improve water drainage. Seven culverts would be placed under the roadway, and drainage ditches would be constructed. A Categorical Exclusion for this project was completed on May 19, 2008 (ADOT&PF, 2008b). As of September 2009, construction to upgrade Don Young Road had not begun.

O.1.11.5 South Big Lake/Burma Road Upgrades (previously STIP #21355)

These adjacent projects would upgrade South Big Lake and Burma Roads. In 2008, the ADOT&PF performed environmental and preliminary design work for the Burma Road improvements (ADOT&PF, 2008d). Final design and ROW acquisition funds are earmarked for 2009 (ADOT&PF, 2008c). The designs of both road projects are expected to be completed by mid-2010; however, the ADOT&PF will need additional state appropriations to begin construction.

O.1.11.6 Knik Goose Bay Road Improvements

Improvements to the Knik Goose Bay Road would include installing traffic signals at Fairview Loop Signal and Vine Road. At present, the project is in the design phase, with construction and installation anticipated for summer 2009 (Kemplen, 2008); however, the ADOT&PF needs an additional $600,000 in funding for the Fairview Loop Signal options. The ADOT&PF completed Environmental Checklists for both intersection projects in 2008 (ADOT&PF, 2008e).

O.1.12 South Wasilla Rail Line Relocation

Alaska Railroad Corporation (ARRC) plans to straighten curves along the main line track in South Wasilla, between ARRC Mile Posts 154 and 158. The relocation would take place in the far eastern end of the Port MacKenzie Rail Extension project area and would be closest to the Big Lake Segment. The Federal Transit Administration issued an Environmental Assessment in September 2005 and a Finding of No Significant Impact in January 2006 (FTA, 2006). ARRC will construct the project in two phases. Phase One is approximately from ARRC Mile Posts 154 to 156; Phase Two is from ARRC Mile Posts 156 to 158. As of January 2009, ARRC was working to acquire the ROW for Phase One (ARRC, 2009b).

O.1.13 Su-Knik Wetland Bank – Umbrella Mitigation Bank Instrument – Big Lake South Individual Bank Plan

The MSB and Sustainable Environments, LLC partnership, together referred to as Su-Knik, propose to establish an umbrella preservation mitigation bank. The Big Lake South Bank, a 2,279-acre wetland preservation mitigation bank, is located in the MSB just southeast of Big Lake and just south of the Houston, Wasilla, and Palmer growth corridor, and would be a part of this umbrella. Fish Creek, Threemile Creek, and Goose Creek flow through the project area and connect an extensive complex of existing wetlands. The Supplement to the Umbrella Bank Instrument[1] for Big Lake South Bank was completed in September 2007 (Interagency Review

[1] A Mitigation Bank Instrument is a planning document used to establish a wetland mitigation bank.

Team, 2007a and 2007b). The mitigation banks would be located near the area of the Connector 1 Segment, and the Houston Segment, and would cross the Big Lake Segment of the Port MacKenzie Rail Extension.

O.1.14 West Mat-Su Access Project

The MSB has proposed to build a bridge across the Little Susitna River into the southern part of the Fish Creek Management Area, thereby providing road access to the western side of the Little Susitna River. The MSB is studying four road access route options including three locations for the bridge: the extension of Susitna Parkway in the Big Lake area, a location approximately 0.8 mile north of where the Iditarod National Historic Trail crosses the river, and near the existing Little Susitna River access at the end of Ayrshire Road. The access project might also include a short spur road continuing 3 to 4 miles west past the Little Susitna River (MSB, 2007). The Federal Highway Administration would fund the project. Potential road options associated with the access project could intersect Connector 1 and Big Lake segments of the Port MacKenzie Rail Extension.

O.2 Projects Considered but not Included in the Analysis

Certain projects proposed in the vicinity of the Port MacKenzie Rail extension have been excluded from this cumulative impacts analysis for the reasons provided below.

- A proposed Matanuska Electric Association coal-fired power plant is not being considered until at least 2012 (Carter pers. comm., 2008) and is therefore not considered reasonably foreseeable.
- A proposed MSB agricultural processing and product development facility to be co-located with a nutrition center is not funded and is therefore not considered reasonably foreseeable.
- Certain Port MacKenzie development projects have been proposed but have no associated design specifics and/or funding and are therefore not considered reasonably foreseeable.
- U.S. Army Corps of Engineers permitting actions were considered; however, no current or foreseeable USACE permit applications would be in the area of the proposed Port MacKenzie Rail Extension. SEA searched the USACE Alaska District Web site for USACE-sponsored operations and permit applications and contacted officials from the USACE's Regulatory Division to identify future applications that are known, but have not yet been officially filed. Because no projects require permits are planned in the vicinity, USACE actions are not included in this cumulative impacts analysis.
- The MSB completed a draft Joint Land Use Study to provide recommendations regarding land development policies and a compatible implementation strategy that supports the military's mission in the study area (MSB, 2009b). The draft Joint Land Use Study addresses noise concerns and appears to indicate that no noise contour is generated for helicopter operations because of the low number of helicopter operations. Because there are no residences in the very small area of overlap between the Port MacKenzie Rail Extension

project area and the Elmendorf AFB contour, SEA concluded that it did not require further analysis.

O.3 Environmental Consequences

This section discusses the potential cumulative impacts resulting from the proposed Port MacKenzie Rail Extension in conjunction with the other reasonably foreseeable actions described in Section O.1. For this analysis, SEA identified potential cumulative impacts to all of the environmental resource areas described in Chapters 3 through 15 of the Environmental Impact Statement (EIS). Cumulative impacts are discussed according to these resource areas in Sections O.3.1 through O.3.13 below.

O.3.1 Geology and Soils

O.3.1.1 Analysis

The primary impacts to geology and soils from the proposed Port MacKenzie Rail Extension construction and operations would include:

- Modification of topography through excavation and fill
- Removal and replacement of soils classified as unsuitable for construction of railroad embankments and service roads
- Exposure of highly erodible soils to the erosive forces of wind and water
- Conversion of lands within the ROW that contain soils considered to be of local importance for agriculture
- Potential damage to infrastructure from seismic events

Past impacts to soils and geology in the project area are primarily a result of excavation and fill activities associated with construction of the existing roadway network, residential and agricultural development, and borrow-site development. All of these activities result, to some extent, in minor impacts involving topographic modification and removal and replacement of the existing soil profile. Some these activities also lead to the exposure of highly erodible soils or conversion of agricultural lands.

Present and reasonably foreseeable cumulative impacts to geology and soils resulting from the Port MacKenzie Rail Extension in conjunction with the specific projects described in Section O.1 are listed below.

Cook Inlet Areawide Oil and Gas Lease Sale

The lease of state-owned land under the Cook Inlet areawide oil and gas lease sale would result in minor impacts to geology and soils resources in the Port MacKenzie Rail Extension project area. Impacts to geology and soils would result primarily from development activities, such as the excavation and fill associated with construction of facilities and access roads and land

clearing to create linear corridors for seismic surveys (ADNR, 2008). Such development activities could expose highly erodible soils, which could result in potential cumulative impacts to geology and soils in conjunction with those impacts associated with the Port MacKenzie Rail Extension alternatives.

Cook Inlet Ferry

The Cook Inlet Ferry project would impact geology and soils in the Port MacKenzie Rail Extension project area through excavation and fill activities associated with construction of the dock and landing. Minor cumulative impacts to geology and soils could result from these construction activities. Terminal buildings and parking areas for the ferry are already constructed and would therefore not contribute to cumulative impacts to geology and soils in conjunction with the Port MacKenzie Rail Extension alternatives.

Knik Arm Crossing

The Knik Arm crossing would impact geology and soils in the Port MacKenzie Rail Extension project area through excavation and fill activities associated with road upgrades and construction of new roadways connecting to the bridge. Development in the Point MacKenzie Agricultural Area would be expected as a result of the Knik Arm Crossing Project, and would contribute to the conversion of land that contain soils the MSB considers to be of local importance for agricultural purposes (FHWA and KABATA, 2007). Construction activities and development in previously undisturbed areas could also increase soil erosion (FHWA and KABATA, 2007). Minor cumulative impacts to geology and soils could result from these construction and development activities.

Knik-Willow Transmission Line Upgrade

The four alternative routes for the 230 kilovolt Teeland-Douglas transmission line upgrade project would require 236 to 242 acres of land clearing (Dryden and LaRue *et al.*, 2004). The land clearing could expose highly erodible soils, and could cumulatively contribute to potential impacts from the Port MacKenzie Rail Extension alternatives that include the Big Lake, Houston North, and Houston South segments. The transmission line facilities would be vulnerable to damage from seismic events.

Goose Creek Correctional Center

The Goose Creek Correctional Center is a new construction project that could contribute minor cumulative impacts to geology and soils in the Port MacKenzie Rail Extension project area through excavation and fill activities associated with construction of the facility and associated access roads and parking lots. Furthermore, the location of the facility in the Point MacKenzie Agricultural Area would result in the conversion of agricultural lands that the MSB considers to be of local importance, thereby cumulatively contributing to potential impacts on soils from the Port MacKenzie Rail Extension.

MSB Regional Aviation System Plan

Implementation of the Regional Aviation System Plan could contribute minor cumulative impacts to geology and soils in the Port MacKenzie Rail Extension project area through excavation and fill activities associated with upgrades to existing airstrips, and construction of new airports and float-plane facilities, and support infrastructure such as access roads and parking lots.

Beluga to Fairbanks Natural Gas Pipeline

ANGDA's proposed Beluga to Fairbanks natural gas pipeline could contribute minor cumulative impacts to geology and soils in the Port MacKenzie Rail Extension project area through excavation and fill activities associated with burial of the pipeline and construction of access roads. In addition, land clearing for the project could expose highly erodible soils, which could be cumulative to potential impacts from the Port MacKenzie Rail Extension.

Port MacKenzie Development Projects

Excavation and fill associated with Port MacKenzie development projects including the expansion of existing deep-draft and barge docking facilities, construction of a bi-modal bulk materials facility, and development of an open-pit gravel mine could be expected to contribute minor cumulative impacts to geology and soils in the Port MacKenzie Rail Extension project area. Construction for the bulk materials facility and gravel mining project is already underway.

Road Improvement Projects

Development of new road corridors could contribute to minor cumulative impacts to geology and soils in the Port MacKenzie Rail Extension project area through excavation and fill associated with roadbed construction. In addition, land clearing for the projects could expose highly erodible soils, which could be cumulative to potential impacts from the Port MacKenzie Rail Extension alternatives. The severity of impacts to geology and soils would depend on the length and route of the proposed roadways and the types of soils they would cross. The road projects included in this cumulative impacts analysis would not be expected to result in conversion of any agricultural lands that the MSB considers to be of local importance.

West Mat-Su Access Project

The construction of a bridge across the Little Susitna River and an associated access road could contribute minor cumulative impacts to geology and soils in the Port MacKenzie Rail Extension project area through excavation and fill activities associated with the construction of the roadbed and stream-crossing.

O.3.1.2 Conclusion

Construction and operations activities associated with some of the projects described above would result in minor adverse impacts to geology and soils resources and could cumulatively contribute to minor potential impacts associated with the proposed Port MacKenzie Rail Extension. Most notably, to some extent these construction and operations activities would

result in minor impacts related to topographic modification and removal and replacement of the existing soil profile. In some cases the activities could lead to the exposure of highly erodible soils or conversion of agricultural lands. Furthermore, infrastructure related to these projects would have some degree of vulnerability to damage resulting from seismic events. Impacts from the proposed Port MacKenzie Rail Extension, when added to other relevant present and reasonably foreseeable future projects and actions, could result in minor cumulative impacts to soils and geology in the Matanuska-Susitna area.

O.3.2 Water Resources

O.3.2.1 Analysis

Table O-1 summaries the direct and indirect potential impacts to water resources that could result from proposed Port MacKenzie Rail Extension construction and operations activities.

Table O-1
Potential Impacts to Water Resources from the Proposed Port MacKenzie Rail Extension

Effects of Construction and Operations	Direct Impacts	Indirect Impacts
Blockage, convergence or changes to the natural drainage	x	
Altered flood hydraulics		x
Increased potential for overbank flooding and/or ice/debris jams		x
Reduced floodplain area	x	
Increased scour, bank erosion and/or channel aggradation		x
Stresses on natural water balances		x
Increased turbidity and sediment loads		x
Increased concentrations of pollutants		x
Removal of surface soils and changes in recharge potential	x	
Dewatering of aquifers		x
Impacts to wetland mitigation bank lands	x	
Impacts to Goose Creek Fen	x	

Potential rail line impacts could contribute to existing direct and indirect impacts to water resources in the project area, which have resulted from past and ongoing urban, recreation, transportation, agriculture, and natural resource development activities. The Big Lake Segment would affect the Goose Creek Fen and wetland mitigation bank lands, both of which are considered to be sensitive and important wetlands resources. The following paragraphs describe cumulative impacts to water resources from the Port MacKenzie Rail Extension when added to the impacts of several ongoing and reasonably foreseeable future projects and actions. SEA analyzed impacts to surface waters and wetlands; impacts to groundwater and floodplains were not analyzed as there are not likely to be adverse impacts to groundwater or floodplains resulting from the proposed rail line extension.

Cook Inlet Areawide Oil and Gas Lease Sale

Potential impacts to surface water and wetlands from the proposed Port MacKenzie Rail Extension, when added to surface water and wetlands impacts from Cook Inlet Areawide oil and gas lease sale activities, could result in cumulative impacts to water resources in areas where the projects overlap. Development activities would include clearing corridors for seismic surveys, drilling of wells, production activities, and direct excavation and fill activities for construction of associated facilities and access roads. Physical disturbances such as land clearing, excavation, and placement of fill near waterbodies could result in direct impacts to surface water and wetlands.

Knik Arm Crossing

The Knik Arm Crossing project would be expected to impact water resources in the Port MacKenzie Rail Extension project area. Bridge construction, road upgrades, new roadways to connect to the bridge, and increased traffic near waterbodies, could directly impact surface water. However, since there is no overlap of potential surface water impacts from the Knik Arm Crossing with those from the rail line extension, no cumulative impacts would result.

Knik-Willow Transmission Line Upgrade

The preferred alternative for the Teeland-Douglas transmission line project could contribute to cumulative impacts to surface water and wetlands in the Port MacKenzie Rail Extension area through construction and land clearing activities near waterbodies. The preferred alternative for the transmission line would require construction that would run parallel to existing main lines and cross the proposed Port MacKenzie Rail Extension Houston North, Houston South, and Big Lake segments. The transmission line construction and clearing activities near waterbodies could directly impact the same surface water and wetlands resources as those in the impact areas of the proposed rail line segments.

Goose Creek Correctional Center

The Goose Creek Correctional Center could impact surface water resources in the area of the Mac East Segment. Potential impacts to surface water resources from the Port MacKenzie Rail Extension along the Mac East Segment, when added to surface water impacts from the Goose Creek Correctional Center, could result in locally substantial cumulative impacts to surface water resources.

MSB Regional Aviation System Plan

Physical disturbances such as land clearing, excavation, and placement of fill near waterbodies under the Regional Aviation System Plan could directly impact surface water resources. In addition, oil and fuel leaks from float planes and runoff from new airports and associated parking lots could reduce water quality. The potential impacts to water resources from the Big Lake Segment of the proposed Port MacKenzie Rail Extension, when added to regional and localized impacts to surface water quality from implementing the Regional Aviation System Plan, could cumulatively impact water resources in the area of the Big Lake Segment due to the proximity of the Big Lake Airport facility.

Beluga to Fairbanks Natural Gas Pipeline

The proposed Beluga to Fairbanks natural gas pipeline would cross numerous waterbodies and floodplains, and cause increased off-road vehicle travel. The Enstar route for the pipeline would cross the Port MacKenzie Rail Extension Big Lake Segment, Connector 1 Segment, and Connector 2 Segment, and coincide with the Ayrshire Road option of the West Mat-Su Access Project, which includes a bridge across the Little Susitna River. The Chugach route for the pipeline would cross the Port MacKenzie Rail Extension Mac East Segment. Physical disturbances such as land clearing, excavation, and placement of fill near waterbodies could directly impact surface water and wetlands. Therefore, potential impacts to water quality from the Port MacKenzie Rail Extension, when added to potential impacts from the Beluga to Fairbanks natural gas pipeline (especially at areas near the pipeline), could result in cumulative impacts to surface water and wetlands in the area of the Connector 1 Segment, Connector 2 Segment, the Big Lake Segment, and the Mac East Segment.

Port MacKenzie Development Projects

Cumulative impacts to surface water could occur in the area of the Mac West and Mac East segments as a result of the combination of surface water impacts from Port MacKenzie development projects including the expansion of existing deep-draft and barge docking facilities, construction of a bi-modal bulk materials facility, and development of an open-pit gravel mine, and the proposed rail line extension.

Port of Anchorage Marine Terminal Redevelopment Project

The U.S. Department of Transportation, Maritime Administration, in cooperation with the Port of Anchorage concluded that the Port of Anchorage Marine Terminal Redevelopment Project would not result in significant adverse impacts to water resources. Therefore, there would be no significant cumulative impacts to water resources from the Port MacKenzie Rail Extension and the Port of Anchorage Marine Terminal Redevelopment Project.

Road Improvement Projects

Development of new road corridors would directly impact surface water, groundwater, and floodplains resources. The scale of impacts would depend on the length and routes of the proposed roads and the waterbodies they would cross. Physical disturbances such as land clearing, excavation, and placement of fill near waterbodies could directly impact surface water resources. Water resources impacts from road projects in the areas of the Mac West, Willow, and Big East segments would overlap with potential impacts of the rail line extension resulting in cumulative impacts to surface water resources.

Su-Knik Wetland Bank – Umbrella Mitigation Bank – Big Lake South Individual Bank Plan

The wetland bank concept would compensate for wetland impacts from developments that occur elsewhere. The Big Lake Segment would cross two wetland mitigation bank areas; thus reducing the wetland acreage available to compensate for the impacts of other projects. Therefore, potential impacts from the Port MacKenzie Rail Extension, when added to the

impacts of other development projects in the area of the Big Lake Segment, could result in cumulative impacts to water resources in the wetland bank areas.

West Mat-Su Access Project

Construction of the bridge and access roads under the West Mat-Su Access Project could cause increased traffic near waterbodies and could directly impact surface water. Potential road options associated with the project could be constructed near Connector 1 Segment and the Willow Segment. Therefore, potential impacts to surface water resources from the Port MacKenzie Rail Extension, especially in areas close to the West Mat-Su Access Project, could result in cumulative impacts to surface water resources.

O.3.2.2 Conclusion

Construction and operations activities associated with the projects described above could impact surface water and wetlands resources in some of the same areas as certain rail line segments. There would be no overlap of impacts to the Goose Creek Fen from other present or reasonably foreseeable future proposed projects and actions. Therefore, potential impacts to water resources from the proposed Port MacKenzie Rail Extension, when added to other relevant projects and actions, could result in cumulative impacts to water resources in the Matanuska-Susitna area.

O.3.3 Biological Resources

O.3.3.1 Analysis

The primary potential impacts to biological resources from construction and operations of the proposed Port MacKenzie Rail Extension would be habitat loss and altered suitability; fish, wildlife, and vegetation mortality; and reduced survival and reproductive success of native species. Linear projects that involve significant land clearing across long distances could interrupt natural fire ecology by leading to the creation of fire breaks along the project right-of-way. These fire breaks could lead to an increase in fuel accumulation along one side of the project right-of-way, thereby increasing the risk of more intense wildland fires. As a result of this disruption of the natural fire cycle, separated vegetation communities might experience different rates of ecological succession leading to a decrease in biodiversity in the project area.

All Port MacKenzie Rail Extension alternatives could contribute to cumulative impacts to biological resources in the rail line project area. The potential impacts could add to impacts from existing urban, recreation, transportation, agriculture, and resource development activities. The following paragraphs describe the impacts of other relevant projects and how potential impacts from the proposed rail line, when added to the impacts of other relevant projects, could result in cumulative impacts to biological resources.

Cook Inlet Areawide Oil and Gas Lease Sale

The ADNR's Minerals Management Service found that lease sales and potential subsequent exploration and development would have no measurable negative effects on the Cook Inlet area (MMS, 2003) and the ADNR issued a Final Best Interest Finding on January 20, 2009 (ADNR, 2009).

Oil and gas lease activities in the Susitna Flats and Goose Bay State Game Refuges could impact the same areas as the proposed rail line's Connector 1 Segment and the Mac West and Mac East segments; these rail segments would encroach on the Susitna Flats and Goose Bay State Game Refuges. Seismic survey lines and temporary and permanent access roads and facilities in these refuges could increase access to hunting and fishing areas in the refuges. Seismic survey lines could contribute to additional fragmentation of forested and wetland habitats throughout the Port MacKenzie Rail Extension project area. Cleared seismic-line and temporary-access corridors would likely receive heavy off-road vehicle use, especially corridors through heavily forested areas. Increases in off-road vehicle traffic would impact stream banks by increasing erosion at crossings and would impact wetlands as off-road vehicles make new trails through wetland areas. Any increases in off-road vehicle access would also contribute to the spread of invasive plant species by aiding in the distribution of seed material and creating environmental conditions such as soil compaction and exposed mineral soils that favor the growth of non-native plants. Therefore, potential impacts to biological resources from the proposed Port MacKenzie Rail Extension, when added to impacts from oil and gas lease activities, could result in cumulative impacts to biological resources in the Susitna Flats and Goose Bay State Game Refuges.

Cook Inlet Ferry

Cook Inlet Ferry construction and operations would impact essential fish habitat, anadromous fish, marine mammals, and marine birds through reduced water quality resulting from increased suspended sediments from runoff; non-point source pollution from the ferry parking lot runoff, associated buildings, and roads; and noise from terminal and ferry operations (HDR, 2006a). Potential indirect impacts of the Port MacKenzie Rail Extension related to increased vessel traffic at Port MacKenzie, when added to marine pollution and disturbance from the Cook Inlet Ferry, could result in cumulative impacts to biological resources.

The indirect impacts of increased vehicle traffic on Port MacKenzie and Knik-Goose Bay Roads resulting from the Cook Inlet Ferry would result in collision mortality for moose and other animals. Potential wildlife-train collision impacts from the proposed rail line, particularly from the Mac East and Big Lake segments, when added to wildlife-vehicle collision impacts associated with the ferry, could result in cumulative impacts to wildlife. Increased vehicle traffic would also have the potential to contribute to the spread of invasive plant populations.

Cook Inlet OCGen™ Power Project

Development of a pilot marine tidal power project employing mid-water OCGen™ turbine generator units, mooring lines, anchors, and power cables could impact marine benthic habitat, essential fish habitat, beluga whales, and marine and anadromous fish. The project could disturb migratory patterns that, along with the potential impacts to essential fish habitat from the Port MacKenzie Rail Extension, could reduce the reproductive success of salmonids. Additionally, temporary construction noise (boat traffic, pile driving, etc.) and potential turbidity would likely disturb beluga whales. Operations of the turbine generator units could potentially affect beluga whales through collision or obstruction. The Cook Inlet demonstration project area extends from north of Cairn Point in the Knik Arm to Fire Island Shoals. Potential impacts from the Port MacKenzie Rail Extension, when added to the impacts from installation of the pilot project,

could result in minor cumulative impacts to vessel traffic, noise, beluga whales, and marine and anadromous fish.

Knik Arm Crossing

The Knik Arm Crossing could result in minor impacts to marine fish and invertebrates, beluga whales, and marine birds, essential fish habitat, and anadromous fish. The Knik Arm Crossing project could cause reduced freshwater habitat quantity and quality; reduced terrestrial habitat quality; changes in local abundance and distribution of bird and mammal species; increased mortality from vehicle collisions; barriers to movement between habitats; increased hunting pressure leading to population declines; and changes in game management plans for moose and brown bears (HDR and URS, 2006).

Vehicle collision mortality for moose and other wildlife from increased traffic along Point MacKenzie Road, Big Lake Road, Knik-Goose Bay Road, and other secondary roadways on the west side of Knik Arm would result due to increased traffic from the Knik Arm Crossing. Collision mortality from the Port MacKenzie Rail Extension, when added to collision mortality from the Knik Arm Crossing, could result in cumulative impacts to wildlife.

Road upgrades and new roadways that would be constructed to connect to the Knik Arm bridge would impact fisheries by decreasing water quality due to runoff of pollutants from road surfaces and increased turbidity caused by increased erosion from construction areas. In addition, underwater noise during bridge construction could adversely affect belugas as they are sensitive to types of pile driving that are within the range of their hearing. Increased vehicle traffic would also have the potential to contribute to the spread of invasive plant populations, and could cause indirect impacts to beluga whales causing them to avoid the area. Potential impacts from the Port MacKenzie Rail Extension, when added to impacts from the Knik Arm Crossing, could result in cumulative impacts to fisheries, beluga whales, wildlife, and the spread of invasive plant populations.

Knik-Willow Transmission Line Upgrade

The preferred alternative for the 230 kilovolt Teeland-Douglas transmission line project would parallel the existing 230 kilovolt and 138 kilovolt lines. Upgrades to the existing lines would not require additional land clearing under the preferred alternative. Other alternatives would require land clearing of between 236 and 242 acres (Dryden and LaRue *et al.*, 2004) resulting in incremental impacts through habitat loss and alteration. The proposed power lines associated with the Port MacKenzie Rail Extension and the proposed Knik-Willow transmission line would result in collision mortality for migratory and resident bird species and when combined, could lead to cumulative impacts to these birds.

New transmission line corridors would also lead to impacts of increased habitat fragmentation and subsequent use by recreational off-road vehicles, especially along the transmission line alternatives through heavily forested areas. Potential impacts from the Port MacKenzie Rail Extension, when added to impacts of the proposed new transmission line, could result in cumulative impacts to biological resources, especially along the Houston North, Houston South, and Big Lake segments. The increase in off-road vehicle use would also result in habitat change

along streams where crossings would be made and through adjacent wetlands as off-road vehicles create more trails.

Goose Creek Correctional Center

The Goose Creek Correctional Center requires clearing 150 acres of forested habitat, which would result in wildlife habitat loss and fragmentation. Correctional center operations would result in increased traffic along Point MacKenzie Road, Knik-Goose Bay Road, and other local secondary roads from correctional workers, visitors, and suppliers traveling to and from the center; the increased traffic would increase moose and other wildlife-vehicle collision mortality.

Potential impacts from the Port MacKenzie Rail Extension, when added to impacts from the correctional center, could result in cumulative habitat loss, forested habitat fragmentation, and wildlife-vehicle collision mortality, which could cause locally substantial impacts along rail line alternatives that include the Mac East Segment.

MSB Regional Aviation System Plan

Upgraded and new facilities under the Regional Aviation System Plan would result in habitat loss and alteration; increased air traffic; increased associated recreational activities, which would consequently increase disturbance to wildlife, especially waterbirds and waterfowl. New float-plane facilities would result in reduced water quality due to oil and fuel leaks, and runoff from new airports and associated parking facilities, and the location of the proposed Seven-Mile Lake facility near a wetland mitigation bank area would conflict with the purpose of the mitigation bank to provide wildlife habitat. Proposed upgrades to the Goose Bay Airport would contribute to disturbance of shorebird migration staging habitat, and waterfowl migration and nesting habitat in the Goose Bay State Game Refuge, and the expansion of the Goose Bay Airport would also contribute to additional noise disturbance near habitats used by beluga whales in the Knik Arm. Increased aviation traffic and related activities would also have the potential to increase the spread of invasive plant species. Potential impacts along Port MacKenzie Rail Extension alternatives that include the Mac East and Big Lake segments, when added to the impacts of aviation system activities, could result in cumulative impacts to various biological resources.

Beluga to Fairbanks Natural Gas Pipeline

The Beluga to Fairbanks Natural Gas Pipeline would contribute to habitat loss and alteration in the Susitna Flats State Game Refuge and, depending on the pipeline route alignment, the Goose Bay State Game Refuge. The proposed Enstar route would go through Susitna Flats State Game Refuge and Goose Bay State Game Refuge. The Chugach Electric Easement alternative would go through the Susitna Flats State Game Refuge, but not through the Goose Bay State Game Refuge. The pipeline would cross numerous drainages that contain essential fish habitat. Both proposed pipeline routes could increase off-road vehicle access to the Susitna Flats State Game Refuge. The Chugach Electric Easement alternative coincides with the Ayrshire Road option of the West Mat-Su Access Project, which includes a bridge across the Little Susitna River and runs parallel to an existing pipeline ROW. Pipeline corridors would facilitate off-road vehicle access to the Susitna Flats State Game Refuge and westward to the east bank of the Susitna River. Either pipeline alternatives would contribute to habitat loss and alteration, fragmentation of

forested and wetland habitats, and loss of riparian habitat along streams. If ANGDA selected the Chugach Electric Easement alternative for the pipeline, the MSB selected the Ayrshire Road option for the West Mat-Su Access Project, and the STB authorized a Port MacKenzie Rail Extension alternative that includes Connector 1 Segment, there could be substantial cumulative impacts to the biological environment in this area.

Port MacKenzie Development Projects

Environmental reviews indicate that the Port MacKenzie development projects including the expansion of existing deep-draft and barge docking facilities, construction of a bi-modal bulk materials facility, and development of an open-pit gravel mine, would affect marine resources and essential fish habitat and could result in cumulative impacts to beluga whales and beluga whale habitats (National Marine Fisheries Service, 2008). The Port MacKenzie Rail Extension could indirectly contribute to cumulative effects on the beluga whale marine environment through possible increases in vessel traffic and noise. ARRC anticipates that if the proposed rail line were completed, approximately five vessels per year would arrive and load coal at Port MacKenzie (ARRC, 2009a). Development of the Port MacKenzie bi-modal facility would increase truck traffic to and from Port MacKenzie, resulting in increased moose and other wildlife-vehicle collision mortality along Point MacKenzie and Knik Goose Bay Roads. Potential wildlife-train collision mortality impacts from the proposed rail line, when added to collision impacts of the Port MacKenzie development projects, could result in cumulative impacts to wildlife, particularly in the areas of the Port MacKenzie Rail Extension Mac East and Big Lake segments.

Port of Anchorage Marine Terminal Redevelopment Project

An assessment of the environmental effects of the Port of Anchorage Marine Terminal Redevelopment Project concluded that there would be no substantial cumulative impacts to vegetation and wildlife because of the disturbed nature of the site and minimal native habitat to support wildlife (DOT, 2005). The Port of Anchorage expansion project affects intertidal and subtidal habitats and could result in adverse, but not significant, cumulative impacts to essential fish habitat (DOT, 2005). The National Marine Fisheries Service determined that valuable habitat for fish and beluga whales in upper Cook Inlet would be affected by the Port of Anchorage expansion and that habitats would be degraded due to increased noise (National Marine Fisheries Service, 2006). The Biological Assessment included in this Draft EIS as Appendix H addressed potential indirect impacts from the proposed rail line to the endangered Cook Inlet beluga whale and concluded that the Port MacKenzie Rail Extension may affect, but is not likely to adversely affect, the beluga whales or access of beluga whales to Type 1 habitats in the Knik Arm. The proposed rail line could cause potential indirect effects on the beluga whale from increases in vessel traffic and associated noise and disturbance effects. When noise impacts from the Port of Anchorage expansion project are added to the potential indirect impacts of the proposed rail extension, cumulative impacts to the beluga whales could result.

Road Improvement Projects

Development and improvement of road corridors would contribute to habitat loss and alteration. The scale of impacts would depend on the length and route of the proposed road and the type and

nature of the habitats that would be crossed. Most road improvement projects would require vegetation clearing next to the roadway or across new corridors, resulting in incremental habitat loss. Roadway improvements could benefit fish and wildlife by providing for enhanced fish passage with upgrades to existing bridges or culverts; reducing collision mortality for big game species with increasing driver visibility on widened roadways with improved lighting; providing for wildlife protection and movement by providing underpasses. However, these beneficial effects could be offset by detrimental effects such as incremental habitat loss and alteration; increased exposure to contaminated runoff from pavement; increased sedimentation to streams; fragmentation of connected wetlands from fill; increased traffic volumes and traffic velocity, leading to increased moose- and other wildlife-vehicle collisions. In general, the six road projects included in the cumulative impacts analysis would involve approximately 50 miles of existing or new roadways throughout the Port MacKenzie Rail Extension project area. Therefore, there could be cumulative impacts to biological resources in the form of habitat loss and alterations, and wildlife-vehicle mortality.

Su-Knik Wetland Bank – Umbrella Mitigation Bank – Big Lake South Individual Bank Plan

Wetlands in wetland banks would generally be considered protected. The bank concept would facilitate development in wetland habitats outside the bank, for which the protected wetlands would be used to comply with compensatory mitigation requirements. Provided the protected wetlands are of superior capacity to support fish and wildlife populations, this would result in a net benefit for most wildlife species. The Port MacKenzie Rail Extension Big Lake Segment would cross two areas in the wetland mitigation bank and would remove wetlands in the bank, which would be contrary to the intended conservation purpose of the mitigation bank and result in a negative impact to the wetland mitigation bank.

West Mat-Su Access Project

Construction of a bridge and access road under the West Mat-Su Access Project would result in incremental terrestrial and aquatic habitat loss and alteration. The new access road would cross Port MacKenzie Rail Extension segments and could enable both off-road and highway vehicles to access the rail line maintenance road along the Willow Segment and Connector 1 Segment. This increased access could put additional harvest pressure on the Little Susitna River and the Susitna River tributary fisheries and local wildlife resources. Increased access and off-road vehicle use could result in cumulative stream habitat loss from instream crossings and the habitat loss of adjacent wetlands.

O.3.3.2 Conclusion

Construction and operations activities associated with the projects described above could contribute to adverse cumulative effects to the biological environment in the area of the Port MacKenzie Rail Extension. Most notably, these projects include actions that would affect wildlife habitat through habitat destruction and altered suitability, including increases in invasive plant populations and interruption of natural fire ecology, increased public access, noise, and potential direct and indirect wildlife mortality. The potential impacts of the proposed Port

MacKenzie Rail Extension, when added to the impacts of the noted projects, could result in cumulative impacts to the biological environment in the Matanuska-Susitna area.

O.3.4 Cultural and Historic Resources

O.3.4.1 Analysis

The Mac East-Connector 3-Willow Alternative would affect the most known cultural resources and pass through areas with a high probability of having large numbers of undocumented cultural resources. The Mac West-Connector 1-Houston-Houston South Alternative would affect the fewest known cultural resources and pass through areas with a low probability (e.g., wetlands) of having large numbers of undocumented cultural resources.

Archaeological sites in the Port MacKenzie Rail Extension ROW that cannot be avoided could possibly be damaged during proposed rail line construction and could lose their eligibility for listing on the National Register. Numerous salmon streams in the area are host to archaeological sites in and adjacent to the streambeds and the proposed rail crossings of these streams, and changes in stream flow, could affect those archaeological sites.

Historic properties in the project area could be adversely affected and lose their context and integrity through visual and audible effects. The dog sledding cultural landscape could be adversely affected to varying degrees through loss of visual integrity, cultural privacy, potential loss of, or changes to access, and changes to traditional or culturally substantial use of, and connection, to the property. Officially recognized trails would be grade-separated, facilitating free passage; however, the integrity of any historic trails would still be adversely affected through the introduction of auditory and visual effects, and access across the study area by dog sledders who travel across unofficial trails would be impeded. All alternatives would cross the Iditarod National Historic Trail, thereby affecting the historic integrity of the trail and its ancillary network, and potentially affecting the eligibility of the ancillary network as NHPA trails or NHPA historic trail segments.

Noise and vibration impacts during construction and operations of the proposed rail line are not anticipated to be adverse as the estimated construction noise and general vibration levels would be below the FTA criteria for adverse impacts. An increase of two trains per day along the existing main line would increase noise less than three dBA and would not cause adverse noise impacts. Based on the anticipated average train speed of 40 miles per hour on the proposed rail line, the contour for the FTA fragile building damage criterion would be 10 feet wide and the vibration annoyance contour along the proposed rail line would be 80 feet of the track centerline. Since there would be no buildings within five feet of the rail line and no receptors within 80 feet from the track centerline, there would be no damage to buildings or vibration impacts due to vibration from rail line operations.

Knik Arm Crossing

Although there would be no immediate impacts from the proposed Knik Arm Crossing in the study area, any increase in residential development from people taking advantage of the short commute between Point MacKenzie and Anchorage via the bridge across the Knik Arm could

have an impact on existing cultural resources in the study area, particularly for those closest to the Point MacKenzie and Knik areas, and including the Iditarod National Historic Trail and a dog sledding cultural landscape.

Knik-Willow Transmission Line Upgrade

Impacts to cultural resources from the 25-mile, 230-kilovolt transmission line could include direct destruction or disturbance of cultural resources in the transmission line ROW. However, since the preferred transmission line alternative parallels the existing transmission line, additional impacts to cultural resources would be expected to be minor.

Goose Creek Correctional Center

Impacts to cultural resources from the Goose Creek Correctional Center would be localized to the 330 acres developed for the correctional facility. The contribution to cumulative impacts to cultural resources in the study area from the Goose Creek Correctional Center would likely be low given the small footprint of the correctional center compared to the study area.

MSB Regional Aviation System Plan

Direct impacts to cultural resources from the MSB Regional Aviation System Plan would be localized to any new airport sites selected under this plan. Increase in access to the study area created by new airports could attract more residential development or recreational users, thereby increasing cumulative impacts to cultural resources in the study area.

Beluga to Fairbanks Natural Gas Pipeline

Impacts to cultural resources in the study area from construction of a potential gas pipeline segment between Beluga and Palmer could include direct destruction or disturbance of cultural resources in the pipeline segment ROW which would be located in the southern half of the Port MacKenzie Rail Extension project area. Both the Enstar and Chugach route alignments would also cross a number of trails, several of which could have historical importance or be part of a dog sledding cultural landscape. The pipeline could diminish the integrity of these trails. Thus, the cultural resources impacts from the potential Beluga to Palmer segment of the natural gas pipeline, could cumulatively contribute to cultural resources impacts in the southern half of the Port MacKenzie Rail Extension project area.

West Mat-Su Access Project

Direct impacts to cultural resources from a proposed bridge across the Little Susitna River would be localized to the site of bridge construction, if there are any cultural resources in the area. Indirect impacts to cultural resources near the bridge could be greater because the new access created by the bridge would open the western side of the Little Susitna River to an increased number of recreational users and could contribute to cumulative cultural resources impacts.

O.3.5 Subsistence

O.3.5.1 Analysis

All Port MacKenzie Rail Extension alternatives are in the state nonsubsistence area and are at a considerable distance from areas where state-regulated subsistence activities occur; therefore, impacts to subsistence uses outside the nonsubsistence area would be similar regardless of which alternative the STB authorized, if any. Impacts to wildlife associated with the rail line could vary depending on the alternatives. Impacts to subsistence resulting from the proposed rail line include:

- Adverse impacts to resource availability as a result of train-resource collisions, especially for species that migrate through the project area.
- Changes in resource availability if disruption from rail operations affects species distribution and/or survival rates.
- Adverse impacts to user access because of ARRC regulations prohibiting access across the rail line except at designated crossing points. The farther west the rail line alternative, the more subsistence users that could be affected.

The most substantial past impact to subsistence activities in the study area resulted from the creation of the Anchorage-Matsu-Kenai nonsubsistence area in 1992 under 5 Alaska Administrative Code 99.015, which removed subsistence hunting and fishing regulations and the subsistence priority from a large continuous area of the Matanuska-Susitna, Anchorage, and Kenai Peninsula areas. Subsequent appeals to the constitutionality of this regulation by local indigenous groups with a history of subsistence activities in the area, including the Kenaitze Indian Tribe, Ninilchik Traditional Council, Knik Tribal Council, and Native Village of Eklutna, were eventually overruled.

Cook Inlet Areawide Oil and Gas Lease Sale

While offshore oil and gas development could affect fish and marine subsistence uses through potential oil spills, habitat degradation, contamination, and other effects, the study area lies in the Anchorage-Matsu-Kenai nonsubsistence area; therefore, impacts to subsistence uses from offshore oil and gas development would not be expected in the study area. Subsistence users residing in the study area who travel to other nearby subsistence areas to harvest fish or marine mammals (for example, at Tyonek) could, however, experience impacts. Any onshore oil and gas developments in the study area could affect subsistence users through the introduction of new roads, which could increase access to nearby subsistence areas (for example, Game Management Unit [GMU] 16B), thereby potentially increasing competition and decreasing resource availability.

Cook Inlet Ferry

To the extent that marine activities affect beluga populations, the Cook Inlet Ferry could affect subsistence uses of beluga whales by Cook Inlet Dena'ina villages such as Tyonek, Eklutna, and Knik.

Cook Inlet OCGen™ Power Project

No impacts to subsistence uses would be expected in the study area with the development of the Cook Inlet OCGen™ Power Project. The project lies in Cook Inlet within the Anchorage-Matsu-Kenai nonsubsistence area and would not be expected to impede subsistence users' access to areas managed under subsistence regulations. Studies on the impacts of the OCGen™ TGU on migrating subsistence resources such as marine mammals and fish are limited. Preliminary information related to other similar tidal devices indicates that these devices do not affect fish (ORPC, 2008). To the extent that these devices could affect beluga whale migration patterns and their populations due to device and mammal interactions through strikes and collision/entanglements, underwater noise and vibration, electromagnetic radiation fields, and alteration of habitats, it could affect subsistence uses of beluga whales by Cook Inlet Dena'ina villages such as Tyonek, Eklutna, and Knik.

Knik Arm Crossing

The proposed Knik Arm Crossing could have the greatest indirect effect on subsistence of all foreseeable development projects. A bridge connecting the Municipality of Anchorage residents with Port MacKenzie and other lands in the Susitna Valley could increase the number of residents in these areas, which could in turn increase the number of people who might travel to GMU 16B for subsistence purposes, thereby increasing competition among existing users and reducing resource availability. To the extent that marine activities resulting from the bridge affect beluga whale populations, it could affect subsistence uses of beluga whales by Cook Inlet Dena'ina villages such as Tyonek, Eklutna, and Knik.

Beluga to Fairbanks Natural Gas Pipeline

Impacts to subsistence in the study area from the proposed natural gas pipeline could include short-term effects on subsistence resources and user access during construction activities and potentially long-term adverse impacts to user access if the project proponents restrict user access along the pipeline ROW. However, user access to subsistence use areas in GMU 16B could also be improved by allowing general public access along the ROW.

O.3.5.2 Conclusion

Cumulative impacts to subsistence uses would be minimal given that any planned or reasonably foreseeable projects in the area would be in the Anchorage-Matsu-Kenai nonsubsistence area. Several of these projects would have a small footprint in the nonsubsistence area and, except for small habitat disturbances in the immediate area, could likely contribute to larger cumulative impacts to subsistence. Two foreseeable projects that could add to cumulative impacts to subsistence uses outside the Anchorage-Matsu-Kenai nonsubsistence area are the proposed Knik Arm Crossing and the Beluga to Fairbanks natural gas pipeline projects. The Knik Arm Crossing could draw more residents to the study area, thereby increasing the number of people traveling to the closest subsistence-managed lands in GMU 16B. Depending on the proponent's policy regarding access along the pipeline ROW, the natural gas pipeline could restrict or improve subsistence user access to GMU 16B.

An overall increase in the number of development projects in the study area could lead to cumulative impacts to Knik and Eklutna tribal members' traditional use areas. While these traditional use areas are now in a nonsubsistence area, Eklutna and Knik tribal members might still have a traditional connection to the lands, and construction and operation of future projects could add to a sense of loss and intrusion by outsiders into their traditional harvest areas.

O.3.6 Climate and Air Quality

O.3.6.1 Analysis

SEA has concluded that increases in emissions from construction and operation of the proposed Port MacKenzie Rail Extension project would be minimal in the context of existing conditions. Using a conservative approach, SEA determined that construction emissions for the alternative requiring the most rail construction (Mac East-Connector 3-Willow, the longest potential route at 45 miles) would be expected to be a small fraction of the Borough's total annual emissions during the assumed construction period of 2 years. Estimated nitrogen oxides (NO_x), PM_{10}[2], and $PM_{2.5}$[3] construction-related emissions would be well below the *de minimis* conformity thresholds of 100 tons per year for each pollutant.

SEA used a similar conservative approach to estimate rail line operations emissions assuming an average of one round trip (two one-way trips) freight rail train per day with three locomotives, 80 rail cars, with a loaded weight of 125 tons per car and unloaded weight of 30 tons per car (ARRC, 2008b and ARRC, 2008a). SEA also assumed that freight trains would begin operating along the proposed rail line in 2012 (ARRC, 2008a, Section 3.4) or later using ultra low-sulfur diesel fuel (Effective December 1, 2010, all diesel fuel sold in Alaska is required to be ultra low sulfur diesel). The estimated operations-related emissions would be a small fraction of MSB annual off-highway vehicle emissions and the emission totals for each of the pollutants would be well below the *de minimis* conformity thresholds of 100 tons per year for each pollutant. SEA has also determined that emissions from the proposed terminal reserve at the end of the line in the Port MacKenzie District would be a fraction of the rail line operations-related emissions and well below the *de minimis* conformity thresholds of 100 tons per year for each pollutant.

Globally, sources of human-induced emissions of greenhouse gases include mainly burning of fossil fuels, with important contributions from clearing of forests, agricultural practices and other similar activities. Greenhouse gas emissions associated with the proposed project would be mostly carbon-dioxide (CO_2) emissions. Construction-related emissions would be limited to the 2-year construction period and operations-related emissions would continue in subsequent years. Estimated annual average construction-related CO_2 emissions would be 3,073 metric tons per year and operations-related emissions would be 2,539 metric tons per year. Operations-related CO_2 emissions would represent a 2-percent increase in Alaska rail CO_2 emissions and would be less than 0.01 percent for Alaska as a whole (ADEC, 2008). Also, CO_2 emissions from existing highway activity would likely decrease as a result of the proposed rail line to the extent that transportation activity by truck would be shifted to rail. Similarly, CO_2 emissions would likely decrease if commodities from Interior Alaska were transported over the proposed rail line to Port

[2] All particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers.
[3] All particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.

MacKenzie rather than to the Port of Anchorage or Seward because of the shorter distance the commodities would move by rail.

Although the emissions generated from the construction and operation of the Port MacKenzie Rail Extension would be very small in comparison to annual global CO_2 emissions, they would contribute to global greenhouse gas emissions and when added to emissions from the reasonably foreseeable future projects and actions described in this Appendix (see Section O.2) and similar projects and actions across the globe, they could lead to a cumulatively adverse impact. The following paragraphs provide a discussion of the general impacts of climate change with a focus on Alaska and their effects on the proposed project.

The Intergovernmental Panel on Climate Change (IPCC) and the U.S. Global Change Research Program (USGCRP) have assessed the potential consequences of global climate change (IPCC, 2007 and USGCRP, 2009). The global average temperature since 1990 has risen by about 1.5 degrees Fahrenheit (ºF) and it is projected to rise another 2 to 11.5ºF by 2100 with the greatest increases expected to occur in the Arctic and in the middle of continents. The U.S. average temperature has risen by a comparable amount and is very likely to rise more than the global average over this century, with some variation from place to place (USGCRP, 2009). Over the past 50 years, Alaska has warmed at more than twice the rate of the rest of the U.S. average leading to more pronounced climate change impacts in this state than in the rest of the U.S. Alaska's annual average temperature has increased 3.4ºF and the winters have warmed by 6.3ºF (Fitzpatrick *et. al.*, 2008 in USGCRP, 2009). Average annual temperatures in Alaska are predicted to rise about 3.5ºF to 7ºF by the middle of the century (USGCRP, 2009).

Precipitation patterns are also changing with increases and decreases observed across the globe and in some regions there have been increases in both droughts and floods (Trenberth *et. al.*, 2007 in USGCRP, 2009). Precipitation is projected to increase overall but substantial shifts are expected in where and how precipitation occurs and simultaneous increases in air temperature are expected to lead to drier conditions overall (Meehl *et. al.*, 2007 in USGCRP, 2009). Sea levels are rising at roughly double the rate observed over the past century as recorded by satellite data over the last 15 years (Bindoff *et. al.*, 2007 in USGCRP, 2009).

In Alaska, higher temperatures are already contributing to earlier spring snowmelt, reduced sea ice, and widespread glacier retreat (IASC, 2004; Fitzpatrick *et. al.*, 2008 in USGCRP, 2009). Reduced sea ice provides opportunities for increased shipping and resource extraction, however, at the same time increases coastal erosion (Jones *et al.*, 2009 in USGCRP, 2009) and flooding associated with coastal storms. Climate models project the Bering Sea to experience the largest decreases in atmospheric pressure in the Northern Hemisphere, suggesting an increase in storm activity in the region (Meehl *et. al.*, 2007 in USGCRP, 2009). Reduced sea ice also alters the timing and location of plankton blooms which is expected to drive major shifts of marine species such as Pollock and other commercial fish stocks (Grebmeier *et al.*, 2006 in USGCRP, 2009). The Bering Sea Pollock fishery off Alaska's west coast is the world's largest single fishery and has undergone major declines in recent years (USGCRP, 2009).

Insect outbreaks and wildfires are increasing with warming temperatures and Southcentral Alaska experienced the largest outbreak of spruce beetles in the world in the 1990s destroying over 5 million acres of Alaska spruce forest (Ryan *et al.*, 2008 in USGCRP, 2009; Juday *et al.*,

2005 in USGCRP, 2009). The average area burned per year in wildfires in Alaska is projected to double by the middle of this century (Balshi *et al.*, 2008 in USGCRP, 2009).

O.3.6.2 Conclusion

The relatively low concentrations of ambient air pollutants in the project area should remain well below National Ambient Air Quality Standards even with the addition of emissions associated with the proposed rail line operations. Although the greenhouse gas emissions generated from the proposed Port MacKenzie Rail Extension would be very small in comparison to global emissions levels, they could contribute to a cumulatively adverse impact on global climate change. Consequences of global climate change include increased global temperatures, change in precipitation patterns, and rise in sea levels. The long-term climate change-induced changes in water availability would not be expected to impact the proposed project as water extraction would occur only during the estimated 2-year construction period.

O.3.7 Noise and Vibration

O.3.7.1 Analysis

Primary noise sources during construction of the proposed Port MacKenzie Rail Extension would include heavy equipment that would be used during rail line construction and piledriving during bridge construction. Construction of bridges is anticipated only for the Big Lake Segment, the Willow Segment, and Connector 1 Segment.

The primary sources of noise from proposed rail line operations would be wayside noise and locomotive warning horn sounding for at-grade rail-highway crossings. Because of the relatively low ambient noise level and proximity of receptors, the 3 A-weighted decibel (dBA) increase contour associated with the Big Lake Segment would include 16 receptors, 8 receptors with the Houston South Segment, and 2 receptors with the Mac West Segment. Because of relatively low ambient noise levels in these areas, train noise would be more noticeable than in other areas with higher ambient noise levels. However, because noise levels would be below a 65 decibel day-night average noise level (DNL) for all identified potential receptors, there would be no adverse noise impacts associated with any of the rail line alternatives.

Cook Inlet Areawide Oil and Gas Lease Sale

One of the primary concerns related to oil and gas development in marine waters is the potential effect that noise from seismic surveys, construction activities, and ongoing boat, drilling, and aircraft activities, could have on marine mammals and other marine animals (Hofman, 2003). In 2005, the Minerals Management Service found that a proposed geophysical (seismic) survey would have no significant effect on the lower Cook Inlet Area (MMS, 2005).

Cook Inlet Ferry

A minor adverse impact during construction of the Cook Inlet Ferry would include increased noise. Upgrades to the Knik Arm Access Road could temporarily increase noise levels near the mouth of Ship Creek. Additionally, it is unlikely that noise levels would have a lasting adverse impact on fish in Knik Arm or near the mouth of Ship Creek, because these areas currently

experience considerable noise due to Port MacKenzie, U.S. Air Force, and ARRC operations. Construction activities would be temporary and would not be expected to last more than 6 months.

Knik Arm Crossing

The proposed Knik Arm Crossing project could facilitate development in the MSB, which would lead to increased noise levels in the study area.

Future noise levels under the proposed Knik Arm Crossing build alternatives for each of the three receptors in the MSB portion of the study area are projected to range from 60 to 64 dBA, depending on the alternative, and are not expected to approach the noise abatement criteria for residential areas.

Traffic-noise modeling results indicate that there would be impacts from traffic noise within 200 feet of the centerline of the proposed Knik Arm Crossing ROW. Therefore, any future residential land uses immediately adjacent to the ROW could experience traffic noise impacts. More noise-compatible uses, such as commercial or retail activities, would not be affected at this distance. For areas where the ROW might be wider than 400 feet, there should be no impacts from traffic noise.

MSB Regional Aviation System Plan

Implementation of the Regional Aviation System Plan would include upgrades to existing airstrips and development of new airports and float-plane facilities. The plan identifies noise-sensitive land uses, but does not include a noise impacts analysis. SEA assumes noise impacts due to increased air traffic would be moderate or less.

Port of Anchorage Marine Terminal Redevelopment Project

Because construction activities such as dredging, filling, and pile driving would be the same for all construction years, noise levels during any construction day would remain around 81 dBA (equivalent sound level [L_{eq}]) at 100 feet (within the Port of Anchorage) and 61 to 65.5 dBA at 1,000 to 2,000 feet in any given year. What varies by construction year is the duration of pile driving, which is the loudest contributor of the noise. Pile driving associated with dock construction is anticipated to range from a high of 130 days to a low of 106 days. Although some hourly noise levels would exceed 85 dBA, daily noise levels from construction at the Port of Anchorage would not exceed the 85 dBA 8-hour time-weighted level in which a hearing conservation program for on-site workers is required under the Occupational Safety and Health Administration (29 Code of Federal Regulations 1910.95).

Maximum noise levels in nearby residential areas from construction at the Port of Anchorage would not exceed the Anchorage noise ordinance requirements of 80 (hourly L_{eq}) dBA during any of the construction years. Therefore, construction noise would not affect residential areas. Noise levels in DNL at areas closest to construction at Cherry Hill housing, parks, and residential areas on Government Hill are projected to be between 61.0 and 65.5 dBA during a construction day, increasing 0.5 to 1.0 dBA over baseline levels. This amount of change falls below the

threshold for cumulative noise levels. Therefore, construction noise would not have a significant adverse impact on adjacent residential areas.

South Wasilla Rail Line Relocation

A noise and vibration analysis indicated that no significant noise and vibration impacts are expected. Existing noise sources in the project vicinity include roadway traffic, aircraft overflights, railroad operations, and local neighborhood activities. The project would reduce horn noise because trains would no longer have to sound their horns at the five eliminated at-grade mainline crossings. Trucks using the gravel pits and freight and passenger trains operating through the area are the primary sources of existing vibration. The vibration analysis indicated that one property would be affected; however, this property is already affected by the existing track. The noise and vibration analysis indicated that the project's impact to this property would be small enough that the vibration change would not be perceptible to the residents.

O.3.7.2 Conclusion

Construction and operations activities associated with the projects described above could contribute minor noise-related impacts to the environment in the study area. Although some of these projects include actions that would increase noise levels considerably, there is no overlap of the areas of noise impact from these projects and actions with the areas of potential noise impact from the proposed rail line. Because no adverse noise impacts would result from the proposed rail line extension, no cumulative noise impacts would result.

O.3.8 Energy

O.3.8.1 Analysis

All segments of the Port MacKenzie Rail Extension would cross a 230-kilovolt transmission line linking the Beluga Power Plant near Tyonek to a bulk substation just south of the Port MacKenzie District. The Big Lake, Houston South, and Houston North segments would also cross a 138-kilovolt transmission line parallel to the ARRC main rail line between Knik-Fairview and Willow. Connector 1 Segment, Connector 3 Segment, and the Big Lake Segment would cross the Beluga-Wasilla natural gas pipeline that runs along Ayrshire Avenue and just north of Point MacKenzie Road. ARRC would have to ensure appropriate grade separations and employ appropriate construction industry standards to minimize any potential to disrupt the provision of energy resources. Increases in energy consumption for proposed rail line construction would be negligible. Train operations would consume less than 0.5 percent of the annual statewide consumption of distillate fuel.

Cook Inlet OCGen™ Power Project

Increased production of energy from the utilization of the Cook Inlet tidal flows would establish landfalls for transmission line routes along Cook Inlet’s eastern coast near Kenai and East Foreland. In areas of potential overlap with Port MacKenzie Rail Extension segments, Ocean Renewable Power Company would need to carefully site their transmission line pylons to avoid the risk of power interruptions.

Knik-Willow Transmission Line Upgrade

This project is in the preliminary stage of design, and there could be changes to the current alignment. ARRC would need to coordinate with the Alaska Energy Authority regarding possible relocation of pylons.

Beluga to Fairbanks Natural Gas Pipeline

ANGDA has started the process for preparing an EIS for a natural gas pipeline between Beluga and Fairbanks that would cross the Port MacKenzie Rail Extension project area. The proposed new pipeline would parallel the existing Beluga-Wasilla natural gas pipeline. The Enstar route alignment of the Beluga to Fairbanks pipeline would cross proposed Connector 1 Segment, Connector 3 Segment, and the Big Lake Segment. The Chugach route alignment of the Beluga to Fairbanks pipeline would cross the Mac East and Mac West segments. ARRC would need to coordinate with ANGDA to ensure that grade separation and appropriate construction industry standards are followed.

O.3.8.2 Conclusion

Cumulative impacts on energy resources in the affected area would be limited to crossings of the Port MacKenzie Rail Extension alternatives with proposed transmission lines and pipelines. Coordination between ARRC and agencies responsible for the proposed project would be required to ensure appropriate planning for location of transmission pylons and for grade separation between the Port MacKenzie Rail Extension and proposed pipelines.

O.3.9 Transportation Safety and Delay

O.3.9.1 Analysis

The proposed project has the potential to result in impacts to traffic safety and delay on the network of local, arterial, and collector roads that comprise much of the existing transportation system in the project area. Where new crossings on the proposed Port MacKenzie Rail Extension would be grade separated, there would be no increase in the number of potential train-vehicle accidents and no change in vehicle delay. Where crossings would not be grade separated (at-grade crossings), SEA's analysis indicates that there could be some accidents and an increase in vehicle delay.

At present, there are four at-grade crossings along the ARRC main line in the project area. SEA's analysis indicates that accident frequencies at the existing at-grade crossings would increase slightly due to increased train traffic from the proposed rail line. For these at-grade crossings, the greatest accident frequency increase would be 6.2 percent. This corresponds to a decrease in the time between predicted accident events from one accident every 66 years under existing conditions to one accident every 62 years under the proposed project. For new at-grade crossings constructed as part of the proposed project, the predicted accident frequency for the most heavily traveled roads, South Burma Road and Willow Creek Parkway, would be one accident every 131 and 114 years, respectively.

SEA anticipates temporary vehicle delays during proposed rail line construction at new at-grade crossings and where roads would be improved or relocated. At the existing at-grade crossing with the highest total daily delay, Willow Fishhook Road on the ARRC mainline, the number of vehicles delayed is projected to increase from 11 to 13 delayed vehicles per day under the proposed rail line. This represents an increase from 0.5 to 0.7 percent of all vehicles traveling through that crossing. At the new at-grade crossings constructed as part of the proposed rail line, the highest total delay would be 0.3 percent of all daily traffic at the South Burma Road crossing. Although Port MacKenzie Rail Extension project operations would impact delay at at-grade crossings, SEA concludes that this impact would be minimal.

Impacts to transportation safety resulting from at-grade crossings are largely a function of the number of trains and the volume of vehicle traffic traversing the at-grade crossing, along with other factors. Impacts to transportation delay are influenced primarily by the amount of time trains obstruct an at-grade crossing, and the volume of vehicle traffic along roads with at-grade crossings. Therefore, the other projects and actions with the greatest potential to cumulatively contribute to impacts on transportation safety and delay are those that increase train traffic along the Port MacKenzie Rail Extension or ARRC main line in the project area; those that increase vehicle volume on roads that have at-grade crossings of the Port MacKenzie Rail Extension or the ARRC main line in the project area; or those that result in the construction of additional at-grade crossings in the project area.

Projects with the Potential to Affect Rail Traffic

Of the potential projects identified in Section O.1, the Port MacKenzie development projects, including gravel mining, the bulk materials facility, and the deep-draft and barge dock expansions, could increase rail traffic along the Port MacKenzie Rail Extension. However, the need for increased shipments of bulk materials, intermodal containers, and other freight to and from Port MacKenzie is part of the purpose and need of the ARRC proposed action and was factored into the analysis of direct and indirect impacts. If the Port MacKenzie development projects increased rail traffic beyond the levels already evaluated in the impacts analysis, there would be increased rail traffic along the Port MacKenzie Rail Extension (regardless of alternative), which would lead to more traffic delays and increased accident frequencies at at-grade crossings in the area. The other projects identified in this cumulative impacts analysis are not anticipated to increase rail traffic in the project area.

Projects with the Potential to Affect Vehicular Traffic

Projects that would increase the amount of vehicular traffic in the Port MacKenzie Rail Extension project area could be expected to increase the frequency of future accidents and add to the number of vehicles delayed by train traffic. These impacts would depend on the combination of segments constructed as part of the proposed Port MacKenzie Rail Extension and the roads where traffic volumes would increase. In most cases, increased delay and accident frequencies would occur only if traffic volumes increased along roads that cross the proposed rail line at grade. However, if traffic increased along nearby roads or other primary roads in the project area, there could be increased traffic spill-over onto the roads with at-grade crossings.

Knik Arm Crossing and Cook Inlet Ferry

Of the projects listed in Section O.1, both, the proposed Knik Arm Crossing and the Cook Inlet Ferry were identified as projects that could increase vehicular traffic from Anchorage to Port MacKenzie, leading to higher traffic volumes in the area of the proposed rail line. The Knik Arm Crossing would connect the Municipality of Anchorage to the MSB via Point MacKenzie Road, which the proposed rail line's Big Lake Segment would cross at grade. If this segment and the Knik Arm Crossing were constructed, there could be increased vehicular traffic along a road with an at-grade crossing, thereby increasing the frequency of future accidents and the number of vehicles delayed by train traffic. Cook Inlet Ferry operations could also lead to increased traffic on Point MacKenzie Road, and could also lead to increased transportation safety and delay impacts at the at-grade crossing.

West Mat-Su Access Project

The West Mat-Su Access Project would include road access to the Fish Creek Management Area that could cross Port MacKenzie Rail Extension Connector 1 Segment and/or the Willow Segment. One access road option associated with this project would cross both the Connector 1 and Willow segments, while the other access road options would only cross either the Willow Segment or Connector 1 Segment. If at-grade crossings were constructed at intersections of the roads in the West Mat-Su Access Project and the rail line, they would increase the frequency of future accident events and the number of vehicles that could experience delay at at-grade crossings.

Other Road Projects

Section O.1 identifies several other road projects. These actions can be generally characterized as upgrades to road surfaces, increases in the number of lanes to road segments, addition of safety devices, and flattening and straightening roadways. Evaluated individually, these projects would not be expected to notably affect the overall volume of traffic in the area of the proposed rail line. They would not include new at-grade crossings and they would not increase traffic on the roads the Port MacKenzie Rail Extension would cross using at-grade crossings. Therefore, none of the road projects would contribute to a cumulative impact on transportation safety and delay. However, the combination of all road projects would lead to an overall upgrade in the transportation infrastructure in the project area. As road infrastructure improved and capacity was added, this could encourage more vehicular traffic in the project area for a variety of reasons, including access to recreational resources; driving through the area en route to other destinations; and/or increased commercial, industrial, and residential development allowed by improved roadways. As the general volume of traffic in the project area increased, the likelihood of a portion of that traffic spilling over onto roads with at-grade crossings would increase. Therefore, road projects that improve the transportation infrastructure in the Port MacKenzie Rail Extension project area could lead to cumulative impacts on transportation safety and delay.

O.3.9.2 Conclusion

The proposed Port MacKenzie Rail Extension is expected to result in a small increase in future accident frequencies as a result of at-grade crossings. The proposed rail line is not anticipated to

result in a considerable increase in vehicle delay. There could be an increase in future accident frequency and vehicle delay as a cumulative result of the proposed rail line combined with Port MacKenzie development projects, the Knik Arm Crossing, Cook Inlet Ferry, the West Mat-Su Access Project, and road improvement projects.

O.3.10 Navigation

O.3.10.1 Analysis

The proposed Port MacKenzie Rail Extension includes bridges and structures that would cross inland rivers and streams in the project area, resulting in negligible potential impacts to navigation. The Willow, Houston North, and Houston South segments include a bridge crossing of the Little Susitna River. Of the reasonably foreseeable future projects analyzed for cumulative impacts, only the proposed West Mat-Su Access Project would include a new bridge across the Little Susitna River, creating the potential for cumulative impacts to navigation along this waterbody.

For the West Mat-Su Access Project, the MSB proposes to build a bridge across the Little Susitna River into the southern part of the Fish Creek Management Area, thereby providing road access to the western side of the Little Susitna River. The Fish Creek Management Area is approximately 45,000 acres of State of Alaska and MSB land northwest of Point MacKenzie between the Little Susitna and Big Susitna Rivers. The Draft Fish Creek Management Plan (MSB, 2008a) includes a figure depicting three potential locations for the bridge – the extension of Susitna Parkway in the Big Lake area; a location approximately 0.8 mile north of where the Iditarod National Historic Trail crosses the river; and a location near the existing Little Susitna River access at the end of Ayrshire Road. The Access Project might also include a short spur road continuing 3 to 4 miles west, past the Little Susitna River. The MSB has not yet developed a detailed bridge design.

O.3.10.2 Conclusion

Assuming that the bridge across the Little Susitna River would be designed with vertical and horizontal clearances similar to other existing and proposed bridges on the river, significant impacts to navigation would not be likely, and there would not be substantial cumulative impacts.

O.3.11 Land Use

O.3.11.1 Analysis

The MSB, the State of Alaska, and private entities own most of the land the proposed rail line would directly affect. Potential impacts to land use from proposed Port MacKenzie Rail Extension construction and operations would vary depending on alternative. Existing land uses within the ROW would be permanently changed, and any activities within the ROW not associated with the rail line would require an ARRC entry permit. In the area of the Big Lake Segment the proposed rail line extension would require the taking of approximately ten structures, most of which are residences. The proposed rail line would also require the taking of

two structures in the ROW of the Connector 3 Segment, and one structure in the Mac East Segment ROW. There would be no adverse land use impacts outside the ROW.

Public lands in the project area are used primarily for recreation, hunting, and fishing. Construction activities could temporarily impede access to trails and waterways, including the Iditarod National Historic Trail. Operations activities could impact the experience of users engaged in activities such as recreation, hunting, fishing and wildlife viewing. Officially recognized trails would be grade-separated or relocated, but ARRC has not proposed to provide crossings for unofficial trails. Unofficial trails would be blocked, and ARRC's trespassing regulations would prohibit the public from crossing of the ROW without first obtaining approval from ARRC.

Mining and timber harvesting are also allowed by permit. Private lands in the project area are primarily in agricultural and residential use. Lands outside the ROW would maintain their existing ownership and uses, but landowners could change the way they use the land as allowed by MSB building or zoning rules. The proposed rail line includes two freight-only trains per day, with no passenger service or whistle stops. Except for the rail line and associated facilities within the ROW, the presence and operation of the proposed rail line would not likely result in substantial changes in land use in the project area.

Cook Inlet Areawide Oil and Gas Lease Sale

The proposed lease sale area consists of all state-owned uplands in the Matanuska and Susitna River valleys generally south and west of Houston and Wasilla; the Anchorage Bowl; the western and southern Kenai Peninsula from Point Possession to Anchor Point; and the western shore of Cook Inlet from the Beluga River to Harriet Point. The lease sale area also includes all state-owned tidal and submerged lands in upper Cook Inlet from Knik Arm and Turnagain Arm south to Anchor Point and Tuxedni Bay (ADNR, 2008).

The lands offered in this lease sale include lands in which the state owns both the land and mineral estate and lands where the state owns just the mineral estate, with the land estate either privately owned or held by a borough or municipality. Only state-owned lands and oil and gas mineral estates within the tracts that are free and unencumbered would be included in any lease issued. The use of some lands leased could change from undeveloped to developed for oil and gas production if exploration finds developable reserves. This change in land use for leased areas, combined with land use impacts from the proposed Port MacKenzie Rail Extension, could result in cumulative impacts to existing land use patterns in the project area. Depending on where future land-based lease sales occur, cumulative impacts to recreational resources could result.

Knik Arm Crossing

Of all foreseeable development projects, the proposed Knik Arm Crossing could have the greatest impact on land use. The area from Point MacKenzie/Port MacKenzie to approximately Parks Highway, which includes the Big Lake and the Knik-Fairview areas, would likely experience increased growth and development with the proposed bridge in place (HDR, 2006b). The proposed Point MacKenzie Road and Northern Access alternatives associated with the Knik

Arm Crossing project would be consistent with the MSB Long Range Transportation Plan, MSB Core Area Comprehensive Plan, and MSB Special Use Districts because a Knik Arm crossing is identified and described in those plans as part of the future transportation system. At present, there is no zoning, no building-permit requirement, and few MSB land use controls in the southwest MSB area (HDR, 2006b). Increased access, provided by the Knik Arm Crossing, could contribute to significant cumulative impacts to land use patterns within the project area. However, since the proposed rail line has minimal land use impacts, its contribution to cumulative land use impacts is minimal.

The indirect impacts of increased traffic, and growth and development could affect some of the same recreational resources as those potentially affected by the Port MacKenzie Rail Extension, thereby resulting in cumulative impacts.

Knik Willow Transmission Line

The proposed transmission line could potentially conflict with land use in the area of the Little Susitna State Recreation River, which would combine with potential impacts to recreational resources in the areas of the Houston North, Houston South, and Big Lake segments and could result in cumulative land use impacts.

Goose Creek Correctional Center

The Goose Creek Correctional Center requires clearing 150 acres of forested land at the junction of Alsop Road and Point MacKenzie Road. The MSB owns this undeveloped land. Impacts to land use from this project would be near to, but not overlapping, potential impacts from the Port MacKenzie Rail Extension's Mac East Segment. Therefore, cumulative impacts to land use patterns and recreational resources in the project area would be minimal.

MSB Regional Aviation System Plan

Upgrades to existing airstrips and development of new airports and float-plane facilities would take place by implementation of the Regional Aviation System Plan . Upgraded and new facilities could increase access and demand for land in the project area. The plan requires that an airport, commercial floatplane base, helipad, and heliport be shown on a plat if subdivision of land is required. This requirement would help ensure that adequate land is provided for approach and departure clearances and development setbacks from runways, and that the aviation facility's compatibility with surrounding land uses is considered before a plat is approved. Therefore, cumulative impacts to land use and recreational resources would be expected to be minimal.

Beluga to Fairbanks Natural Gas Pipeline

ANGDA's proposed Beluga to Fairbanks natural gas pipeline could contribute to changes in land use in the Port MacKenzie Rail Extension project area. The proposed pipeline corridor would transverse the southern and eastern reaches of the project area, bisect the Mac West Segment near its southern terminus, and parallel the Mac West Segment where it would run along West Point MacKenzie Road. The pipeline's Chugach route alignment would bisect the Big Lake Segment, Connector 1 and Connector 3 segments, crossing privately-owned, Native Corporation and State of Alaska land. These areas could experience cumulative impacts to land use and

recreational resources in areas of Port MacKenzie Rail Extension segments that overlap with the proposed pipeline alignment and the pipeline's Alterative 1.

Port MacKenzie Development Projects

Port MacKenzie development projects include the expansion of existing deep-draft and barge docking facilities, construction of a bi-modal bulk materials facility, and development of an open-pit gravel mine. Some of these projects have already been constructed. The gravel mine is operating in the vicinity of the southern terminus of the Mac East and Mac West segments. The land in the vicinity of the port is either undeveloped public or privately owned land. There is some past and present agricultural use. Development of industrial-related facilities to support the Port of MacKenzie would constitute a permanent change from undeveloped or agricultural land to developed industrial land. Where these areas coincide with the proposed rail line, there could be cumulative impacts to land use. There are no impacts to recreational resources from the proposed rail line extension that overlap with impacts of the port development projects, therefore, no cumulative impacts would be expected to occur.

South Wasilla Rail Line Reloation

The proposed track realignment and other action alternatives could have a minor cumulative impact on land use by removing some parcels that are currently residential and other parcels that could be used for future expansion of the existing residential community (Creekside Preserve residential area). There are no foreseeable large-scale economic activities that would stimulate a substantial amount of expansion of the community; therefore, adequate vacant replacement land is available, and potential adverse cumulative impacts to land use would be minimal. There are no impacts from the proposed rail line to recreational resources in the area of the South Wasilla Rail Line Relocation, therefore, no cumulative impacts to recreational resources would be expected to occur.

West Mat-Su Access Project

The proposed West Mat-Su Access Project includes development of access across the Little Susitna River into the southern Fish Creek Management Area. Construction of a bridge and access road would result in incremental changes to land use in the vicinity of the proposed Port MacKenzie Rail Extension. At present, this land is undeveloped private- and publicly-owned land. The West Mat-Su Access Project's new access road would cross either Connector 1 Segment and/or the Willow Segment. The bridge access road could also facilitate access to these areas for hunting, fishing, and recreation. Potential impacts to recreational resources from the proposed rail alignment, when combined with impacts from the West Mat-Su access project could result in cumulative impacts to recreational resources.

O.3.11.2 Conclusion

The proposed Port MacKenzie Rail Extension would not likely result in substantial changes in land use patterns in the project area, with the exception of the rail line associated facilities within the ROW. Impacts of the proposed rail line could combine with the impacts of the Cook Inlet areawide oil and gas lease sale and the Knik Arm Crossing to produce potentially substantial changes in land-use patterns; the rail line contribution to those cumulative impacts would be

expected to be minimal. The Beluga to Fairbanks natural gas pipeline project could combine with the Port MacKenzie Rail Extension to produce cumulative impacts to land use in the areas of the Connector 1, Connector 3 and Mac West segments, depending on pipeline and rail line route alternatives.

As noted on Figures 13.2-1 through 13.2-6 and Table O-2, all segments of the proposed Port MacKenzie Rail Line Extension could result in impacts to recreational resources. Potential impacts to recreational resources could overlap with impacts from certain other projects resulting in cumulative impacts. All rail line alternatives would cross the Iditarod National Historic Trail.

Table O-2
Impacts to Recreation Areas and Trails by Alternative [a]

Alternative	Willow Creek State Recreation Area	Nancy Lake State Recreation Area	Little Susitna State Recreation River	Susitna Flats State Game Refuge	Point MacKenzie Trailhead and Parking Lot	West Gateway Trails	Iron Dog Trail	Crooked Lake Trail	Iditarod National Historic Trail	Houston Lake Loop Trail	Flat Lake Connector Trail	Aurora Dog Mushing Trails	Mud Lake Trail	Iditarod Link Trail	Flathorn Lake Trail	Pipeline Trail	Figure 8 Lake Loop Trail	Lucky Shot Trail	Nancy Lake – Susitna Trail	Herning Trail	16 Mile Trail	Knik Connector Trail
Mac West-Connector 1-Willow	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X			
Mac West-Connector 1-Houston-Houston North			X	X	X			X	X	X	X			X	X	X	X					
Mac West-Connector 1-Houston-Houston South			X	X	X			X	X	X	X			X	X	X	X					
Mac West-Connector 2-Big Lake				X	X				X			X					X			X	X	X
Mac East-Connector 3-Willow	X	X	X	X		X	X	X	X				X	X				X	X			
Mac East-Connector 3-Houston-Houston North			X					X	X	X	X											
Mac East-Connector 3-Houston-Houston South			X					X	X	X	X											
Mac East-Big Lake									X			X								X	X	X

[a] Source: ADNR, 2009

O.3.12 Socioeconomics

O.3.12.1 Analysis

The potential socioeconomics impacts of the Port MacKenzie Rail Extension would include a temporary increase in direct employment during construction. This temporary increase in direct employment would be complemented by additional indirect employment generated through suppliers and service providers, and induced employment through multiple rounds of expenditures and consumption along production and consumption chains. The increased labor demand is expected to be met in part by the local labor force, and any increased pressures on

housing and public services derived from the migration of laborers to the affected area would be minor.

Potential long-term negative impacts that the Port MacKenzie Rail Extension could have on recreational activities, by crossing land used for recreational purposes, are expected to be minor and minimized through appropriate crossings for people and wildlife at trail crossings and within state recreational areas. ARRC would provide grade-separated crossings or relocations for officially recognized trails, but has not proposed to provide crossings for unofficial trails. Unofficial trails would be blocked, and ARRC's trespassing regulations would prohibit crossing of the ROW.

The cumulative impacts analysis required expanding the analysis of housing availability to include the Municipality of Anchorage, because some of the projects expected in the near future would be either in Anchorage or link the MSB to Anchorage. The Municipality of Anchorage would be a potential option for residence for workers on these projects.

Table O-3 lists reasonably foreseeable projects that could generate cumulative socioeconomic impacts to those generated by the Port MacKenzie Rail Extension, and identifies what those cumulative impacts could be. The table does not include the Su-Knik Environmental Mitigation Bank. The bank would be used to offset authorized impacts to wetlands with no reasonably foreseeable impacts on employment, migration, demand for housing and public services, or economic activity. The table includes the Cook Inlet areawide oil and gas lease sale because it would have socioeconomic impacts through its subsequent activities (exploration and production of oil and gas). Potential socioeconomic impacts would include job creation; potential in-migration of workers to production areas, generating increased demand for housing and public services; and potential use of land currently used for recreational activities. However, the extent of these potential impacts on the MSB would depend on the specific areas for which bids are received and the extent to which exploration leads to production. Because this is currently unknown, no further cumulative impacts analysis is included here. The table includes the MSB Regional Aviation System Plan to the extent that implementation includes upgrades of public airports in the area or the construction of a new public airport. Because discussions of potential locations for a new airport are still preliminary, permanent increases in local demand for labor, housing, and public services, or displacements and loss of economically productive land generated by the construction of a new airport, cannot be determined at this time.

All projects listed in Table O-3 would temporarily generate increased demand for construction labor in the project area, as and if they came to fruition. Although estimates of the number of jobs generated by each of these projects are not readily available, there are estimates for some of the potentially larger projects. Construction of the proposed Knik Arm Crossing would generate an annual average of between 2,200 and 3,100 jobs in its 2-year construction period, with a share of these jobs being filled by non-local hires. A construction start date for the bridge is not yet known. The Goose Creek Correctional Center is located at a site 9 miles from the Port MacKenzie dock; construction began in spring 2009 and is expected to be complete by late 2011 to early 2012 (MSB, 2008b). This construction project is expected to generate 600 to 700 jobs. To the extent that these large construction projects absorb the existing local labor force, the Port MacKenzie Rail Extension would be obliged to recruit from beyond the MSB for construction

Table O-3
Potential Impacts of Expected Projects in the Affected Area

	Temporary Increase in Demand for Labor (construction)	Permanent Increase in Local Demand for Labor, Housing, and Public Services	Displacements, Loss of Economically Productive Land, or Barriers to Mobility
Cook Inlet OCGen™ Power Project	✓		
Knik-Willow transmission line upgrade	✓		
B2F natural gas pipeline	✓		✓
Cook Inlet Ferry	✓	✓	
Knik Arm Crossing	✓	✓	
Goose Creek Correctional Center	✓	✓	✓
Port MacKenzie development projects	✓	✓	
South Wasilla rail line relocation	✓		✓
Redevelopment of the Port of Anchorage Marine Terminal	✓		
West Mat-Su access road to the Fish Creek area	✓		✓
Various road improvement projects	✓	✓	
Cook Inlet areawide oil and gas lease sale	✓	✓	✓
MSB Regional Aviation System Plan	✓		

workers. In that case, increased pressures on housing and public services from labor migrating to the MSB to work on the Port MacKenzie Rail Extension would add to the pressure generated by other construction projects.

Some of the construction projects would employ workers who reside in the Anchorage urban area and would not necessarily stimulate relocation to the MSB. This would be the case for the redevelopment of the Port of Anchorage Marine Terminal, and likely the Knik Arm Crossing and the Cook Inlet Ferry. To the extent that the labor employed is able to reside in Anchorage, not only the Anchorage labor force but also its housing market, would be available to address the rising demands (for labor and housing for in-migrating labor) from the projects. The Municipality of Anchorage is estimated to have 110,164 housing units, 7,688 (7 percent) of which were estimated to be vacant between 2005 and 2007 (U.S. Census Bureau, 2005-2007).

Some projects could permanently increase the demand for housing and public services in the MSB. The Goose Creek Correctional Center operations area is expected to create 350 prison jobs (MSB, 2008c). The proposed Knik Arm Crossing, the Cook Inlet Ferry, and the improvement of roads around Port MacKenzie would reduce the travel time between Anchorage and areas in the MSB such as Knik-Fairview and Big Lake. This could stimulate the use of these

MSB areas for residential or business purposes linked to Anchorage. To the extent that increased migration to the MSB derives from this shorter commute to Anchorage, this could contribute to a cumulative increased demand on local housing and associated public services such as water, sanitation, and electricity. Because this permanent stimulus for relocation would occur only after construction was completed, the MSB housing market and its public services would have time to adjust to expected increases in demand.

Some projects would occupy or cross lands potentially used for various economic activities. The proposed Beluga to Fairbanks natural gas pipeline would cross the Port MacKenzie Rail Extension project area parallel to the existing Beluga-Wasilla natural pipeline; the Goose Creek Correctional Center would be developed at the corner of Alsop Road and Point MacKenzie Road; and the South Wasilla rail line relocation would straighten about 4 miles of the rail line in the Wasilla urban area. The cumulative impacts of the Port MacKenzie Rail Extension and these projects on the economic activities derived from the use of lands in the affected area is expected to be minor. Burial of the Beluga to Fairbanks natural gas pipeline would minimize impacts to the productive use of lands crossed; the Goose Creek Correctional Center would be developed off recreational parks or trails in a mostly undeveloped area; and the South Wasilla rail line relocation would cross mostly vacant, residential, and some commercial (gravel pit) land. A fourth project, the proposed West Mat-Su Access road to the Fish Creek area would cross the Little Susitna State Recreation River and possibly the Susitna Flats State Game Refuge, providing access from the eastern side of the Little Susitna River. To the extent there were any impacts to recreational activities, these could be cumulative to those from the Port MacKenzie Rail Extension, particularly along the Willow Segment, which would also cross the Little Susitna State Recreation River in the same general area.

O.3.12.2 Conclusion

Cumulative impacts to socioeconomic resources would include increased demand for labor that would likely lead to increased demand for local housing and public services to the extent that labor migrates to the MSB from outside the area. Labor for some of the construction projects could come from the Municipality of Anchorage and reside in that area, which would reduce pressure on the MSB housing market and public services from migration to the area. To the extent that some of the projects would shorten the commute time between the MSB and Anchorage, there could be incentives for permanent relocation of workers to the MSB. However, because this permanent stimulus for relocation would occur only after construction was completed, the MSB housing market and its public services would have time to adjust to increases in demand. Cumulative impacts to recreation activities from use of land by the various expected projects in the affected area would be expected to be minor.

O.3.13 Environmental Justice

Because proposed Port MacKenzie Rail Extension construction and operations would not result in high and adverse impacts to human health or the environment, there would be no disproportionately high and adverse impacts to minority and low-income populations.

Based on the cumulative impacts analysis in this appendix and summarized in Chapter 16 of this Draft EIS, there would be no high and adverse impacts to human health or the environment from

the cumulative impacts of proposed Port MacKenzie Rail Extension construction and operations activities when added to the impacts of other past, present and reasonably foreseeable future projects and actions.

O.4 REFERENCES

ADEC (Alaska Department of Environmental Conservation). 2008. Draft Summary Report of Improvements to the Alaska Greenhouse Gas Emission Inventory. January.

ADN (Anchorage Daily News). 2009. "Application Withdrawn for Ferry Landing Close to Ship Creek." *Anchorage Daily News* (Anchorage, AK). June 3, 2009. Online at: http://www.adn.com/news/alaska/matsu/story/818487.html (accessed July 7, 2009).

ADNR (Alaska Department of Natural Resources). 2008. Proposed Cook Inlet Areawide Oil and Gas Lease Sale, Preliminary Finding of the Director. ADNR Division of Oil and Gas, September 29.

ADNR. 2009. Cook Inlet Areawide Oil and Gas Lease Sale: Final Finding of the Director. January 20.

ADOC (Alaska Department of Corrections) and MSB (Matanuska Susitna Borough). 2009. Goose Creek Correctional Center June 2009 Project Status Report. Online at: http://ww1.matsugov.us/index.php?option=com_docman&task=doc_download&gid=1732&Itemid=238 (accessed September 2, 2009).

ADOT&PF (Alaska Department of Transportation & Public Facilities). 2003. Categorical Exclusion Checklist. Project Name: Parks Highway MP 72-83 Rehabilitation Willow Creek to Kashwitna River. Project Number: IM-OA4-1(22) / 54985.

ADOT&PF. 2006. Parks Highway Visioning Document. AKSAS Project Number 74833. Prepared by CHM2HILL. Online at: http://www.parkshighway44-52.info/documents/ParksHwyVisioning.pdf (accessed December 5, 2008).

ADOT&PF. 2008a. 2006-2009 Alaska Statewide Transportation Improvement Program Amendment 17. Approved by FHWA and FTA, July 2, 2008, Updated with Administrative Modifications through November 15, 2008. Part of 2006-2008 Final STIP, Approved by FHWA and FTA, February 2006.

ADOT&PF. 2008b. Categorical Exclusion Documentation Form. Project Name: Point MacKenzie Road Improvement (Don Young Road Upgrades). Project Number (state/Federal): 58168/SDP-0001-(370). May 19.

ADOT&PF. 2008c. Burma Road Improvements. (Project No. 53199.) November 10.

ADOT&PF. 2008d. South Big Lake Road Realignment. (Project No. 57187.) November 10.

ADOT&PF. 2008e. State Projects Environmental Checklist. Palmer – Wasilla Highway Phase II – Knick Goose Bay Road and Vine Road Intersection Improvements. (Project Number: 50951.) March, 18. Online at: http://alaskarailroad.com/pdf/2009%20South%20Wasilla%20Rail%20Relocation.pdf

ADOT&PF. 2009a. DOT&PF Economic Stimulus Packages Putting Alaskans to Work. Submitted Reports. ADOTPF-ARRA-Init-Rep_FHWA-1586_3-31-2009.pdf. Online at: http://www.dot.state.ak.us/econstim/documents/ADOTPF-ARRA-Init-Rep_FHWA-1586_3-31-2009.pdf (accessed September 9, 2009).

ADOT&PF. 2009b. Statewide Transportation Improvement Program (STIP) 2010 – 2013 STIP Draft. September 1. Online at: http://www.dot.state.ak.us/stwdplng/cip_stip/assets/10_13stip/stip_2010_2013_review_draft_corrected_9_1_09.pdf (accessed September 3, 2009).

AMATAS (Anchorage Metropolitan Area Transportation Solutions). 2009. Anchorage Bowl 2009 Major Amendment to the 2027 LRTP – Chapter 13. Public Review Draft. September 24. Online at: http://www.muni.org/Departments/traffic/AMATS/Documents/PRDLRTPC13092409.pdf (accessed October 13, 2009).

ANGDA (Alaska Natural Gas Development Authority). 2008. Beluga to Fairbanks Natural Gas Pipeline. Online at: http://www.angda.state.ak.us/B2F/B2F.asp (accessed December 5, 2008).

ARRC (Alaska Railroad Corporation) 2008a. Preliminary Environmental and Alternatives Report for the Port MacKenzie Rail Extension Project.

ARRC. 2008b. Petition for Exemption to Construct And Operate A Rail Line Extension to Port MacKenzie, Alaska. December 5.

ARRC. 2009a. ARRC's Response to SEA's January 30, 2009, Document Request. Enclosure in letter from Kathryn Floyd (Mayer Brown LLP) to Victoria Rutson (Surface Transportation Board Section of Environmental Analysis). June 25, 2009.

ARRC. 2009b. South Wasilla Rail Line Relocation: Project Facts. Online at: http://alaskarailroad.com/pdf/2009%20South%20Wasilla%20Rail%20Relocation.pdf. (accessed January 21, 2009).

Balshi, M. S., A. D. McGuire, P. Duffy, M. Flannigan, J. Walsh, and J. M. Melillo. 2008. "Assessing the Response of Area Burned to Changing Climate in Western Boreal North America using a Multivariate Adaptive Regression Splines (MARS) Approach." *Global Change Biology* 15(3):578-600.

Bindoff, N. L., J. Willebrand, V. Artale, A. Cazenave, J. Gregory, S. Gulev, K. Hanawa, C. Le Quéré, S. Levitus, Y. Nojiri, C. K. Shum, L. D. Talley, and A. Unnikrishnan. 2007. Observations: Oceanic Climate Change and Sea Level. Pages 385-432 in S. Solomon, D.

Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor, and H. L. Miller (eds.), Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK, and New York: Cambridge University Press.

Black and Veatch. 2009. Alaska Railbelt Regional Integrated Resource Plan Study. December 2009.

Carter, L. 2008. Telephone conversation between Lorali Carter (Matanuska Electrical Association) and Debi Rogers (ICF International). December 17, 2008.

DOT (Department of Transportation). 2005. Port Intermodal Expansion Project: Final Marine Terminal Redevelopment Environmental Assessment. Prepared by Anchorage Port Expansion Team, Port of Anchorage, Anchorage, AK, and U.S. Department of Transportation, Seattle, WA.

Dryden and LaRue, Inc., Land Field Services, Inc., Travis/Peterson Environmental Consultants, Inc. 2004. Alaska Intertie Upgrade Study: 230 kV Transmission Line Teeland Substation to Douglas Substation. January 30. Prepared for Alaska Energy Authority, Inc., Anchorage, AK by Dryden & LaRue, Inc., Land Field Services, Inc., and Travis/Peterson Environmental Consultants, Inc., Anchorage, AK.

FERC (Federal Energy Regulatory Commission). 2009. Written Request Letter for Additional Information on Draft License Application for a Pilot Project from Jennifer Hill (FERC) to Christopher Sauer (Ocean Renewable Power Company Alaska, LLC). Project No. 12679-002.) June 29, 2009.

FERC. 2010. Personal communication from Megan T. McCann (FERC) to Debi Rogers (ICF International) regarding acceptance of the filing of the information request for the Cook Inlet Tidal Energy Project. Email dated February 1, 2010.

FHWA (Federal Highway Administration) and Knik Arm Bridge Toll Authority (KABATA). 2007. Knik Arm Crossing Final Environmental Impact Statement. December 18.

Fitzpatrick, J., R. B. Alley, J. Brigham-Grette, G. H. Miller, L. Polyak, and M. Serreze. 2008. Preface: Why and How to Use This Synthesis and Assessment Report. Pages 8-21 in Past Climate Variability and Change in the Arctic and at High Latitude. Synthesis and Assessment Product 1.2. Reston, VA: U.S. Geological Survey.

FTA (Federal Transit Administration). 2006. Finding of No Significant Impact for the Alaska Railroad Corporation South Wasilla Track Realignment. FTA Region 10. February 1.

Grebmeier, J. M., J. E. Overland, S. E. Moore, E. V. Farley, E. C. Carmack, L. W. Cooper, K. E. Frey, J. H. Helle, F. A. McLaughlin, and S. L. McNutt. 2006. "A Major Ecosystem Shift in the Northern Bering Sea." *Science* 311(5766):1461-1464.

HDR (HDR Alaska, Inc.). 2006a. Final Cook Inlet Ferry NEPA Supplemental Environmental Assessment. Submitted pursuant to 42 U.S.C. 4332(2)(c), 23 CFR Part 771. Prepared for Federal Transit Administration, Seattle, WA, and MSB, Palmer, AK, by HDR Alaska, Inc., Anchorage, AK.

HDR. 2006b. Land Use and Transportation Forecasting Draft Report. Prepared for: Knik Arm Bridge and Toll Authority, Alaska Department of Transportation & Public Facilities, and Federal Highway Administration. February.

HDR and URS (HDR Alaska, Inc and URS Corporation). 2006. Knik Arm Crossing Final Cumulative Effects Technical Report. (Agreement No: P 42070. Federal Project No: ACSTP-0001(277). AKSAS Project No: 56047.) March. Prepared for Knik Arm Bridge and Toll Authority, Alaska Department of Transportation & Public Facilities, Anchorage, AK, and Federal Highway Administration, Juneau, AK, by HDR Alaska, Inc. and URS Corporation, Anchorage, AK.

Hofman, R. J. 2003. "Marine Sound Pollution: Does it Merit Concern?" *Marine Technology Society Journal* 37(4):66-77.

IASC (Arctic Council and the International Arctic Science Committee). 2004. Impacts of a Warming Arctic: Arctic Climate Impact Assessment. Cambridge, UK, and New York: Cambridge University Press. Online at: http://www.acia.uaf.edu

Interagency Review Team. 2007a. Su-Knik Environmental Bank. Southcentral Alaska. Umbrella Mitigation Bank Instrument.

Interagency Review Team. 2007b. Su-Knik Environmental Bank. Southcentral Alaska. Appendix G: Big Lake South Individual Bank Plan. Supplement to the Umbrella Bank Instrument. Su-Knik Environmental Bank. Southcentral Alaska.

IPCC (Intergovernmental Panel on Climate Change). 2007. Climate Change 2007: Synthesis Report. A. Allali, R. Bojariu, S. Diaz, I. Elgizouli, D. Griggs, D. Hawkins, O. Hohmeyer, B. P. Jallow, L. Kajfež-Bogataj, N. Leary, H. Lee, D. Wratt (eds.). Online at: http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf (accessed July 2008).

Jackson, K. 2009. Email communication between Kevin Jackson (Alaska Department of Transportation & Public Facilities) and Christopher Moelter (ICF International) regarding the Don Young Road Upgrade Project. January 9, 2008.

Jones, B. M., C. D. Arp, M. T. Jorgenson, K. M. Hinkel, J. A. Schmutz, and P. L. Flint. 2009. "Increase in the Rate and Uniformity of Coastline Erosion in Arctic Alaska." *Geophysical Research Letters* 36, L03503, doi:10.1029/2008GL036205.

Juday, G. P., V. Barber, P. Duffy, H. Linderholm, T. S. Rupp, S. Sparrow, E. Vaganov, and J. Yarie. 2005. Forests, Lland Management, and Agriculture. Pages 781-862 in Arctic Climate Impact Assessment. Cambridge, UK, and New York: Cambridge University Press. Online at: http://www.acia.uaf.edu/pages/scientific.html.

KABATA (Knik Arm Bridge and Toll Authority) and ADOT&PF (Alaska Department of Transportation & Public Facilities). 2007. Knik Arm Crossing Final Environmental Impact Statement and Final Section (4)f Evaluation. Prepared for Federal Highway Administration. December 18, 2007.

KABATA. 2008. Knik Arm Crossing Project Milestone and Schedule. Online at: http://www.knikarmbridge.com/schedule.html (accessed December 4, 2008).

KABATA. 2009. NEPA and the Knik Arm Crossing. Online at http://www.knikarmbridge.com/nepa.html (accessed February 19, 2010).

Kemplen, A. 2008. Telephone conversation between Allen Kemplen (Alaska Department of Transportation & Public Facilities) and Debi Rogers (ICF International) regarding schedule for Knik Goose Bay Road Improvements. December 1, 2008.

Koski, R. 2009. Email communication between Robert Koski (Matanuska-Susitna Borough Project Manager) and Christopher Moelter (ICF International) regarding status and location of the Point MacKenzie Road Improvement and Paving Project. January 9, 2009.

Larsen, P. H., S. Goldsmith, O. Smith, M. L. Wilson, K. Strzepek, P. Chinowsky, and B. Saylor. 2008. "Estimating Future Costs for Alaska Public Infrastructure at Risk from Climate Change." *Global Environmental Change* 18(3):442-457.

Lemke, P., J. Ren, R. B. Alley, I. Allison, J. Carrasco, G. Flato, Y. Fujii, G. Kaser, P. Mote, R. H. Thomas and T. Zhang. 2007. Observations: Changes in Snow, Ice and Frozen Ground. In S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor and H. L. Miller (eds.), Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK New York: Cambridge University Press.

Lettenmaier, D., D. Major, L. Poff, and S. Running. 2008. Water Resources. Pages 121-150 in P. Backlund, A. Janetos, D. Schimel, J. Hatfield, K. Boote, P. Fay, L. Hahn, C. Izaurralde, B. A. Kimball, T. Mader, J. Morgan, D. Ort, W. Polley, A. Thomson, D. Wolfe, M. G. Ryan, S. R. Archer, R. Birdsey, C. Dahm, L. Heath, J. Hicke, D. Hollinger, T. Huxman, G. Okin, R. Oren, J. Randerson, W. Schlesinger, D. Lettenmaier, D. Major, L. Poff, S. Running, L. Hansen, D. Inouye, B. P. Kelly, L. Meyerson, B. Peterson, and R. Shaw (eds.), The Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity in the United States. (Synthesis and Assessment Product 4.3.) Washington, D.C.: U.S. Department of Agriculture.

Maritime Reporter and Engineering News. 2009. Alaska Shipbuilder Finishing Unique Ferry. June 15. In partnership with MarineLink.com. Online at: http://marinelink.com/en-US/News/Article/330889.aspx (accessed July 2009).

Meehl, G. A., T. F. Stocker, W. D. Collins, P. Friedlingstein, A. T. Gaye, J. M. Gregory, A. Kitoh, R. Knutti, J. M. Murphy, A. Noda, S. C. B. Raper, I. G. Watterson, A. J. Weaver, and Z. C. Zhao. 2007. Global Climate Projections. Pages 747-845 in S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller (eds.), Climate Change 2007: The Physical Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK and New York: Cambridge University Press.

MMS (Minerals Management Service). 2003. Cook Inlet Planning Area Oil and Gas Lease Sales 191 and 199, Final Environmental Impact Statement. OCS EIS/EA MMS 2003-055, Alaska Outer Continental Shelf.

MMS. 2005. Proposed Geophysical Survey Cosmopolitan Unit, Cook Inlet, Environmental Assessment. OCS EIS/EA MMS 2005-045, Alaska Outer Continental Shelf. Online at: http://www.mms.gov/alaska/ref/EIS%20EA/Cosmo_EA/ea_Cosmo.pdf (accessed October 5, 2009).

MSB (Matanuska-Susitna Borough). 2007. Fish Creek Management Plan: Draft Alternatives. May 7. Online at: http://www.agnewbeck.com/pdf/matsu/Fish_Creek/Fish_Creek_Alternatives_draft.pdf (accessed December 5, 2008).

MSB. 2008a. Draft Fish Creek Management Plan. Final Draft Released July 21, 2008. Prepared by Agnew: Beck Consulting , LLC, JadeNorth, LLC. Online at: http://www.agnewbeck.com/pages-portfolio/matsu/fishcreek-mngt-plan.htm (accessed June 25, 2008).

MSB. 2008b. Mat-Su Borough Goose Creek Correctional Center October 2008 Status Report. Online at: http://ww1.matsugov.us/prison/images/stories/site/October08.pdf (accessed December 4, 2008).

MSB. 2008c. Goose Creek Correctional Center: Home Page. Online at: http://ww1.matsugov.us/prison (accessed December 4, 2008).

MSB. 2009a. Point MacKenzie Road Improvements. MSB Public Works Webpage. Online at: http://ww1.matsugov.us/publicworks/index.php?option=com_content&view=article&id=53:pt-mac-road-improvements&catid=7:pme-projects&Itemid=5 (accessed January 8, 2009).

MSB. 2009b. Joint Land Use Study. Public Review Draft. Produced by WHPacific with assistance by EDAW and AECOM. July.

National Marine Fisheries Service. 2006. POA-2003-502-N Ship Creek. March 22, 2006 correspondence from Robert D. Mecum, Acting Administrator, Alaska Region, National Marine Fisheries Service, Juneau, AK, to Colonel Timothy J. Gallagher, U.S. Army Corps of Engineers, Anchorage, AK.

National Marine Fisheries Service. 2008. POA-1979-412 Knik Arm. May 15 correspondence from Robert D. Mecum, Acting Administrator, Alaska Region, National Marine Fisheries Service, Juneau, Alaska, to Colonel Kevin J. Wilson, District Engineer, U.S. Army Corps of Engineers AK District, Anchorage, AK.

ORPC (Ocean Renewable Power Company Alaska, LLC). 2006. Application for Preliminary Permit. Before the United States Federal Energy Regulatory Commission (FERC). Docket No. P-12679-000. May 2006.

ORPC. 2008. Alaska Cook Inlet OCGen Tidal Energy Project. FERC No. 12679. Initial Consultation and Informational Meeting. Meeting Notes. July 3, 2008.

ORPC. 2009. OCGEN™ Projects. Alaska. Online at: http://www.oceanrenewablepower.com/ocgenproject_alaska.htm (accessed September 4, 2009).

Osterkamp, T. 2007. "Characteristics of the Recent Warming of Permafrost in Alaska." *Journal of Geophysical Research* 112, F02S02, doi:10.1029/2006JF000578.

Port MacKenzie. 2008. Long-Term Vision for Future of Commercial Transportation Users. Presentation at Alaska Regional Ports Conference. January 10-11, 2008. Online at: http://www.poa.usace.army.mil/en/cw/AK%20Regional%20Ports%20Study/Panel1_MarcVanDongen.pdf (accessed December 5, 2008).

Port of Anchorage Intermodal Expansion Project. Online at: http://www.portofanchorage.org/ov_project.html (accessed December 5, 2008).

Ryan, M. G., S. R. Archer, R. Birdsey, C. Dahm, L. Heath, J. Hicke, D. Hollinger, T. Huxman, G. Okin, R. Oren, J. Randerson, and W. Schlesinger. 2008. Land Resources. Pages 75-120 in P. Backlund, A. Janetos, D. Schimel, J. Hatfield, K. Boote, P. Fay, L. Hahn, C. Izaurralde, B. A. Kimball, T. Mader, J. Morgan, D. Ort, W. Polley, A. Thomson, D. Wolfe, M. G. Ryan, S. R. Archer, R. Birdsey, C. Dahm, L. Heath, J. Hicke, D. Hollinger, T. Huxman, G. Okin, R. Oren, J. Randerson, W. Schlesinger, D. Lettenmaier, D. Major, L. Poff, S. Running, L. Hansen, D. Inouye, B. P. Kelly, L. Meyerson, B. Peterson, and R. Shaw (eds.), The Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity in the United States. (Synthesis and Assessment Product 4.3.) Washington, D.C.: U.S. Department of Agriculture.

Sworts, B. 2008. Email communication between Brad Sworts (Matanuska-Susitna Borough Planning, Transportation, and Environmental Division) and Debi Rogers (ICF International) regarding the status of the Matanuska-Susitna Borough Regional Aviation Systems Plan. November 25, 2008.

Sworts, B. 2009. Telephone communication between Brad Sworts (Matanuska-Susitna Borough Planning, Transportation, and Environmental Division) and Debi Rogers (ICF

International) regarding the status of various proposed Port MacKenzie projects. October 13, 2009.

Travis, M. 2009. Email communication between Michael Travis (Travis/Peterson Environmental Consulting, Inc.) and Debi Rogers (ICF International) regarding updated to the Knik-Willow Transmission Line project. October 12, 2009.

Trenberth, K. E., P. D. Jones, P. Ambenje, R. Bojariu, D. Easterling, A. Klein Tank, D. Parker, F. Rahimzadeh, J. A. Renwick, M. Rusticucci, B. Soden, and P. Zhai. 2007. Observations: Surface and Atmospheric Climate Change. Pages 235-335 in S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor, and H. L. Miller (eds.), Climate Change 2007: The Physical Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK and New York: Cambridge University Press.

U.S. Census Bureau. 2005-2007. American Community Survey 3-Year Estimates. Online at: http://factfinder.census.gov (accessed February 25, 2009).

USGCRP (U.S. Global Change Research Program). 2009. Global Climate Change Impacts in the United States. A State of Knowledge Report from the U.S. Global Climate Change Research Program. June. Online at: http://www.globalchange.gov/usimpacts

White, R. 2008. "Gravel Operation Revives Port MacKenzie." *Anchorage Daily News* (Anchorage, AK). July 18, 2008. Online at: http://www.adn.com/matsu/story/468242.html (accessed December 4, 2008).

Zartman, S. 2008. Telephone communication between Sandy Zartman (Port MacKenzie Port Director's Office) and Debi Rogers (ICF International) regarding the status of various Port MacKenzie projects, including the deep draft dock expansion. November 20, 2008.