

*Port MacKenzie Rail Extension Project*

**Mac East Variant Assessment**

Prepared for:



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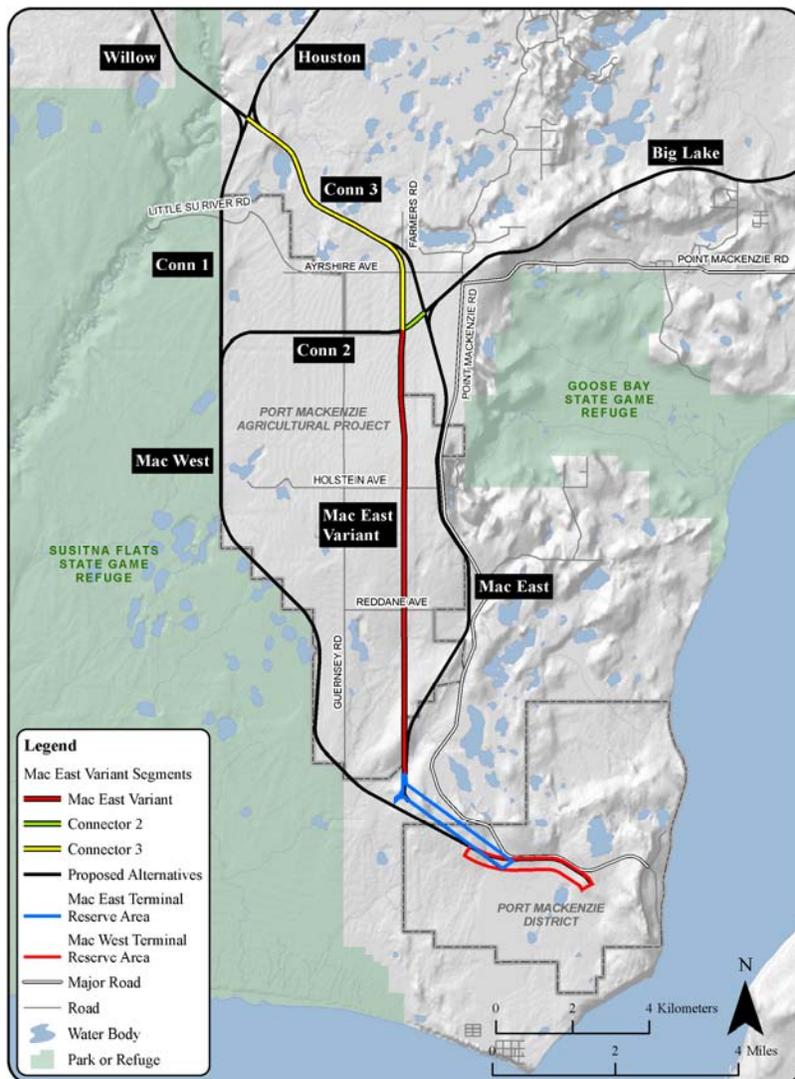
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## Introduction

In March 2010, the Draft Environmental Impact Statement (DEIS) for Alaska Railroad Corporation Construction and Operation of a Rail Line Extension to Port MacKenzie, Alaska was released to the public. The ARRC is proposing a minor modification to the Mac East Segment described in the DEIS. This modification is called Mac East Variant Segment and is shown on Figure 1.\* This document describes the Mac East Segment and the Mac East Variant Segment and compares the impacts of each. This document is organized the same as the DEIS including chapter numbers for each section, and is intended to provide additional information not included in the DEIS. This report is not intended to be a stand alone document and includes many references to the DEIS.

Figure 1 Southern Segments of Proposed Rail Line.



\* The Mat-Su Borough's Transportation Advisory Board has referred to this modification as "Mac Central."



## **1. PURPOSE AND NEED**

The Purpose and Need of the Port Mackenzie Rail Extension is described in the DEIS.

## **2. PROPOSED ACTION AND ALTERNATIVES**

The Mac East Segment as described in the DEIS would begin at the terminal reserve and head north following a ridge along the eastern border of the Point MacKenzie Agricultural Project. At approximately Milepost (MP) 4.7, the segment would cross a ravine and then curve to the northeast along the top of another ridge. North of MP 6, the segment would follow the same alignment as Port MacKenzie Road, offset 200 feet or more to the west. The segment would then continue along undulating terrain before reaching a junction with the Big Lake Segment or Connector 3 Segment. The terminal reserve area is proposed at the southern terminus on the north side of the Mac East alignment (Figure 1) (STB, 2010). The full length of the Mac East Segment would be approximately 8 miles from the exit of the terminal reserve to the junction with the other Segments and includes an area of 470 acres including the 265-acre terminal reserve area.

The Mac East Variant (MC) Segment would begin in the terminal reserve area and head north near the same alignment as the Mac East Segment. At approximately MP 4.7 the segment would continue to head north through the Port MacKenzie Agriculture Project Area approximately 150 feet east of the section lines to allow the railroad right-of-way (ROW) limits to remain clear of the section line easement and the easement to remain unoccupied for potential future use. At MP MC 5 the segment would cross to the western side of the section line (to another railroad ROW) for approximately one mile and then head slightly east to occupy the section line. Along the section line at approximately MP MC 7, the embankment would cross a deep depression. The segment would continue north until its junction with Connector 2 and continuance on Connector 2 (7.7 miles from the exit of terminal reserve) or it could continue on to a modified and shorter Connector 3 (Hereafter referred to as Modified Connector 3 when discussion of Mac East Variant Segment occurs) (11.9 miles total) which is 1.65 miles north of the Connector 2. The total area for this segment including the terminal reserve is 480 acres. The total length of the Mac East Variant Segment up to Connector 2 including the length of the terminal reserve would be approximately 9.1 miles (1.85 miles of terminal reserve, 7.25 miles of the Mac East Variant Segment).

## **3. TOPOGRAPHY, GEOLOGY, AND SOILS**

### **3.1 Regulatory Setting**

As described in the DEIS, the Mac East would not be subject to Federal, State of Alaska, or Matanuska-Susitna Borough (MSB) regulations regarding the protection of or minimization of impacts to topography, geology, or permafrost. This also applies to the Mac East Variant. There are Federal Codes for buildings and structures in place to address structure earthquake resistance. The American Association of State Highway Transportation Officials has provided guidelines for seismic design of highway bridges, which could apply to portions of the rail line extension. There are also recommended guidelines and standards for seismic design of new railroad

structures and embankments provided by the American Railway Engineering and Maintenance-of-Way Association (STB 2010).

### **3.2 Study Area**

The study area as defined in the DEIS for topography, geology, and soils encompasses the Mac East Variant Segment.

### **3.3 Topography**

#### *3.3.1 Analysis Methodology*

The methodology used for all segments in the DEIS, including the Mac East Segment, can be found in the DEIS. The same methodology was used to analyze the Mac East Variant, but had to be modified due to relatively flat terrain and shorter lengths of the segments being analyzed. In the DEIS, 50-foot contours were used and for this analysis more detailed topography was generated from the Digital Elevation Model (DEM) and 10-foot contours were used.

#### *3.3.2 Affected Environment*

The Affected Environment Section 3.3.2 of the DEIS encompasses the Mac East and Mac East Variant Segment.

#### *3.3.3 Environmental Consequences*

#### **Common Impacts**

Steeper terrain would require a greater amount of either fill or cut and fill during rail line construction than flatter terrain, and would therefore have a larger impact on topography.

#### Construction Impacts

Temporary impacts would include cuts for construction of roads needed for construction access and temporary facilities such as staging areas, material laydown/stockpile areas and camp/emergency facilities. If such areas were regraded to match the preexisting topography, there would be no permanent impact (STB 2010).

Permanent impacts to topography would occur where terrain would be reshaped during construction to meet railroad design objectives. The ARRC's objective is to construct the rail line with a grade of 1 percent or less. This requires fill or cut and fill earthwork along most of the alternatives.

As shown in Table 3.3-1 the Mac East Segment has approximately 400 linear feet of rail line that would be on a slope greater than 5 percent and 7,100 linear feet of rail line on a slope greater than 1 but less than 5 percent. A majority of the rail line would be on land with slope less than or equal to 1 percent (50,100 linear feet).

The Mac East Variant Segment does not have any length of rail line that would have a slope greater than 5 percent. A small portion would have a slope between 1 and 5 percent (4,800 linear feet) and a majority of the rail line would be in areas with slope less than or equal to 1 percent (33,400 linear feet).

Table 3.3-1  
Slope Analysis of Alternative Segments and Segment Combinations

Segment/Segment Combination	Percent Slope Less Than or Equal to 1 Percent (linear feet)	Percent Slope Greater Than 1 to 5 Percent (linear feet)	Percent Slope Greater Than 5 Percent (linear feet)
Mac East Variant-Modified Connector 3	87.4 (55,000)	12.6 (7,900)	0.0 (0)
Mac East Variant-Connector 2	88.2 (35,900)	11.8 (4,800)	0.0 (0)
Mac East Variant	87.4 (33,400)	12.6 (4,800)	0.0 (0)
Mac East	86.9 (50,100)	12.3 (7,100)	0.7 (400)

Operation Impacts

As stated in the DEIS there would be no operational impacts to topography along the proposed rail lines including the Mac East Variant.

**Comparison of Mac East and Mac East Variant**

Mac East Segment would require more cuts into the topographic landscape than the Mac East Variant and would include a cut through a large hill and several climbs in elevation along ridge lines. The Mac East Variant would required a descent along one slope and then a rise of another until it reaches the Port MacKenzie Agriculture Project Area where the topography is relatively flat and would not require as much cut and fill work. The Mac East Segment slope work would occur throughout the proposed alignment, whereas the slope work for Mac East Variant would be confined to the southern portion of the alignment.

**3.4 Geology and Soils**

3.4.1 *Analysis Methodology*

Analysis methodology for geology and soils is described in the DEIS and was used to analyze the geology and soils for the Mac East Variant and the Mac East Segment.

3.4.2 *Affected Environment*

The Affected Environment portion of the DEIS describes the geology and soils for both the Mac East and Mac East Variant.

3.4.3 *Environmental Consequences*

**Common Impacts**

Construction Impacts

As stated in the DEIS outcroppings of bedrock are rare or absent throughout the study area, and therefore, bedrock is not expected to be encountered or any cuts required for rail line construction. Therefore, there are no impacts to the geology of the area (STB 2010).

Construction activities would affect soils unsuitable for rail line construction, which would be removed and replaced with well-draining soils. Any soft, compressible organic and peat soils

present in wetland areas would also be compacted or removed and replaced. Slope stability could be affected in areas where soils are excavated to accommodate the rail line. Wind and water erosion would also affect any erodible soils exposed by cuts on slopes (STB 2010).

Along the Mac East and Mac East Variant segments there are soils that the MSB considers locally important for agricultural purposes. There would be some loss of agriculturally important soils along portions of the rail line ROW inside the Port MacKenzie Agriculture Project Area (Figure 1).

In the DEIS, the alternatives were scored according to the Farmland Conversion Impact Rating System as a requirement of the Farmland Protection Policy Act (FPPA). All of the alternatives received a score of less than 160 requiring no further consideration for protection. The Mac East Segment was included in the analysis. However, the Mac East Variant will need to be scored and analyzed as required by FPPA by the NRCS and the ARRC.

Operation Impacts

There would be no operational impacts to geology or soils from the proposed rail line operations as long as the erodible soils are stabilized and vegetated following construction.

*Impacts to Soils by Alternative*

Table 3.4-1 shows construction impacts to soils by segment and segment combinations for Mac East Variant. They can be compared to Table 3-7 in the DEIS. Overall, the Mac East Variant combinations would have a slightly higher percentage of agricultural soils along the length of the rail lines because Mac East Variant runs through the Port Mackenzie Agriculture Project. The Mac East Segment runs along the border of the Agriculture Project but would still impact agricultural soils. The Mac East Alternatives have a higher percentage of good soils for construction and need to have less fill brought in. All of the Mac East Alternatives have at least 30 percent of the length in soils considered good for construction. Poor soils for construction exist along the majority of the length of the Mac East Variant Alternatives.

Table 3.4-1  
Construction Impacts to Soils by Rail Line Alternative (percent)<sup>a,b</sup>

Segment	Good	Moderate	Poor	Agricultural Soils
Mac East Variant-Modified Connector 3-Willow	4(33) <sup>c</sup>	4(8)	92(65)	49(40)
Mac East Variant-Modified Connector 3-Houston-Houston North	3(28)	7(1)	90(71)	40(29)
Mac East Variant-Modified Connector 3-Houston-Houston South	5(30)	16(1)	79(69)	41(30)
Mac East Variant-Connector 2-Big Lake	7(28)	12(2)	81(70)	36(33)
Mac East Variant	0	1	99	69
Mac East	32	0	68	62

<sup>a</sup> Source: MSB GIS, 2009

<sup>b</sup> Based on "Localroads" attribute of NRCS soils data, defined as, "Suitability of soil map unit for local road construction." MSB GIS Data Dictionary, 2009.

<sup>c</sup>Impacts for Mac East in parenthesis ()

Table 3.4-2 presents segment combinations using the Mac East Variant along with the percent of erodible soils along the length of the rail line. This table can be compared to Table 3-8 of the DEIS. The Mac East Variant Alternatives have slightly higher percentages of highly or potentially highly erodible soils along the length of the rail line (2% to 4%), with the Connector 2-Big Lake Alternative having the highest increase. However, the rest of the Alternatives using the Mac East Variant have at least 20 percent higher portion of non erodible soils along the length as compared to the alternatives using the Mac East Segment.

Table 3.4-2  
Erodibility of Soils by Segment (percent)

Segment	Not Highly Erodible Soils	Highly or Potentially Highly Erodible Soils
Mac East Variant-Modified Connector 3-Willow	57	43(41) <sup>b</sup>
Mac East Variant-Modified Connector 3-Houston-Houston North	58	42(39)
Mac East Variant-Modified Connector 3-Houston-Houston South	59	41(38)
Mac East Variant-Connector 2-Big Lake	49	51(47)
Mac East	68	32
Mac East Variant	60	40

<sup>a</sup> Source: MSB GIS, 2009  
<sup>b</sup>Impacts for Mac East in parenthesis ()

### Southern Segments

#### Mac East

The Mac East Segment would cross agricultural soils along 62 percent of its length that the MSB considers to be locally important. Mac East would also cross poor soils (NRCS classification for usability for construction) along 68 percent of its length. There are 23 acres of peat and organic soils along the segment. Highly erodible soils are present along 32 percent of the length of the segment.

#### Mac East Variant

The Mac East Variant Segment would cross agricultural soils along 69 percent of its length that the MSB considers to be locally important. Mac East Variant would also cross poor soils for construction along 99 percent of its length. There were no data available to determine if there were peat and organic soils present along the segment. Based on the analysis conducted with aerial photography there is 40% highly or potentially highly erodible soils along the length of the segment.

### Comparison of Mac East and Mac East Variant

The Mac East Segment would cross seven percent less agricultural land than the Mac East Variant Segment. Also, the Mac East Segment would have less poor soils to excavate and fill for construction than the Mac East Variant. The percent of non-erodible soils is higher by eight percent on the Mac East Segment.

## **3.5 Permafrost**

### *3.5.1 Analysis Methodology*

The analysis methodology described in the DEIS was used to analyze the Mac East Variant Segment.

### *3.5.2 Affected Environment*

The Permafrost Affected Environment for Mac East Variant Segment is described in the DEIS.

### *3.5.3 Environmental Consequences*

There have been no locations or types of permafrost identified in the area of study for the DEIS which included a 200-ft corridor study area. Since the Mac East Variant Segment does not fall into the described study area, it could be necessary to do subsurface probing to further determine if there is permafrost present along the segment.

## **Construction Impacts**

There have been no reported problems with permafrost along the existing railroad south of the Alaska Range. If permafrost were present, construction activities such as clearing, vegetative cover disruption, placement of fill materials could induce thawing and subsidence of the ground surface. If permafrost were present, which is expected to be few and small, minor shifts of the rail alignment could avoid or minimize impacts. Therefore, impacts to permafrost would be low (STB 2010).

## **Operation Impacts**

During operation of the rail line, compaction and friction resulting in temperature changes could cause impacts to permafrost. However, these impacts are expected to be low (STB 2010).

## **Comparison of Mac East to Mac East Variant Segments**

Permafrost is not expected along Mac East or Mac East Variant Segments. Therefore, there is no measureable difference between the two segments.

## **3.6 Seismic Hazards**

### *3.6.1 Analysis Methodology*

The DEIS describes the analysis methodology for Seismic Hazards.

### *3.6.2 Affected Environment*

The Affected Environment section of Seismic Hazards includes Mac East and Mac East Variant.

### *3.6.3 Environmental Consequences*

Neither Mac East nor Mac East Variant is located directly on a fault line. However, both segments are within close proximity to fault lines and seismic activity along the fault lines could have impacts to either segment during construction and/or operation. Impacts on the rail line could include misalignment or damage to tracks, railbed, or access roads. These impacts would be caused by ground shaking, offset lateral movement, or subsidence. During operation, ground shaking, if strong enough could lead to train derailment (STB 2010).

### **Comparison of Mac East to Mac East Variant Segments**

Due to the similarity in location there would be no measureable differences in impacts between the Mac East and Mac East Variant Segments.

## **4. WATER RESOURCES**

### **4.1 Regulatory Setting**

The DEIS describes the various Federal, state, and local water resource laws, regulations, and Executive Orders that would apply to the project.

### **4.2 Surface Water**

#### *4.2.1 Study Area*

The Study Area is described in the DEIS and covers both the Mac East and Mac East Variant.

#### *4.2.2 Analysis Methodology*

The analysis methodology of the DEIS describes the analysis methods used for the Mac East Segment and the Mac East Variant.

#### *4.2.3 Affected Environment*

#### **Hydrologic Environment**

The Hydrologic Environment for both the Mac East and Mac East Variant were described in the Affected Environment portion of the DEIS.

#### **Water Quality Conditions**

Water Quality Conditions in the DEIS describe both the Mac East and Mac East Variant environments.

#### *4.2.4 Environmental Consequences*

#### **Common Construction Impacts**

Construction activities along either the Mac East or Mac East Variant could result in short term impacts to the flow and quality of water. The DEIS describes the impacts during construction of the rail line and unpaved road access, excavation of borrow areas, construction of staging areas, construction and installation of bridges and culverts, and channel disturbances.

#### **Common Operations Impacts**

Operation activities along either the Mac East or Mac East Variant could affect both the hydrology and quality of surface water in the surrounding area. The DEIS describes impacts if bridges and culverts are needed, and operation of the rail line and unpaved access roads.

#### *Impacts by Segment*

##### *Mac East*

The Mac East Segment would cross three waterbodies. Two are natural wetland drainages that would be crossed with culverts and the third is a small unnamed stream near Baker's Farm Road that would be crossed by a bridge. This segment would also require crossing of 101 acres of

wetlands and other waters. The DEIS indicated this segment would have relatively low potential for impacts to water quality and alteration of hydrology in the area. There are no major rivers or streams to cross along the alignment.

*Mac East Variant*

The Mac East Variant would cross two of the three waterbodies that the Mac East Segment crosses: the unidentified stream near Baker’s Farm Road (with a bridge) and the natural wetland drainage at MP 2.5 (with a culvert). This segment would require crossing 92 acres of wetlands and other waters. There would be relatively low potential for impacts to water quality or alteration of hydrology in the area since a large portion of the Segment crosses agricultural lands that are relatively flat and have few water features.

**Comparison of Mac East to Mac East Variant Segments**

The Mac East Segment would cross one more waterbody and nine more acres of wetlands than the Mac East Variant. This would be slightly more potential impacts to surface water during construction and operation of the rail line along the Mac East Segment than the Mac East Variant Segment.

**4.3 Groundwater**

*4.3.1 Study Area*

The DEIS describes the study area for groundwater for both the Mac East and Mac East Variant Segment.

*4.3.2 Analysis Methodology*

The analysis methodology used to analyze the Mac East Segment was also used for the Mac East Variant segment and is described in the DEIS.

*4.3.3 Affected Environment*

The Groundwater Affected Environment section of the DEIS describes the environment for both the Mac East and Mac East Variant.

Township-North	Range-West	Sections	Number of Wells within sections in the study area
14	4	6	6
15	4	18,19	0

*4.3.4 Environmental Consequences*

**Construction Impacts and Operation Impacts**

The DEIS describes the common impacts of all segments and alignments being considered. These impacts also apply to the Mac East Variant and include construction of rail line, associated facilities, unpaved access roads, staging areas, and operation impacts.

## **Comparison of Mac East to Mac East Variant Segments**

There are no measureable differences in impacts between the Mac East and Mac East Variant Segments.

### **4.4 Floodplains**

#### *4.4.1 Study Area*

The DEIS describes the floodplains study area and includes the Mac East segment and the Mac East Variant.

#### *4.4.2 Analysis Methodology*

The analysis methodology described in the DEIS was used for the Mac East Segment and the Mac East Variant.

#### *4.4.3 Affected Environment*

The Affected Environment section of the DEIS describes the affected environment for both the Mac East and Mac East Variant locations.

#### *4.4.4 Environmental Consequences*

### **Common and Operation Impacts**

#### Construction Impacts

Construction impacts to the floodplain are described in the DEIS and would be similar for the Mac East Variant. Impacts are associated with construction of the rail and access road, excavation of borrow area, staging areas, and construction of bridges and culverts.

#### Operation Impacts

As stated in the DEIS the operation impacts would be common to all proposed rail line alternatives. These impacts include presence of raised rail beds and bridges, presence of channel stabilization, and culvert obstructions.

#### Impacts by Alternative Segment

##### *Mac East*

There are no available Federal Emergency Management Agency (FEMA) floodplain data for the area along the Mac East Segment. The DEIS identified a potential floodplain at a proposed stream crossing at Baker's Farm Road that is approximately 450 feet wide. A bridge is proposed for the crossing. The Mac East Segment would also cross two waterbodies that do not have defined channels or discernable floodplains. The ARRC would size all proposed water crossings to convey the 100-year flow event associated with local drainages. Therefore, rail line construction and operations of the Mac East Segment would not likely adversely impact floodplains (STB 2010).

##### *Mac East Variant*

There are no available FEMA floodplain data for the area along the Mac East Variant Segment. The segment would cross the same stream at Baker's Farm Road as the Mac East Segment with a bridge and has potential for a floodplain to be identified. The Mac East Variant Segment also crosses one of the natural wetland drainages as the Mac East Segment with a proposed culvert,

but the drainage has no discernable floodplain. The ARRC will size all crossings along the segment to convey the 100-year flow event associated with any local drainage. Construction and operation of this alternative would not likely result in adverse impacts to floodplains.

### **Comparison of Mac East to Mac East Variant Segments**

The Mac East Segment crosses three waterbodies, two of the three do not have discernable floodplains and the other has a potential floodplain. The Mac East Variant Segment crosses two of the same three waterbodies as the Mac East Segment. The stream crossing has a potential floodplain and the other does not. No adverse impacts to floodplains are expected from either alternative.

## **4.5 Wetland Resources**

### *4.5.1 Study Area*

In the DEIS the study area for wetland resources covers the area that both the Mac East and Mac East Variant would be located.

### *4.5.2 Analysis Methodology*

The DEIS describes the methodology used to analyze the wetland resources of the study area. The analysis completed for the DEIS includes the Mac East Segment. The same methodology was used to analyze the Mac East Variant.

### *4.5.3 Affected Environment*

The Wetland Resources Affected Environment section of the DEIS describes the types and quantities of wetlands in the study area. This includes the wetlands in the area of the Mac East Variant.

### **Unique or Sensitive Wetlands**

There are no mitigation banks in the area of the Mac East or Mac East Variant Segments. There are also no designated unique or sensitive wetlands in the area of the Mac East or Mac East Variant Segments.

### **Wetland Functions and Values**

Wetland functions and values are described in the DEIS and include functions such as erosion control, storm and flood water control, stream flow moderation, sediment removal and nutrient cycling, and wildlife habitat.

### *4.5.4 Environmental Consequences*

#### **Common Impacts**

##### Construction Impacts

Impacts to wetlands from excavation and direct placement of fill into wetlands for construction of the rail line and the associated facilities could include direct loss of wetlands, elimination or reduction of wetland function, prevention of surface water storage, reduction of water quality enhancement functions, acceleration of flow downstream, loss of fish and wildlife habitats, loss of riparian zones, and loss of hydric soils (STB 2010).

*Operation Impacts*

Wetlands within the ROW would be impacted during operation and maintenance activities. Such impacts could include introduction of chemicals and sand that could kill vegetation and aquatic life, storm water discharges from the rail line and bed could introduce low concentrations of pollutants altering soil chemistry and pH as well as vegetation, dust generated by vehicles could cover vegetation and inhibit photosynthesis, and sparks from the rail line could cause fires (STB 2010).

*Impacts by Segment and Segment Combinations*

*Mac East*

The Mac East Segment would impact 98 acres of wetlands within the 200-foot ROW and terminal reserve areas. These wetlands are identified as predominately forested wetlands (73.5 percent) (STB 2010) (See Table 4.5-1).

*Mac East-Connector 3*

The Mac East-Connector 3 Segment combination (DEIS Table 4.5-2) would impact 103 acres of wetlands within the 200-foot ROW and terminal reserve areas. These wetlands are identified as predominately forested wetlands (74 acres or 71.8 percent). The The Mac East wetlands impacts increase by 2 acres when Connector 3 is added.

*Mac East Variant*

The Mac East Variant Segment would impact 92 acres of wetlands within the 200-foot ROW and terminal reserve area. The wetlands are identified as predominately forested wetlands (75.6 percent) (See Table 4.5-1).

*Mac East Variant-Connector 2*

The Mac East Variant-Connector 2 combination would impact 70 acres of predominately forested wetlands (75.6 percent) within the 200-foot ROW and terminal reserve area. The Mac East Variant wetlands impacts do not increase when Connector 2 is added (See Table 4.5-1).

*Mac East Variant-Modified Connector 3*

The Mac East Variant-Modified Connector 3 combination would impact 100 acres of predominately forested wetlands (74 percent) (See Table 4.5-1) within the 200-foot ROW and terminal reserve area. This combination would add approximately eight additional acres of impacted wetlands to the Mac East Variant Segment.

Table 4.5-1  
Wetlands within the 200-foot Right-of-Way of the Mac East Variant and Segment Combinations<sup>a, b</sup>

National Wetlands Inventory Code	Description	Mac East Variant-Connector 2		Mac East Variant-Modified Connector 3		Mac East Variant		Mac East (from DEIS)	
		Area (acres)	Wetland Proportion (percent)	Area (acres)	Wetland Proportion (percent)	Area (acres)	Wetland Proportion (percent)	Area (acres)	Wetland Proportion (percent)
PFO1	Broadleaf Forest Wetlands	None	0	None(23) <sup>d</sup>	0(31.1)	None	0	23	31.9
PFO4	Needleleaf Forest Wetlands	10	14.2	13(48)	18.2(64.9)	10	14.2	46	63.9
PFO##	Mixed Forest Wetlands	60	85.7	60(3)	81.8(4.0)	60	85.7	3	4.2
<b>PFO</b>	<b>Subtotal Forest Wetlands<sup>c</sup></b>	<b>70</b>	<b>75.6</b>	<b>73(74)</b>	<b>74.0(71.8)</b>	<b>70</b>	<b>75.6</b>	<b>72</b>	<b>73.5</b>
PSS1	Broadleaf Scrub/Shrub Wetlands	0	0.1	2(7)	6.4(25.0)	0	0.1	5	20.0
PSS4	Needleleaf Scrub/Shrub Wetlands	1	3.8	1(1)	3.4(3.6)	1	3.8	1	4.0
PSS##	Mixed and Other Scrub/Shrub Wetlands	21	96.1	23(20)	90.2(71.4)	21	96.1	19	76.0
<b>PSS</b>	<b>Subtotal Scrub/Shrub Wetlands</b>	<b>22</b>	<b>24.2</b>	<b>25(28)</b>	<b>25.2(27.2)</b>	<b>22</b>	<b>24.2</b>	<b>25</b>	<b>25.5</b>
<b>PEM</b>	<b>Emergent Wetlands</b>	<b>0</b>	<b>0.1</b>	<b>1(1)</b>	<b>0.7(0.9)</b>	<b>0</b>	<b>0.1</b>	<b>1</b>	<b>0.1</b>
P	Palustrine Waters	None	0	None(None)	0(None)	None	0	None	None
R	Riverine Waters	0	100	0(0)	100(100)	0	100	0	100.0
L	Lacustrine Waters	None	0	None	0(None)	None	0	None	None
	<b>Subtotal Other Wetlands and Waters</b>	<b>0</b>	<b>0.1</b>	<b>0(0)</b>	<b>0.1(0.1)</b>	<b>0</b>	<b>0.1</b>	<b>0</b>	<b>0.1</b>
	<b>All Wetlands and Waters</b>	<b>92</b>		<b>100(103)</b>		<b>92</b>		<b>98</b>	

<sup>a</sup> Source: HDR, 2008; HDR, 2010.

<sup>b</sup> Wetland impacts include impacts from the terminal reserve area located outside the 200-foot right-of-way.

<sup>c</sup> Totals might not equal sums of values due to rounding.

<sup>d</sup> Impacts for Mac East-Connector 3 in parentheses ()

*Comparison of Mac East to Mac East Variant Segments*

The Mac East Variant would impact approximately six acres less wetlands than the Mac East Segment. The percent and quantity of forested wetlands and scrub/shrub wetlands is fairly equal between the two segments.

*Comparison of Impacts by Alternative using Mac East and Mac East Variant Segments*

*Mac East-Connector 3-Willow versus Mac East Variant Connector 3-Willow*

The Mac East Alternative would impact 188 acres (Table 4.5-2) of wetlands and waters as compared to 185 acres impacted by the alternative with the Mac East Variant Alternative (Table 4.5-2), a difference of 3 acres. The Mac East Variant Alternative would have the least amount of wetlands and waters impacted by any Alternative described for this project.

*Mac East-Connector 3-Houston-Houston North versus Mac East Variant –Connector 3-Houston-Houston North*

The Mac East Alternative would impact 301 acres (DEIS Table 4.5-4) of wetlands and waters as compared to 298 acres impacted by the Mac East Variant (Table 4.5-2). Both of these Alternatives could potentially impact adjacent habitats due to sensitivity to fragmentation and open water being adjacent to and within the 200-foot ROW.

*Mac East –Connector 3-Houston-Houston South versus Mac East Variant-Modified Connector 3-Houston-Houston South*

The Mac East Alternative would impact 248 acres (DEIS Table 4.5-4) of wetlands and waters as compared to 245 acres impacted by the Mac East Variant (Table 4.5-2). There could be impacts to wetlands outside of the 200-foot ROW and terminal reserve areas from fragmentation of wetland communities.

*Mac East-Big Lake versus Mac East Variant-Connector 2-Big Lake*

The Mac East Alternative would impact 209 acres (DEIS Table 4.5-4) of wetlands and waters with more than half of the wetlands being shrub/scrub wetlands. The Mac East Variant would impact 199 acres (Table 4.5-2) of wetlands and waters of which a majority is shrub/scrub wetlands. Both of these alternatives would also cross 25 acres of MSB wetland mitigation bank lands that would likely require additional mitigation to replace.



Table 4.5-2  
Summary of Impacts to Wetlands (acres) within the 200-Foot Right-of-Way by Alternative<sup>b, c</sup>

Segment	Forested Wetlands	Scrub/Shrub Wetlands	Emergent Wetlands	Total Wetlands	All Waters <sup>d</sup>	Total Wetlands and Waters	Total Uplands
Mac East Variant-Modified Connector 3-Willow	94 (94)	75 (78)	12 (13)	182 (185)	3 (3)	185 (188)	1084 (1095)
Mac East Variant-Modified Connector 3-Houston-Houston North	116 (116)	148 (151)	29 (30)	293 (297)	5 (4)	298 (301)	704 (712)
Mac East Variant-Modified Connector 3-Houston-Houston South	99 (100)	121 (124)	20 (21)	241 (245)	3 (3)	245 (248)	771 (779)
Mac East Variant-Connector 2-Big Lake	86 (88)	104 (112)	8 (8)	198 (208)	1 (1)	199 (209)	753 (768)

<sup>a</sup> Source: HDR, 2008; HDR, 2010.

<sup>b</sup> Wetland impacts within the Mac East Variant include impacts from the terminal reserve areas outside the 200-foot right-of-way.

<sup>c</sup> Impacts for Mac East in parentheses ( ).

<sup>d</sup> Includes palustrine, riverine, and lacustrine waters.

## 5. BIOLOGICAL RESOURCES

### 5.1 Regulatory Setting

The DEIS describes the Regulatory Setting for Biological Resources and regulations described would apply to both the Mac East and Mac East Variant Segments.

### 5.2 Vegetation Resources

#### 5.2.1 Study Area

The Study Area described in the DEIS includes the areas in which Mac East and Mac East Variant are located.

#### 5.2.2 Analysis Methodology

The analysis methodology described in the DEIS was used for the Mac East Segment and the Mac East Variant.

#### 5.2.3 Affected Environment

The Affected Environment Section of the DEIS defines the affected environment for both the Mac East and Mac East Variant Segments. The section includes descriptions of the fire ecology, native plant communities, invasive and noxious plants, and rare plants.

#### 5.2.4 Environmental Consequences

### Common Impacts

#### Construction Impacts

Impacts to vegetation due to clearing and fill placement could include soil compaction and erosion, spread of invasive plants, destruction of rare plants, dust deposition, fragmentation, interruption of natural wildfire regimes, and potential damage of riparian zones. See the DEIS for a description of these impacts.

#### Operation Impacts

Operation impacts common to all segments are maintenance clearing, possible chemical spills, dust deposition and runoff, and possible wildland fire and fire management. These impacts are described in the DEIS and apply to both the Mac East and Mac East Variant.

#### Impacts by Segment

##### *Mac East*

Construction of the Mac East Segment would include clearing of approximately 469 acres of vegetation within the 200-foot ROW. The type of vegetation most impacted would be 200 acres of mixed forest, followed by 143 acres of deciduous forest, and 47 acres of evergreen forest. Thirty four acres of woody wetlands and 13 acres of emergent wetlands would be impacted. Other types of vegetation that would be cleared are 31 acres of shrub/scrub and one acre of cultivated crops/pasture/hay (See Table 5.2-4 in DEIS). There are three known weed sites in the ROW corridor for this segment (STB 2010).

Vegetation communities along the Mac East Segment would be impacted during construction by further fragmenting the communities that have been fragmented by existing development. This impact would reduce the ecological functions of the communities such as providing wildlife habitat and nutrient cycling (STB 2010).

*Mac East Variant*

Construction of the Mac East Variant would include clearing of approximately 440 acres of vegetation in the 200-foot ROW. The vegetation communities most impacted would be 143 acres of mixed forest, followed by 83 acres of deciduous forest. The next highest community impact would be 39 acres of emergent wetlands, 38 acres of evergreen forest, 27 acres of woody wetlands, and 23 acres of shrub/scrub (See Table 5.2-1). There are possibly 1 to 2 known weed sites in the ROW corridor for this segment based on visual analysis of Figure 5.2-2 of the DEIS.

Approximately 6.25 miles of the Mac East Variant would go through the Port Mackenzie Agriculture Project area. Vegetation communities have already been fragmented in this area due to the cultivation of crops. The rail line would fragment the cultivated areas themselves, but likely would not impact natural vegetation communities in this portion of the rail line.

Table 5.2-1  
Summary of Impacts to Vegetation (acres) by Segments and Segment Combinations<sup>a</sup>

Segment	Cultivated Crops/Pasture/ Hay	Deciduous Forest	Evergreen Forest	Mixed Forest	All Forests	Shrub/ Scrub	Woody Wetlands	Emergent Wetlands	Total Area <sup>b</sup>
Mac East Variant- Modified Connector 3	92	95	70	187	<b>352</b>	25	31	53	553
Mac East Variant- Connector 2	88	83	38	153	<b>274</b>	23	28	39	452
Mac East Variant	87	83	38	143	<b>264</b>	23	27	39	440
Mac East (from DEIS)	1	143	47	200	<b>390</b>	31	34	13	469

<sup>a</sup> Source: Homer *et al.*, 2004

<sup>b</sup> Totals might not equal sums of values due to rounding

Comparison of Mac East to Mac East Variant Segments

The Mac East Segment would impact approximately 29 more acres of vegetation than the Mac East Variant. It would also impact more acres of forest than Mac East Variant. Nearly 10 more acres of wetland vegetation could be impacted by the Mac East Variant over the Mac East Segment. Acres of shrub/scrub vegetation impacted are nearly the same for both segments.

Impacts by Alternative

*Comparison between Mac East-Connector 3-Willow and Mac East Variant-Modified Connector 3-Willow*

As stated in the DEIS, the Mac East Alternative would impact approximately 1,249 acres of vegetation. Mac East Variant would impact 1,315 acres and has the second highest impact to vegetation in terms of acreage. Both Alternatives would impact large acreages of forested land and restoration of the vegetation would be long term (See Table 5.2-2 below and Table 5.2-6 of the DEIS).

*Comparison between Mac East-Connector 3-Houston-Houston North and Mac East Variant-Modified Connector 3-Houston-Houston North*

The Mac East Alternative would impact roughly 1,003 acres of vegetation within the 200-foot ROW (STB 2010) (See Table 5.2-2 below and Table 5.2-6 of the DEIS). The Mac East Variant Alternative would impact nearly the same at 1,000 acres. Both Alternatives would cross through relatively high concentrations of invasive plant populations on the Houston North Segment and increase the likelihood of the spread of weed species. The species could then spread outside of the ROW and outside of the project area (STB 2010).

*Comparison between Mac East-Connector 3-Houston-Houston South and Mac East Variant-Modified Connector 3-Houston-Houston South*

The Mac East Alternative would impact nearly 1,003 acres while the Mac East Variant Alternative would impact 993 acres of vegetation (See Table 5.2-2 below and Table 5.2-6 of the DEIS). The Houston South Segment used in the northern portion of the Alternatives has a relatively high concentration of invasive plant populations and could contribute to the spread of weed species inside and out of the ROW (STB 2010).

*Comparison between Mac East-Big Lake and Mac East Variant-Connector 2-Big Lake*

The Mac East Alternative would impact 930 acres of vegetation within the 200-foot ROW and has the lowest impact of all the alternatives analyzed in the DEIS (STB 2010). The Mac East Variant Alternative would impact 915 acres of vegetation and would now have the lowest impact of all the alternatives. The Mac East Alternative would only impact one acre of agricultural land whereas the Mac East Variant Alternative would impact 88 acres. The Mac East Variant would impact less forest acreage and shrub/scrub and woody wetland acreage. The Mac East Alternative would impact less emergent wetland acreage (See Table 5.2-2 below and Table 5.2-6 of the DEIS).

Table 5.2-2  
Summary of Impacts to Vegetation (acres) by Alternative<sup>a</sup>

Segment	Cultivated Crops/Pasture/ Hay	Deciduous Forest	Evergreen Forest	Mixed Forest	All Forests	Shrub/ Scrub	Woody Wetlands	Emergent Wetlands	Total Area <sup>b</sup>
Mac East Variant- Modified Connector 3- Willow	95	347	159	469	<b>975</b>	30	59	78	1,315
Mac East Variant- Modified Connector 3- Houston-Houston North	93	192	156	259	<b>607</b>	26	140	134	1,000
Mac East Variant- Modified Connector 3- Houston-Houston South	93	154	138	235	<b>527</b>	53	120	200	993
Mac East Variant- Connector 2-Big Lake	88	210	84	276	<b>570</b>	63	101	93	915

<sup>a</sup> Source: Homer *et al.*, 2004

<sup>b</sup> Totals might not equal sums of values due to rounding

## 5.3 Wildlife

### 5.3.1 Study Area

The Study Area was defined in the DEIS and includes the Mac East and Mac East Variant.

### 5.3.2 Analysis Methodology

The methodology used to analyze the Mac East Segment is described in the DEIS. The methodology used to analyze the Mac East Variant included visually analyzing the maps in the DEIS that included the area of the Mac East Variant and analyzing habitat impacts based on vegetation cover classes. Analysis of animal use by species could not be completed due lack of data.

### 5.3.3 Affected Environment

In the DEIS the Affected Environment for Wildlife is described and includes the Mac East Variant Segment.

### 5.3.4 Environmental Consequences

#### Common Impacts

##### Construction Impacts

As stated in the DEIS, there could be potential temporary impacts due to construction related activities which include short term habitat loss, short term displacement of wildlife, and construction mortality. It also discusses long term habitat loss or alteration.

##### Operation Impacts

During operation of the proposed rail line and maintenance of the ROW, potential impacts could include operation mortality, habitat fragmentation, and possible reduced survival or productivity. These impacts are further discussed in the DEIS. The DEIS also discusses impacts to specific species.

##### Impacts to Wildlife by Segment

As stated in the DEIS there would be a potential loss of wildlife habitat. None of the southern segments including the Mac East Variant cross moose calving habitat, but the agriculture area is shown as being high density moose habitat (Figure 5.3-1 DEIS) in the DEIS. However moose habitat can vary from year to year. There could be potential impacts to nesting trumpeter swans and loons located within a 0.5 miles radius of the ROW. Raptor and owl nests could also be impacted if located near the rail line.

There would be habitat fragmentation by the southern segments. However, the segments analyzed in the DEIS were along the borders of habitat areas such as agriculture lands that are next to wetland or forested areas. The Mac East Variant would fragment habitat in the lower portions where the Mac East Segment would also be located. When the Mac East Variant splits from the Mac East Segment it would cross through agricultural lands. This would fragment the agricultural land habitat, but it would not disturb the forested or wetland habitats that surround the agricultural lands. The agricultural lands are already disturbed and if cultivation is taking place, such activities would disturb wildlife.

### **Comparison of Mac East to Mac East Variant Segments**

Table 5.2-1 and Table 5.2-4 (DEIS) in the Vegetation Resources Section describes the acreage that could be impacted by the two Segments. These vegetation communities are also habitat types. Based on these numbers, which are similar to what is found in Table 5.3-1 of the DEIS, the Mac East Variant would impact approximately 126 acres less of forested habitat than the Mac East Segment. The Mac East Variant would impact 88 acres of agricultural area and would divide the area into two sections. Mac East Variant would also potentially impact 6 acres less of wetland habitat than the Mac East Segment.

### **Comparison of Mac East to Mac East Variant Alternatives**

As stated in the previous section, the Vegetation Resources Section describes the acreage that would be impacted by the different Alternatives in Table 5.2-2 and Table 5.2-6 (DEIS) and are also the habitat types used in the analysis of wildlife habitat loss.

#### *Comparison between Mac East-Connector 3-Willow and Mac East Variant-Modified Connector 3-Willow*

As stated in the DEIS, the Mac East Alternative would impact approximately 1,249 acres of habitat. The Mac East Variant Alternative would impact 1,315 acres and has the second highest impact to vegetation in terms of acreage. Both Alternatives would impact large acreages of forested habitat (1,093 acres and 975 acres respectively). The Mac East Alternative would also impact 149 acres of wetland habitat and the Mac East Variant Alternative would impact 137 acres (the least impact to wetlands of Alternatives) of wetland habitat.

#### *Comparison between Mac East-Connector 3-Houston-Houston North and Mac East Variant-Modified Connector 3-Houston-Houston North*

The Mac East Alternative would impact roughly 1,010 acres of habitat within the 200-foot ROW (STB 2010). The Mac East Variant Alternative would impact nearly the same at 1,000 acres. The Mac East Alternative impact would be approximately 721 acres forested habitat and 284 acres of wetland habitat. The Mac East Variant Alternative impact to habitat would be 607 acres of forested habitat and 274 acres of wetland habitat.

#### *Comparison between Mac East-Connector 3-Houston-Houston South and Mac East Variant-Modified Connector 3-Houston-Houston South*

The Mac East Alternative would impact nearly 1,003 acres while the Mac East Variant Alternative would impact 993 acres of habitat. The Mac East Alternative would impact 643 acres of forested habitat and 356 acres of wetland habitat. The Mac East Variant Alternative would impact approximately 527 acres of forested habitat (the least amount of impact to forested habitat by Alternatives) and 320 acres of wetland habitat.

#### *Comparison between Mac East-Big Lake and Mac East Variant-Connector 2-Big Lake*

The Mac East Alternative would impact approximately 930 acres of wildlife habitat. Of the 930 acres, 678 acres are forested habitat and 250 acres are wetland habitat. The Mac East Variant Alternative would impact 915 acres of wildlife habitat of which 570 acres are forested and 194 acres are wetland habitat.

## 5.4 Fisheries Resources

### 5.4.1 Study Area

The DEIS describes the study area for fisheries resources. This study area includes the area in which Mac East and Mac East Variant Segments are located.

### 5.4.2 Analysis Methodology

The analysis methodology described in the DEIS was used to analyze all segments including the Mac East Segment and Mac East Variant Segment.

### 5.4.3 Affected Environment

The Affected Environment in the DEIS describes the entire study area including where the Mac East and Mac East Variant Segments are located.

### 5.4.4 Environmental Consequences

#### Common Impacts

##### Construction Impacts

Construction impacts could include loss or alteration of instream and riparian habitats, fish mortality from instream construction, blockage of fish movement, degradation of water quality, alteration of stream hydrology and ice breakup, and displacement of fish due to noise and vibration. The DEIS includes a discussion of these impacts (STB 2010).

##### Operation Impacts

Operation of the rail line could cause loss or alteration of instream and riparian habitats, block fish movement, and degrade water quality. These impacts are described in the DEIS (STB 2010).

##### Impacts to Fisheries by Segment

###### *Mac East*

Mac East Segment does not cross any anadromous streams. However, the segment does cross one stream that is described to have resident fish that use the stream for summer rearing and migration habitat (Table 5.4-3 of DEIS). A bridge is proposed to be constructed so as not to impact fish or fish habitat.

###### *Mac East Variant*

Mac East Variant Segment does not have any anadromous stream crossings. The Segment crosses the same stream, at nearly the same location, and is expected to have the same impacts to fish and fish habitat. No other water crossings occur along this Segment and no additional drainage structures are expected. If any additional drainage structures are identified during project design, the structures would be selected to provide localized drainage and sized accordingly.

#### Comparison of Mac East to Mac East Variant Segments

Both the Mac East and Mac East Variant Segments do not cross anadromous streams and cross one stream with resident fish and summer habitat. Therefore, there is no measureable difference between the two.

## **5.5 Threatened and Endangered Species**

### *5.5.1 Study Area*

The Study Area described in the DEIS describes the area in which the Mac East and Mac East Variant would be located.

### *5.5.2 Analysis Methodology*

The methodology used to analyze the study area for threatened and endangered species was used to evaluate Mac East Segment in the DEIS. The same methodology was used to analyze the Mac East Variant Segment.

### *5.5.3 Affected Environment*

The endangered species that the project could indirectly affect is the Cook Inlet beluga whale. The beluga whale uses the habitat intensively from spring through fall as foraging and nursery habitat near Port MacKenzie. The project could potentially cross streams that support anadromous fish which are important food sources for the beluga whales.

### *5.5.4 Environmental Consequences*

#### **Impacts by Segment**

##### *Mac East and Mac East Variant*

There would be no impact to beluga whales or their food sources under either the Mac East or Mac East Variant Segments.

#### **Comparison of Mac East to Mac East Variant Segments**

There are no measureable differences between the Mac East and Mac East Variant Segments in terms of impacts to threatened and endangered species. No threatened or endangered species are expected to be adversely affected by either segment.

## **6. CULTURAL AND HISTORIC RESOURCES**

### **6.1 Regulatory Setting**

All Federal, state, and local regulations that are relevant to cultural and historic resources are discussed in the DEIS.

### **6.2 Study Area**

The Study Area is defined in the DEIS and includes the location of both Mac East and Mac East Variant.

### **6.3 Analysis Methodology**

The Mac East Segment was analyzed according to the methodology described in the DEIS. The Mac East Variant was analyzed based on broad analysis of the study area and visual analysis of the figures and maps provided in the DEIS.

## 6.4 Affected Environment

### 6.4.1 Prehistory

Prehistory of the area is described in the DEIS and contains information about prehistoric sites and prehistoric cultural sequences.

### 6.4.2 History

In the DEIS the history of the area is described and includes Dena'ina place names and trails, Russian America from 1740 to 1867, Alaska purchase and territory from 1867 to 1958, and Statehood from 1959 to 2008.

### 6.4.3 Cultural Resources in the Project Area

#### Documented Cultural Resources

##### Prehistoric and Historic Cultural Resources

Sites have been documented along the proposed rail lines, but have not had a National Register determination of eligibility completed.

##### *Mac East*

Figure 6-4 in the DEIS shows that there are several previously documented cultural resource sites and sites and a trail identified by Stephen R. Braund and Associates during the 2008 cultural survey along the Mac East Segment. There is a high and moderate probability for the discovery of previously unidentified cultural resources along sections of this segment. One Dena'ina place name was identified along the segment.

##### *Mac East Variant*

Based on a visual analysis of Figure 6-4 in the DEIS there is a possibility that the Mac East Variant Segment could run near or on a documented resource site located by Stephen R. Braund and Associates during the 2008 cultural survey. According to Figure 6.2 in the DEIS, portions of the Mac East Variant Segment would have a low probability for the discovery of previously unidentified cultural resources.

#### Cultural Landscapes

It was recommended by the State Historic Preservation Officer that an assessment of cultural resources include an analysis of potential cultural landscapes for dog sledding, recreation, homesteading, and agriculture. The DEIS further details the cultural landscapes for the aforementioned activities.

## 6.5 Environmental Consequences

### 6.5.1 Common Impacts

Construction of a rail line could possibly damage archaeological sites, historic trails, structures and sites, and cultural landscapes. A detailed analysis of those impacts is included in the DEIS.

## 6.5.2 Impacts by Rail Line Segment

### **Mac East**

According to the DEIS, the Mac East Segment in conjunction with Connector 3 Segment would cross the Knik-Susitna Station mail trail, and intersect four known cultural resources within the proposed ROW. Within one mile of the center line of the rail line there are 11 known cultural resources. Potential adverse effects to these known cultural resources includes diminishing the integrity of the mail trail, destruction or disturbance during construction of four sites, and indirect impacts to the 11 sites located one mile from the center line (STB 2010).

### **Mac East Variant**

Construction of the Mac East Variant Segment could potentially damage cultural/archeological sites in the area. There is one site based on visual inspection of Figure 6-4 that could be in the path of the rail line and may not be avoided. If destroyed, the site and any possible unknown sites could lose the eligibility required for listing on the National Register. However, a major portion of the Segment is agricultural lands that have been previously disturbed and if there were any archeological sites along the rail line they could have been destroyed already due to the large disturbance in the area from agricultural activities.

According to visual analysis of Figure 6-5 of the DEIS, the Mac East Variant Segment would not impact any dog sled trails. However, when combined with other segments such as Connector 3 it could impact historically important trails and contributing trails.

### **Comparison of Mac East to Mac East Variant Segments**

The Mac East Variant Segment would be constructed and operated in an area that has largely already been disturbed. Therefore, it is possible that if any archeological or cultural resources were located in the area they have been destroyed. Based on this possibility, it is likely that the Mac East Variant Segment would impact fewer archeological and/or cultural resources than the Mac East Segment.

### Programmatic Agreement

As described in the DEIS, a programmatic agreement for the project will provide for the completion of the Level 2 identification survey if the board authorizes the project.

### Tribal Consultation

As stated in the DEIS, tribal consultation is ongoing.

## **7. SUBSISTENCE**

Subsistence fishing and hunting are traditional activities that help transmit cultural knowledge between generations, maintain the connection of people to their land and environment, and support healthy diet and nutrition in almost all rural communities in Alaska (STB 2010). It is further described in the DEIS.

### **7.1 Regulatory Setting**

Subsistence fishing and hunting are regulated under a dual management system which includes Federal and state regulations which are described in the DEIS.

## **7.2 Study Area**

The Study Area as defined in the DEIS includes communities that could harvest subsistence resources in or near the project area. They are described further in the DEIS.

## **7.3 Analysis Methodology**

The Analysis Methodology is described in the DEIS.

## **7.4 Affected Environment**

The Affected Environment is described in the DEIS and covers the affected environment for the Mac East Variant Segment.

## **7.5 Environmental Consequences**

As stated in the DEIS all rail line alternatives would result in similar types of impacts to subsistence. The DEIS describes the overall impact of the project.

### **Construction Impacts**

Construction impacts are discussed as an overall impact in the DEIS. Such impacts include limiting access to subsistence users and are described in the DEIS.

### **Operation Impacts**

Operation impacts are discussed as an overall impact in the DEIS and include restricting user access.

### **Comparison of Mac East to Mac East Variant Segments**

A large portion of the Mac East Segment falls in Eklutna traditional use areas according to Figure 7-3 in the DEIS. The Mac East Variant would likely have a smaller portion of the rail line within the traditional use area.

## **8. CLIMATE AND AIR QUALITY**

### **8.1 Regulatory Setting**

The Federal and state regulations that apply to the climate and air quality portion of this document are described in the DEIS and include National Ambient Air Quality Standards.

### **8.2 Analysis Methodology**

In the DEIS, there were three steps in the analysis which included identifying the emission sources, obtaining estimated total emissions per year for construction and operations for each air quality standard, and finally estimating air emissions for the longest alternative and comparing the increase in estimated emissions to the *de minimis* conformity thresholds (STB 2010). Since the analysis was for the longest alternative it can be assumed that any alternative that is shorter could have a smaller quantity of emissions.

### **8.3 Study Area**

The Study Area defined in the DEIS for this section is the immediate project area.

## 8.4 Affected Environment

The Affected Environment in the DEIS included climate data for the project area. It also includes historical and newer ambient air concentrations from air monitoring stations.

## 8.5 Environmental Consequences

### Common Impacts

#### Construction Impacts

The longest alternative used to develop estimated emissions was the Mac East-Connector 1-Willow Alternative which is approximately 46 miles. If this alternative were chosen it would have estimated emissions below the *de minimis* conformity thresholds and indicates a relatively small potential impact (STB 2010). These impacts are described in further detail in the DEIS.

#### Operation Impacts

The same alternative rail line was used to determine operation impacts in the DEIS. The outcome of the analysis was that with the emissions from operation of the rail line being a small percentage of emissions in the MSB and being distributed over the course of approximately 46 miles it would have minimal impact (STB 2010).

#### Comparison of Mac East to Mac East Variant Segments

Since the analysis of the impacts for air quality were completed for the longest alternative it is assumed that all other alignments being shorter would cause less emissions and potentially lower impacts. Therefore, it is assumed that there could be little to no difference in choosing either the Mac East or Mac East Variant.

## 9. NOISE AND VIBRATION

### 9.1 Regulatory Setting

Federal laws, regulations and guidelines that pertain to noise and vibration impacts are described in the DEIS

### 9.2 Study Area

The Study Area is fully described in the DEIS.

### 9.3 Analysis Methodology

Appendix K of the DEIS contains information used to determine the distance to the 65 dBA DNL and 3 dBA increase noise contours. Using the same rail operations assumptions, noise contour distances were calculated as shown in Table 9.3-1 below.

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Table 9.3-1  
Distance from Rail Line (and Total Width) in Feet of Noise Contour of Interest

Noise Contour	Wayside Noise	Horn Noise at At-Grade Crossing
65 dBA DNL	80 (160)	215 (430)
3 dBA increase	234 (468)	630 (1,260)

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Similarly to the DEIS, the number of noise-sensitive receptors within the 65 DNL noise contours or where the DNL would increase by at least 3dBA were estimated using digital aerial photographs. The result of this analysis was an estimate of the total number of sensitive receptors likely to be exposed to 65 DNL or greater and the number of receptors where the DNL would increase by at least 3 dBA as a result to the Mac East Variant. The accuracy of the estimated number of potentially affected receptors is limited by the resolution and age of the available aerial photographs, and the interpretation or identification of structures in these photographs. Table 9.3-2 presents the resulting receptor count information.

Table 9.3-2  
Noise Receptor Counts for the Mac East Variant – Rail Operations

Segment	65 DNL <sup>a</sup>	Plus 3 dBA <sup>b</sup>
Mac East Variant	1	2
Mac East (from DEIS)	0	0

<sup>a</sup> DNL = day-night average sound level.  
<sup>b</sup> dBA = A-weighted decibels.

## 9.4 Affected Environment

The Affected Environment is described in the DEIS.

## 9.5 Environmental Consequences

### Comparison of Mac East to Mac East Variant Segments

The Mac East Segment noise and vibration impacts can be seen in the DEIS.

As defined by STB’s regulation, an adverse noise impact resulting from railroad operation would occur if project noise levels meet or exceed 65 DNL and increase by at least 3 dBA DNL. Table 9.3-2 shows that one receptor was identified as being within both noise contours and would experience an adverse noise impact due to operation of the Mac East Variant. This one receptor, located approximately 280 feet south of Holstein Avenue, however, is within a distance of approximately 45 feet to the east of the proposed Mac East Variant centerline and is within the proposed right-of-way required for the rail corridor. Due to the proximity to the Mac East Variant, this structure, if identified as a residential unit, would require relocation and therefore would not be subject to noise impact mitigation. No other receptors along the Mac East Variant were identified as experiencing adverse noise impacts.

Operation of the Mac East Variant would not result in any noise impacts to Section 4(f) properties, including state game refuges or state recreation areas.

## 10. ENERGY RESOURCES

### 10.1 Regulatory Setting

The Regulatory Setting described in the DEIS and includes citing of Council on Environmental Quality regulations and STB procedures for implementing environmental laws.

## **10.2 Analysis Methodology**

The methodology used to analyze possible impacts due to the project in the project area are described in the DEIS and were used to analyze the Mac East Variant Segment.

## **10.3 Study Area**

The Study Area for Energy Resources in the DEIS is the State of Alaska, because the source and transportation modes of fuel to be consumed by the project would not be limited to the MSB (STB 2010).

## **10.4 Affected Environment**

The Affected Environment is described in the DEIS and includes the project area as well as the State of Alaska.

## **10.5 Environmental Consequences**

### **Common Impacts**

#### *Construction Impacts*

Energy consumption during the construction period would be temporary and would not put stress on the local energy supply causing the impact on energy resources to be low (STB 2010). Further discussion is provided in the DEIS.

#### *Operation Impacts*

As described in the DEIS, the total demand for diesel generated by the operation of the project would remain a very small portion of the statewide consumption of distillate fuel. The assumptions made for this analysis are described in the DEIS.

#### *Impacts by Alternative*

##### *Construction*

As stated in the DEIS all alternatives would cross the energy transmission line that traverses the Port Mackenzie District. ARRC would need to ensure that industry standards are met and disruptions minimized to pylons. There also should be no anticipated disruptions to the Beluga-Wasilla natural gas pipeline running through the project area (STB 2010).

##### *Operations*

The DEIS states that energy consumption during operation could vary within 25% of the median energy consumption for all alternatives. The only segments that would cross the Beluga-Wasilla natural gas pipeline would be Connector 1 and 3, and Big Lake.

### **Comparison of Mac East to Mac East Variant Segments**

The Mac East and Mac East Variant Segments have little to no difference between them.

## **11. GRADE CROSSING SAFETY AND DELAY**

### **11.1 Regulatory Setting**

The Regulatory Setting is defined in the DEIS and includes rules and regulations for traffic control devices and hazardous material transport.

## **11.2 Analysis Methodology**

The methodology used to analyze the impacts for grade crossing safety and delay as well as hazardous material transport is discussed in the DEIS.

## **11.3 Affected Environment**

The Affected Environment is discussed in the DEIS and includes the Mac East Segment crossings. The Mac East Variant would cross three roads which all are also crossed by the Mac East Segment. The Mac East Variant would cross Ayrshire Avenue as an at-grade crossing. Also, if the Mac East Variant is chosen the crossing at Holstein Avenue would be an at-grade crossing as opposed to grade separated if the Mac East Segment is chosen. The Baker Farm Road crossing would be a grade-separated crossing.

All of the crossings on the Mac East Segment would be designed as grade-separated because the crossing would be adjacent to Point MacKenzie Road where terrain creates a situation that makes grade-separated crossings easier than at-grade. The terrain along the section line on the Mac East Variant Segment is flat and does not lend itself to grade separation.

## **11.4 Environmental Consequences**

### *11.4.1 Grade Crossing Safety*

ARRC has proposed to equip proposed at-grade crossings associated with warning devices such as flashing lights and gates when the road has an AADT of more than 500. If the road has an AADT of less than 500 there would be passive warning devices such as crossbucks and stop signs installed.

### **Comparison of Mac East and Mac East Variant**

The three at-grade crossings along the Mac East Variant are along relatively remote and rural roads and therefore it is possible that only passive warning devices such as crossbucks and stop signs would be installed. The Mac East Segment would cross the same three roads but would use separated grade crossings due to terrain.

### *11.4.2 Grade Crossing Delay*

In the DEIS, grade crossing delays are calculated for Alternatives. The DEIS shows that all alternatives analyzed would have minimal impact on traffic with a maximum travel time increase of about seven minutes per day. Since the Mac East Variant would cross rural roads it is likely that the delays at the crossings would have minimal impact.

### *11.4.3 Rail Safety*

As stated in the DEIS, the ARRC does not indicate plans to carry hazardous materials. Therefore, potential impacts of hazardous material transport would be minimal (STB 2010).

## **12. NAVIGATION RESOURCES**

### **12.1 Regulatory Setting**

As stated in the DEIS, there are Federal, state, and local agencies with regulatory authority over navigable water and waterways.

## **12.2 Study Area**

The Study Area is described in the DEIS and includes several designated and possibly navigable waterways that the rail line would cross.

## **12.3 Analysis Methodology**

The DEIS includes a description of the methodology used to determine navigable waterways and possible impacts in the study area.

## **12.4 Affected Environment**

The DEIS describes the Affected Environment for the Navigation Resources. This description includes the navigable and possibly navigable stream crossings by the rail line segments. There is one crossing at an unnamed stream along the Mac East Segment at ME-4.5. The appropriate drainage structure will be determined during final design since the stream is six feet wide and it is classified as possible for navigable status. The Mac East Variant crosses the same unnamed stream as the Mac East Segment.

## **12.5 Environmental Consequences**

### *12.5.1 Common Impacts*

#### **Construction Impacts**

Construction impacts to navigation resources are discussed in the DEIS and include impacts associated with facilities adjacent to and over navigable rivers and streams.

### *12.5.2 Impacts by Rail Line Segment*

Both of the Mac East and Mac East Variant Segments would include one crossing of a possible navigable waterway with a culvert. If the stream is determined to be a navigable waterway the stream crossing would be designed to ensure navigability. There could be a temporary impact to navigability during construction.

#### **Comparison of Mac East to Mac East Variant Segments**

There is no difference between the Mac East and Mac East Variant Segments in relation to navigational resources.

## **13. LAND USE**

### **13.1 Land Use**

#### *13.1.1 Regulatory Setting*

The DEIS describes the Regulatory Setting for Land Use as it relates to the project. This description includes Federal, state, and local regulations.

#### *13.1.2 Study Area*

The Study Area defined by the DEIS includes the Susitna River Valley and extends between the Susitna River, Cook Inlet, Knik Arm, and the existing Alaska Railroad mainline (STB 2010).

### 13.1.3 *Analysis Methodology*

The analysis methodology described in the DEIS was used to analyze the Mac East Segment. The same methodology was also used to analyze the Mac East Variant Segment.

### 13.1.4 *Affected Environment*

#### **Existing Land Ownership**

There are no federally owned lands within the proposed rail line ROW and few federally owned parcels within the study area. The land in federal holding is a post office near Willow Lake and parcels on Flat Lake near Big Lake (STB 2010).

There are approximately 382 acres of state-owned land within the proposed rail line ROW which include the Mac East Variant Segment. Public lands in the study area include lands within several State Recreation Areas and State Game Refuges. Alaska Mental Health Trust Authority owns approximately 384 acres of land including the proposed route for Mac East Variant. A description of the Alaska Mental Health Trust Authority is in the DEIS. The University of Alaska owns and manages approximately 150,000 acres in Alaska, of these land holdings only 51 acres are in the proposed rail line ROW. The MSB owns approximately 1,066 total acres within the project area. The Private land holdings within the vicinity of the proposed rail line include approximately 869 acres. Native Corporations own approximately 271 acres of land in the proposed rail line ROW. Table 13.1-1 breaks down the acres owned in the ROW for the alternatives that include the Mac East Variant and the single segment Mac East.

Table 13.1-1  
Land Ownership (acres) within the 200-Foot Right-of-Way

Segment	MSB	City of Houston	Mental Health Trust Authority	Public ROW <sup>b</sup> (MSB and State)	Native Corporation	No Data <sup>c</sup>	Private	Public University	State	Total <sup>d</sup>
Mac East Variant-Modified Connector 3-Willow	452	0	96	16	31	106	240	0	292	1264
Mac East Variant-Modified Connector 3-Houston-Houston North	291	0	224	5	38	99	206	44	72	1001
Mac East Variant-Modified Connector 3-Houston-Houston South	299	0	238	5	110	22	241	44	34	1014
Mac East Variant-Connector 2-Big Lake	329	1	97	1	62	16	388	7	12	950
Mac East	235	0	92	0	57	0	73	0	12	469
Mac East Variant	194	0	92	1	25	0	156	0	12	480

<sup>a</sup> Source: MSB GIS, 2009

<sup>b</sup> Right-of-way parcels (including AK Railroad ROW) are classified as "NA" within the MSB parcel database. Parcels were manually inspected to distinguish between what appeared to public ROW vs. AKRR ROW.

<sup>c</sup> Assumed to be State of Alaska- and MSB-owned land because the source of data is the MSB Tax Assessor codes. Public land would not appear on these codes.

<sup>d</sup> Totals might not equal sums of values due to rounding

### **Existing Land Use**

The DEIS describes the existing land use in the study area including large areas that are undeveloped, public recreation use and wildlife habitat on public land, low-density residential use, light industrial use, commercial and non-commercial aviation uses, forestry, agriculture, and mineral and timber resource development.

### **Existing Zoning**

The DEIS describes the existing zoning in the study area. The area of importance for the Mac East and Mac East Variant Segments are the Point MacKenzie Agricultural Project. This area covers 14,983 acres and is designated for the purpose of dairy farming and general agricultural use. The DEIS describes the area in further detail.

### **Existing Land Use Plans**

Table 13.1-2 of the DEIS shows existing land use and land management plans for the study area.

## *13.1.5 Environmental Consequences*

### **Common Impacts to Land Use**

ARRC would acquire the land within the proposed rail line ROW from existing land owners. If the Board's authority were granted, the railroad would have the right to acquire ROW through condemnation pursuant to state condemnation laws. The land would then shift to ARRC ownership for rail line operations and maintenance, and any non-rail uses within the ROW would be only by ARRC-issued entry permits. The DEIS further describes the common impacts to land use.

### Construction Impacts

As stated in the DEIS, rail line construction activities would occur within the designated 200-foot rail line ROW. The area in the ROW cleared for construction but not for permanent structures would be restored to conditions compatible with operation of the rail line. Facilities such as staging areas and temporary structures would be removed after construction of the rail line and the area would be rehabilitated. At all possible locations, temporary structures would be within the 200-foot ROW (STB 2010).

### Operation Impacts

All areas inside the ROW would have their designated land use changed to allow for facilities associate with rail line operations and maintenance as discussed the DEIS.

### Impacts to Land Use by Alternative Segment and Segment Combinations

#### *Mac East Variant-Modified Connector 3-Willow*

This alternative would impact 1,264 acres and includes 452 acres of MSB land (the highest amount of all alternatives using the Mac East Variant Segment), 31 acres of Native Corporation land, 240 acres private land, 96 acres of Mental Health Trust Authority land, 292 acres of State land, and 153 acres of land for which there are no data.

This alternative combination impacts the most acres when using the Mac East Variant Segment. In the Mac East Variant Segment of the combination there would be approximately 156 acres of private land that is designated for agricultural use in the Port MacKenzie Agricultural Project.

This land would be impacted by construction in that it would most likely be purchased by ARRC and the designated land use changed to allow construction and maintenance of the railroad.

*Mac East Variant-Modified Connector 3-Houston-Houston North*

This alternative would impact 1,001 acres. The MSB owns about 291 acres along the rail line. Native Corporations own approximately 38 acres and there is approximately 206 acres of Private land (the least of any alternative combination using Mac East Variant). Approximately 224 acres of Mental Health Trust Authority land and 44 acres of University of Alaska land is also along the rail line. The State land along this rail line is approximately 72 acres and there are no data for 126 acres.

This alternative combination would also impact the Port MacKenzie Agricultural Project lands along the Mac East Variant Segment.

*Mac East Variant-Modified Connector 3-Houston-Houston South*

The combination of Mac East Variant-Connector3-Houston-Houston South has 299 acres of MSB land along the rail line. It also has 110 acres of Native Corporation land, 241 acres of Private land, 238 acres of Mental Health Trust Authority land, 44 acres of University of Alaska land, and 34 acres of State lands along the proposed rail line. The total number of acres impacted is approximately 1,014.

*Mac East Variant-Connector 2-Big Lake*

The final combination using the Mac East Variant has 329 acres owned by the MSB, one acre by the City of Houston, 62 acres by Native Corporations, 388 by Private land owners, 97 acres by the Mental Health Trust Authority, seven acres by the University of Alaska, and 12 acres by the State. This alternative combination would impact the least amount of land at 950 acres.

**Comparison of Mac East to Mac East Variant Segments**

When compared to Mac East Segment combinations, Mac East Variant Segment combinations impact roughly the same amount of acres, but the distribution of impact to land owners is different. The combinations that use the Mac East Segment impact Private lands less than the Mac East Variant Segment. MSB owned lands would be impacted more by the Mac East Segment over the Mac East Variant. In general, Native Corporation lands would be impacted less by Mac East Variant alignments and the lands held by the Mental Health Trust Authority would be impacted the same. To see the impacts to land ownership from the Mac East Segment refer to the DEIS Table 13.1-4.

The Mac East Segment would potentially impact 85 acres in the Port MacKenzie Agricultural Project. The Mac East Variant Segment could impact up to 152 acres of the Port MacKenzie Agricultural Project. Although these soils are classified as locally important to the MSB, as stated in the Cultural Resources section of the DEIS, the area only had two active dairy farms by 1992. Further, since agriculture did not play an important role in settlement and history of the area properties used for agriculture are not eligible for inclusion in the National Register as a cultural landscape (STB 2010).

## **13.2 Parks and Recreation Resources**

The Regulatory Setting, Analysis Methodology, Study Area, and Affected Environment Portions of the Parks and Recreation Resources can be found in the DEIS.

### *13.2.1 Environmental Consequences*

The Mac East Segment and Mac East Variant Segment do not come in contact with or cross any Federal or State Parks or Recreation areas nor do they cross any designated trails. Therefore, there is no impact to these resources.

## **13.3 Hazardous Materials and Waste Sites**

### *13.3.1 Regulatory Setting*

All regulations relating to and dealing with hazardous materials and waste sites are cited in the DEIS in Table 13.3-1.

### *13.3.2 Study Area*

The Study Area in the DEIS includes the former Susitna Gunnery Range Site Investigation which Mac East and Mac East Variant are located. For further details please refer to the DEIS.

### *13.3.3 Analysis Methodology*

Based on the information given in the DEIS and analysis completed for the Mac East Segment general assumptions could be made about the Mac East Variant.

### *13.3.4 Affected Environment*

The DEIS discusses the Affected Environment including five sites with potential for impacts. The 5<sup>th</sup> site is the Former Susitna Gunnery Range Site which has a large boundary across a large portion of the southern segments.

### *13.3.5 Environmental Consequences*

## **Common Impacts**

### Construction Impacts

As stated in the DEIS, there could be safety or environmental impacts during construction activities that could expose contaminated soils or groundwater within the rail line ROW.

### Operation Impacts

Day to day rail line operations would not be likely to result in adverse impacts from hazardous material sites as stated in the DEIS.

### *Southern Segments*

The former Susitna Gunnery Range is composed of 86,570 acres. All areas within 0.5 miles of Mac East and Mac East Variant Segment ROWs would be sited in the Gunnery Range. Rail line construction and operation of either Segment could result in environmental or safety impacts due to the potential presence of munitions, munitions constituents, and explosives. A further evaluation of the former range is planned for summer of 2010.

## **14. SOCIOECONOMICS**

### **14.1 Regulatory Setting**

The Regulatory Setting is described in the DEIS and includes requirements set forth by the National Environmental Policy Act of 1969.

### **14.2 Analysis Methodology**

The DEIS describes the methodology used to analyze possible socioeconomic impacts in the study area.

### **14.3 Study Area**

The Study Area as described in the DEIS includes the areas in which the Mac East and Mac East Variant would be located.

### **14.4 Affected Environment**

The Affected Environment portion of the DEIS for socioeconomics includes the Mac East and Mac East Variant.

### **14.5 Environmental Consequences**

#### *14.5.1 Common Impacts*

##### **Construction and Operation Impacts**

The construction and operation impacts that are common to all rail line segments include the number of people who would be employed and the cost of construction which would result in an indirect temporary stimulus to the MSB economy. Operation impacts would also include employment stimulus in order for operations of the rail line to be maintained.

#### *14.5.2 Impacts by Segment*

##### **Southern Segments**

As stated in the DEIS the southern segments would require the permanent taking of some residential properties. The southern segments also cross agricultural parcels. In the DEIS Mac West-Connector 1 had the greatest impacts to agricultural lands. However, with the introduction of the Mac East Variant segment, which impacts 152 acres by itself, 20 acres less than the Mac West added to Connector 1, it is likely that Mac East Variant when added to Connector impacts would be larger. The impacts would include some farmland production to be lost.

## **15. ENVIRONMENTAL JUSTICE**

The purpose of the Environmental Justice portion of the DEIS is to identify and consider “disproportionately high and adverse” human health or environmental effects of actions on minority and low-income communities (STB 2010). The DEIS analyzed census block information within the project area and determined that there would be no high or adverse human health or environmental effects from construction or operation of the rail line. The Mac East Variant falls within the same census blocks that were analyzed therefore there would be no adverse impacts.