5.1 NO ACTION ALTERNATIVES

Under the No Action Alternative, the Presidential Permit would not be issued and/or the proposed Project would not be constructed for that or other reasons. Three scenarios, described below, have been carried forward for analysis under the No Action Alternative in the Supplemental Environmental Impact Statement (Supplemental EIS). See Section 2.2, Description of Reasonable Alternatives, for detailed descriptions of these scenarios and how they were developed.

Council on Environmental Quality guidance (1981) states that if denial of a Proposed Action would result in predictable actions by others, the consequences of adopting the No Action Alternative should be considered in the EIS. In this case, given the Government of Canada's (and Alberta) stated commitment to develop the oil sands, the global crude oil market dynamics, the economic modeling done as part of the Final EIS, and the examples of market responses over the past few years regarding crude oil transport in North America, it remains likely that if the proposed Project did not proceed, producers of Western Canadian Sedimentary Basin (WCSB) and Bakken crude oil production would continue to utilize alternative transport infrastructure to accommodate increasing production of WCSB and Bakken crude oils. Therefore, the No Action Alternative considers scenarios that include the reasonable consequences of denying the Presidential Permit for the proposed Project. It is important for both the policy makers (i.e., the Department of State) and the public to understand the potential effects of the implementation of other reasonable crude oil transport scenarios.

The Status Quo Scenario assumes the proposed Project is not approved, and/or is otherwise not constructed. This scenario provides the baseline against which the other No Action scenarios, as well as the proposed Project and other alternatives, can be compared. The environmental effects of this scenario are described in Section 5.1.1, Status Quo Scenario.

Although it is reasonable to expect the market to respond to denial of the proposed Project by seeking to implement alternative transport options, it is more difficult to predict exactly how that may occur. As mentioned above, there have been alternatives proposed that would transport crude oil by pipeline to the south (e.g., increases in Enbridge's pipeline system), to the east (e.g., conversion of TransCanada's Mainline natural gas pipeline system), and to the west (pipeline or rail to Pacific coast ports for transfer to tankers). Under some of these alternatives, it is likely that the crude oil would be transported for refining in countries other than the United States (e.g., it likely will be less expensive to ship crude oil by tanker from Canada's Pacific ports to Asia than from Canada's Pacific ports to the Gulf Coast area). In the past 2 years, there has been exponential growth in the use of rail to transport crude oil throughout North America, primarily originating from the Bakken in North Dakota and Montana, but also increasingly utilized in other production areas, including the WCSB. Because of the flexibility of rail delivery points, once loaded onto trains the crude oil could be delivered to refineries, terminals, and/or port facilities throughout North America, including the Gulf Coast area.

In developing alternative transport scenarios, efforts were made to focus on scenarios that would be practical (e.g., economically competitive), take advantage of existing infrastructure to the extent possible, used proven technologies, and are similar to transport options currently being utilized. To facilitate comparisons with the proposed Project, the scenarios were developed considering the following criteria:

- Transport similar quantities of crude oil as the proposed Project (e.g., up to 730,000 barrels per day (bpd) of WCSB crude oil and up to 100,000 bpd of Bakken crude oil);
- Transport the crude oil from generally the same locations as the proposed Project (i.e., Hardisty area of Alberta and Bakken area of Montana/North Dakota) to the same primary market as the proposed Project (i.e., Gulf Coast area refineries); and
- Transport scenarios that could be operational in approximately the same time frame as the proposed Project (e.g., late 2010s).

Based on these guidelines, two additional No Action Alternative scenarios were developed (see Section 2.2, Description of Reasonable Alternatives, for a detailed description):

- Rail/Pipeline Scenario[1]—assumes construction of new rail loading terminals in Lloydminster, Saskatchewan and Epping, North Dakota; transport of WCSB and Bakken crude oil via existing rail lines to new rail unloading terminals in Stroud, Oklahoma; a short pipeline interconnection to Cushing, Oklahoma; and onward delivery to the Gulf Coast area refineries via existing pipelines.
- Rail/Tanker Scenario—assumes construction of new rail terminals in Lloydminster, Saskatchewan; transport of WCSB crude oil via existing rail lines to Port Rupert, British Columbia; transfer of crude oil to tankers; and tanker transport of the crude oil down the Pacific Coast, through the Panama Canal, and up through the Gulf of Mexico for delivery to the TCG refineries; and construction of a new rail terminal in Epping, North Dakota, transport of Bakken crude oil via existing rail lines to a new rail terminal in Stroud, Oklahoma; a short pipeline interconnection to Cushing, Oklahoma; and onward delivery of Bakken crude oil to Gulf Coast area refineries via existing pipelines.

These scenarios are intended to be representative of likely market responses to extended constraints in additional pipeline capacity. In reality, these scenarios, modifications of these scenarios, or possibly other transport methods would be developed. For example, rather than all of the potential loading terminals being located in the Lloydminster area, they could also be in Hardisty, Edmonton, Fort McMurray, and/or some combination of those areas. Similarly, some rail transport may go all the way to the Gulf Coast area refineries and terminals (as well as refineries and terminals elsewhere on the Gulf Coast or in other refinery markets) rather than offloading in Stroud/Cushing for pipeline delivery to the Gulf Coast area refineries. The two scenarios developed are believed to reflect reasonable market responses and are presented here to represent the potential environmental consequences of likely market responses to demand for increased transport capacity for crude oil from the WCSB and Bakken basins. To evaluate these scenarios, assumptions were needed regarding the location and design of necessary transportation improvements (i.e., proposed new rail terminals and crude oil storage facilities in Lloydminster, Epping, and Stroud; proposed pipeline interconnection between Stroud and Cushing; and proposed expanded port facilities at Prince Rupert).

[1] To conduct the impact assessment, representative sites for the proposed rail terminals (i.e., Lloydminster, Stroud, and Epping); the proposed pipeline interconnection between Stroud and Cushing; and the expanded port in Prince Rupert were identified. These representative sites were selected solely for purposes of conducting this impact assessment. Use of these representative sites does not imply that they would ultimately be acceptable for these facilities, and for this reason the specific locations and ownership of these sites are not identified in this Supplemental EIS. The environmental effects of these scenarios are described in Sections 5.1.2, Rail/Pipeline Scenario, and 5.1.3, Rail/Tanker Scenario, respectively.

As a matter of policy, in addition to its environmental analysis of the proposed Project in the United States, the Department has incorporated the environmental review of the portion of the proposed Keystone XL Project in Canada conducted by the National Energy Board of Canada. In so doing, the Department was guided by Executive Order 12114 (Environmental Effects Abroad of Major Federal Actions), which stipulates the procedures and other actions to be taken by federal agencies with respect to environmental impacts outside of the United States. In the consideration of the No Action Scenarios, information is provided about the potential effects in Canada associated with those scenarios.

5.1.1 Status Quo Scenario

Under the Status Quo Scenario, the proposed Project would not be approved and/or built. Under this scenario, there would be no new impacts to any resources from the proposed Project route. To the extent some impacts are occurring, or could occur, as a result of transporting WCSB and Bakken crude oil by existing pipelines and rail (i.e., air emissions, noise, and potential release risk), these impacts are assumed to continue.

5.1.2 Rail/Pipeline Scenario

Under the Rail/Pipeline Scenario, a similar volume of crude oil (e.g., up to 730,000 bpd of WCSB crude oil and up to 100,000 bpd of Bakken crude oil) would be transported by rail to Stroud, Oklahoma, and the majority of that crude oil would then be delivered by existing pipeline to the Gulf Coast area. The Rail/Pipeline Scenario is described in more detail in Section 2.2.3.2, Rail/Pipeline Scenario. In summary, this scenario would include the following components for transporting the WCSB crude oil:

- A new approximately 3,500 acre rail terminal and storage complex near Lloydminster, Saskatchewan, with access to both Canadian Pacific and Canadian National (CN) Class 1 major rail systems, where the WCSB crude oil would be loaded onto approximately thirteen 100-car unit trains per day; and
- Use of approximately 2,000 miles of existing rail lines from the proposed Lloydminster rail terminals to a new, approximately 3,500-acre rail terminal and oil storage complex near Stroud, Oklahoma, where the crude oil would be offloaded.

It should be noted that the two representative rail routes for WCSB transport from Lloydminster to Stroud were chosen for analysis purposes only. The exact routes and levels of use at any one time could be different in practice because of congestion on certain lines, track maintenance, and other factors outside the scope of this assessment. It should also be noted that while CN and Canadian Pacific are the two railroads used in this analysis, they may use the assets (i.e., tracks) of other carriers, such as BNSF Railway Company, Union Pacific, or other owners through the United States (Cambridge Systematics 2007.)

There are no Class I rail routes that serve both the Hardisty area and the Bakken area; therefore, it was assumed that an alternate rail route would be needed to serve the Bakken region. The components for transporting the Bakken crude oil include the following:

- A new approximately 500-acre rail terminal and storage complex near Epping, North Dakota (to accommodate increased rail volume), where the Bakken crude oil would be loaded onto approximately one to two 100-car unit trains per day[2]; and
- Use of approximately 1,350 miles of existing rail lines from the proposed Epping rail terminal to the same proposed rail terminal and oil storage complex used for the WCSB crude oil near Stroud, Oklahoma, where the crude oil would be offloaded. No specific railroad company or route between Epping and Stroud was identified for this segment, although it should be noted that Bakken crude oil is currently being transported via rail from Epping to Stroud.

Once the WCSB and Bakken crude oil reaches Stroud, Oklahoma, it would be stored temporarily and then transported as follows:

- Transported via a new approximately 17-mile-long pipeline (referred herein as the Cushing pipeline) from the proposed Stroud crude oil storage complex to the existing Cushing, Oklahoma, crude oil terminal, which would create an initial impact of 227 acres, of which 103 acres would remain permanently affected; and
- Temporarily stored in Cushing pending delivery via existing crude oil pipelines (e.g., Keystone Gulf Coast pipeline that is currently under construction) to Gulf Coast area refineries.

In summary, the Rail/Pipeline Scenario would take advantage of existing rail lines, existing crude oil pipelines, and the existing Cushing storage facility, and would require little if any new rail tracks, but would require the construction of new rail terminals and crude oil storage facilities in Lloydminster, Epping, and Stroud, as well as a new pipeline from the proposed Stroud rail terminals to the existing Cushing tank farm. There is the potential that some improvements may be required along the existing rail lines and crude oil pipelines included in this scenario; the location, scale, and timing of these improvements are unknown, but it is believed that they would be minor in comparison with the overall scale of the scenario, and they are thus not considered in this analysis.

The environmental setting and potential impacts for the Rail/Pipeline Scenario are described below for each resource. Since the rail lines from Lloydminster and Epping to Stroud and the existing Keystone pipeline from Cushing to the Gulf Coast area refineries already exist, with little or no improvements to these facilities assumed to be necessary, the discussion of environmental setting and impacts for the Rail/Pipeline Scenario focuses on the proposed new facilities (i.e., the three new rail terminals/oil storage complexes in Lloydminster, Epping, and Stroud and the new pipeline connections to Cushing). The existing rail line and pipeline segments are only discussed in terms of resources that would be affected by increased rail traffic (i.e., air, noise, climate change, and socioeconomics) and the increased potential for accidental releases (as a result of greater throughput). Since no new construction would be needed along these existing segments, it is assumed that there would be little potential for impacts to other resources (i.e., geology, soils, water, wetlands, vegetation, wildlife, fish, threatened and

[2] Because significant rail loading capacity exists in the Bakken area, a new terminal specifically to provide transport for the Bakken crude contracted to the proposed Project likely would not be required. Information about the impacts associated with a new terminal in that area are provided to present more complete information regarding the impacts associated with rail transport of crude oil from the Bakken.

endangered species, land use, and cultural resources) as a result of increased rail traffic along the existing rail lines, other than an increased potential for impacts from accidental releases.

5.1.2.1 Geology

Environmental Setting

The Rail/Pipeline Scenario would include the construction of new facilities in three areas—Lloydminster, Saskatchewan; Epping, North Dakota; and Stroud/Cushing, Oklahoma. A brief overview of the geologic resources of these three areas is provided below.

The geology at the Lloydminster Terminal sites is predominantly composed of Cretaceous and Tertiary formations overlain with glacial till. The rock formations consist of sandstone, shale, and limestone. The geology in the vicinity of the Epping Terminal site is predominantly composed of Cretaceous sedimentary rocks such as the Dakota Group (predominantly sandstone and shale), in addition to aeolian (wind driven) deposits. At the site of the Stroud Terminals, Upper Paleozoic (Permian) rock is present. Earthquake potential and seismic activity are low for all three terminal sites (Earthquaketrack.com 2012).

Potential Impacts

During construction of the proposed rail terminals, oil storage facilities, and pipeline for the Rail/Pipeline Scenario, approximately 7,727 acres of land would need to be graded and shallow bedrock may be encountered. Rock ripping (the break up and removal of rock material with an excavator) could be necessary where dense material, paralithic bedrock, abrupt textural change, or strongly contrasting textural stratification is present. The impacts of rock ripping would be limited to the immediate construction area and would not result in any significant impacts to the underlying geology.

Excavation activities, erosion of fossil beds exposed due to grading, and unauthorized collection can damage or destroy paleontological resources during construction. The potential for finding paleontological resources in the areas that would be disturbed is unknown. Since the proposed construction would occur on privately owned land, construction under this scenario would only be subject to applicable provincial or state requirements regarding the protection of paleontological resources.

The proposed rail terminals, oil storage facilities, and pipeline would be located in areas where there would be no anticipated impact to access to any existing surface mines and quarries or known fossil fuel or mineral resources. In terms of geologic hazards, the proposed facilities would not be located near any known active faults and would be outside of known zones of high seismic hazard, landslides, and subsidence.

Routine operations of the Rail/Pipeline Scenario would not require disturbance of, or impacts to, the underlying geology, paleontological resources, or mineral and fossil fuel resources. The rail terminal and pipeline facilities would be designed to withstand potential seismic hazards and would be located in areas that are not susceptible to landslides or subsidence. Although the rail terminals would be located outside of designated floodplains, the pipeline would cross streams and there would be the potential for pipeline exposure as a result of erosion during high water events. As with the proposed Project, the pipeline would be designed to be buried below the calculated scour depth at stream crossings.

5.1.2.2 Soils

Environmental Setting

The Rail/Pipeline Scenario would include the construction of new facilities in three areas—Lloydminster (Saskatchewan), Epping (North Dakota), and Stroud/Cushing (Oklahoma). A brief overview of the soil resources of these three areas is provided below.

The Lloydminster Terminal complex would be located in an area in the Saskatchewan Province where the soils consist primarily of Chernozemic soils. In general, these soils are deep with dark-colored surface horizons and brownish to lighted colored subsurface horizons that have high organic matter content with textures that range from heavy clays to sands.

The soils found in the general vicinity of the Epping Terminal site consist of the Williams-Bowbells association and the Williams-Zahill and the Zahl-Williams-Zahill complex. The Williams-Bowbells association soils are typically clay loams, deep, and moderately well drained and are found in landscapes with slopes that ranges from 0 to 6 percent slopes. The Williams-Zahill and Zahl-Williams-Zahill complex soils are found in knolls areas with slopes that range from 6 to 9 percent and are deep and well drained.

The soils found in the area in which the Stroud Terminal and Cushing pipeline would be located consist primarily of Port-Pulaski, Dornell-Stephville, and Renfrow-Vernon-Bonhan associations. In general, these soils are deep to shallow, loamy over sandstone, clay, or shale on nearly level to strongly sloping landscapes.

Potential Impacts

During construction of the rail terminals, oil storage facilities, and pipeline for the Rail/Pipeline Scenario, typical clearing, grading, trench excavation, and equipment traffic would disturb approximately 7,727 acres of land, which would likely result in soil erosion, loss of topsoil, soil compaction, and possibly soil contamination (e.g., fuel leaks, herbicide use). Most of these impacts can be mitigated by the use of standard construction erosion and sediment control methods (e.g., silt fences, sediment ponds) and soil remediation essentially identical to those proposed for the proposed Project. As construction is completed, the disturbed sites would be restored in a manner similar to that for the proposed Project. Approximately 7,603 acres of land, however, would be permanently impacted by this scenario as a result of construction of rail terminals and crude oil storage facilities.

During the operational phase of the Rail/Pipeline Scenario, there would remain the potential for minor soil erosion, compaction, differential settling, and contamination from vehicle/pipeline spills and leaks. Maintenance procedures as described for the proposed Project would be implemented to address these potential impacts.

5.1.2.3 Water Resources

Groundwater

<u>Environmental Setting</u>

The Lloydminster Terminals would be located in Saskatchewan where groundwater is perched on glacial till and more recent deposits that include glacial outwash and thin soils. Groundwater is shallow or at the surface in many areas around the terminal as evident by the numerous shallow lakes, ponds, and wetlands. Shallow groundwater is reported to be high in nitrates, with drinking water pumped from deeper aquifers below the till. Because of the landscape and flatness of the till in this area, lateral groundwater flow (hydraulic conductivity) and gradient are low and shallow.

The Stroud Terminals would be located in a fairly flat area of Oklahoma. Pennsylvanian-age sandstone, shale, and limestone underlie Quaternary-age loess and alluvial deposits. The major water source for residences, crops, and industry in this part of central Oklahoma is the Ada-Vamoosa Aquifer, which consists of Pennsylvanian sandstones (Ryder 1996). In 1985 in Lincoln County, up to 2 million gallons per day of water were withdrawn from this aquifer; those withdrawal rates have increased substantially since 1985. Groundwater in the area is shallow (depth of about 50 feet) and deepens to the west of Stroud, Oklahoma. Dissolved solids are reportedly less than 500 milligrams per liter yielding high-quality freshwater. Groundwater in the area of the Cushing Terminal, located just northwest of Stroud, is similar in quantity and quality, although it occurs at a depth of about 100 feet.

The Epping Terminal would be located in a fairly flat agricultural area of northeastern North Dakota. Groundwater in the vicinity of the planned terminal near Epping, North Dakota, is within the Lower Tertiary Fort Union Formation, which consists of sandstone and shale beds within interbedded coal in some areas. This unit is part of the Northern Great Plains Aquifer System, and extends into Montana where the proposed Project pipeline crosses the unit. Wells extracting groundwater from this unit in North Dakota are typically greater than 300 feet deep and yield up to 100 gallons per minute. Groundwater in the vicinity may also be present in alluvium aquifers in unconsolidated sediments overlying the Tertiary rocks. These alluvial deposits consist of 100 feet or more of fine-grained glacial till with interbedded and overlying sand and gravel deposits. The permeability of these deposits is highly variable, with well yields ranging from 1 to 1,000 gallons per minute (Whitehead 1996).

Potential Impacts

Potential groundwater impacts related to terminal construction are anticipated to be related to releases of refined petroleum products used as vehicle fuels and lubricants, as well as releases of crude oil. In addition, there could be potential releases and/or spills associated with operations include crude oil loading/unloading of railcars, and railcar derailment or pipeline failure. The releases of refined petroleum products associated with construction activities would typically be relatively small in volume (less than 2,100 gallons); however, releases of crude oil associated with operations could be larger, ranging from 42,000 to 840,000 gallons.

Section 5.1.2.14, Potential Risk and Safety, discusses the potential risks of these releases during rail transport of the crude oil. Loading and unloading would only occur at the new rail terminals near Lloydminster, Saskatchewan; Epping, North Dakota; and Stroud, Oklahoma. In addition to the risk of crude oil spills during loading and unloading, releases of refined petroleum products (e.g., diesel fuels, motor oils, and lubricants) may also occur during construction and operation of new rail terminals. Although the initial impacts of potential releases or spills at the rail terminals may be contained or limited to soil, potential impacts to groundwater may occur depending on the depth to groundwater, soil characteristics (porosity, permeability, etc.), spill volume and extent, and whether the spill reaches surface waterbodies, which can be interconnected to groundwater.

Downward migration of the releases to groundwater would be attenuated by intervals of fine-grained sediments and glacial till in unconsolidated deposits; however, there is the potential to impact groundwater quality. Migration characteristics of the release in groundwater would be expected to be similar to that discussed for other potential Project-related petroleum releases in Section 4.3.3.1, Groundwater.

Surface Water

Environmental Setting

The two representative rail routes between Lloydminster and Stroud would cross through a variety of surface water resources, including lakes, reservoirs, natural and man-made ponds, as well as intermittent and perennial streams and rivers. Some of the larger rivers that would be crossed in Saskatchewan and Manitoba include the North and South Fork of the Saskatchewan River in Saskatchewan and the Assiniboine River and Red River in Manitoba. In the United States, larger rivers that would be crossed include the Red River, which forms the border between Minnesota and North Dakota; the Mississippi River, Saint Louis River, and Vermilion River in Minnesota; the Des Moines River in Iowa; the Missouri River on the border of Nebraska and Iowa; the Platte River in Nebraska; and the Arkansas River in Oklahoma.

The Lloydminster Terminals location is characterized by existing energy wells, rail terminal infrastructure, agricultural, and livestock uses with intermittent streams and isolated open-water features that may be connected to shallow groundwater. Residential and park areas of Lloydminster are within 1 mile (1,400 meters) of the potential terminal complex. Large, open waterbodies are within 2 miles (3,200 meters) of the potential terminal complex. The relatively flat topography is likely conducive to sheet flow and infiltration. Surface waterbodies may have use as agricultural or stock water sources.

The Stroud Terminals region is characterized by open grassland with partial forest coverage. Surface water features include natural and manmade open waterbodies and intermittent grass-lined to bare stream courses with generally wide bed structures. The proximity to the community of Stroud varies based on the potential terminal sites. Surface waterbodies may have use as agricultural or stock water sources.

The Epping Terminal location is characterized by cultivated agricultural uses with grass-lined intermittent streams and isolated natural and manmade open water features. Large, open waterbodies are located within 2 miles of the community of Epping (approximately 12 miles northeast of Williston North Dakota) and the potential terminal site. Surface waterbodies may have use as agricultural or stock water sources.

Potential Impacts

Potential surface water impacts related to this scenario would primarily be related to releases and spills associated with crude oil loading/unloading of railcars, and railcar derailment or pipeline failure. Section 5.1.2.14, Potential Risk and Safety, discusses the potential risks of these releases during rail transport of the crude oil. The proper implementation of spill prevention, control, and countermeasures (SPCC) plans should minimize the potential for releases of crude oil or other hazardous materials (e.g., diesel fuel, motor oil, lubricants) to reach surface waterbodies during rail terminal construction and operations. Similarly, implementation of stormwater management should mitigate impacts to water quality and runoff volumes from the terminals.

5.1.2.4 Wetlands

Environmental Setting

The Rail/Pipeline Scenario would include the construction of new facilities in three areas—Lloydminster (Saskatchewan), Epping (North Dakota), and Stroud/Cushing (Oklahoma). A brief overview of wetland resources of these three areas is presented below.

The Lloydminster Terminals would be located in the Aspen Parkland Level III Ecoregion, which lies within an area with a moderately high concentration of prairie pothole wetlands, commonly referred to as the Prairie Pothole Region (PPR) (U.S. Environmental Protection Agency [USEPA] 2010, USEPA 2011). The PPR is not a USEPA ecoregion, but rather a general region of the United States and Canada where there is a high density of prairie pothole wetlands. While there is no exact boundary of the PPR, most government agencies and non-government organizations agree upon its general boundaries, which stretches through the Canadian provinces of Saskatchewan, Alberta, and Manitoba, and the U.S. states of North Dakota, South Dakota, Nebraska, Minnesota, Iowa, and Montana (USEPA 2011; Gleason et al. 2008; Kantrud at al. 1989). As discussed in Section 3.4.3.1, Sensitive Wetland Areas, and Section 3.5, Terrestrial Vegetation, prairie potholes are water-holding depressions of glacial origin (Sloan 1972). Prairie pothole wetlands associated the conceptual Lloydminster terminal complex include emergent (herbaceous) and scrub-shrub wetlands associated with wet meadows, streams, and open water features.

The Epping, North Dakota, Terminal would be located in the Northwestern Glaciated Plains Level III Ecoregion (USEPA 2011). This ecoregion is located within the broader PPR described above. Wetlands associated with the Epping, North Dakota, terminal include emergent (herbaceous) wetlands associated with prairie pothole wet meadows, streams, and open water features, most of which are managed for agricultural purposes.

The southern extent of the route would cross the northeast corner of Oklahoma to the Stroud, Oklahoma, terminals. Ecoregions include the Central Great Plains and Cross Timbers USEPA Level III Ecoregions (USEPA 2011), where the primary wetlands are forested and herbaceous wetlands.

Potential Impacts

Based on preliminary aerial photo interpretation, construction of the Lloydminster terminals could impact approximately 20 acres of herbaceous wetlands, 173 acres of scrub-shrub wetlands, and 60 acres of open water habitat. Construction of the Epping Terminal could result in approximately 6 acres of temporary or permanent impacts to herbaceous wetlands and associated shallow ponds (pothole wetlands) based on wetland coverage provided by the National Wetland Inventory (NWI) database (NWI 2012). Construction of the Stroud Terminals and along the Cushing pipeline could result in approximately 40 acres of temporary or permanent impacts to open water features and approximately 19 acres of temporary or permanent impacts to forested wetlands based on the wetland coverage provided by the National Wetlands Inventory database (NWI 2012). These estimates of potential wetland impacts at these representative rail station locations, which are based on aerial photo interpretations and secondary sources such as NWI mapping, are intended to be illustrative of the magnitude of actual impacts that may occur. Please note that wetland acreages estimated using the NWI (2012) database may differ from wetland acreages estimated using the National Land Cover Database (Fry et al. 2011) presented in Section 5.1.2.5, Terrestrial Vegetation, below. If rail terminals were constructed, the actual acreage of wetland impacts would be determined through a formal wetland delineation.

5.1.2.5 Terrestrial Vegetation

Environmental Setting

The Rail/Pipeline Scenario would include the construction of new facilities in three areas—Lloydminster (Saskatchewan), Epping (North Dakota), and Stroud/Cushing (Oklahoma). A brief overview of the terrestrial vegetation resources of these three areas is provided below.

The Lloydminster Terminal complex would be located in the Aspen Parkland Level III Ecoregion. The parkland is considered transitional between the boreal forest to the north and the grasslands to the south. Open stands of trembling aspen and shrubs occur on most sites, and bur oak and grassland communities occupy increasingly drier sites on loamy Black Chernozemic soils (The Ecological Framework of Canada [TEFC] 2012a). The Epping Terminal would be located in the Northwestern Glaciated Plains Level III Ecoregion and the Glaciated Dark Brown Prairie Level IV Ecoregion. Geographic information system analysis indicates the existing land cover of the approximately 500 acre terminal site is comprised of Grassland/Herbaceous, Developed Land, Cultivated Crops, Shrub/Scrub, and Emergent Herbaceous Wetlands. The Stroud Terminals would be located in the Central Great Plains and Cross Timbers Level III Ecoregions. Geographic information System analysis utilizing the 2006 NLCD (Fry et al. 2011) indicates the existing land cover of the approximately 3,500-acre Stroud Terminal complex is composed of Grassland/Herbaceous, Developed, Cultivated Crops, Deciduous Forest, and Open Water.

Potential Impacts

The Rail/Pipeline Scenario would impact approximately 7,727 acres of terrestrial vegetation where new facilities and the Stroud to Cushing pipeline would be built. Although the exact design and location for the terminals is not known, the general impacts to terrestrial vegetation associated with these facilities are presented below in Table 5.1-1. Deciduous forests within the Stroud Terminal sites may be considered biologically unique landscapes or vegetative communities of conservation concern.

Table 5.1.-1 Potential Impacts to Terrestrial Vegetation by Landcover Type under the Rail/Pipeline Scenario

	Acreage			
Land Cover	**Lloydminster**	**Stroud[a]**	**Epping**	**Total Acres**
Grassland/Pasture	2,756	2,101	40	4,897
Developed	493	127	6	626
Deciduous Forest	0	1174	0	1,174
Cultivated cropland	0	85	455	540
Open Water	60	13	0	73
Scrub/shrub wetlands	173	0	0	173
Emergent wetlands	20	0	0	20
Total	**3,500[b]**	**3,500[b]**	**500 [b]**	**7,500 [b]**

[a] Plus land for a new pipeline between Stroud and Cushing that would affect 227 acres.
[b] May not add up due to rounding.

5.1.2.6 Wildlife

Environmental Setting

The Rail/Pipeline Scenario would include the construction of new facilities in three areas—Lloydminster (Saskatchewan), Epping (North Dakota), and Stroud/Cushing (Oklahoma). A brief overview of the wildlife resources of these three areas is presented below.

The Lloydminster Terminal area is home to large game, small game furbearers, upland game birds, waterfowl, and non-game wildlife. There are over 600 species of birds and mammals in Saskatchewan, and their territorial ranges in southern Saskatchewan are shrinking. Human activities and development over the last century (including roads, towns and cities, agriculture, and industry) have reduced 75 percent of the natural areas in the province's agricultural region (Government of Saskatchewan 2012). The Lloydminster area lies within the Central Flyway, which is a major migration route for birds (U.S. Fish and Wildlife Service [USFWS] 2012). The terminals would also lie within an ecoregion known as Aspen Parkland, which provides a major nesting habitat for waterfowl, and includes habitat for white-tailed deer (*Odocoileus virginianus*), coyote (*Canis latrans*), snowshoe hare (*Lepus americanus*), cottontail (*Sylvilagus* spp.), red fox (*Vulpes vulpes*), northern pocket gopher (*Thomomys talpoides*), Franklin's ground squirrel (*Poliocitellus franklinii*), and bird species such as sharp-tailed grouse (*Tympanuchus phasianellus*) and black-billed magpie (*Pica hudsonia*) (TEFC 2012).

The Epping rail terminal would be located in the Prairie Potholes bird conservation region, which is an ecologically distinct region in North America with similar bird communities, habitats, and resource management issues as defined by the U.S. North American Bird Conservation Initiative (USNABCI). This conservation region provides breeding and migratory habitat to over 200 species of birds (USNABCI 2000).

The Stroud Terminals would be in an area that is home to large game, small game and furbearers, upland game birds, waterfowl, and non-game wildlife. This area also lies within the Central Flyway, which is a major migration route for birds (USFWS 2012). It would be located in two Level III Ecoregions: the Central Great Plains and the Cross Timbers (USEPA 2012). The Stroud Terminals would be located in the Oaks and Prairies bird conservation region, which is an ecologically distinct region in North America with similar bird communities, habitats, and resource management issues as defined by the USNABCI (2000). This conservation region serves as a transition zone between the Great Plains and the forests of the eastern United States and is a complex mix of prairie, savanna, cross timbers, and shrubland. Among the priority land birds that use this mix of woodland and open country are scissor-tailed flycatcher (*Tyrannus forficatus*), painted bunting (*Passerina ciris*), and Mississippi kite (*Ictinia mississippiensis*), with a small population of black-capped vireos (*Vireo atricapilla*) in areas of denser shrub. Agriculture and urbanization have made tremendous impacts on this region, leaving very little natural habitat available for healthy priority bird populations (USNABCI 2000).

Potential Impacts

Construction of the proposed rail terminals and pipeline for the Rail/Pipeline Scenario would have direct and indirect, and temporary and permanent impacts on wildlife resources and result in the clearing of approximately 7,727 acres of wildlife habitat, including approximately 4,997 acres of grasslands, 1,175 acres of forest habitat, and 83 acres of emergent and scrub/shrub wetland habitats. Approximately 7,603 acres of these impacts would be permanent. Direct impacts could occur due to vegetation removal or conversion, obstructions to movement patterns, or the removal of native habitats that may be used for foraging, nesting, roosting, or other wildlife uses (Barber et al. 2010). Indirect impacts to wildlife are difficult to quantify and are dependent on the sensitivity of the species, individual, type and timing of activity, physical parameters (e.g., cover, climate, and topography), and seasonal use patterns of the species (Berger 2004). Short-term impacts on wildlife would occur during construction and may extend beyond construction activities. Long-term impacts on wildlife could extend through the life of a project and possibly longer for those habitats that require many years to be restored (Harju et al. 2010). Permanent impacts would result from construction of the rail terminals and oil storage facilities that convert natural habitat, and where operational maintenance of the pipeline right-of-way permanently alters vegetation characteristics (Braun 1998). The facilities would not affect any federal/national or provincial/state wildlife areas.

Operations at the rail terminals would generate noise, vibration, traffic, and human presence, which would have indirect impacts to surrounding habitats making them less attractive for more sensitive wildlife species. Since the rail terminals lie within the Central Flyway, it is possible that these operational impacts could affect migratory birds.

5.1.2.7 Fisheries

Environmental Setting

The Rail/Pipeline Scenario would include the construction of new facilities in three areas—Lloydminster (Saskatchewan), Epping (North Dakota), and Stroud/Cushing (Oklahoma). A brief overview of the fishery resources of these three areas is provided below.

In the Lloydminster area, the provincial government of Saskatchewan manages fisheries within its borders except for aboriginal fishing and fish habitat protection, which are managed by the federal government of Canada and the Department of Fisheries and Oceans. Most of Canada's prairies have been converted to farmlands, and the fisheries therein have been subject to alterations brought about by agriculture such as channelization and sedimentation from run-off. Moreover, streams originating in Canada's interior plains have variable water quality and are usually high in suspended and dissolved solids, and high in turbidity due to erosion (Rosenburg et al. 2005). This is best exemplified by the silt-laden Saskatchewan River, whose prairie reaches contain warm water species like northern pike, walleye, sauger, carp, and yellow perch (Table 5.1-2). Upstream, forested reaches are dominated by cold water species such as cutthroat, rainbow, bull, brook and brown trout (Rosenburg et al. 2005) (Table 5.1-2).

Table 5.1-2 Common Representative Species of the Saskatchewan River[a]

Warm water fish species[a]	Cold water fish species[a]
northern pike (*Esox lucius*)	cutthroat trout (*O. clarki*)
walleye (*Sander vitreus*)	rainbow trout[b] (*O. mykiss*)
sauger (*Sander canadensis*)	bull trout (*Salvelinus confluentus*)
goldeye (*Hiodon alosoides*)	brook trout[b] (*S. fontinalis*)
yellow perch (*Perca flavescens*)	brown trout[b] (*Salmo trutta*)
lake sturgeon (*Acipenser fulvescen*)	mountain whitefish (*Prosopium williamsoni*)

Source: Rosenburg et al. 2005.

[a] List is non-inclusive. Some rivers in the basin are very species-rich (e.g., Assiniboine/Red River are represented by 94 fish species in 18 families).
[b] Non-native.

The Epping Terminal would be located in a prairie region of North America that shares many of the same fisheries characteristics and many of the same species that are expected to be present as in the proposed Project areas and is characterized by prairie streams draining the glaciated plains, with attendant low stream gradient, high sediment load (in many cases), subject to perennial drying and flooding, and flowing through sparsely populated agricultural lands. There are warm water and cold water fisheries present in the area, having commercial and recreational value.

The Stroud Terminals would be located in the Southern Plain Basin, which is drained by two large, separate river systems: the Arkansas and Red rivers. The entire state of Oklahoma is within the basin, and the basin includes many commercially and recreationally valuable fisheries. Streams of the Arkansas River drainage, which would be crossed by this scenario, contain many warm water, big river species such as paddlefish, gars, and river shad (Table 5.1-3). The Arkansas River system is fragmented by five major reservoirs on the mainstem (Matthews et al. 2005). A large tributary of the Arkansas River, the Neosho (Grand) River, originates in the Flint Hills of Kansas. Native and endemic fish species are represented in the headwaters and include isolated populations of formerly widespread species like the Topeka shiner (*Notropis Topeka*), and isolated populations of cardinal shiner (*Luxilus cardinalis*), southern redbelly dace (*Chrosomus erythrogaster*), and the endemic and federally threatened Neosho Madtom (*Noturus placidus*). The downstream river reaches are impounded by a series of five major reservoirs (Matthews et al. 2005).

Table 5.1-3 Representative Fish Species in the Stroud Area

Common Arkansas River Fish		
paddlefish (*Polyodon spathula*)	white bass (*Morone chrysops*)	channel catfish (*Ictalurus punctatus*)
gars (*Lepisosteus* sp.)	largemouth bass (*Micropterus salmoides*)	flathead catfish (*Pylodictis olivaris*)
gizzard shad (*Dorosoma cepedianum*)	spotted bass (*Micropterus punctulatus*)	blue catfish (*Ictalurus furcatus*)
smallmouth buffalo (*Ictiobus bubalus*)	striped bass[a] (*Morone saxatilis*)	
bigmouth buffalo (*Ictiobus cyprinellus*)	sunfishes (*family Centrarchidae*)	

Source: Matthews et al. 2005.

[a] non-native.

Potential Impacts

During construction, the Rail/Pipeline Scenario would disturb approximately 7,727 acres, which would increase the potential for erosion and for sediment to enter waterbodies. Excessive suspended sediment can interfere with respiration in fish and invertebrates, leading to mortality or reduced productivity in rearing and spawning (Newcombe and Jensen 1996, Sutherland 2007, Wood and Armitage 1997). Suspended sediment could result in short-term impairment of foraging efficiency for species that are visual predators. Longer-term effects could occur if sediment covers spawning gravels, preventing water exchange and oxygen to developing eggs or young fish (sack or emerging fry), potentially causing increased mortality, and reducing recruitment to the population (Newcomb and MacDonald 1991).

The quantity, cover, and type of riparian bank vegetation in the affected area vary depending upon site-specific waterbody conditions and locations. Removal of bank vegetation (including overhead cover) could lead to bank instability and erosion. Loss of riparian vegetation reduces shading, potentially causing an increase in water temperature and a reduction in dissolved oxygen; nutrient input, food input, and hiding cover (Brown et al. 2002, Ohmart and Anderson 1988). A reduction in escape cover can increase vulnerability of certain species to predation. Loss of riparian vegetation and disturbance to the bank and substrate can alter benthic communities and change food availability (Brown et al. 2002).

Most of these impacts can be mitigated by the use of standard construction erosion and sediment control methods (e.g., silt fences, sediment ponds) essentially identical to those proposed for the proposed Project, as well as maintenance of riparian buffers. These mitigation measures would reduce the potential impacts.

Most impacts to fish from this scenario would initially occur during construction, but are essentially permanent and would continue throughout operations. During operation, the reduction of trees along affected waterbodies could result in a permanent loss of shading, nutrients, and habitat enrichment features for fish. Herbicides would potentially be used to control vegetation during proposed Project operation. The use of herbicides near waterbodies could harm aquatic organisms, including fish. Herbicides could enter a waterbody through runoff, seepage through the soil, and/or direct introduction to water during application through overspray or wind drift. Mitigation measures would include maintenance of riparian buffers and the provision of appropriate stormwater management measures to control runoff volumes and improve water quality.

5.1.2.8 Threatened and Endangered Species

Environmental Setting

The Rail/Pipeline Scenario would include the construction of new facilities in three areas—Lloydminster (Saskatchewan), Epping (North Dakota), and Stroud/Cushing (Oklahoma). A brief overview of the threatened and endangered species present in these three areas is presented below.

The Lloydminster Terminals would be located in one of the most altered landscapes in North America (Government of Saskatchewan 2012), which is generally unfavorable habitat for threatened and endangered species. The terminals would cover approximately 3,500 acres, which currently is primarily grassland/pasture according to aerial interpretation. Because Lloydminster is in a grassland region of North America that shares many of the same qualities as the grasslands that would be traversed by the proposed Project, Lloydminster may be inhabited by many of the same protected species that are expected to occur in the proposed Project area. In particular, Lloydminster is within the whooping crane (*Grus americana*) central corridor (see Figure 3.8.3-1 in Section 3.8, Threatened and Endangered Species and Species of Conservation Concern). The nesting range for the piping plover (*Charadrius melodus*) (a federally threatened species, Saskatchewan endangered species, and Canada Species at Risk Act (SARA) endangered species), and the nesting range for the Sprague's pipit (*Anthus spragueii*) (a U.S. federal candidate species, and a Canada SARA threatened species), include the Lloydminster area (Saskatchewan Conservation Data Centre 2012). There is no federally designated critical habitat in the area where the Epping Terminal would be located.

The area around Stroud is inhabited by a variety of common wildlife species. Agriculture and urbanization have made tremendous impacts on this region, leaving very little natural habitat available for threatened and endangered species, which in general prefer habitat in its natural, unfragmented state. This area lies within the Central Flyway, which is a major migration route for birds (USFWS 2012). Of note, the Stroud Terminals would be within the flyway corridor for the Arkansas-Wood Buffalo population of the whooping crane (see Figure 3.8.3-1). There is no federally designated critical habitat in the area where the Stroud Terminals would be located.

Potential Impacts

Although no site specific surveys for the presence of any threatened or endangered species have been conducted, the Lloydminster, Epping, and Stroud terminals would be located in areas that have been already impacted by agriculture and urbanization, leaving little suitable habitat for threatened and endangered species. These terminal locations would not be located within designated critical habitat for any federally listed threatened or endangered species.

The Rail/Pipeline Scenario is located within the central migration corridor for the Arkansas-Wood Buffalo population of the whooping crane; however, the three terminal sites are already relatively disturbed, and they offer little habitat for the whooping crane. Detailed field surveys would need to be conducted to confirm the absence of any federal or state listed threatened and endangered species and consultation would need to occur with the USFWS, appropriate state agencies in North Dakota and Oklahoma, and appropriate Canadian agencies.

5.1.2.9 Land Use, Recreation, and Visual Resources

Environmental Setting

The Rail/Pipeline Scenario would include the construction of new facilities in Lloydminster (Saskatchewan), Epping (North Dakota), and Stroud/Cushing (Oklahoma). A brief overview of the land use, recreation, and visual resources of these three areas is provided below.

Aside from developed areas in and around Lloydminster itself, the area surrounding the Lloydminster Terminal site is almost entirely used for cropland, with small patches of grassland and numerous small lakes and ponds (Natural Resources Canada 2012). However, some residential and park areas of Lloydminster are within 1 mile (1,400 meters) of the potential terminal complex.

Except for the developed areas in and near the town of Epping itself, the area surrounding Epping is primarily agricultural. Land within approximately 1 mile of Epping includes pasture land to the east, and grasslands and shrub/scrub areas to the north, south, and west. Cultivated crops surround these land uses (U.S. Geological Survey [USGS 2006]). Epping is approximately 12 miles northwest of Lake Sakakawea, a reservoir on the Missouri River used for flood control, hydroelectric power, irrigation, and recreation (North Dakota Parks and Recreation Department 2012). Lewis and Clark State Park, on the northern shoreline of Lake Sakakawea, is the closest land-based public recreation area. Other public lands with recreational value are found along the entire shoreline of the lake, which extends through much of North Dakota. There are no other regionally significant recreation areas near Epping.

The area around Stroud is primarily rangeland with developed and forest land comprising most of the remaining areas (USGS 2006). Portions of the Deep Fork Wildlife Management Area lie along the Deep Fork of the Canadian River, approximately 8 miles southeast of Stroud. Managed by the Oklahoma Department of Wildlife Conservation (ODWC), the Wildlife Management Area provides outdoor recreation and hunting opportunities (ODWC 2012). There are no other federal lands, state parks, or regionally significant recreation areas near Stroud.

The states of Oklahoma and North Dakota have no formal guidelines for managing visual resources on private or state-owned lands. The Historic Route 66 National Scenic Byway passes through Stroud. The Scenic Byway designation enables the State of Oklahoma to obtain grants from the Federal Highway Administration to upgrade the road in accordance with its Corridor Management Plan.

Potential Impacts

The only land use, recreation, and visual impacts from this scenario would be the construction and operation of the Lloydminster, Epping, and Stroud rail terminals. The Stroud Terminal complex area would encompass about 3 percent of the land in Creek and Lincoln counties. The 500-acre Epping Terminal would cover less than one-tenth of 1 percent of the approximately 1.4 million acres in Williams County, North Dakota. Similarly, the 3,500 acres needed for terminals near Lloydminster represent a fraction of 1 percent of the approximately 5.9 million acres of land in Census Division 17 of Saskatchewan—an approximate equivalent to a U.S. County (Statistics Canada 2012).

The Lloydminster Terminals would be located in an agricultural area, but along existing rail lines. Terminals in this location would be expected to result in some land use changes in the area as more land may be converted to crude oil storage and transport uses. The Epping and Stroud terminals would be located in areas that already have rail terminals transporting crude oil, so little land use, recreation, or visual impact would be anticipated.

5.1.2.10 Socioeconomics

Environmental Setting

The Rail/Pipeline Scenario would include the construction of new facilities in Lloydminster (Saskatchewan), Epping (North Dakota), and Stroud/Cushing (Oklahoma). This section also includes consideration of the rail lines and pipelines as operational use of these segments could affect socioeconomic resources. An overview of the socioeconomic resources of these areas is provided below.

This scenario would intersect 49 U.S. counties in six different states and 17 Canadian census divisions within three provinces (Table 5.1-4). It would go through seven metropolitan areas: Saskatoon, Saskatchewan; Winnipeg, Manitoba; Duluth, Minnesota/Wisconsin; Minneapolis-St. Paul, Minnesota/Wisconsin; Des Moines, Iowa; Kansas City, Kansas/Missouri; and Tulsa, Oklahoma. The Canadian Pacific Route would intersect 6,159 U.S. counties in eight states and eight Canadian census divisions within the Province of Saskatchewan (Table 5.1-5). It would go through eight metropolitan areas: Saskatoon, Saskatchewan; Regina, Saskatchewan; Fargo, North Dakota/Minnesota; Sioux City, Nebraska/Iowa; Omaha, Nebraska; St. Joseph, Kansas/Missouri; Kansas City, Kansas/Missouri; and Tulsa, Oklahoma. In comparison, the proposed pipeline Project would intersect 31 U.S. counties in four states and one metropolitan area: Rapid City, South Dakota.

Table 5.1-4 U.S. States and Counties and Canadian Provinces/Census Divisions within the Rail/Pipeline Scenario—Canadian National Route

State (U.S.)/ Territory (CA)	Number of Counties (U.S.)/ Census Divisions (CA)	Counties (U.S.)/Census Divisions (CA)
Rail/Pipeline Corridor		
Canada		
Saskatchewan	7	#17; #16; #12; #11; #10; #6; #5
Manitoba	9	#15; #7; #8; #9; #10; #11; #12; #2; #1
Ontario	1	Rainy River District
United States		
Minnesota	16	Roseau; Lake of the Woods; Koochiching; St. Louis; Carlton; Kanabec; Pine; Isanti; Anoka; Hennepin; Ramsey; Washington; Dakota; Rice; Steele; Freeborn
Wisconsin	1	Douglas
Iowa	10	Worth; Cerro Gordo; Franklin; Hardin; Story; Polk; Warren; Marion; Lucas; Wayne
Missouri	8	Mercer; Grundy; Daviess; Livingston; Caldwell; Clay; Ray; Jackson
Kansas	7	Johnson; Miami; Anderson; Linn; Allen; Neosho; Labette
Oklahoma	7	Craig; Mayes; Creek; Tulsa; Wagoner; Lincoln; Muskogee
Terminal Facilities		
Canada		
Saskatchewan	1	#17
United States		
Oklahoma	2	Lincoln; Creek

Table 5.1-5 U.S. States and Counties and Canadian Provinces/Census Divisions within the Rail/Pipeline Scenario—Canadian Pacific Route

State (U.S.)/ Territory (CA)	Number of Counties (U.S.)/ Census Divisions (CA)	Counties (U.S.)/Census Divisions (CA)
Rail/Pipeline Corridor		
Canada		
Saskatchewan	8	#17; #13; #12; #11; #6; #7; #2; #1
United States		

State (U.S.)/ Territory (CA)	Number of Counties (U.S.)/ Census Divisions (CA)	Counties (U.S.)/Census Divisions (CA)
North Dakota	15	Burke; Renville; Williams; Mountrail; Ward; McHenry; Pierce; Wells; Eddy; Foster; Griggs; Steele; Barnes; Cass; Richland
Minnesota	14	Clay; Wilkin; Grant; Traverse; Stevens; Pope; Swift; Kandiyohi; Chippewa; Yellow Medicine; Lincoln; Lyon; Pipestone; Rock
South Dakota	1	Minnehaha
Iowa	6	Lyon; Sioux; Plymouth; Woodbury; Mills; Fremont
Nebraska	6	Dakota; Thurston; Burt; Dodge; Saunders; Cass
Missouri	7	Atchison; Holt; Andrew; Buchanan; Platte; Clay; Jackson
Kansas	7	Wyandotte; Johnson; Miami; Linn; Bourbon; Crawford; Cherokee
Oklahoma	7	Craig; Ottawa; Rogers; Delaware; Tulsa; Lincoln; Creek
Terminal Facilities		
Canada		
Saskatchewan	1	#17
United States		
North Dakota	1	Williams
Oklahoma	2	Lincoln; Creek

Population[3]

The population of the census divisions and counties that would be crossed by the CN route in 2010/2011 was approximately 8 million. The corresponding population of the Canadian Pacific route in 2010/2011 was just over 4.5 million (Table 5.1-6). In comparison, the pipeline corridor population under the proposed Project was 267,569 in 2010 (see Table 3.10-5). Of the rail corridor populations, a relatively small portion (about 166,000 persons) lives in the counties and census divisions adjacent to the terminals (Lloydminster 40,000; Williams County, North Dakota, 22,000; and Lincoln and Creek counties in Oklahoma 104,000).

Table 5.1-6 Rail/Pipeline Corridor Populations

CN Route		Canadian Pacific Route	
State (U.S)/Territory (CA)	**Population[a]**	**State (U.S)/Territory (CA)**	**Population[a]**
Rail/Pipeline Corridor		**Rail/Pipeline Corridor**	
Canada		Canada	
Saskatchewan	663,722	Saskatchewan	746,435
Manitoba	905,577	United States	
Ontario	20,370	North Dakota	297,431
United States		Minnesota	221,809
Minnesota	3,112,972	South Dakota	169,468
Wisconsin	44,159	Iowa	194,943
Iowa	694,980	Nebraska	117,516
Missouri	966,689	Missouri	1,102,508

[3] Population data were collected by county in the United States and by census division in Canada.

CN Route		Canadian Pacific Route	
State (U.S)/Territory (CA)	**Population[a]**	**State (U.S)/Territory (CA)**	**Population[a]**
Kansas	656,214	Kansas	820,037
Oklahoma	908,006	Oklahoma	882,912
Rail/Pipeline Corridor Total	*7,972,689*	*Rail/Pipeline Corridor Total*	*4,553,059*
Terminal Facilities[b]		**Terminal Facilities[b]**	
Canada		Canada	
Saskatchewan	40,135	Saskatchewan	40,135
United States		United States	
		North Dakota	22,398
Oklahoma	104,240	Oklahoma	104,240
Project Area Total	*7,972,689*	*Project Area Total*	*4,553,059*

Source: U.S. Census Bureau 2010; Statistics Canada 2012.

[a] Population data are from 2010 for U.S. areas and from 2011 for Canadian areas.
[b] Populations near terminal facilities are included in the corridor totals above.
Note: The table only includes the population of the counties and census divisions the route would go through, not the population of the states/provinces as a whole.

Environmental Justice

Populations near the terminal facilities were evaluated on a range of geographies: city, census division, province, county, and state. A total of two meaningfully greater minority populations were identified: an aboriginal population in Census Division 17 in Saskatchewan (12,000 persons out of a population of 40,000), and a multiracial population in Williams County, North Dakota (644 persons out of a population of 22,400) (see Appendix O), Socioeconomics, for detailed data).

Public Services

A total of 20 police/sheriff departments, 28 fire departments, and four medical facilities would be located near the terminals in the United States. Appendix O, Socioeconomics, includes a table listing these facilities.

Traffic and Transportation

In 2005, the existing railroads that would be utilized under this scenario had between 25 and 200 freight trains per day depending on the segment (Cambridge Systematics 2007). Some segments were near or above capacity, especially in the American Midwest between St. Paul, Minnesota, and Oklahoma and along the Gulf Coast area (Cambridge Systematics 2007, pp. 4-10.) An increase of between seven and 14 trains per day for crude by rail shipments from Lloydminster to Stroud would strain some segments of these rail networks by increasing volume anywhere from 7 percent to 56 percent.

Potential Impacts

The Rail/Pipeline Scenario would require new facilities in only three locations (terminal locations), as it would use existing rail lines for most of the crude oil transport. Thus, the analyses of potential socioeconomic impacts are focused on the immediately affected areas near Lloydminster, Epping, and Stroud/Cushing.

Population/Housing

The impacts of the Rail/Pipeline Scenario on population and housing would be small. This scenario is expected to bring over 4,000 construction jobs and 100 operations jobs to the areas of the terminals. The estimated peak employment of 1,700 persons in Lloydminster, Saskatchewan, would represent just over a 4 percent increase in the population of the census division. In Epping, North Dakota, the peak employment of 320 terminal construction jobs would represent a 1.5 percent population increase for Williams County. In Lincoln and Creek counties, the population influx from Stroud/Cushing terminal construction jobs would increase the population by less than 2 percent.

In Lloydminster, the number of hotel/motel rooms is approximately 1,075 (TripAdvisor 2012). This number would likely be insufficient to house the approximately 2,000 workers that would need lodging. In this area, additional lodging would need to be made available for workers. While the 287 hotel/motel rooms near Stroud/Cushing alone (see Final EIS Section 3.10) would not provide capacity for the over 2,000 workers needed, the cities of Tulsa and Oklahoma City, Oklahoma, are both within commuting distance, and would provide enough commercial housing to accommodate the workforce. Epping, North Dakota, has approximately 1,500 hotel/motel rooms (TripAdvisor 2012), suggesting it would be able to accommodate the approximately 300 workers that would be needed for terminal construction.

Local Economic Activity

Construction

Key components of this scenario would include new terminal facilities in Lloydminster, Saskatchewan; Stroud, Oklahoma; and Epping, North Dakota. These facilities would generate from $80 to $100 million in economic activity in each area to construct the infrastructure necessary to transfer and transport crude oil. Much of the construction workforce for each location would likely be local, which for Stroud would encompass the Tulsa and Oklahoma City metropolitan areas. The local workforce sourcing area for Epping would include cities and towns throughout North Dakota. It is uncertain how wide of an area would provide the construction workforce in Lloydminster, but given Lloydminster's relatively small population, it would likely encompass communities within Alberta and Saskatchewan.

As discussed in Section 4.10.3.1, Construction, economic effects are distinguished by whether they are direct, indirect, or induced. Direct employment effects of facility construction would include 1,900 jobs over a 2-year period at Lloydminster; 2,240 jobs over a 2-year period at Stroud; and 320 jobs over a single-year period at Epping. Indirect employment effects would include those triggered by the supply-chain for construction activity.

Developing terminal rail facilities is a process that requires a particular mix of inputs that may not be well represented by general construction for commercial facilities. Employment impacts in supply-chain industries, such as concrete, would certainly occur locally, but the mix, magnitude, and location of industry effects cannot be reliably estimated at this point. Induced effects are those triggered by construction workers and their households who spend income received for their construction labor. Estimates for Lloydminster could not be made because the models used for the economic analyses in this Supplemental EIS do not extend into Canada. In Stroud, it is estimated that about 300 additional jobs and $1.2 million of earnings would be supported each of the two years throughout Oklahoma, primarily in the Tulsa and Oklahoma

City metropolitan areas. In Epping, about 10 additional jobs and $0.5 million of earnings would be supported throughout North Dakota during the 1 year of facility construction.

Operations

Operations costs are estimated to range from $49 million annually for Lloydminster and Stroud to $7 million annually for Epping. Annual terminal employment would range from 50 jobs at each of the Lloydminster and Stroud facilities to 15 jobs at Epping (Table 2.2-2). The supply-chain characteristics of these rail facilities are sufficiently different from available, generalized operations data that effects could not be estimated. Effects triggered by worker spending in Oklahoma are estimated to be an additional 20 jobs and $800,000 annually. In North Dakota, effects are estimated to be less than 10 jobs and $200,000 annually. For the reasons mentioned above, worker spending effects in the Lloydminster area could not be estimated.

Operational socio-economic effects resulting from trains transporting WCS and Bakken crude oil daily could not be estimated. However, it is reasonable to expect annual increases in maintenance and other operational costs of track, crossings, bridges, and related facilities throughout the rail systems.

Environmental Justice

Portions of one or both of the two identified meaningfully greater minority populations could potentially be affected by construction or operations activities related to the terminals. No meaningfully greater low-income populations were identified. Impacts to minority and low-income populations would be similar to those described for the proposed Project and could result in increased competition for medical or health services in underserved populations. Williams County, North Dakota, which contains a minority population, is or contains Health Professional Storage Areas (HPSAs) and Medically Underserved Areas/Populations (MUA/Ps). Canada does not define HPSAs and MUA/Ps, so it is unknown whether or not the minority population in Saskatchewan exists in a medically underserved area. Appendix O, Socioeconomics, provides information about the HPSAs and MUA/Ps in relation to areas with minority and/or low-income populations.

Tax Revenues and Property Values

Under the Rail/Pipeline Scenario, the new terminal in Epping would cost $110 million and new terminals in Stroud would cost $700 million and would generate state and local government sales and use tax and fuel tax revenue during construction. During construction the terminals in Lloydminster would also cost about $700 million and generate provincial sales taxes, goods and services taxes, and hotel taxes. Once in operation and on the tax roll, the terminals would generate county property tax revenue. Many states along the rail routes would assess a property or similar tax on the new railcar traffic passing through, generating additional revenue. Railcar taxes typically go to a state fund for use according to each state’s tax policy. The Canadian terminals would generate municipal property tax revenue. (Government of Saskatchewan 2012)

Impacts to private property values in North Dakota and Oklahoma could occur under the Rail/Pipeline Scenario if there are residential land uses that would experience offsite nuisance effects but would receive no offsetting consideration from being in the vicinity of the terminals, although there already are oil transportation facilities near these sites. Construction and operation of rail facilities, additional connecting pipelines, and additional train traffic could have an adverse effect on local property values. These would be long-term impacts, extending through the operations phase.

Traffic and Transportation

Under this scenario, up to 15 unit trains per day would arrive at Stroud, including 13 from Lloydminster, Saskatchewan and up to two from Epping, North Dakota. Depending on the mix of train types and the type of control system used, a typical Class 1 railroad segment can accommodate up to 48 unit trains per day with one set of tracks or up to 100 trains per day with two sets of tracks (Cambridge Systematics 2007). To accommodate new rail traffic in this scenario, railroads may need to add infrastructure components (e.g., passing tracks or a second set of tracks) or upgrade control equipment. These upgrades would likely occur on property owned by the railroads. As of 2007, most of the rail corridors included in this scenario had (or, with upgrades already likely to occur regardless of crude oil transport, were likely to have) substantial available capacity (Cambridge Systematics 2007). Overall, the rail system could accommodate additional traffic under this scenario.

Construction of the rail terminals at Epping and Stroud would involve large numbers of road trips by heavy trucks to transport construction materials and equipment to and from the sites. Especially near Stroud, where seven rail terminals would be built, this increased traffic could cause congestion on major and local roadways, and could require temporary traffic management solutions such as police escorts for oversize vehicles.

Under the Rail/Pipeline Scenario, rail loading and offloading facilities would be sited to avoid disruption of major surface transportation routes. This scenario would marginally increase delays for motorists at at-grade railroad crossings by adding additional periods of time when trains use those crossings; however, most major roads (i.e., freeways and high-traffic arterial roads) have grade-separated railroad crossings. Increased crossing delays would therefore have negligible impacts on regional or metropolitan-scale traffic patterns.

5.1.2.11 Cultural Resources

Environmental Setting

The Rail/Pipeline Scenario would include the construction of new facilities in three areas—Lloydminster (Saskatchewan), Epping (North Dakota), and Stroud/Cushing (Oklahoma). A brief overview of the cultural resources in these three areas is provided below.

While no cultural resources studies have been conducted in the Lloydminster area for this Supplemental EIS, review of aerial photographs shows that a small portion of the approximately 3,500 acres that would potentially be developed has already been disturbed by development, including structures and roads. This preliminary review shows that most of the area appears undeveloped, and would have the potential for intact cultural resources.

No cultural resources studies have been conducted in Stroud, Oklahoma, or Epping, North Dakota. However, both areas have undeveloped land adjacent to a transportation corridor, with close proximity to water resources. The regional topography, proximity to a transportation corridor, access to water, and apparent lack of prior disturbance, appears to suggest a relatively high potential for intact cultural resources.

Potential Impacts

Any ground disturbance, especially of previously undisturbed ground, could potentially directly impact cultural resources. The Area of Potential Effect (APE) for this scenario has not been subjected to systematic cultural resources studies at this time. The potential of the APE to include intact buried cultural resources would require evaluation through research and cultural resources surveys. If cultural resources were identified, follow-up studies could be required. In general terms, the archaeological potential of heavily disturbed areas, such as might be found in active rail yards, or within developed transportation corridors, is normally lower than in undisturbed areas. Archaeological potential is also contingent upon factors such as access to water, soil type, and topography, and would have to be evaluated for each area to be disturbed. Aboveground facilities have the potential to indirectly impact cultural resources from which they may be visible or audible. The potential for increased rail traffic to contribute to indirect impacts would require consideration. The APE would have to be evaluated for historic structures and archaeological sites that could be impacted by this scenario.

5.1.2.12 Air and Noise

Environmental Setting

The Rail/Pipeline Scenario would include the construction of new facilities in three areas—Lloydminster (Saskatchewan), Epping (North Dakota), and Stroud/Cushing (Oklahoma). This section also includes consideration of the rail lines and pipeline as operational use of these segments could affect air and noise resources. An overview of the air and noise characteristics of these areas is provided below.

The areas around the Lloydminster, Epping, and Stroud terminal sites are generally rangeland and other agricultural uses. The rail routes associated with this scenario would cross multiple rural counties in Canada and the United States. The existing air quality (including greenhouse gases [GHGs]) in Lloydminster, Epping, and Stroud is expected to be similar to that of the proposed Project area due to the similarities in land use (i.e., rangeland and agriculture).

Potential Impacts

This scenario would include new rail terminals in Lloydminster, Epping, and Stroud. On an aggregate basis, criteria pollutant emissions, direct and indirect GHG emissions, and noise levels during the operation phase for this scenario would be higher than that of the proposed Project (see Section 4.12.3, Potential Impacts), mainly due to the increased regular operation and location of railcars and new rail terminals.

<u>Air Quality</u>

Emissions of criteria pollutants would be generated during the construction and operation of the Rail/Pipeline Scenario. Emissions attributed to construction of the new rail terminals and pipeline under this scenario were not quantified due to a lack of design data. However, construction-related emissions would be short-term and similar to those of the proposed Project.

During the operation phase, WCSB crude oil would be transported regularly over railroads extending from Lloydminster, Saskatchewan, to Stroud, Oklahoma; and Bakken crude would be transported via rail from Epping, North Dakota, to Stroud. Under this scenario, two railway routes were evaluated from Lloydminster, to Stroud: Canadian Pacific Rail Route (1,903 miles); and CN Rail Route (2,008 miles). In terms of an air quality analysis, the only difference in the railway routes is the difference in route distances, so only one of the railway routes (Canadian Pacific Rail Route) was assessed in detail. Air quality impacts associated with the CN Railway Route would have a similar but slightly greater air quality impact as the Canadian Pacific Rail Route due to the longer rail length.

The trains transporting the WCSB and Bakken crudes would consume large amounts of diesel fuel each day, which equate to direct emissions of hydrocarbons (HCs) or volatile organic compounds (VOCs), carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO_2), and particulate matter (PM_{10} and $PM_{2.5}$). Emissions of VOCs would also be generated by “breathing” from 82 storage tanks holding over 6 million barrels (bbl) of crude oil. The total operational emissions (tons) estimated over the life of the project (50 years) presented in Table 5.1-7 are significantly greater than those associated with the combined construction and operation of the proposed Project.

Table 5.1-7 Comparison of Criteria Pollutant Emissions for the Rail/Pipeline Scenario and Proposed Project over a 50-Year Period

	Criteria Pollutant Emissions (tons)[a]					
Sources	**HC/VOC**	**CO**	**NO_x**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
Rail/Pipeline Scenario (operation phase)[a]	123,324	467,617	2,030,351	1,693	37,921	36,783
Proposed Project (construction phase; 6-8 months)[b]	158	2,724	1,218	50.2	6,799	1,415
Proposed Project (operation phase)[b]	25.5	NA[c]	NA	NA	NA	NA

[a] Details of air emission calculations for the Rail/Pipeline Scenario, including activity data, emission factors, and assumptions used can be found in Appendix Z, Estimated Criteria Pollutants, Noise, and GHG Emissions.
[b] Details of air emission calculations for the proposed Project, including activity data, emission factors, and assumptions used can be found in Tables 4.12-2 and 4.12-4.
[c] Not applicable (NA).

The rail emissions accounted for return trips (i.e., both loaded cargo going south and unloaded cargo going north). Detailed annual operational emissions (with activity data, emission factors, and assumptions) for this scenario can be found in Table 1 in Appendix Z, Estimated Criteria Pollutants, Noise, and GHG Emissions. The proposed Project is expected to emit 0.51 tons of VOCs per year during operations or 25.5 tons over the life of the project (i.e., from approximately 55 intermediate mainline valves along the pipeline route and from pump station components such as valves, pumps, flanges, and connectors). No other criteria pollutants or hazardous air pollutants would be emitted during the proposed Project operations (see Section 4.12.3.1, Air Quality). Unlike the proposed Project, for which human receptors (residences) are located at least 200 feet away from the air emission sources described above (i.e., pumps, valves, flanges and connectors at the pump stations), this scenario has human receptors as close as 39 feet to some segments of the rail line (e.g., in Cass, North Dakota).

The Rail/Pipeline Scenario would also generate fugitive VOC and methane emissions (direct emissions) from equipment at the new rail terminals and potential pump stations required for pipeline interconnections. Due to the speculative nature of these facilities, fugitive emissions could not be quantified.

Greenhouse Gases

Direct emissions of GHGs would occur during the construction and operation of the Rail/Pipeline Scenario. GHGs would be emitted during the construction phase from several sources or activities, such as clearing and open burning of vegetation during site preparation, operation of on-road vehicles transporting construction materials, and operation of construction equipment for the new pipeline, rail segments, multiple rail terminals, and fuel storage tanks. Due to limited activity data, GHG emissions from construction of the Rail/Pipeline Scenario were not quantified; however, these emissions would occur over short-term and temporary periods, similar to the proposed Project.

During the operation of this scenario, GHGs would be emitted directly from the combustion of diesel fuel in railcars traveling approximately 1,903 to 2,008 miles from Lloydminster, Saskatchewan, to Stroud, Oklahoma, and 1,347 miles from Epping, North Dakota, to Stroud, Oklahoma. As indicated earlier, two railway routes were evaluated under this scenario from Lloydminster, Saskatchewan, to Stroud, Oklahoma: Canadian Pacific Rail Route (1,903 miles) and CN Rail Route (2,008 miles). GHG impacts associated with the CN Rail Route would have a similar but slightly greater regional/global GHG impact as the Canadian Pacific Rail Route due to the longer route distance. The operation of diesel-fueled trains hauling Bakken crude to Epping, North Dakota, would also result in GHG emissions. The rail emissions accounted for return trips (i.e., both loaded cargo going south and unloaded cargo going north). The resulting direct emissions of GHGs (2,955,857 metric tons of carbon dioxide equivalents [CO_2e] per year) from this scenario can be found in Table 2 in Appendix Z, Estimated Criteria Pollutants, Noise, and GHG Emissions. The Rail/Pipeline Scenario would also result in indirect emissions of GHGs due to the operation of 15 new rail terminals and potential pumping stations. The new rail terminals would be required in Saskatchewan, North Dakota, and Oklahoma, and each is projected to require 5 megawatts (MW) of electric power to operate. Indirect GHG emissions (491,099 metric tons of CO_2e per year) for this scenario are presented in Table 5.1-8.

Table 5.1-8 Estimated Indirect Greenhouse Gas Electricity Emissions from the Rail/Pipeline Scenario

State/ Province	e-Grid Region[a]	No. of New Terminals	Power Requirement per Terminal (MW)	Annual Indirect Electricity Usage (MWh/yr)[b]	Greenhouse Gas Emissions (tons/year)[a]				Greenhouse Gas emissions (metric tons/year)
					CO_2	**CH_4**	**N_2O**	**CO_2e**	**CO_2e**
Saskatchewan	NA	7	5	306,600	256,856	13.5	6.6	259,235	235,175
North Dakota,	MROW	1	5	43,800	35,666	0.6	0.6	35,868	32,539
Oklahoma	SPSO	7	5	306,600	245,130	3.6	3.3	246,240	223,386
				TOTAL	**537,652**	**17.7**	**10.7**	**541,344**	**491,099**

[a] The e-Grid region for North Dakota and Oklahoma and emission factors and emission factors used in estimating annual emissions for each pollutant in both states were taken from USEPA's eGRID2012 version 1 database, Year 2009 (http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html). The GHG electricity factors used for estimating annual emissions for the terminal in Saskatchewan, Canada was taken from Environment Canada, National Inventory Report, 1990 - 2010, Annex 13 (Environment Canada 2012). The most recent GHG factors for Canada (Year 2010) were used. (http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/6598.php). [b] Annual indirect electricity usage was estimated based on the number of terminals, power requirements per terminal, and 8,760 hours of operation per year.

Notes: NA = Not applicable; MROW = Midwest Reliability Organization West; SPSO = Southwest Power Pool South; MW = megawatt; MWh/yr = megawatt-hour per year; CH_4 = methane; N_2O = nitrous oxides.

In aggregate, the total annual GHG emissions (direct and indirect) attributed to this scenario are approximately 3,447,000 metric tons CO_2e, which is about eight percent greater than for the proposed Project at just under 3,200,000 metric tons CO_2e (see Section 4.12.3.2, Greenhouse Gases).

Noise

Noise would be generated during the construction and operation of the Rail/Pipeline Scenario. Noise would be generated during the construction phase from the use of heavy construction equipment and vehicles for the new pipeline, rail segments, and multiple rail terminals and fuel storage tanks. Due to limited activity/design data, noise levels from the construction of this scenario were not quantified; however, this noise would occur over a short-term and temporary period, so construction noise impacts are expected to be comparable to those of the proposed Project.

During operation of the railcars that comprise this scenario, noise would be generated from the locomotives, movement of freight cars and wheels making contact with the rails as the train passes, train horns, and warning bells (crossing signals) at street crossings. People that live near rail yards, siding, or terminals likely would experience additional noise due to trains standing for extended periods with their engines idling, as well as from trucks and other mobile sources constantly moving in and out of the yard/terminal. As indicated earlier, two railway routes were considered under this scenario for the transfer of crude oil from Lloydminster, Saskatchewan, to Stroud, Oklahoma: Canadian Pacific Rail Route (1,903 miles); and CN Rail Route (2,008 miles). Both rail routes were evaluated separately for this noise assessment because both routes cross different states with different noise sensitive areas (NSAs) or receptors. Unlike the proposed Project, for which human receptors (residences) are located at least 200 feet away from the noise sources (pump stations), this scenario has human receptors as close as 39 feet to some segments of the rail line (e.g., in Cass, North Dakota).

The day-night sound levels (Ldn) from both rail routes were calculated in accordance with the methodology described by U.S. Department of Transportation (USDOT 2006) for commuter rail system. The calculation assumes up to 730,000 bbl of WCSB crude oil transported per day from Lloydminster, Saskatchewan to a storage facility at Stroud, Oklahoma, 581 bbl of crude oil per railcar, four diesel-powered locomotives per train unit with a speed of 40 miles per hour, and 100 railcars per train. Aerial photography was used to identify the closest NSAs within 0.5 mile of the rail corridor for both rail routes. The existing noise levels at the closest NSAs were estimated using the methodology described in USDOT 2006, which is based on the proximity of the NSAs to the existing rail routes. The noise calculations do not include potential noise from train horns, warning bells (crossing signals) at street crossings, and locomotive idling at layover tracks near terminals. The noise calculations also exclude potential noise attenuation from barriers such as vegetation blocking the line of sight between the source (train) and some receptors (NSAs).

Noise levels would vary depending on the distance of closest NSAs to the rail routes. This additional rail traffic could result to noise increases of approximately 10 decibels on the A-weighted scale (dBA) above existing levels (ambient noise levels are estimated to be 73 dBA at the closest NSA) at the source. Under the Canadian Pacific Route, Ldn levels could be as high as 83 dBA at the closest NSA in Cass, North Dakota (39 feet from the rail route). This level of Project-induced noise at an NSA is greater than the expected noise level at an NSA from pump station operations under the proposed Project, which was estimated to be approximately 79 dBA at 200 feet (closest receptor) (see Section 4.12.3.3, Noise). Similarly, under the CN route, Ldn levels (including existing levels) could be as high as 82 dBA at the closest NSA in Marion, Iowa (47 feet from the rail route). The addition of noise from train horns, warning bells, and locomotive idling would further increase noise levels at these NSAs, unless there are barriers present such as vegetation that blocks the line of sight between the trains and the NSAs. Detailed operational noise emissions (with activity data, distance to closest NSA, and assumptions) for this scenario can be found in Tables 3 and 4 in Appendix Z, Estimated Criteria Pollutants, Noise, and GHG Emissions.

This scenario also has the potential for noise due to the transport of 100,000 bpd of Bakken crude via trains from Epping, North Dakota to the storage facility at Stroud, Oklahoma (approximately 1,347 miles). Noise from the Epping-Stroud route was not quantified because approximately 90 percent of this rail route is the same as the Canadian Pacific route. The remaining 10 percent of this route goes through Williams, Mountrail, and Ward counties in North Dakota. The closest NSAs in these three counties are between 160 and 200 feet from the Epping-Stroud route, so Ldn levels for this portion of the Epping-Stroud route are expected to be lower than the Ldn levels for the nearest NSAs along the Canadian Pacific and CN rail routes. Based on the increased train traffic/volume and proximity of the NSAs to the rail routes, noise impacts from the Rail/Pipeline Scenario (i.e., Canadian Pacific route plus Epping-Stroud route or CN Route plus Epping-Stroud route) would be greater than those of the proposed Project.

5.1.2.13 Climate Change Effects on the Scenario

Environmental Setting

Historical Climate Trends

The historical changes in temperature for the region affected by the Rail/Pipeline Scenario are presented below in Table 5.1-9 and are similar to those discussed in Section 4.14, Climate Change Impacts on the Proposed Project. Overall, temperatures have been warming compared to historical averages. These historical climate trends are expected to continue and to intensify according to GHG emissions levels and associated projections of climate change (Intergovernmental Panel on Climate Change (IPCC) 2007 and 2012).

Table 5.1-9 Historical Changes in Temperature by State (1895-2009)

State	Annual Average (˚F[e] Increase)	Summer Average (˚F Increase)	Winter Average (˚F Increase)
Montana[a]	1.6	1.0	1.7
North Dakota[b]	2.9	1.8	5.0
South Dakota[b]	2.2	1.6	3.9
Nebraska[b]	1.2	0.7	1.8
Kansas[b]	1.1	0.6	2.0
Iowa[c]	1.0	0.4	1.5
Minnesota[c]	1.4	0.9	2.4
Missouri[c]	0.4	0.0	0.9
Oklahoma[d]	1.2	0.7	2.5

[a] Source: Breckner 2012; [b] Source: HPRCC 2012; [c] Source: SCIPP 2012; [d] Source: MRCC 2012; [e] Degrees Fahrenheit (˚F).

Projected Climate Trends

As part of preparation of this Supplemental EIS, an analysis was performed to evaluate the potential impacts of climate change on facilities that would be built under the Rail/Pipeline Scenario. The routes for the Rail/Pipeline Scenario would cross through several of the climate regions in the United States that were already discussed in Section 4.14, Climate Change Impacts on the Proposed Project. The Rail/Pipeline Scenario routes are east of the proposed Project pipeline route and pass through the Continental, Dry Temperate, and Prairie Climate Regions. In general, these climate regions are projected to experience the same overall trends in temperature and precipitation (see Tables 4.14-2 and 4.14-3).

Potential Impacts

The impacts of climate change on the pipeline portion (construction and operation) of the Rail/Pipeline Scenario would be similar to the proposed Project due to similarities in climate regions (see Section 4.14.2, Impacts on the Proposed Project). The climate modeling results described in Table 4.14-2, Projected Changes in Average Mean Daily Maximum Temperatures (2010-2099), show that there are very small relative differences between the affected climate regions in projected future temperature changes over baseline conditions by 2040. For precipitation, the relative difference is greater due to the differences in the baseline precipitation rates for each climate region (see Table 4.14-3, Projected Changes in Precipitation by Climate Region [2010-2099]). Increased high temperatures could have an impact on operation of the existing rail line. Increased hot temperatures above a certain level can cause compression and expansion of rail line (sun kinks or thermal misalignments). This can lead to service interruptions or derailment.

5.1.2.14 Potential Risk and Safety

Environmental Setting

The Rail/Pipeline Scenario would combine risk inherent in both pipeline and rail transport. However, the risks and consequences for using rail (freight trains) to transport hazardous materials are greater than those for the proposed Project, as crude oil transportation via rail has historically had a higher safety incident rate than pipelines, in terms of both fire/explosion and injuries (Trench 2003). Pipelines are the primary mode of transportation for crude oil, petroleum products, and natural gas; approximately 71 percent of crude oil and petroleum products are shipped by pipeline on a ton-mile basis. Tankers and barge traffic account for 22 percent of oil shipments. Trucking accounts for 4 percent of shipments, and rail for the remaining 3 percent (Furchtgott-Rott, 2012).

USDOT has compared the incident, injury, and fatality rates for oil and gas pipelines with those for transportation by road and rail for the period 2005 through 2009 (USDOT 2010). From these statistics, road has the highest rate of hazardous material incidents, with 651 incidents per billion ton-miles per year (Table 5.1-10). This is followed by rail, with 20 incidents per billion ton-miles per year. Natural gas transmission by pipeline has the next highest rate, with 0.89 incidents per billion ton-miles per year. Hazardous liquid product transmission by pipeline has the lowest rate of the four, with 0.61 incidents per billion ton-miles per year (Furchtgott-Rott 2012). The source reviewed for these incident rates does not distinguish between types of oil products, and pipeline data are based upon all reported incidents in the PHMSA database. Oil-related incidents also are not distinguished from other products, such as chemicals, in the rail and road statistics.

Table 5.1-10 Comparative Statistics for Hazardous Material Transportation Incident Rates (2005-2009)

Transport Mode	Billion Ton-Miles of Shipments	Average Hazmat Incidents per Year	Average Hazmat Incidents per Billion Ton-Miles per Year
Road	23.0	14,963	650.60
Railway	35.1	713	20.50
Hazardous Liquid Pipeline (Onshore)	584.1	354	0.61
Gas Transmission Pipeline (Onshore)	338.5	300	0.89

Source: Furchtgott-Rott 2012

The principal reported cause of spills for transporting crude oil via rail is derailment. Spills due to overfilling a railcar or a leaking car tank primarily occur at loading/unloading facilities. Once a railcar is part of a train, the integrity of the railcar is assumed complete unless an accident occurs. The following are the main threats that could contribute to a rail spill:

- Derailment: railcar separates from train tracks due to track damage, vandalism, or other hazard event;
- Train-train collision: railcar separates from the train due to impact with another train;
- Motor vehicle-train collision: railcar separates from the train due to impact with a motor vehicle; and
- Other train collisions: railcar separates from the train due to impact with track obstructions such as a collapsed bridge or debris on the track.

The throughput of the proposed Project pipeline is estimated at 730,000 bpd of diluted bitumen (dilbit) and 100,000 bpd of Bakken shale oil. The maximum size railcar allowed by regulations in 49 Code of Federal Regulations 179.13 is 34,500 gallons (about 820 bbl). Use of these cars to ship 730,000 bpd would require approximately 850 railcars per day moving from the loading sites to delivery points. At maximum capacity, approximately 1,010 railcars would be required to unload at the delivery points each day. It is likely that unit trains would be created and devoted exclusively to the Project, with each train consisting of from 60 to 100 railcars. Transporting the maximum throughput of 830,000 bpd would require 10 to 17 unit trains moving from the loading sites to delivery points, and the same number of (empty) unit trains making the return trip each day. It is possible that for continuous operation, the transporters may need to have additional trains in transit along the route or routes selected.

Potential Impacts

Surface Water

The existing railroads that would be crossed under this scenario could be adversely affected if a derailment causing a large spill occurred. If a spill occurred along a small, low-gradient tributary, the impact would be confined to the local area. If the spill occurred in a major river, such as the Mississippi River or other waterbody, impacts could be large and wide ranging.

Wetlands

Spills within wetlands would most likely be localized, unless they were to occur in open, flowing water conditions such as a river. A crude oil spill in a wetland could affect vegetation, soils, and hydrology. The magnitude of impact would depend on numerous factors including but not limited to the volume of spill, location of spill, wetland type (i.e., tidal versus wet meadow wetland), time of year, and spill response effectiveness. The construction of additional passing lanes to accommodate increased train traffic resulting from this scenario could result in permanent impacts to wetlands if passing lanes were constructed where wetlands occur. However, as there is some flexibility regarding the exact location of the passing lanes, it is expected that wetlands would be avoided by design.

Fisheries

The Rail/Pipeline Scenario railroad route would cross numerous major streams and rivers in Canada and the United States. Under this scenario, current risks to fisheries would increase due to the increase in the number of trains that would use the routes.

Threatened and Endangered Species

The existing rail routes cross mostly prairies and some forested land that include habitat for certain threatened and endangered species. These species could be affected in the case of a spill in its habitat.

5.1.3 Rail/Tanker Scenario

Under the Rail/Tanker Scenario, it was assumed that crude oil production in the WCSB and Bakken basins would increase at least to the level proposed for transport in the proposed Project (e.g., up to 730,000 bpd of WCSB crude oil and up to 100,000 bpd of Bakken crude oil). The Rail/Tanker Scenario is described in more detail in Section 2.2.3.3, Rail/Tanker Scenario. In summary, this scenario would include the following components for transporting the WCSB crude oil:

- A new, approximately 3,500-acre rail terminal and storage complex near Lloydminster, Saskatchewan, with access to a Class I major rail system, where the WCSB crude oil would be loaded onto 100-car unit trains;
- Use of approximately1,100 miles of existing rail lines from the proposed Lloydminster rail terminal complex to a new approximately 3,500-acre rail terminal complex where the oil would be offloaded from the rail cars, with a short pipeline connection to the port at Prince Rupert;
- An approximately 1,200-acre expansion of the existing port at Prince Rupert, where the crude oil would be temporarily stored and then loaded onto crude oil tankers;
- Transport via Suezmax crude oil vessels south along the Pacific Coast, through the Panama Canal, and north into the Gulf of Mexico; and
- Off-loading of the crude oil onto smaller vessels for final transport to the Gulf Coast area refineries.

Under this scenario, Bakken crude oil would still be transported via rail to Stroud/Cushing as proposed in the Rail/Pipeline Scenario. The following are components for transporting the Bakken crude oil:

- A proposed approximately 500-acre rail terminal and storage complex near Epping, North Dakota (to accommodate increased rail volume), where the Bakken crude oil would be loaded onto one to two 100-car unit trains per day
- Transport along approximately 1,350 miles of existing rail lines from the proposed Epping rail terminal to a proposed approximately 500-acre rail terminal and oil storage complex near Stroud, Oklahoma, where the crude oil would be offloaded. No specific railroad company or route between Epping and Stroud was identified for this segment, although it should be noted that Bakken crude oil is currently being transported via rail from Epping to Stroud.
- Transport via a new approximately 17-mile-long pipeline from the proposed Stroud crude oil storage complex to the existing Cushing, Oklahoma, crude oil terminal (referred to herein as the Cushing pipeline).
- Temporary storage in existing facilities at Cushing pending delivery via existing crude oil pipelines (e.g., Keystone Gulf Coast pipeline that is currently under construction) to Gulf Coast area refineries.

The locations for proposed rail terminals and the expanded port in Prince Rupert are meant to provide representative examples. The exact rail routes used at any one time could differ from those presented here because of congestion on certain lines, track maintenance and other factors outside the scope of this document.

In summary, the Rail/Tanker Scenario would take advantage of existing rail lines and crude oil pipelines and the existing Cushing storage facility and require little if any new rail tracks, but would require the construction of new rail terminals and crude oil storage facilities in Lloydminster, Prince Rupert, Epping, and Stroud; port expansion in Prince Rupert; as well a new, approximately 17-mile-long Stroud-Cushing pipeline. There is the potential that some improvements may be required along the existing rail lines and crude oil pipelines included in this scenario; the location, scale, and timing of these improvements are unknown, but they are believed to be minor in comparison with the overall scale of the scenario, and are thus not considered in this analysis.

The environmental setting and potential impacts for the Rail/Tanker Scenario are described below for each resource. Since the rail lines from Lloydminster to Prince Rupert and from Epping to Stroud and the pipeline from Cushing to the Gulf Coast area refineries already exist or are under construction, little or no improvements to these facilities are assumed to be necessary. Since no new construction would be needed, it is assumed that there would be no construction impact to any resources along these segments. There would also be little potential for operational impacts from increased rail traffic along the existing rail lines for most resources (i.e., geology, soils, water, wetlands, vegetation, wildlife, fish, threatened and endangered species, land use, and cultural resources), other than an increased potential for impacts from accidental releases, which is described in Potential Risk and Safety (Section 5.1.3.14) below.

In addition, the transport of the crude oil via tankers from Prince Rupert to the Gulf Coast area refineries would not have any effects on geology, soils, groundwater, wetlands, vegetation, land use, socioeconomics, noise, or cultural resources, other than in the event of a spill, which is discussed in Potential Risk and Safety (Section 5.1.3.14) below. The Gulf Coast area refineries already receive crude oil shipments via tankers from Mexico, Venezuela, and other locations; the Rail/Tanker Scenario is expected to simply displace these sources of crude oil with WCSB crude oil. Therefore, no new construction or new operational impacts are expected to occur as a result of this scenario at the Gulf Coast area refineries or surrounding habitats or communities.

The Rail/Tanker Scenario would include the construction of new facilities in four areas—Lloydminster (Saskatchewan), Prince Rupert (British Columbia), Epping (North Dakota), and Stroud/Cushing (Oklahoma). The resources of the Lloydminster, Epping, and Stroud/Cushing areas are the same as those described for the Rail/Pipeline Scenario, therefore the environmental setting discussion for each resource below only describes the setting for the Prince Rupert area. See Section 5.1.2, Rail/Pipeline Scenario, for a description of the environmental setting for the Lloydminster, Epping, and Stroud/Cushing areas.

In addition, the discussion of impacts for the Rail/Tanker Scenario below focuses on the proposed new rail terminals and expanded port facilities at Prince Rupert, as the impacts at the other proposed rail terminals and the Cushing pipeline would be the same as the for the Rail/Pipeline Scenario. The only exception would be that the size of the rail terminal at Stroud would be less under this scenario, as it is only receiving Bakken crude oil and not WCSB crude, and therefore the extent of the potential geologic impacts at this location would be proportionately less. Where applicable, impacts for the total Rail/Tanker Scenario (including impacts from construction at Lloydminster, Epping, Stroud/Cushing, and Prince Rupert) are referenced for comparison purposes (e.g., total wetland impacts). The existing rail lines are only discussed in terms of resources that would be affected by increased rail traffic (i.e., air, noise, socioeconomics) and the relative risk of accidental releases.

5.1.3.1 Geology

Environmental Setting

The local surface geology at the Prince Rupert site consists of bedrock (granitic rocks) overlain by glacial outwash and a thin soil cover. The local surface geology predominantly displays metamorphic formations overlain with colluvium and glacial till. The area is highly foliated, and topography is quite ridged (Environment 1995). Prince Rupert is located along the coastal region of Canada, which is seismically active.

Potential Impacts

Overall, construction of the proposed rail terminals, oil storage facilities, port facilities, and the pipeline for the Rail/Tanker Scenario would disturb approximately 9,427 acres of land. The construction and operational impacts on resources at the Lloydminster, Epping, and Stroud terminals and the Cushing pipeline would be essentially the same as for the Rail/Pipeline Scenario. Therefore, the following discussion of geologic impacts for the Rail/Tanker Scenario focuses on potential impacts at the Prince Rupert facilities.

At Prince Rupert, depth to bedrock is expected to be relatively shallow, so rock ripping and some blasting could be necessary. The impacts of rock ripping and blasting are limited to the immediate area and would not result in any significant impacts to the underlying or nearby geology. Excavation activities, erosion of fossil beds exposed due to grading, and unauthorized collection can damage or destroy paleontological resources during construction. The potential for finding paleontological resources in the areas that would be disturbed is unknown. The proposed Prince Rupert rail terminals and port complex would be located in areas that would not impact access to any existing surface mines and quarries or known fossil fuel or mineral resources. In terms of geologic hazards, the Prince Rupert terminals would be located along the coastal region of Canada, which is seismically active. In addition, the presence of steep slopes increases the risk of landslides and the port's coastal location increases the risk of flooding.

Routine operations of the Rail/Tanker Scenario would not involve disturbance of, or impacts to, the underlying geology, paleontological resources, or mineral and fossil fuel resources. The Prince Rupert rail terminals and port facilities would be designed to withstand potential seismic hazards and flooding, and would be located in areas that are not susceptible to subsidence.

5.1.3.2 Soils

Environmental Setting

The Prince Rupert terminals would be located in British Columbia. The soil groups that occur between Lloydminster and Prince Rupert include the Brunisols, Gray Luvisols, and Black Chernozemics. Podzols and Luvisols are the soil groups that would be traversed in British Columbia. In general, the Brunisols and Luvisols soil groups are associated with forest vegetation, are usually not well developed, and have a calcareous layer in the subsoil. The Podzol soils are relatively infertile and light-colored, and are typically found in coniferous forest areas in cool and humid regions. The Chernozemic soils are dark colored soils that have high organic matter content with textures that range from heavy clays to sands. The soils found within the Prince Rupert terminal and in the port area are typically organic soils over residual soils. These organic soils exhibit various stages of organic matter decomposition. The organic layer varies in depth, ranging from a thin veneer to about 12 inches.

Potential Impacts

Overall, construction of the proposed rail terminals, oil storage facilities, port facilities, and the pipeline for the Rail/Tanker Scenario would disturb approximately 9,427 acres of land. The construction and operational impacts on soil resources at the Lloydminster, Epping, and Stroud terminal complexes and the along the Cushing pipeline route would be the same as for the Rail/Pipeline Scenario. Therefore, the following discussion of soil impacts for the Rail/Tanker Scenario focuses on potential impacts at the Prince Rupert facilities.

Construction of the proposed terminals and port expansion in Prince Rupert would result in the disturbance of approximately 3,500 acres of land for the construction of the rail terminal complex and approximately 1,200 acres for the expansion of the port. Potential impacts to the soils resources of the area could result from vegetation clearance, landscape grading, and re-contouring to ensure proper drainage, the installation of stormwater drainage systems, construction of the required infrastructure, and other construction activities.

One of the primary concerns during construction activities is soil erosion and sedimentation. Potential impacts to soils from erosion are expected to occur in areas where the slopes are greater than 20 percent and where the erosion potential due to their nature is high. Based on available landscape and soils information, the soils found in the area are not highly erodible and the required infrastructure would be located in areas that are relatively flat. Therefore, the impact of the proposed terminal complex and port construction activities on soil erosion would be minor.

Potential impacts resulting from the movement of heavy equipment required to support the planned clearance and construction activities may also impact the soil resources by causing the rutting (rutting occurs when soil strength is not sufficient to support the applied load from vehicle traffic) and compaction of susceptible soils. In general, compaction and rutting can affect hydrology and result in the loss of soil by erosion and productivity. Given that the soils of the area are primarily organic over residual material, which are less susceptible to compaction, compaction and rutting is not considered a widespread concern, and the impacts to the soil resources are expected to be minor.

5.1.3.3 Water Resources

Groundwater

Environmental Setting

The Prince Rupert Terminals and port expansion would occur in British Columbia on Kaien Island, which receives about 102 inches of rainfall per year. The terminals would be located on an inlet that is part of the eastern Pacific Ocean on the Venn Passage near the much larger Inland Passage, which extends from Washington State to Alaska along the islands and mainland of British Columbia, Canada. Venn and Inland Passages are marine (salt water) waterbodies. The islands consist of bedrock (granitic rocks) overlain by glacial outwash and a thin soil cover. Groundwater is shallow, poor quality, and unused. Drinking water is derived from lakes on the mainland. Water quality in the terminal complex area is seawater and inland brackish.

Potential Impacts

The construction and operational impacts on water resources at the Lloydminster, Epping, and Stroud terminal complex sites and along the Cushing pipeline route would be the same as for the Rail/Pipeline Scenario. The only exception would be that the size of the rail terminal at Stroud would be less under this scenario, as it is only receiving Bakken crude oil and not WCSB crude, and therefore the extent of the potential groundwater impacts at this location would be proportionately less. Because of this, the following discussion of impacts to groundwater resources for the Rail/Tanker Scenario focuses on potential impacts at the Prince Rupert facilities.

During construction of the facilities at Prince Rupert, the primary potential impacts to groundwater would be spills or leaks from construction equipment. Mitigation for these impacts includes having in place appropriate plans in place and appropriate cleanup materials available.

During operations of the facilities at Prince Rupert, the primary potential impacts to groundwater would again most likely be spills or leaks from operation equipment or associated with crude oil unloading of railcars. Although the initial impacts of potential releases or spills may be contained or limited to soil, potential impacts to groundwater may occur depending on the depth to groundwater, soil characteristics (e.g., porosity, permeability), spill volume and extent, and whether the spill reaches surface waterbodies, some of which are interconnected to groundwater. The potential impacts to groundwater from spills or releases of crude oil or refined petroleum products as part of construction and operation of the Rail/Tanker Scenario would be similar to those expected for the proposed Project. These effects are discussed in more detail in Potential

Risk and Safety (Section 5.1.3.14). Mitigation for these potential spills and leaks would be similar to those for the proposed Project.

Surface Water

Environmental Setting

The upland character surrounding the potential Prince Rupert terminal area is dominated by bog forest uplands and the flowing surface water bodies are predominantly precipitation- and shallow groundwater-fed intermittent streams. Some open waterbodies are present in the southeast portion of Kaien Island. Tidal shore zones are of a rugged and rocky nature and receive wave energy generated by naturally occurring fetch and large wakes from marine traffic. Winter winds are strong and from the southeast to southwest, with surface currents predominantly northward from the Hecate Strait. Lighter summer winds have less influence on currents and allow freshwater runoff from land and deep water tidal effects to exert more control and provide variation in summer current patterns. Significant wind and tidal mixing tend to occur where waters are shallow and around islands and rocky points of land. The coastal landscape is predominantly fjords carved into the granitic Coast Mountains, created by the last of several glacial periods approximately 12,000 years ago. Shores tend to be rocky and steep with beaches restricted to sheltered areas adjacent to estuaries and the navigable straits and channels provide a wide variety of exposures and habitats.

Potential Impacts

Overall, construction of the proposed rail terminals, oil storage facilities, port facilities, and the pipeline for the Rail/Tanker Scenario would disturb approximately 9,427 acres of land. The construction and operational impacts on surface water resources at the Lloydminster, Epping, and Stroud terminal complex sites and along the Cushing pipeline route would be the same as for the Rail/Pipeline Scenario. The only exception would be that the size of the rail terminal at Stroud would be less under this scenario, as it is only receiving Bakken crude oil and not WCSB crude. Therefore the extent of the potential surface water impacts at this location would be proportionately less. Because of this, the following discussion of surface water impacts for the Rail/Tanker Scenario focuses on potential impacts at the Prince Rupert facilities.

Construction of the facilities at Prince Rupert would disturb approximately 4,700 acres. The primary potential impacts to surface waters include erosion and sedimentation and spills/leaks of hazardous materials. Mitigation for these impacts includes having in place appropriate SPCC plans in place and appropriate cleanup materials available.

During operations, the primary potential impacts to surface waters include stormwater runoff, spills, or leaks from operation equipment or associated with crude oil unloading of railcars. Provision of stormwater management measures would mitigate the impacts of stormwater runoff. The potential impacts to surface waters from spills or releases of crude oil or refined petroleum products as part of the operation of the Rail/Tanker Scenario would be similar to those expected for the proposed Project. These effects are discussed in more detail in Potential Risks and Safety (Section 5.1.3.14). Mitigation for these potential spills and leaks would be similar to those for the proposed Project.

5.1.3.4 Wetlands

Environmental Setting

Prince Rupert, British Columbia, is in the USEPA Level III Coastal Gap and Coastal Western Hemlock-Sitka Spruce Forest Ecoregion. These ecoregions contain extensive wetlands, including freshwater forested, scrub-shrub, and herbaceous wetlands associated with wet meadows, lakes, and rivers. These ecoregions are also characterized by intertidal marine wetlands and estuarine wetlands. Refer to Section 5.1.3.3, Water Resources for a general discussion of the surface water resources that are associated with the Rail/Tanker Scenario.

Potential Impacts

Potential adverse impacts to wetlands associated with this scenario are similar to those described in the Rail/Pipeline Scenario (Section 5.1.2.4, Wetlands), with the addition of new facilities in Prince Rupert, British Columbia. Overall, construction of the proposed rail terminals (including those for Lloydminster, Epping, Stroud, and Prince Rupert), oil storage facilities, an expanded port, and the pipeline for the Rail/Tanker Scenario would disturb about 9,427 acres of land, some of which include wetland habitat. The construction and operational impacts on wetland resources at the Lloydminster and Epping complex sites and along the Cushing pipeline route would be the same as for the Rail/Pipeline Scenario. Therefore, the following discussion of wetland impacts for the Rail/Tanker Scenario focuses on potential impacts at the smaller Stroud, Oklahoma, terminal and the Prince Rupert facilities.

Construction of the 500-acre Stroud terminal for the Rail/Tanker Scenario would result in approximately 3 acres of temporary or permanent impacts to freshwater ponds, and additional impacts to streams, based solely on the presence of wetlands known to occur according to the NWI database (NWI 2012). New rail terminals and an expanded port would be required at Prince Rupert. Based on preliminary aerial photo interpretation, it is estimated that approximately 34 acres of emergent (herbaceous) wetlands, 124 acres of scrub-shrub wetlands, and 22 acres of open water habitat would be affected by permanent impacts as a result of the Prince Rupert terminal construction. Other wetland types likely present that were not readily identifiable using aerial photo interpretation may include freshwater forested wetlands, estuarine wetlands and intertidal wetlands.

These estimates of potential wetland impacts at these representative terminal locations, which are based on aerial photo interpretations and secondary sources such as NWI mapping, are intended to be illustrative of the magnitude of actual impacts that may occur. Please note that wetland acreages estimated using the NWI (2012) database may differ from wetland acreages estimated using the NLCD (Fry et al. 2011) presented in Table 5.1-2. If rail terminals are constructed, the actual acreage of wetland impacts would be determined through a formal wetland delineation.

5.1.3.5 Terrestrial Vegetation

Environmental Setting

The Prince Rupert terminals and port facilities would be located in the Coastal Gap Level III Ecoregion. The vegetation immediately adjacent to the Pacific Ocean includes stunted, open-growing western red cedar, yellow cedar, and western hemlock with some stunted shore pine and Sitka spruce (TEFC 2012b). There are also open areas present within the affected areas. It is unclear if biologically unique landscapes or vegetation communities of concern exist within the proposed Prince Rupert terminal complex boundary.

Potential Impacts

Overall, construction of the proposed rail terminal complexes, oil storage facilities, port facilities, and the pipeline for the Rail/Tanker Scenario would disturb about 9,427 acres (Table 5.1-11). The construction and operational impacts on terrestrial vegetation at the Lloydminster, Epping, and Stroud terminal complex sites and along the Cushing pipeline route would be the same as for the Rail/Pipeline Scenario. The only exception would be that the size of the rail terminal at Stroud would be less under this scenario, as it is only receiving Bakken crude oil and not WCSB crude, and therefore the extent of the potential terrestrial vegetation impacts at this location would be proportionately less. Therefore, the following discussion of terrestrial vegetation impacts for the Rail/Tanker Scenario focuses on potential impacts at the Prince Rupert facilities.

Table 5.1-11. Potential Impacts to Terrestrial Vegetation by Landcover Type under the Rail/Tanker Scenario

	Acreage				
Land Cover	**Prince Rupert**	**Lloydminster**	**Stroud**[a]	**Epping**	**Total Acres**
Grassland/Pasture	901	2,756	371	40	4,068
Developed	313	493	21	6	833
Deciduous Forest	3,307	0	106	0	3,413
Cultivated cropland	0	0	0	455	455
Open Water	22	60	0	0	82
Scrub/shrub wetlands	124	173	0	0	297
Emergent wetlands	34	20	0	0	54
Total	**4,700**[b]	**3,500**[b]	**500**[b]	**500**	**9,202**

[a] Plus land for a new pipeline between Stroud and Cushing that would affect 227 acres.
[b] May not add up due to rounding.

The proposed rail terminal complex and port facilities at Prince Rupert would require the clearing of up to 4,700 acres of natural vegetation, most of which is forested based on aerial photo interpretation. There does not appear to be any biologically unique landscapes or communities of conservation concern within the terminal complex boundary. Nearly all of these impacts would be permanent as natural habitats are converted for use as rail terminals and port facilities.

5.1.3.6 Wildlife

Environmental Setting

The habitat found in and around the Prince Rupert Terminals and along the Pacific Coast is in the Coastal Gap Ecoregion (TEFC 2012a). Many wildlife species use this coastal area for hunting, foraging, roosting, breeding, and nesting (Tourism Prince Rupert 2012). Wildlife characteristic of this ecoregion include grizzly bear (*Ursus arctos horribilis*), black bear (*Ursus americanus*), mountain goat (*Oreamnos americanus*), black-tailed deer (*Odocoileus hemionus columbianus*), wolf (*Canis lupus*), moose (*Alces alces*), mink (*Mustela* sp.), bald eagle

(*Haliaeetus leucocephalus*), seabirds, shorebirds, waterfowl, and grouse (*Tetraoninae*) (TEFC 2012a).

The Prince Rupert terminal complex would be located in the Northern Pacific Rainforest (Region 5) bird conservation region, which is an ecologically distinct region in North America with similar bird communities, habitats, and resource management issues as defined by the USNABCI (2000). The coast of the Northern Pacific Rainforest is characterized by river deltas and pockets of estuarine and freshwater wetlands set within steep, rocky shorelines. These wetlands provide critical nesting, wintering, and migration habitat for internationally significant populations of waterfowl and other wetland-dependent species. The area includes major stopover sites for migrating shorebirds, especially western sandpipers (*Calidris mauri*) and dunlins (*Calidris alpina*). Black oystercatchers (*Haematopus bachmani*), rock sandpipers (*Calidris ptilocnemis*), black turnstones (*Arenaria melanocephala*), and surfbirds (*Aphriza virgata*) are common wintering species. Nearshore marine areas support many nesting and wintering sea ducks. Many seabirds breed on offshore islands, including important populations of ancient murrelet (*Synthliboramphus antiquus*), rhinoceros auklet (*Cerorhinca monocerata*), tufted puffin (*Fratercula cirrhata*), common murre (*Uria aalge*), western gull (*Larus occidentalis*), glaucous-winged gull (*Larus glaucescens*), and Leach's storm-petrel (*Oceanodroma leucorhoa*). Pelagic waters provide habitat for large numbers of shearwaters (*Calonectris* spp. and *Puffinus* spp.), storm-petrels (*Hydrobatidae*), and black-footed albatross (*Phoebastria nigripes*) (USNABCI 2000).

Potential Impacts

Overall, construction of the proposed rail terminal complexes, oil storage facilities, port facilities, and the pipeline for the Rail/Tanker Scenario would disturb approximately 9,427 acres. The construction and operational impacts on wildlife resources at the Lloydminster, Epping, and Stroud terminal complexes and along the Cushing pipeline route would be the same as for the Rail/Pipeline Scenario. Therefore, the following discussion of wildlife resource impacts for the Rail/Tanker Scenario focuses on potential impacts at the Prince Rupert facilities.

Construction of the proposed rail terminal complex and port facilities at Prince Rupert would have impacts on wildlife resources, and result in the clearing of approximately 4,700 acres of wildlife habitat. Direct impacts could occur due to vegetation removal or conversion, obstructions to movement patterns, or the removal of native habitats that may be used for foraging, nesting, roosting, or other wildlife uses (Barber et al. 2010). Indirect impacts to wildlife are difficult to quantify and are dependent on the sensitivity of the species, individual, type and timing of activity, physical parameters (e.g., cover, climate, and topography), and seasonal use patterns of the species (Berger 2004). Most of these impacts would be essentially permanent.

5.1.3.7 Fisheries

Environmental Setting

Prince Rupert is an important deepwater port and transportation hub of the northern coast of British Columbia. It is located on the northwest shore of Kaien Island, which is connected to the mainland by a short bridge. The town of Prince Rupert is just north of the mouth of the Skeena River, a major salmon-producing river. Key commercial fisheries include Pacific salmon, halibut, herring, and groundfish, which are processed from Prince Rupert (Table 5.1-12). The

Prince Rupert area supports a high density of streams and rivers that host an array of valuable recreational fisheries for salmon, steelhead (anadromous rainbow trout), rainbow trout, lake trout, cutthroat trout, char, Arctic grayling, and northern pike (Table 5.1-12). These fisheries (both commercial and recreational) are managed by Canada's Department of Fisheries and Oceans.

Table 5.1-12 Fish Species Relevant to Prince Rupert Facilities

Pacific salmon/anadromous species[a]	Marine/Commercial Species[a]	Freshwater/Recreational Species[b]
Chinook salmon (*Oncorhynchus tshawytscha)*	walleye pollock (*Theragra chalcogramma)*	rainbow trout (*O. mykiss*)
sockeye salmon (*O. nerka*)	Pacific cod (*Gadus macrocephalus*)	lake trout (*Salvelinus namaycush*)
coho salmon (*O. kisutch*)	Pacific herring (*Clupea pallasi*)	cutthroat trout (*O. clarki*)
chum salmon (*O. keta*)	Pacific halibut (*Hippoglossus stenolepi*s)	Arctic grayling (*Thymallus arcticus*)
pink salmon (*O. gorbuscha*)	Pacific sardine (*Sardinops sagax*)	northern pike (*Esox lucius*)

Sources: [a] Irvine and Crawford 2012; [b] Department of Fisheries and Oceans 2012.

Potential Impacts

The construction and operational impacts on fishery resources at the Lloydminster, Epping, and Stroud terminal complex sites and along the Cushing pipeline route would be the same as for the Rail/Pipeline Scenario. Therefore, the following discussion of fishery impacts for the Rail/Tanker Scenario focuses on potential impacts at the Prince Rupert facilities. New impacts to commercial and recreational fisheries' habitats from the construction and operation of the facilities in Prince Rupert could include marine intertidal zones as well as fish spawning zones (e.g., herring), if present. There would likely be short-term impacts to the benthic (bottom dwelling) community during construction of the berths and mooring facilities. Bottom-dwelling fish (i.e., halibut, flounder, and rockfish) and marine invertebrates (i.e., clams, mussels, crabs, and other bivalves and crustaceans) could potentially be impacted during construction as well, but these affects are expected to be minor and temporary or short-term in duration.

Additional shipping traffic would increase underwater sound because large vessels, including tankers, put out relatively high noise levels (Popper and Hastings 2009). Fish and other aquatic organisms (including invertebrates and marine mammals) use sound as a means of communication and detection within the marine acoustic environment. Increased shipping traffic could mask natural sounds by increasing the ambient noise environment from Prince Rupert Harbor and along the marine route to the Gulf Coast area. Long-lasting sounds, such as those caused by continuous ship operation, can cause a general increase in background noise and there is a risk that such sounds, while not causing immediate injury, could mask biologically important sounds, cause hearing loss in affected organisms, and/or have an impact on stress levels and on the immune systems of aquatic species (Popper and Hastings 2009).

Exotic and invasive species are sometimes transferred in the ballast water of tanker ships. Monitoring and controls would need to be implemented to treat ballast water discharged into Prince Rupert Harbor such that invasive or exotic species would not be released into the marine environment.

5.1.3.8 Threatened and Endangered Species

Environmental Setting

This section focuses on animal and plant species present in the Prince Rupert area that are Canada SARA protected. As a coastal area along the Pacific Migratory Bird Route, and an area that receives a lot of precipitation and is heavily forested, many wildlife species inhabit the area, as discussed in Section 5.1.3.6, Wildlife. According to the British Columbia (B.C.) Conservation Data Centre (2012), only one SARA threatened/endangered species is known to occur in Prince Rupert—the green sturgeon (*Acipenser medirostris*), a Pacific Ocean inhabitant. In addition, several SARA special concern species occur in Prince Rupert, including western toad (Anaxyrus boreas), coastal tailed frog (*Ascaphus truei*), North American racer (*Coluber constrictor*), grey whale (*Eschrichtius robustus*), and Stellar sea lion (*Eumetopias jubatus*) (B.C. Conservation Data Centre 2012).

Potential Impacts

The construction and operational impacts on threatened and endangered species at the Lloydminster, Epping, and Stroud terminal complex sites and along the Cushing pipeline route would be the same as for the Rail/Pipeline Scenario. Therefore, the following discussion of threatened and endangered species impacts for the Rail/Tanker Scenario focuses on potential impacts at the Prince Rupert facilities.

As indicated above, only one SARA threatened/endangered species is known to occur in the Prince Rupert area—the green sturgeon. The green sturgeon is typically found along nearshore marine waters, but is also commonly observed in bays and estuaries. The expansion of the proposed port facility could have minor adverse effects on the green sturgeon, but the sturgeon could readily avoid the port area.

Increased shipping traffic at Prince Rupert and as the vessels transit to the Gulf Coast area refineries may affect the feeding success of marine mammals (including threatened and endangered species) through disturbance, because the noise generated by tankers could reduce the effectiveness of echolocation used by marine mammals to forage for food. Whales use underwater vocalizations to communicate between individuals while hunting and while engaged in other behaviors. Increased underwater noise from additional shipping traffic could disrupt these vocalizations and alter the behavior of pods of whales. Moreover, additional boat and tanker traffic could also increase the potential for collisions between marine mammals and shipping vessels. These effects would be additive in nature and could potentially add to existing disturbance effects and collision risks caused by the current level of shipping traffic, commercial and recreational fishing, and cruise ship passage.

5.1.3.9 Land Use, Recreation, and Visual Resources

Environmental Setting

Land use, recreation, and visual resources for the Prince Rupert area where the new terminals and expanded port facilities would be built differ sharply from the other terminal sites. Prince Rupert is located on an inlet of the Pacific Ocean in a heavily forested area of British Columbia. Urban land use is generally limited to the communities in and around the city of Prince Rupert, with some small outlying communities and villages in the area. Given Prince Rupert's role as a terminus of the Alaska Ferry System, many people see the port and surrounding areas in a recreational context. The area is largely undeveloped and would be sensitive to changes in the visual landscape.

Potential Impacts

Overall, construction of the proposed rail terminal complex, oil storage facilities, and port facilities for the Rail/Tanker Scenario would disturb approximately 9,427 acres of land in Prince Rupert (Natural Resources Canada 2012). If constructed on previously undeveloped land, the new facilities would primarily impact mixed forest (Natural Resources Canada 2012). The construction and operational impacts on land use, recreation, and visual resources at the Lloydminster, Epping, and Stroud terminal complex sites and along the Cushing pipeline route would be the same as for the Rail/Pipeline Scenario.

5.1.3.10 Socioeconomics

Environmental Setting

This route scenario intersects nine Canadian census divisions within three provinces: British Columbia, Alberta, and Saskatchewan (see Table 5.1-13). The Bakken to Stroud rail corridor would intersect 59 U.S. counties in eight states. This scenario provides for the construction of terminal facilities in Prince Rupert, British Columbia; Lloydminster, Saskatchewan; Epping, North Dakota; and Stroud/Cushing, Oklahoma. The terminus of the tanker route is along the Gulf Coast in Houston and Port Arthur, Texas. The route would affect two metropolitan areas: Edmonton, Alberta; and Port Arthur, Texas.

Table 5.1-13 U.S. States and Counties and Canadian census Divisions affected by the Rail/Tanker Scenario

State (U.S.)/Province (CA)	Number of Counties (U.S.)/Census Divisions (CA)	Counties (U.S.)/Census Divisions (CA)
Rail/Tanker Corridor		
Canada		
British Columbia	4	Skeena-Queen Charlotte; Kitimat-Stikine; Bulkley-Nechako; Fraser-Fort George
Alberta	4	#15; #14; #11; #10
Saskatchewan	1	#17
Bakken to Stroud Rail Corridor		
United States		
North Dakota	13	Williams; Mountrail; Ward; McHenry; Pierce; Wells; Eddy; Foster; Griggs; Steele; Barnes; Cass; Richland
Minnesota	14	Clay; Wilkin; Grant; Traverse; Stevens; Pope; Swift; Kandiyohi; Chippewa; Yellow Medicine; Lincoln; Lyon; Pipestone; Rock
South Dakota	1	Minnehaha
Iowa	6	Lyon; Sioux; Plymouth; Woodbury; Mills; Fremont
Nebraska	6	Dakota; Thurston; Burt; Dodge; Saunders; Cass
Missouri	7	Atchison; Holt; Andrew; Buchanan; Platte; Clay; Jackson

State (U.S.)/Province (CA)	Number of Counties (U.S.)/Census Divisions (CA)	Counties (U.S.)/Census Divisions (CA)
Kansas	7	Wyandotte; Johnson; Miami; Linn; Bourbon; Crawford; Cherokee
Oklahoma	7	Craig; Ottawa; Rogers; Delaware; Tulsa; Lincoln; Creek
Terminal Facilities		
Canada		
British Columbia	1	Skeena-Queen Charlotte
Saskatchewan	1	#17
United States		
North Dakota	1	Williams
Oklahoma	2	Lincoln; Creek
Texas	2	Jefferson; Harris

Population[4]

In 2010-2011, just over 1.5 million persons lived along the corridors in Canada affected by the Rail/Tanker Scenario (see Table 5.1-14) compared to approximately 268,000 persons for the proposed Project (see Table 3.10-5). The total population in the areas of the terminal facilities in Texas is approximately 4.3 million. Prince Rupert, Lloydminster, Epping, and Stroud contain much smaller populations.

Table 5.1-14 Population Affected Under the Rail/Tanker Scenario

State (U.S.)/Territory(CA)	Population[a]
Rail/Tanker Corridor	
Canada	
British Columbia	187,232
Alberta	1,360,721
Pipeline Corridor Total	*1,547,953*
Terminal Facilities	
United States	
North Dakota	22,398
Texas	4,344,732
Project Area Total	*5,915,083*

Source: U.S. Census Bureau 2010; Statistics Canada 2012.

[a] Population data are from 2011 for Canadian areas.
Note: The table only includes the population of the counties and census divisions the route would go through; not the population of the states/provinces as a whole.

Several areas potentially affected by this option contain meaningfully greater minority or low income populations:

- Prince Rupert City and the district in which it is located, Skeena-Queen Charlotte, contain aboriginal populations that exceed 35 percent of their total populations.
- Census Division 17 in Saskatchewan has an aboriginal population, 12,000 persons out of a population of 40,000.

[4] Population data were collected by county in the United States and by census division in Canada.

- Williams County, North Dakota, has a multiracial population 644 persons out of a population of 22,400.
- The cities of Port Arthur and Houston, as well as their respective counties, have aggregate minority populations, resulting from large numbers of African Americans. These cities also exceed criteria for multiple other populations as well as for low-income.

At the Epping Terminal in Williams County, North Dakota, the multiracial population is 644 persons out of a total population of 22,400. Detailed data for this environmental justice assessment are presented in Appendix O, Socioeconomics.

Traffic and Transportation

The Rail/Tanker Scenario would utilize existing Class I railroads to transport crude oil from Lloydminster to the Port of Prince Rupert, British Columbia, for shipment to new existing ports along the Gulf Coast area. As described in Section 5.1.2.10, Socioeconomics, the rail lines have capacity to accommodate substantial rail volumes. Prince Rupert and the Gulf Coast area both have substantial international shipping activity. The Gulf Coast area crude oil ports likely to be used under this scenario are already designed and configured to accept deliveries of crude oil, while the Prince Rupert port facilities are not configured in this way.

Potential Impacts

This section also includes consideration of the Lloydminster to Prince Rupert and Epping to Stroud rail lines; the Cushing pipeline; and the pipeline for onward delivery of crude oil from Cushing to Gulf Coast area refineries because socioeconomics is a resource that could be affected by scenario operations. Additionally, this scenario would include the transportation of crude from Epping, North Dakota, to Stroud/Cushing, Oklahoma, as detailed in the Canadian Pacific Rail/Pipeline Route (See Section 5.1.2.10, Socioeconomics). An overview of the potential construction and operational impacts is presented below.

Population/Housing

Construction and operations activities are not expected to have a significant effect on population and housing for this scenario. Because construction and operations job estimates have not yet been determined for this scenario, worker requirements for Prince Rupert, Lloydminster, and Epping are assumed to be minor, similar to those under the Rail/Pipeline Scenario. The counties surrounding Port Arthur and Houston have a combined population of over 4.3 million persons. Therefore, effects on the local population from an influx of workers would be negligible.

During construction, additional temporary housing could be needed in Lloydminster and in Prince Rupert. In Lloydminster, the number of hotel/motel rooms is approximately 1,075 (TripAdvisor 2012). This number would likely be insufficient to house the approximately 2,000 workers that would need lodging. Prince Rupert only has about 740 hotel/motel rooms (TripAdvisor 2012). Epping and the cities of Port Arthur and Houston have enough short-term housing so that additional accommodations would not be necessary in these areas. While the 287 hotel/motel rooms near Stroud/Cushing (see Final EIS Section 3.10) alone would not provide capacity for the over 2,000 workers needed, the cities of Tulsa and Oklahoma City, Oklahoma, are both within commuting distance, and would provide enough commercial housing to accommodate the workforce.

Local Economic Activity

This scenario would include transportation of WCSB crude oil that is primarily located outside the United States. New rail infrastructure and operations would occur in western Canada as crude oil would be transported to Prince Rupert. Tanker infrastructure and operations would be affected as ships transport crude oil from Prince Rupert through the Panama Canal to Texas ports near Houston. Other than U.S. firms that may own and operate tankers, U.S. industries would only become engaged in the transport of WCSB crude oil as tankers approach Gulf Coast area ports. Firms involved in lightering (off-loading onto smaller ships for final delivery in the Port of Houston), port management, unloading, and transport of the oil from the port to refineries would all realize workforce and payroll effects. Because details regarding port operations are beyond the scope of this analysis, economic effects were not estimated.

Direct capital costs and employment required by facility construction in Lloydminster are identical to those for the Rail/Pipeline Scenario, and would include 1,900 jobs over a 2-year period. Direct construction expenditures for facilities at Prince Rupert would be approximately $700 million, with approximately 1,400 annual construction jobs.[5]. Estimates of indirect or induced effects for Lloydminster and Prince Rupert could not be made because the models used for the economic analyses in this Supplemental EIS do not extend into Canada.

The transport of Bakken crude oil would require facilities identical to those described for the Rail/Pipeline Scenario. As discussed above, indirect effects could not be estimated although some local effects could be anticipated. Effects resulting from the expenditure of worker income would result in about 10 additional jobs and $0.5 million of earnings throughout North Dakota.

Environmental Justice

Minority and low-income populations could be potentially affected by construction and operations activities related to the terminals. Impacts to minority and low-income populations during construction and would be similar to those described for the proposed Project and could possibly result in increased competition for medical or health services in underserved populations. Williams County, North Dakota; Jefferson County, Texas; and Harris County, Texas, which contain one or more minority populations, contain HPSAs and MUA/Ps. Canada does not define HPSA and MUA/P, so it is unknown whether or not the minority populations in Prince Rupert or Lloydminster exist in a medically underserved area.

Tax Revenues and Property Values

Under the Rail/Tanker Scenario a variety of taxes would be paid to a range of different jurisdictions and entities:

- Construction of a new rail terminal in North Dakota costing $110 million would generate state and local government sales and use tax and fuel tax revenue. During operations, the facility would generate county property tax revenue.

[5] Cost estimates are based on the cost of the Enbridge Northern Gateway marine terminal in Kitimat (Enbridge 2010).

- The Panama Canal Authority is an autonomous entity of the Government of Panama that operates the Panama Canal on a for-profit basis. Ships pay a toll to use the canal. Tankers carrying petroleum pay tolls set per 10,000 tons of laden weight as defined in the Panama Canal Universal Measurement System (Panama Canal Authority 2012).

The Port of Houston comprises public docks and facilities owned, managed, and leased by the Port of Houston Authority and facilities owned by the Authority's partners and lessees located on the Houston Ship Channel (Port of Houston Authority 2012). Deliveries of crude oil could go to refineries fronting the Houston Ship Channel. The Port Arthur International Public Port is connected to the Gulf of Mexico Intracoastal Waterway and the Sabine-Neches Ship Channel. Deliveries of crude oil could go to a refinery with docks on the Sabine-Neches Ship Channel (Port Arthur International Public Port 2011).

Private companies located and operating at both Houston and Port Arthur are state and local government taxpayers. Some facilities are located within United States Foreign Trade Zones at each port, which allows United States tax-free import-export activity. The U.S. government through the U.S. Army Corps of Engineers develops, maintains, and operates the Houston Ship Channel, the Intracoastal Waterway, and the Sabine-Neches Ship Channel as tax-supported public waterways.

During construction the terminals in Lloydminster and Prince Rupert would generate provincial sales taxes, goods and services taxes, and hotel taxes. Once in operation and on the tax roll, the Canadian terminals would generate municipal property tax revenue (Government of Saskatchewan 2012; British Columbia 2012).

Impacts to private property values in North Dakota could occur because of the Rail-Tanker Scenario if there are residential land uses that would experience offsite nuisance effects but would receive no offsetting consideration from being in the vicinity of the Epping Terminal, though there already are rail transportation facilities near this site. Impacts to private property values that might have occurred during operations along the permanent right-of-way of the proposed Project or its appurtenant facilities would be avoided by the Rail/Pipeline Scenario.

Traffic and Transportation

This scenario would add approximately 13 unit train trips per day to the CN and Canadian Pacific rail lines between Lloydminster and Prince Rupert, and one to two unit trains from Epping, North Dakota, to the Gulf Coast area via existing Class I railways in the United States. As described in Section 5.1.2.10, Socioeconomics, these Class I railroads typically have adequate capacity to accommodate such increased demand with little or no infrastructure upgrades. New loading facilities would be required in Lloydminster, and new tank and marine terminals would be required in Prince Rupert.

Construction of the tank and marine terminals at Prince Rupert, and the rail terminal at Epping would involve large numbers of road trips by heavy trucks to transport construction materials and equipment to and from the sites. Construction in Prince Rupert could also potentially involve vessel deliveries of material. This traffic could cause congestion on major roadways, and would likely require temporary traffic management solutions such as police escorts for oversize vehicles.

One to two additional Suezmax tanker vessels per day (430 tankers per year) would travel between Prince Rupert and the Gulf Coast area refinery ports via the Panama Canal. The WCSB crude oil arriving by tanker vessels would be essentially displacing current tankers bringing crude oil from Mexico, Venezuela, and other countries; therefore, there would be no net increase in vessel traffic in the Gulf of Mexico or the refinery port areas.

5.1.3.11 Cultural Resources

Environmental Setting

No cultural resources studies have been conducted for the Prince Rupert area. Review of aerial photographs shows that a small portion of the area that could potentially be developed has already been disturbed by development, including port facilities, structures, and roads. This preliminary review shows that most of the area appears undeveloped and would have the potential for intact buried cultural resources.

Potential Impacts

Overall, construction of the proposed rail terminals, oil storage facilities, port facilities, and the pipeline for the Rail/Tanker Scenario would disturb approximately 9,427 acres. The construction and operational impacts on cultural resources at the Lloydminster, Epping, and Stroud terminal complex sites and along the Cushing pipeline route would be the same as for the Rail/Pipeline Scenario. Therefore, the following discussion of cultural resources impacts for the Rail/Tanker Scenario focuses on potential impacts at the Prince Rupert facilities.

Any ground disturbance, especially of previously undisturbed ground, could potentially directly impact cultural resources. The APE for this scenario has not been subjected to systematic cultural resources studies at this time. The potential of the APE to include intact buried cultural resources would require evaluation through research and cultural resources surveys. If cultural resources were identified, follow-up studies could be required. In general terms, the archaeological potential of heavily disturbed areas, such as might be found in active rail yards or within developed transportation corridors, is normally lower than in undisturbed areas. Archaeological potential is also contingent upon factors such as access to water, soil type, and topography, and would have to be evaluated for each area to be disturbed. Aboveground facilities have the potential to indirectly impact cultural resources from which they may be visible or audible. The potential for increased rail traffic to contribute to indirect impacts would require consideration. The APE would have to be evaluated for historic structures and archaeological sites that could be impacted by this scenario.

5.1.3.12 Air and Noise

Environmental Setting

The areas surrounding the port at Prince Rupert and destination ports at the Gulf Coast area are mostly industrial due to the large marine vessel traffic and loading and unloading of cargoes. Due to the current industrial activities at the ports in Prince Rupert and the Gulf Coast area, the existing air emissions (including GHGs) and noise levels for this scenario are expected to be higher than for the area through which the proposed Project would pass.

Potential Impacts

This section also includes consideration of the Lloydminster to Prince Rupert and Epping to Stroud rail lines and the Cushing pipeline because air and noise is a resource that could be affected by scenario operations. A brief overview of potential construction and operational impacts is presented below. Under this scenario, Bakken crude oil would be transported from Epping, North Dakota, via existing railroad systems, and the air and noise impacts would be the same as described under the Rail/Pipeline Scenario above. The marine portion of this scenario is mostly located in open ocean away from receptors such as residences and businesses. On an aggregate basis, criteria pollutant emissions, direct and indirect GHG emissions, and noise levels during the operation phase for this scenario would be significantly higher than that of the proposed Project (see Section 4.12.3, Potential Impacts), mainly due to the increased regular operation of railcars, tankers, and new rail and marine terminals.

Air Quality

Emissions of criteria pollutants would be generated during the construction and operation of the Rail/Tanker Scenario. Emissions attributed to construction of the new rail, pipeline, and marine facilities under this scenario were not quantified due to a lack of design data. However, construction-related emissions would be short-term and temporary, like those of the proposed Project. Due to a significant portion of the transport route being located offshore, construction requirements likely would be less than those of the proposed Project, resulting in fewer construction-related emissions.

The rail cars and tankers transporting the crudes would consume large amounts of diesel fuel and fuel oil each day, which equate to direct emissions HC/VOCs, carbon monoxide (CO), NO_x, SO_2, PM_{10}, and $PM_{2.5}$. Emissions of VOCs would also be generated by the "breathing" of 85 storage tanks holding over 12 million bbl of crude oil. The criteria pollutant emissions would vary by transportation segment, particularly during marine-based transit. Oil tankers traveling from the Prince Rupert marine terminal through the Panama Canal to Houston/Port Arthur pass through several different operational zones, including reduced speed zones leading into and out of the ports, North American Emission Control Areas where the use of low-sulfur marine fuel is mandated, and offshore areas where the tankers travel at cruise speeds.

During the return trip, tankers are filled with seawater (ballast) to achieve buoyancy necessary for proper operation, which affects the transit speeds of the vessel. Furthermore, the tankers spend several days loading or unloading cargo at each marine terminal with auxiliary engines running (an activity called hoteling). The tanker emissions accounted for return trips (i.e., both loaded cargo going south and unloaded cargo going north). In aggregate, the total operational emissions (tons) estimated over the life of the project (50 years), presented in Table 5.1-15, are several times greater than those associated with the combined construction and operation of the proposed Project (see Section 4.12.3.1, Air Quality). Detailed operational emissions (with activity data, emission factors, and assumptions) for this scenario can be found in Tables 5 and 6 in Appendix Z, Estimated Criteria Pollutants, Noise, and GHG Emissions. During its long-term operation, the proposed Project is expected to emit 0.51 tons of VOCs per year or 25.5 tons over the life of the project from approximately 55 intermediate mainline valves along the pipeline route and from pump station components (valves, pumps, flanges, and connectors). No other criteria pollutant or hazardous air pollutants would be emitted during the proposed Project operations (see Section 4.12.3.1, Air Quality). Fugitive VOC emissions (direct emissions) would also be generated under this scenario from valves, pumps, flanges, and connectors at the new rail and marine port and potential pump stations. Due to limited design/activity data, these fugitive emissions could not be quantified.

Table 5.1-15 Comparison of Criteria Pollutant Emissions for the Rail/Tanker Scenario and Proposed Project over a 50-Year Period

	Criteria Pollutant Emissions (tons)[a]					
Sources	**HC/VOC**	**CO**	**NOx**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
Rail/Pipeline Scenario[a]	136,313	435,039	2,921,989	1,278,777	187,381	173,734
Proposed Project (construction phase; 6-8 months)[b]	158	2,724	1,218	50.2	6,799	1,415
Proposed Project (operation phase)[b]	25.5	NA[c]	NA	NA	NA	NA

[a] Details of air emission calculations for the Rail/Tanker Scenario, including activity data, emission factors, and assumptions used can be found in Appendix Z, Estimated Criteria Pollutants, Noise, and GHG Emissions.
[b] Details of air emission calculations for the proposed Project, including activity data, emission factors, and assumptions used can be found in Table 4.12-4.
[c] Not applicable (NA).

Greenhouse Gases

Direct emissions of GHGs would occur during the construction and operation of the Rail/Tanker Scenario. GHGs would be emitted during the construction phase from several sources or activities, such as clearing and open burning of vegetation during site preparation, operation of on-road vehicles transporting construction materials, and operation of construction equipment for the new pipeline, rail segments, multiple rail and marine terminals, and fuel storage tanks. Due to limited activity data, GHG emissions from construction of the Rail/Tanker Scenario were not quantified; however, these emissions would occur over a short-term and temporary period, so construction GHG impacts are expected to be comparable to the proposed Project.

During operation of the railcars and tankers that comprise this scenario, GHGs would be emitted directly from the combustion of diesel fuel in railcars traveling over 4,800 miles and fuel oil in marine tankers traveling over 13,600 miles round-trip. As indicated earlier, the emissions would vary by transportation segment, particularly during marine-based transit, which occurs in various segments. Oil-filled tankers traveling from the Prince Rupert marine terminal through the Panama Canal to Houston/Port Arthur pass through several different operational zones, including reduced speed zones leading into and out of the ports, North American Emission Control Areas where the use of low-sulfur marine fuel is mandated, and offshore areas where the tankers travel at cruise speeds. The tanker emissions accounted for return trips (i.e., both loaded cargo going south and unloaded cargo going north). The resulting direct GHG emissions (3,478,898 metric tons of CO_2e per year) from this scenario can be found in Tables 7 and 8 in Appendix Z, Estimated Criteria Pollutants, Noise, and GHG Emissions.

The Rail/Tanker Scenario would also result in indirect emissions of GHGs due to the operation of 16 new rail terminals, an expanded port, and potential pumping stations. The new rail terminals would be required in Saskatchewan, Prince Rupert Lloydminster, Saskatchewan, and Stroud, Oklahoma, and each is projected to require 5 MW of electric power to operate. Indirect GHG emissions (277,995 metric tons of CO_2e per year) for this scenario are presented in

Table 5.1-16. In aggregate, the total annual GHG emissions (direct and indirect) attributed to this scenario are approximately 3,757,000 metric tons CO_2e, which is approximately 17 percent greater than the proposed Project at just under 3,200,000 metric tons CO_2e (see Section 4.12.3.2, Greenhouse Gases).

Noise

Noise would be generated during the construction and operation of the Rail/Tanker Scenario. Noise would be generated during the construction phase from the use of heavy construction equipment and vehicles for the new pipeline, rail segments, and multiple rail and marine terminals, and fuel storage tanks. Due to limited activity/design data, noise levels from the construction of this scenario were not quantified; however, this noise would occur over a short-term and temporary period, so construction noise impacts are expected to be comparable to those of the proposed Project. During operation of the railcars and tanker ships that comprise this scenario, noise would be generated from the locomotives, movement of freight cars and wheels making contact with the rails as the train passes, train horns, warning bells (crossing signals) at street crossings, and tanker engines during hoteling and maneuverings at the new rail and marine terminals in Prince Rupert (British Columbia) and the existing terminals at the Gulf Coast area. Noise from the railcars would be similar to those described for the Rail/Pipeline Scenario, so NSAs in the immediate vicinity of the rail route in Canada would be impacted in a similar manner. The majority of the transport distance for this scenario (approximately 70 percent) is located in open ocean, away from receptors, such as residences and businesses.

5.1.3.13 Climate Change Effects on the Scenario

Environmental Setting

The climate change effects examined as part of this study can be broadly grouped into three categories:

- Temperature;
- Precipitation; and
- Sea level rise and coastal dynamics (tanker only).

Information on temperature and precipitation is presented in Section 4.14, Climate Change Impacts on the Proposed Project, and 5.1.2.13, Climate Change Effects on the Scenario. New information on sea level rise is presented in this section. Most of the Rail/Tanker Scenario is outside of the boundaries of this study, with the endpoint of this scenario in Texas, so consideration of climate effects in the subtropical climate region are included here. The tanker portion of this scenario is primarily affected by sea level rise and coastal dynamics.

Table 5.1-16 Estimated Indirect Greenhouse Gas Electricity Emissions under the Rail/ Tanker Scenario

State/ Province	e-Grid Region[a]	No. of New Terminals	Power Requirement per Terminal (MW)	Annual Indirect Electricity Usage (MWh/year)[b]	GHG Emissions (tons/year)[a]				GHG Emissions (metric tons/year)
					CO_2	CH_4	N_2O	CO_2e	CO_2e
Saskatchewan	NA	7	5	306,600	256,856	13.5	6.8	259,235	235,175
Prince Rupert	NA	8	5	350,400	11,201	2.3	0.3	11,333	10,281
North Dakota	MROW	1	5	43,800	35,666	0.6	0.6	35,868	32,539
				TOTAL	**303,723**	**16.5**	**7.6**	**306,436**	**277,995**

[a] The e-Grid region for North Dakota state and emission factors used in estimating annual emissions for each pollutant in the state were taken from USEPA's eGRID2012 version 1 database, Year 2009 (http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html). The GHG electricity factors used for estimating annual emissions for the terminals in Canada (Saskatchewan and Prince Rupert [British Columbia]) were taken from Environment Canada, National Inventory Report, 1990 - 2010, Annex 13 (Environment Canada 2012). The most recent GHG factors for Canada (Year 2010) were used. [b] Annual indirect electricity usage was estimated based on the number of terminals, power requirements per terminal, and 8,760 hours of operation per year.

Sea Level Rise and Coastal Dynamics

Sea level rise is a climate change effect applicable only to the tanker portion of the Rail/Tanker Scenario. Sea levels are projected to rise due to glacial melting and thermal expansion of the water. The rate, total increase, and likelihood of the rise is in part dependent on how rapid the ice sheets warm and is a source of ongoing scientific uncertainty. The United States Global Change Research Program (USGCRP) estimates that sea level rise could be between 3 to 4 feet by the end of the century. Table 5.1-17 presents the expected sea level rise for high and low emissions scenarios.

Table 5.1-17 Global Sea Level Rise Projections

Period	Emissions Scenarios	Global Sea Level Rise
2070/2099	Low Emission B1[a]	25 to 29 inches
2070/2099	Higher Emission A1F1[b]	37 to 41 inches

Source: USGCRP 2009.

[a] The B1 scenario assumes very rapid economic growth, a world population that peaks around 2050, and a very fast innovation and adoption of energy-efficient technologies.
[b] The A1F1 scenario assumes rapid economic growth, and a world population that peaks around 2050. Technological innovation and adoption of energy-efficient technologies is fossil intensive.

Subtropical Climate Region

Under the Rail/Tanker Scenario, the southern terminus would be located on the Gulf Coast area and would include ports in the Houston and Port Arthur, Texas area, which is in the subtropical climate region. Table 5.1-17 summarizes projected sea level rise for future scenarios of high and low GHG emissions. Any increase in sea level shifts the mean high tide, storm surge, and saltwater intrusion occur further inland.

Potential Impacts

The impacts of climate change effects on the construction and operation of the rail portion of the Rail/Tanker Scenario are similar to that of the proposed Project due to similarities in climate regions. However, the projected future climate change effect on sea level rise (i.e., tanker portion) does have the potential to adversely affect tanker ports in the Gulf Coast area. The region is in the Subtropical climate region, and along the coast of this region the sea level rise and subsidence already compound existing challenges. Increasing sea level projected due to climate changes as described above shifts the impact of mean high tide, storm surge, and saltwater intrusion to occur further inland and this would negatively affect reliable operation of the port infrastructure for tanker traffic. Mitigation of these climate effects could be addressed by making engineering and operational changes at the port.

5.1.3.14 Potential Risk and Safety

Environmental Setting

The Rail/Tanker Option would combine the risk inherent in both pipeline and oil tanker transport. However, the risks and consequences for using oil tankers to transport the hazardous materials are potentially greater than the proposed Project. Overall, crude oil transportation via oil tankers has historically had a higher safety incident rate than pipelines for fire/explosion, injuries, and deaths (Trench 2003). Spills have been reported while the vessel is loading, unloading, bunkering, or engaged in other operations (International Tanker Owners Pollution Federation Limited [ITOPF] 2011). The main causes of oil tanker spills are the following:

- Collisions: impact of the vessel with objects at sea, including other vessels (allision);
- Equipment failure: vessel system component fault or malfunction that originated the release of crude oil;
- Fires and explosions: combustion of the flammable cargo transported onboard;
- Groundings: running ashore of the vessel; and
- Hull failures: loss of mechanical integrity of the external shell of the vessel.

From 1970 to 2011, historical data by ITOPF show that collisions and groundings were the main causes of oil tanker spills worldwide. More recently, for example, on December 22, 2012 an oil tanker carrying 279,000 barrels of Bakken crude from Albany, NY to eastern Canada ran aground in the Hudson River, puncturing the outer hull of the double-hulled barge, although the inner hull was not breached and no oil was spilled in this incident.

Two data sets were studied for crude oil spills, for tankers up to 700 tons[6] and larger than 700 tons as shown in Figure 5.1.3-1 and Figure 5.1.3-2 (ITOPF 2011). These causes accounted for 46 percent and 52 percent in each group respectively. The third main cause of spill is dependent upon vessel size. Oil tankers may carry up to 2 million bbl of crude oil in their cargo tanks (Swift et. al. 2011).

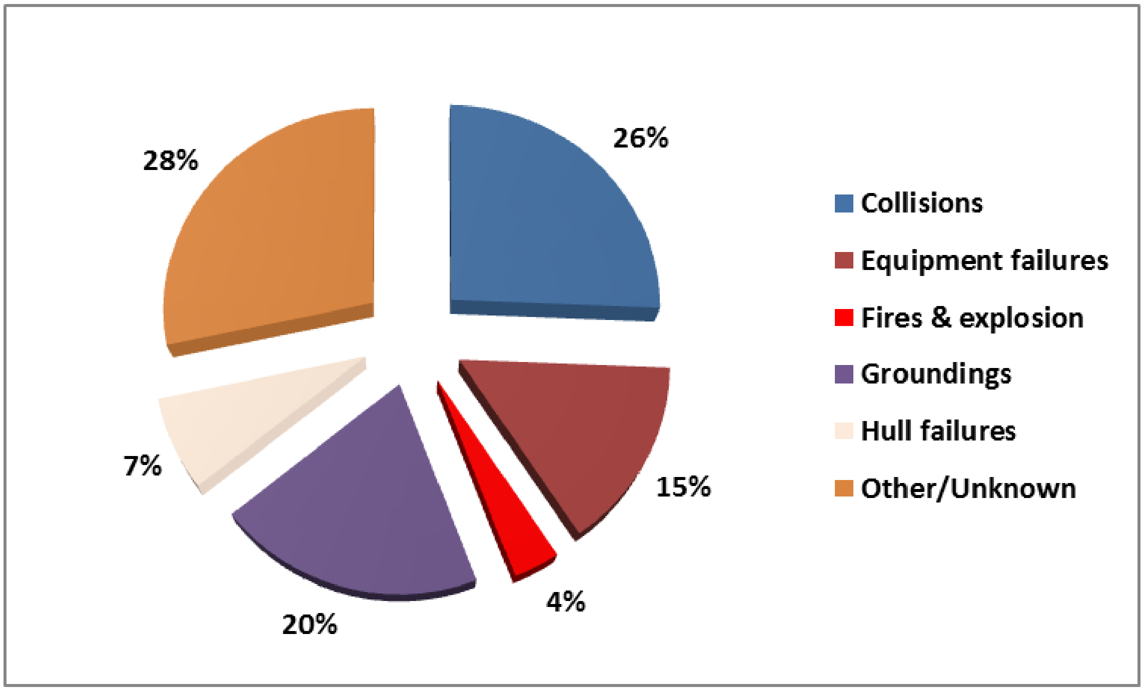
Potential Impacts

The spill migration and potential impacts of the rail portion of this option would be consistent with those described above in Section 3.13, Potential Releases. The only significant difference would be the loading and unloading of the railcars at tank farms near seaports. These areas could allow spills to migrate and impact seawaters and shorelines. However, the loading and unloading are generally carried out under supervision and would be addressed promptly by the operators, limiting the potential migration and impacts of the spill to the immediate area.

Once the tanker is loaded and at sea, the propagation and impacts of a spill could become significant. Oil tankers may carry up to 2,000,000 bbl of oil (Swift et al. 2011). A release of oil at sea would be influenced by wind, waves, and current. Depending on the volume of the release, the spreading of oil on the surface could impact many square miles of ocean and oil birds, fish, whales, and other mammals and could eventually impact shorelines. Oil would also mix with particulates in sea water and degrade. As this occurs some oil will begin to sink and either be retained in the water column (pelagic) or settle to the ocean floor (sessile). Pelagic oil could be consumed by fish or oil fauna passing though the submerged oil. Sessile oil could mix with bottom sediment and potentially consumed by bottom feeding fauna. Spills in ports-of-call could affect receptors similar to an open ocean release but also could temporarily affect vessel traffic and close ports for cleanup activities.

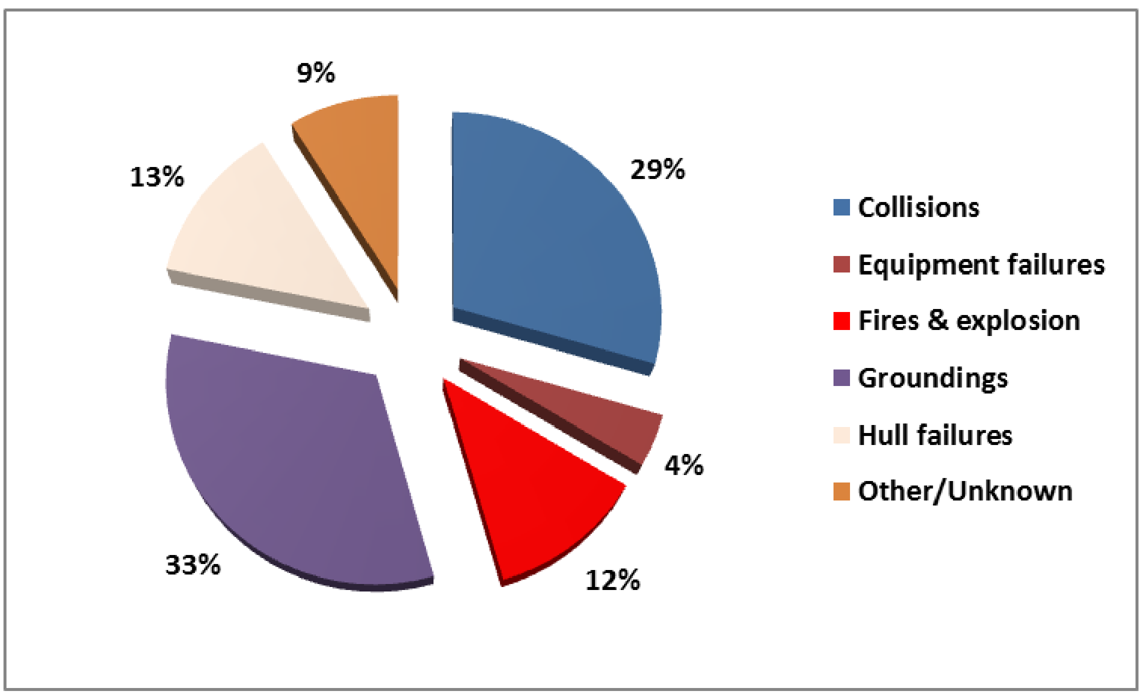
The identification of key receptors along the rail route alternative was not available for this evaluation. Therefore a comparison to the proposed project was not completed.

[6] Seven hundred tons capacity would be equivalent to 3,670 bbl of dilbit or 4,470 bbl of shale oil.



Source: ITOPF 2011.

Figure 5.1.3-1. Causes of Oil Tanker Spills Up to 700 Tons

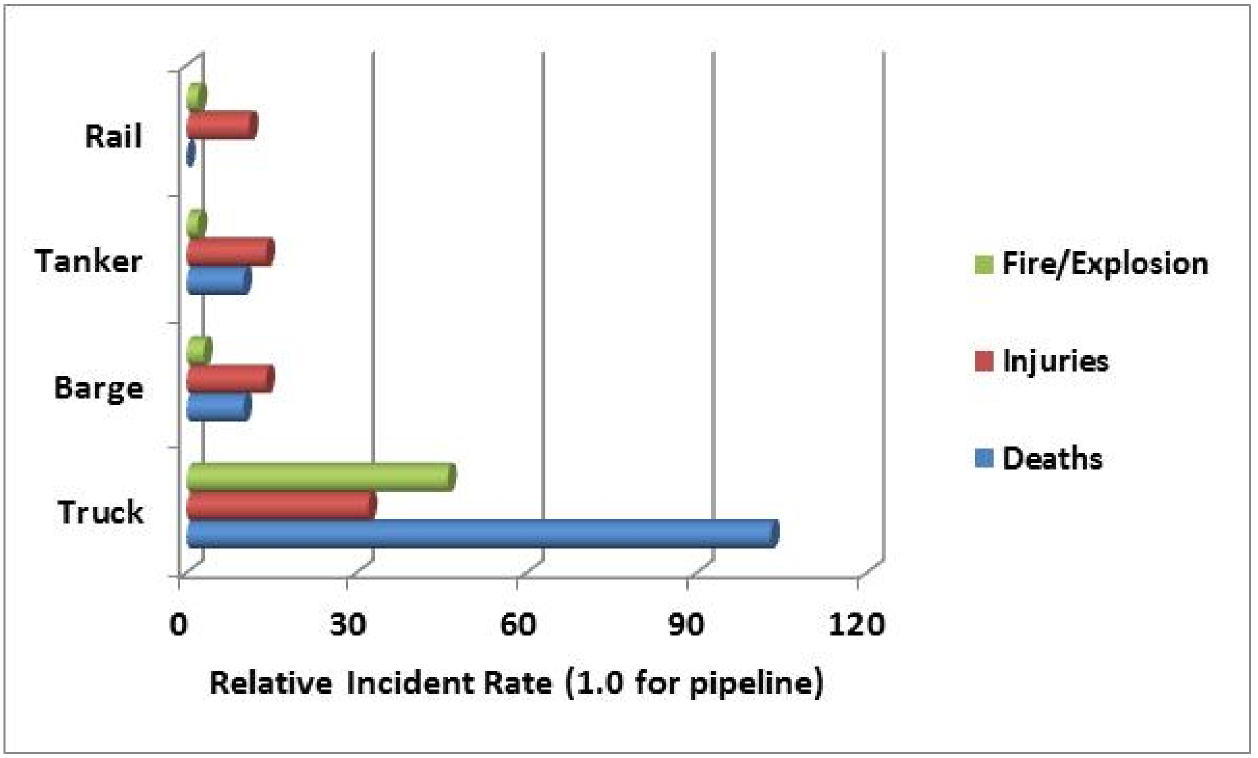


Source: ITOPF 2011.

Figure 5.1.3-2. Causes of Oil Tanker Spills Larger than 700 Tons

Safety

A study prepared for the Association of Oil Pipe Lines (Trench 2003) compared the safety record of U.S. pipelines with other hydrocarbon transportation modes. Between 1997 and 2001, the study showed that the tanker alternative transportation mode had a higher safety incident rate than pipelines. Figure 5.1.3-3 displays a graphical comparison of the oil transportation modes.



Source: Trench 2003.

Figure 5.1.3-3. Relative Incident Rates of Oil Transportation Modes (1997-2001)

The report results show that fires and explosions per ton-mile are 3 times higher, injuries per ton-mile are 14 times higher, and deaths per ton-mile are 10 times higher for both tank barge and tank ship operations than for pipelines (Trench 2003). A more recent study prepared by the AOPL (2012), which examined data from 1990-2009 for pipelines, water carriers, motor carriers, and railroads show that pipelines still transport the greatest volume of crude oil products, at 79.8 percent as of 2009, with water carriers transporting 19.4 percent.

Surface Water

The Lloydminster to Prince Rupert portion of this route would begin in the western plains at the Saskatchewan/British Columbia border and travel west through an area of high-relief mountains with large valleys, referred to as the Cordillera region. From a water resource perspective, the plains region of Canada is characterized by relatively large rivers with low gradients. The plains rivers drain the Rocky Mountains to the Arctic Ocean. The Cordillera region is largely composed of northwest-southwest trending mountain ranges that intercept large volumes of Pacific moisture traveling from the west towards the east. River systems in this region are supplied by a combination of seasonal rainfall, permanent snowfields, and glaciers. The following are larger rivers crossed by the existing rail lines between Lloydminster and Prince Rupert:

- North Saskatchewan River, Alberta
- Pembina River, Alberta
- McLeod River, Alberta
- Fraser River, British Columbia
- Nechako River, British Columbia
- Skeena River, British Columbia

Wetlands

Spills within wetlands would most likely be localized, unless they were to occur in open, flowing water conditions such as a river or in the ocean. A crude oil spill in a wetland could affect vegetation, soils, and hydrology. The magnitude of impact would depend on numerous factors including but not limited to the volume of spill, location of spill, wetland type (i.e., tidal versus wet meadow wetland), time of year, and spill response effectiveness. The construction of additional passing lanes to accommodate increased train traffic resulting from this scenario could result in permanent impacts to wetlands if passing lanes were constructed where wetlands occur. However, as there is some leeway regarding the exact location of the passing lanes, it is expected that wetlands would be avoided by design.

Fisheries

The Rail/Tanker Scenario railroad route would cross numerous major streams and rivers in Canada, many of which support anadromous fish species such as salmon (Table 5.1-12). Anadromous species are those that spawn and rear in freshwater but migrate to the ocean at a certain size and age. Pacific salmon are large anadromous fish that support valuable commercial and recreational fisheries. Commercial fisheries for salmon occur in marine water and most recreational fishing for salmon occurs in freshwater. Salmon eggs are vulnerable to the effects of fine sediment deposition because female salmon deposit their eggs in streambed gravels. Despite this vulnerability, the overland railway route is not expected to present any new impacts to salmon unless there is a spill into its habitat, although the risk of spills does increase under this scenario due to the increase in the number of trains that would use the route. Potential new impacts under the Rail/Tanker Scenario on commercially or recreationally significant fisheries along the route would be minor because the railroads that would be used are already built and in operation. However, the risk of an oil spill or release of oil or other materials still exists. The tanker portion of this route scenario is also subject to oil spill risk.

Threatened and Endangered Species

The rail route would cross over the Rocky Mountain region of western Alberta, which is inhabited by species such as the woodland caribou (*Rangifer tarandus*) (a SARA threatened species) and grizzly bear (a SARA special concern species). This region of British Columbia is home to a number of SARA threatened/endangered species, including the peregrine falcon

(*Falco peregrinus anatum*) (SARA threatened), salish sucker (*Catostomus* sp.) (SARA endangered), white sturgeon (*Acipenser transmontanus*) (SARA endangered), caribou (southern mountain population) (SARA threatened), northern goshawk (*Accipiter gentilis laingi*) (SARA threatened), and Haller's apple moss (*Bartramia halleriana*) (SARA threatened). A number of additional SARA special concern species inhabit the regions of Canada that would be traversed by the Rail/Tanker Scenario, including but not limited to those special concern species expected to occur in the Prince Rupert region, and discussed above (B.C. Conservation Centre 2012).

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