4.15 CUMULATIVE EFFECTS ASSESSMENT AND EXTRATERRITORIAL CONCERNS

A cumulative effects assessment (CEA) considers the impacts of the proposed Project in combination with impacts from the connected actions and actions from other past, present, and reasonably foreseeable future projects. Cumuative effects are described in the Council on Environmental Quality guidance on Considering Cumulative Effects under the National Environmental Policy Act, as: "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions" (40 Code of Federal Regulations 1508.7). In the 2011 Final Environmental Impact Statement (Final EIS), the CEA focused on existing, under construction, and planned linear energy transportation systems, including natural gas pipelines, crude oil pipelines, and electric transmission lines; water delivery projects; and a number of energy development projects.

The CEA presented in this Final Supplemental EIS seeks to focus the list of projects from the Final EIS as they pertain to the proposed Project and broaden the scope of past, present, and reasonably foreseeable future projects under consideration to include non-linear projects and other development activities with the potential to contribute to overall cumulative effects within the proposed Project area. In addition, the Final EIS focused on projects that would geographically intersect with the proposed Project; this Final Supplemental EIS CEA broadens the geographic boundary of the projects and activities considered to have the potential to contribute to cumulative effects. This broader perspective is provided to supplement the analysis provided in the Final EIS to support decision making. Within this context, although not within the project cumulative impact corridor (PCIC), this CEA also considers the potential for impacts associated with the proposed Project in combination with the TransCanada Gulf Coast Pipeline, which was completed in 2013.. This was done in response to public comments received on the scope of work for this Final Supplemental EIS, which indicated a concern that impacts from both projects (proposed Project plus the Gulf Coast Pipeline) would be additive. TransCanada Keystone Pipeline, LP (Keystone) has indicated that it considers the Gulf Coast Pipeline to have independent utility, and construction has been completed. Therefore, impacts associated with the Gulf Coast Pipeline were not evaluated beyond this CEA.

As a matter of Department policy, extraterritorial considerations related to the Canadian portion of the Keystone proposed Project are evaluated in Section 4.15.4, Extraterritorial Concerns, to the extent that the proposed Project would contribute to cumulative environmental impacts within Canada.

Accidental or emergency events may arise due to an unforeseen chain of events during the proposed Project's operational life. For an assessment of the potential short- and long-term effects of oil releases to the environment, see Section 4.13, Potential Releases; for a discussion of potential cumulative effects of oil releases to the environment, see Section 4.15.3.13, Potential Releases. Potential long-term and/or permanent beneficial impacts of proposed pipeline construction would be expected to occur as described elsewhere throughout this Final Supplemental EIS (e.g., in the form of increased tax revenues). However, the focus of this CEA is on potential adverse effects that may result from the proposed project on resources, ecosystems, and human communities. In addition, ancillary facilities (e.g., access roads, pump stations, and construction camps) in North Dakota and Kansas are not included in this CEA because the activities in these states would occur on previously developed/disturbed lands and/or

are geographically small areas. Therefore, these facilities would have negligible contributions to overall cumulative effects.

Summary

Past, present, and future projects and development activities (and thus the potential for cumulative effects) are heavily concentrated in key areas of the proposed Project route. These key areas are characterized by larger populations, which generally have greater demand for transportation (i.e., road, rail), energy generation and transmission (i.e., oil, gas, wind, mineral, electrical), and waste disposal. Key factors in controlling the extent and duration of cumulative effects are mitigation measures designed to reduce or offset effects and/or restore resources impacted by these projects to at or near pre-construction conditions. For the proposed Project, Keystone's Construction, Mitigation, and Reclamation Plan (CMRP) (see Appendix G), additional mitigations, individual federal and state agency permitting conditions, and/or existing laws and regulations all function to control potential impacts and reduce the proposed Project's contribution to cumulative effects.

In a geographic context, Fallon County in Montana has been identified as one of the primary areas for potential cumulative impacts because of its proximity to the Williston Basin oil and gas fields and its population center of Baker. The town of Nashua in southern Valley County, Montana, is also a potential cumulative impact area. The potential for cumulative impacts within South Dakota is not anticipated to be significant. In Nebraska, however, due to its central location between northern oil and gas fields and southern refineries, numerous natural gas, crude oil, and refined product pipelines already crisscross the state. Specifically, existing infrastructure/development is concentrated in the southern portion of the proposed Project route in Nebraska and is a primary area for potential cumulative impacts.

Cumulative impacts associated with the proposed Project and connected actions vary within individual resources. Generally, where long-term and/or permanent impacts are absent, the potential for additive cumulative effects with other past, present, and reasonably foreseeable future projects is also negligible. The potential for a given impact to contribute to cumulative impacts is based on the assumption that 1) the CMRP (see Appendix G) is successfully implemented, and 2) near pre-construction conditions are restored and maintained within the anticipated timeframes.

As a matter of policy, in addition to its environmental analysis of the proposed Project in the United States, the U.S. Department of State (the Department) has included information regarding potential impacts in Canada (see Section 4.15.4, Extraterritorial Concerns). In so doing, the Department was guided by Executive Order (EO) 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. The Canadian government conducted an environmental review of the portion of the proposed pipeline in Canada. As a result, and consistent with EO 12114, the Department did not conduct an in-depth assessment of the potential impacts of the Canadian portion of the proposed pipeline.

Canada's National Energy Board's (NEB) Environmental Screening Report (ESR) determined that with the implementation of Keystone's environmental protection procedures and mitigation measures, and with the NEB's conditions and recommendations, the proposed Keystone XL pipeline in Canada was not likely to cause significant adverse environmental effects. In addition, it is NEB's position that the proposed pipeline would not likely result in significant adverse

cumulative environmental effects in Canada in combination with other projects or activities that have been or will be carried out.

Potential impacts of the proposed pipeline on Aboriginal people were also considered by NEB. In their review, NEB found no specific evidence of Aboriginal use over the proposed pipeline route and no evidence that there would be impacts on areas where traditional cultural activities are currently carried out. NEB noted Keystone's commitment to ongoing Aboriginal consultation and engagement during construction and operation of the proposed pipeline, and NEB imposed conditions to this effect.

As indicated, the purpose of the CEA is to evaluate cumulative effects of the proposed Project. However, a substantial number of comments were received on the 2013 Draft Supplemental EIS raising concerns regarding impacts associated broadly with bitumen extraction. Due to the volume of comments received raising these issues, this Final Supplemental EIS addresses significant concerns expressed by commenters that relate to issues other than the potential cumulative effects of the proposed Project (see Section 4.15.4.2, Concerns Related to Oil Sands Extraction). In addition to consideration of the influence of the proposed pipeline on oil sands development in Canada, publicly available information from both governmental and non-governmental sources was analyzed and a summary of the information related to the environmental impacts of oil sands extraction, boreal forest reclamation, impacts to migratory birds, tailings ponds impacts on birds, and impacts to Aboriginal people is presented in this CEA.

4.15.1 Methods and Scope of the Cumulative Impacts Analysis

In general, the analysis of cumulative impacts in this CEA follows the processes recommended by Council on Environmental Quality (1997 and 2005) and the regulations at Title 40 of the Code of Federal Regulations Part 1508.7. The scope of the CEA is governed by the geographic and temporal boundaries that correlate to the resources impacted by the proposed Project, and how the proposed Project intersects with connected actions and other projects across these resources. In general, the geographic limits of the area evaluated in the CEA can be organized into three categories:

- Project Area—Defined as the area of physical disturbance associated with the proposed Project limits; that is, in and along the pipeline right-of-way (ROW) construction corridor and its ancillary facilities (e.g., access roads, pump stations, and construction camps).
- Local Area[1]—Defined as a 2-mile distance on either side of the proposed pipeline ROW corridor and its ancillary facilities.
- Regional—Defined by the potentially impacted resource (e.g., home range of a wildlife species, bird migration corridor, or a regional watershed).
- PCIC—Activities within the PCIC indicate geographic proximity to the proposed Project (e.g., project area or local area as noted above).

The temporal boundaries for this analysis reflect the nature and timing of the proposed Project activities as they relate to knowledge of past and present projects as well as the availability of information on future projects that have a high probability of proceeding. For any given project,

[1] Correlates to the socioeconomic analysis area as defined in Section 3.10, Socioeconomics.

the duration of potential impacts is typically categorized as temporary, short term, long term, or permanent:

- Temporary impacts would likely occur during construction, with the resources returning to pre-construction conditions almost immediately afterward.
- Short-term impacts are defined as those that would continue for approximately 3 years following construction.
- Long-term impacts are those where the resource would require longer than 3 years recovery.
- Permanent impacts occur as a result of activities that modify resources to the extent that they would not return to pre-construction conditions during the design life of the proposed Project (50 years), such as with construction of aboveground structures.

When considering the broad scope of evaluating the combined effects of past, present, and reasonably foreseeable future projects, it is the long-term and permanent impacts of individual projects that would have the greatest potential to combine with one another to create significant cumulative impacts. Therefore, the primary focus of this CEA is to gain an understanding of the potential combined long-term and/or permanent impacts to resources, ecosystems, and human communities from the proposed Project, connected actions, and other past, present, and reasonably foreseeable future projects (federal, non-federal, and private actions). Temporary and/or short-term impacts, which could occur concurrently (geographically and temporally) between the proposed Project, connected actions, and other projects to produce short term cumulative impacts, are considered qualitatively.

Key factors in controlling the temporal scale of cumulative effects are several measures designed to mitigate, offset, and/or restore impacted resources to pre-construction conditions to the extent practicable. Keystone's CMRP (see Appendix G), additional mitigations, individual federal and state agency permitting conditions, and/or existing laws and regulations all function to control potential impacts and reduce long-term and/or permanent effects. Therefore, this CEA incorporates the implementation of these measures in the evaluation of anticipated resource impacts, specifically as they affect the duration of impacts and their potential to contribute significantly to cumulative effects. The attribution of significance requires the assessment and integration of a number of lines of evidence, to include:

- The effectiveness of mitigation measures or other embedded controls;
- The geographic context of where the activities are taking place (e.g., pristine land versus previously-disturbed areas); and
- The degree to which impacts on a local scale are additive with similar impacts from other projects and activities, and their magnitude (i.e., relative contribution).

This analysis is enhanced through the use of geographic information system mapping, which is presented where applicable.

The remaining sections of this CEA are organized as follows:

- Section 4.15.2, Past, Present, and Reasonably Foreseeable Projects: This section evaluates reasonably identifiable federal, state, local, and private projects and/or development activities based on publically available information with possible effects that could be temporally and/or geographically coincident with those of the proposed Project on resources, ecosystems, and human communities. The discussion in this section is organized by the project/activity timeframe: past, present or future, with an accompanying table listing the identified project/activity. Connected actions to the proposed Project are presented separately following the other future project/activity descriptions.
- Section 4.15.3, Cumulative Impacts by Resource: This section discusses the potential cumulative impacts of the proposed Project and other actions by resource area, along with any pertinent mitigation actions, and how these anticipated cumulative impacts interact with the other past, present, and reasonably foreseeable future projects/activities described in Section 4.15.2.
- Section 4.15.4, Extraterritorial Concerns: This section discusses the potential extent to which the proposed Project would contribute to cumulative environmental impacts within Canada.

4.15.2 Past, Present, and Reasonably Foreseeable Projects

The proposed Project would occur in locations that include numerous existing, under construction, and planned major capital public and private projects, including oil and gas well fields, major product pipelines, water distribution lines, energy development projects (including wind farms), and associated electric transmission lines and mining projects. The identification of the projects and/or activities to be included in the cumulative impact analysis was accomplished through independent research, beginning with review of the Pipeline Hazardous Material Safety Administration (PHMSA) National Pipeline Mapping System (U.S. Department of Transportation 2012). This was followed by queries of the Montana, South Dakota, and Nebraska state government websites as well as private company websites providing publically available data and details on projects and activities within the geographic boundaries of interest. Please see Appendix W, Past, Present, and Reasonably Foreseeable Future Project Descriptions, for a more detailed description of the projects identified, as well as a complete list of the data sources accessed for this CEA.

As previously mentioned, the discussion in this section is organized by the project/activity timeframe: past, present, or future, with an accompanying table listing the identified project/activity. Connected actions to the proposed Project are presented separately following the other future project/activity descriptions.

4.15.2.1 Cumulative Impacts from Past Projects

Past projects and activities considered in the CEA are those that have been completed and their physical features are part of the current/existing landscape. Long-term and/or permanent effects from these projects/activities are considered to be potentially cumulative with the effects of the proposed Project. These projects are further described in Table 4.15-1 below. Unless otherwise noted, it is assumed the impacts of these projects are reflected in existing environmental conditions of each resource area as described in Chapter 3, Affected Environment.

Table 4.15-1 Representative Past Projects Considered in the Cumulative Effects Assessment

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
Crude Oil Pipelines and Storage Facilities			
Express-Platte Pipeline System	Two pipelines: the Express has been in operation since 1997, the Platte since 1952. Approximately 1,700 miles total of crude oil pipelines that are 20 (Platte) and 24 (Express) inches in diameter.	Southeastern Alberta; central Montana; northeastern Wyoming; south-central Nebraska; northeastern Kansas; north-central Missouri	The Express-Platte system would be within the PCIC for the proposed Project near Steele City, Nebraska.
Keystone Mainline Oil Pipeline	Approximately 1,379-mile-long crude oil pipeline has a design capacity between 435,000 barrels per day (bpd) to 591,000 bpd.	Southeastern Alberta; southern Saskatchewan; southwestern Manitoba; eastern North Dakota; eastern South Dakota; eastern Nebraska; northeastern Kansas; central Missouri; central Illinois	The Keystone Mainline Oil Pipeline would be within the PCIC near Steele City, Jefferson County, Nebraska.
Keystone Cushing Extension	298-mile-long, 36-inch-diameter crude oil pipeline from Steele City, Nebraska, to Cushing, Oklahoma.	Southern Nebraska; central Kansas; central Oklahoma	The northern portion of the Cushing Extension would be within the PCIC in Steele City, Jefferson County, Nebraska.
True Company Pipelines and Crude Oil Storage Facility	A system of more than 3,400 miles of crude oil gathering and transportation pipelines, including Bridger Pipeline, LLC that owns and operates the Poplar, Little Missouri, Powder River, Butte, Belle Fourche, Four Bears, Parshall, and Bridger pipeline systems. Three collector pipelines to transport production from the north, west, and east into the Butte Pipeline near Baker are under construction. Plains All American, LP owns the Poplar Pipeline from the Canadian border to Raymond Station, Montana (6 miles south of the border).	Throughout Wyoming; eastern Montana; western and central North Dakota	Portions of the pipeline systems owned and operated by True Companies would be within the PCIC in near Baker, Fallon County, Montana.
Refined/Finished Product Pipelines			
Cenex Pipeline	Eight-inch products pipeline running from Fargo, North Dakota, at Williams Pipeline Terminal to Laurel Station at the Cenex Refinery in Montana.	Western North Dakota and eastern Montana	Within PCIC in southwestern Dawson County, Montana.

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
Magellan Pipeline	Total of 9,600 miles of refined product pipelines, including 50 terminals (four in Nebraska) and seven storage facilities.	The Magellan Pipeline system is located in the following states: North Dakota, Minnesota, South Dakota, Nebraska, Colorado, Iowa, Illinois, Missouri, Kansas, Oklahoma, Arkansas, and Texas.	Magellan Pipeline crosses the PCIC in southern York County, Nebraska.
NuStar Pipeline	Central East Region—East Refined Products Pipeline system transports refined petroleum products, including gasoline, diesel, and propane. The system includes 2,530 miles of pipelines that transport an average of 203,000 bpd and 21 distribution terminals (five in Nebraska, five in South Dakota) with a storage capacity of 4.8 million barrels.	Pipeline system runs north-south from central North Dakota to eastern South Dakota, western Iowa, eastern Nebraska, southern Nebraska, and central Kansas.	NuStar Pipeline is within the PCIC in Fillmore and York counties, Nebraska.
Natural Gas Pipelines			
Williston Basin Interstate Pipeline Company System	A 3,364-mile-long natural gas pipeline transmission system	Pipeline system runs through Montana, North Dakota, Wyoming, and South Dakota.	Portions of the Williston Basin System would be within the PCIC in Valley and Fallon counties, Montana, and Harding County, South Dakota.
Northern Border Pipeline	A 1,249-mile-long interstate natural gas pipeline with a design capacity of approximately 2.4 billion cubic feet per day (bcf/d) of gas	Pipeline runs generally northwest to southeast through Montana, North Dakota, South Dakota, Minnesota, Iowa, Illinois, and Indiana	Portions of the Northern Border Pipeline would be in the PCIC in Phillips and Valley counties, Montana, and would be near and parallel to the proposed Project for approximately 21.5 miles.
Northern Natural Gas	14,900 miles of pipeline, operational since 1930; 2- to 36-inch diameter; 2,357 receipt and delivery points	Minnesota, Wisconsin, Michigan, Iowa, South Dakota, Nebraska, Kansas, Oklahoma, Texas, and New Mexico	The Northern Natural Gas Pipeline system is within the PCIC in Jefferson and Saline counties, Nebraska.
Rockies Express West	A 713-mile-long 42-inch-diameter interstate natural gas transmission pipeline with a capacity of approximately 1.5 bcf/d. The project includes five compressor stations.	Colorado, Wyoming, southern Nebraska, northeastern Kansas, Missouri, Illinois, Indiana, and Ohio	Rockies Express West is within the PCIC in a generally west-to-east direction in the vicinity of Steele City, Nebraska.

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
Bison Natural Gas Pipeline	A 302-mile-long, 30-inch-diameter pipeline with a capacity of 500 million cubic feet per day (MMcf/d); Pipeline system and related facilities that extend northeastward from the Dead Horse Region near Gillette, Wyoming, through southeastern Montana and southwestern North Dakota where the system connects with the Northern Border Pipeline system near Northern Border's Compressor Station No. 6 in Morton County, North Dakota; 407 MMcf/d capacity currently; compression (approved but not yet built) capacity will be approximately 477 MMcf/d , with potential expandability to approximately 1 bcf/d	Southwestern North Dakota, southeastern Montana, and northeastern Wyoming	The Bison pipeline intersects the PCIC in southern Fallon County, Montana.
Kinder-Morgan Interstate Gas Transmission (KMIGT)	Approximately 5,100 miles of transmission lines in Colorado, Kansas, Nebraska, Michigan, and Wyoming; The Huntsman natural gas storage facility, located in Cheyenne County, Nebraska, with approximately 10 billion cubic feet (bcf) of firm capacity commitments is also part of the system.	Transmission system comprised of west zone (central Wyoming); central zone (southeastern Wyoming, southwestern Nebraska, and northeastern Colorado); east-north zone (southern and eastern Nebraska); and east-south zone (northwestern Kansas)	KMIGT within the PCIC in the following counties: northern Fillmore County, Nebraska; central York County, Nebraska; eastern Boone County, Nebraska; eastern Antelope County, Nebraska; and northern Holt County, Nebraska.
Trailblazer Pipeline	436 miles of 36-inch pipe. Certificated capacity of 522,000 decatherms per day (Dth/day). Expansion planned: Expand Trailblazer by 324,000 Dth/day to bring total capacity to 846,000 Dth/day.	Runs generally east-west from Cheyenne, Wyoming along the Wyoming/Colorado border through southern Nebraska	Trailblazer Pipeline crosses the PCIC in southern Saline County, Nebraska.
Natural Gas Pipeline Co. of America—Amarillo Line	Total network: 10,000+ miles of pipelines, 265 bcf of working gas storage capacity. Amarillo Line (based on 2002 stats) produces 1.6 bcf/d.	Runs generally northeast to southwest from Chicago, Illinois through southern Iowa, across southeast Nebraska (at Steele City), central Kansas, western and southern Oklahoma, northwestern Texas, and southeastern New Mexico	The line is within the PCIC at Steele City, Jefferson County, Nebraska.
Central City Gas System	Natural gas pipeline system owned and operated by the city of Central City, Nebraska. 2- to 6-inch-diameter transmission line.	Serves Central City, Nebraska	Central City Gas Pipeline system is within the PCIC in southwestern Polk County, Nebraska.

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
SourceGas LLC	SourceGas - Nebraska transmission system consists of approximately 5,000 miles of transmission and distribution pipeline in 57 counties across Nebraska. The system has interconnections with or laterals off the KMIGT, Pony Express, and Trailblazer pipelines.	Serves the western 2/3 of Nebraska	SourceGas pipelines within the PCIC in northwestern Holt County, Nebraska and southeastern Boone County, Nebraska.
Bakken NGL Pipeline	An approximately 600-mile long natural gas liquids (NGL) pipeline running from northeastern Montana, south to Colorado. Oneok Partners announced completion of this project in April 2013.	Montana, Wyoming, Colorado	Within the PCIC of the proposed pipeline route near Baker, Fallon County, Montana.
Ammonia Pipelines			
NuStar Pipeline	2,000 miles total, ranging from 4- to 10-inch carrying anhydrous ammonia, with a terminal at Aurora, Nebraska.	Pipeline extends through Indiana, Illinois, Missouri, Arkansas, Louisiana, and Nebraska. Specific cities impacted in Nebraska: Blair, Fremont, and Aurora	Anhydrous ammonia pipeline is within the PCIC in northwestern York County, Nebraska.
Water Delivery Systems			
Perkins County Rural Water System	Extension of Southwest Pipeline from Lake Sakakawea, North Dakota	Map of pipeline or system area not readily available; however, project is in Perkins County, South Dakota	Project route is through southwestern Perkins County, South Dakota. Water pipeline possibly within the PCIC depending on location.
Mni Wiconi Rural Water Supply System[a]	4,400 miles of pipeline through southwest and south-central South Dakota; 12- to 24-inch polyvinyl chloride water pipeline, which provides water to Pine Ridge, Rosebud, and Lower Brule Indian Reservations, along with other communities; Federally funded project; Estimated delivery volume 8,591-12,474 acre feet per year; Water source is Missouri River; Federal funding for the project ended in 2013; however, because some portions of the project remain incomplete, the Mini Wiconi Project Act Amendments of 2013 (S. 684) seek to raise the project funding ceiling and extend completion of the project to 2016	Haakon, Stanley, Jones, Lyman, Mellette, Todd, Jackson, Bennett, and Shannon counties, South Dakota. Portions of Pennington and Tripp counties, South Dakota	Mni Wiconi water pipeline possibly within the PCIC in Haakon, Jones, Lyman, and Tripp counties, South Dakota.

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
Electrical Transmission Lines			
345-499-kilovolt (kV) Transmission Lines	The U.S. electric grid consists of independently owned and operated power plants and transmission lines.	The transmission lines affect the entire United States	Transmission lines would affect the PCIC in Boyd, Antelope, Boone, Holt, Nance, Merrick, Hamilton, York, Fillmore, and Jefferson counties in Nebraska. The PCIC would also be affected in Fallon and McCone counties in Montana. In South Dakota, the PCIC is affected in Perkins, Meade, Haakon, and Jones counties.
Railroads			
Union Pacific Railroad Company (UP)	The UP spans 31,900 miles and is the largest railroad network in the United States.	The UP operates in 23 states throughout the central and western United States	Rail is within the PCIC in Jefferson and Merrick counties, Nebraska.
BNSF Railway Company (BNSF)	BNSF owns rail lines running through multiple areas of Montana, primarily east-west along the northern border; northwest to southeast across the central portion of the state; and southwest to northeast in the southeastern portion of the state. BNSF-owned lines also run generally northwest to southeast across Nebraska, with heavier rail line concentration around Lincoln.	The BNSF railway operates throughout the central and western United States.	The railway falls within the PCIC in Fillmore and York counties, Nebraska, and the following counties in Montana: Baker, Prairie, Dawson, and McCone.
Nebraska Central Railroad Company (NCRC)	The NCRC operates over 340 miles of track on three lines concentrated northwest of Lincoln.	The NCRC operates in northeastern and central Nebraska	Rail is within the PCIC in Polk, Nance, and Boone counties, Nebraska.
Nebraska North-eastern Railway Company (NNRC)	The NNRC operates on approximately 120 miles of northeastern Nebraska and runs generally east-west across northeastern Nebraska from the Missouri River to O'Neill, Nebraska.	The NNRC operates in northeastern Nebraska.	Rail is within the PCIC in Antelope County, Nebraska.
Canadian Pacific/ Dakota, Minnesota & Eastern	A 574-mile line that runs north-south along the western South Dakota border and east-west through central South Dakota.	Western and central South Dakota	Rail is within the PCIC in Haakon County, South Dakota.
South Dakota Owned/ Dakota Southern Operated	A 190-mile line that runs generally east-west across south-central South Dakota.	South-central South Dakota	Within the PCIC in Jones and Valley counties, South Dakota

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
Wind Farms			
Diamond Willow Windfarm	Operated by Montana-Dakota Utilities; The first phase began commercial operation in 2008; Expanded in 2010, for a total capacity of 30 megawatts (MW), by 20 General Electric 1.5 MW turbines	South of Baker, Montana, in Fallon County	Potentially within the PCIC in Fallon County (Baker), Montana.
Laredo Ridge	7,600 acre site; Approximately 3 miles northeast of Petersburg, Nebraska, in Boone County, Nebraska; 81 MW capacity	North of Petersburg, Nebraska, in northern Boone County, Nebraska	Possibly within the PCIC in Boone County, Nebraska
Landfills			
City of Baker	Closed landfill, located approximately 2 miles southwest of the city of Baker, Montana	Baker, Fallon County, Montana	Closed landfill is within the PCIC near Baker, Fallon County, Montana.
Town of Nashua	Closed Class III Landfill located approximately 2 miles west of the town of Nashua, Montana	Nashua, Valley County, Montana	Closed landfill is within the PCIC near Nashua, Valley County, Montana.
City of O'Neill	Waste disposal area for construction and demolition debris, generally described as the southwest (SE) 1/4 Nebraska 1/4 Section 29 Township 29 North Range 11 West of the 6th Principal Meridian, located in the City of O'Neill, Nebraska	O'Neill, Holt County, Nebraska	Landfill is potentially within the PCIC.
Power Plants			
Nebraska Public Power District Petroleum Plant	The Nebraska Public Power District operates a mobile petroleum plant within York, Nebraska. This plant provides a maximum of 3.1 MW of electricity generated from petroleum to the surrounding residential and industrial facilities.	York, Nebraska	Within the PCIC in York, Nebraska
Grazing Land			
Montana Grazing Lands	The state of Montana has extensive lands used by ranchers for the grazing of herds of animals.	Multiple	Grazing lands would fall within the PCIC in Valley, McCone, Dawson, Prairie, and Fallon counties.
South Dakota Grazing Lands	The use of lands for grazing herds of animals is widespread in the state of South Dakota.	Multiple	The PCIC would be affected by grazing lands in Harding, Butte, Perkins, Meade, Haakon, Jones, and Tripp counties.
Nebraska Grazing Lands	The state of Nebraska has extensive lands used by ranchers for the grazing of herds of animals.	Multiple	Grazing lands would fall within the PCIC in Keya Paha, Boyd, Holt, Antelope, Boone, Nance, Merrick, Polk, York, Fillmore, Saline, and Jefferson counties.

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
Oil and Gas Storage Facilities			
Baker Facility	Natural gas storage facility in Baker, Fallon County, Montana; Owned and operated by Williston Basin Interstate Pipeline Company, with a total capacity of 287.2 bcf	Baker, Fallon County, Montana	Baker natural gas storage facility is within the PCIC near Baker, Fallon County, Montana.
Oil and Gas Well Fields			
Wildcat and Buffalo	Oil and gas wells in central South Dakota	Central South Dakota and northwestern Harding County, South Dakota	Oil and gas wells within the PCIC in northwestern Tripp County, South Dakota; southeastern Jones County, South Dakota; south-central Jones County, South Dakota; northwestern Harding County, South Dakota; and north-central Meade County, South Dakota
Wildcat Phillips, Fallon, Valley, McCone County fields	Oil and gas fields in Montana	Southeastern Fallon County, southwestern Dawson County, southeastern McCone County, eastern Valley County, northeastern Phillips County, Montana	Oil and gas wells within the PCIC (Gas Light, Plevna, Plevna South, Cedar Creek, Weldon, McCone, and Wildcat) in southeastern Fallon County, southwestern Dawson County, southeastern McCone County, Valley County, northeastern Phillips County, Montana
Mine and Mineral Extraction Sites			
Montana gravel pits	Active surface gravel pits	Southern Valley County, Southeastern McCone County, Montana	Gravel pits within the PCIC through southern Valley County, Montana
Weldon Timber Creek Coal Field	Active surface coal field in northwestern McCone County, Montana	Northwestern McCone County, Montana	Coal field within the PCIC through northwestern McCone County, Montana
Abandoned coal fields	18 abandoned coal fields	Northwestern and southeastern McCone County, western and southwestern Dawson County, Montana	Abandoned coal fields within the PCIC through northwestern and southeastern McCone County, western and southwestern Dawson County, Montana
Fallon County Bentonite Deposit	Active bentonite surface mine in southeastern Fallon County, Montana	Southeastern Fallon County, Montana	Active bentonite mine within the PCIC through southeastern Fallon County, Montana
Fallon County abandoned surface mines and coal fields	1 abandoned coal field and 5 abandoned surface mines in southeastern Fallon County, Montana	Southeastern Fallon County, Montana	Abandoned coal field and surface mines within the PCIC through southeastern Fallon County, Montana

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
Nebraska active sand and gravel mines	Active sand and gravel mines in Nebraska	Northeastern Keya Paha County, northern and central Holt County, southern Jefferson County, Nebraska	Active sand and gravel mines within the PCIC
Nebraska abandoned sand and gravel pits	Abandoned sand and gravel pits in Nebraska	Eastern Boyd County, northern and central Holt County, central and southern Antelope County, southern York County, eastern Fillmore County, southern Jefferson County, Nebraska	Abandoned sand and gravel pits within the PCIC in northern and central Holt County, Nebraska
Nebraska inactive sand and gravel pits	Inactive sand and gravel pits in Nebraska	Southern Jefferson County, Nebraska	Abandoned sand and gravel pits within the PCIC
South Dakota active sand and gravel pits	Active sand and gravel pits in South Dakota	Southeastern and central Tripp County, southeastern Haakon County, eastern Haakon County, northeastern Meade County, northwestern Harding County, South Dakota	Active sand and gravel pits within the PCIC
South Dakota inactive sand and gravel pits	Inactive sand and gravel pits in South Dakota	Southeastern Tripp County, central Jones County, southeastern Haakon County, northeastern Meade County, South Dakota	Inactive sand and gravel pit within the PCIC
Feedlots			
Nebraska Feedlots	A feedlot is a type of animal feeding operation which is used in farming. Very large feedlots are classified as concentrated animal feeding operations (CAFOs), and are used to increase the size of livestock before slaughter.	Feedlots are used across the state of Nebraska and have an impact throughout.	The PCIC of the proposed pipeline route would be affected by large feedlots, or CAFOs, southwest of Naper, north of Atkinson, northeast of O'Neill, east of Page, near Orchard, west of Tilder, north of Clarks, near McCool Junction, and near Milligan, Nebraska.
Mt. Echo Feedlot and Beaver Valley Pork	Additional CAFOs	Feedlots are used across the state of Nebraska and have an impact throughout.	The Mt. Echo feedlot falls within the PCIC near St. Edward, Nebraska. The Beaver Valley Pork feedlot falls within the PCIC near St. Edward, Nebraska.
Grain and Agronomy Hubs			
Central Valley Agriculture (CVA)—multiple locations	The CVA Clarks location is an agronomy hub that offers fertilizers, chemicals, insecticides, seed and seed treatments, custom application, and precision technology and scouting services to the agricultural sector in central Nebraska.	CVA is located throughout central Nebraska and affects multiple localities in Nebraska.	This CVA Clarks location falls within the PCIC for the proposed Project. The location of the agronomy hub is 2947 26th Road, Clarks, Nebraska.

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
CVA—Royal Location	The CVA Royal location is an agronomy and grain hub that offers and ships grain, fertilizers, chemicals, insecticides, seed and seed treatments, custom application, and precision technology and scouting services to the agricultural sector in central Nebraska. CVA's Royal location includes rail terminals that are along the Nebraska Northeastern Railway, which connects to the Burlington Northern.	CVA is located throughout central Nebraska and affects multiple localities. The Royal location affects Royal, Nebraska, in Antelope County.	This CVA location falls within the PCIC for the primary proposed pipeline route. The CVA facility is approximately 3 miles west of Royal, Nebraska.

[a] Although some portions of the Mni Wiconi Rural Water Supply System are not expected to be completed in Fiscal Year 2013, the portions of the system that would be crossed by the proposed Project were completed before the release of this Final Supplemental EIS.

A summary of the long-term and/or permanent impacts associated with the general types of projects listed in Table 4.15-1, as well as the potential for these effects to be cumulative with the effects of the proposed Project, is presented below. Even where effects associated with past projects may be long-term and/or permanent, these effects and the effects of the proposed Project may be localized. In these situations, the greatest potential for cumulative effects across a broad range of resources from the proposed Project occurs where there is geographic proximity of past projects with the proposed Project. Where appropriate, such as greenhouse gas (GHG) emissions and effects to federal threatened, endangered, proposed and candidate species, Bureau of Land Management (BLM) sensitive species, state threatened and endangered species, and species of conservation concern, cumulative effects are considered across a larger geographic scale.

Pipeline and Storage Facility Projects

Pipeline and storage facility projects considered in the CEA include transportation and storage of crude oil, refined/finished products, natural gas, and ammonia. With respect to past (existing) pipeline and storage systems, such as those summarized above in Table 4.15-1, construction and operation of these types of systems may result in permanent alterations to terrestrial vegetation (primarily the conversion of forest cover), as well as impacts to wildlife habitat, land use, visual resources, noise, and air quality. These impacts are related to storage facilities, other aboveground facilities (such as compressor and pump stations), and maintained ROWs. Where multiple past (existing) pipeline and storage systems occur within geographic proximity of the proposed Project, cumulative impacts would be additive among the resource impacts described above. The nature and degree of cumulative impacts depends, in part, on the proximity of the proposed Project facilities to past (existing) facilities. For example, where the proposed Project is located within or directly adjacent to existing pipeline ROWs and storage systems, the effects to terrestrial vegetation with associated impacts to wildlife habitat, land use, and visual resources would represent a contiguous increase of existing impacts through the creation of a wider, permanent ROW. Where the proposed Project is not within or directly adjacent to existing pipeline ROWs and storage systems, there would be potential cumulative effects to vegetation, wildlife habitat, and land use that contribute to further habitat fragmentation and associated impacts.

Water Delivery Systems

Cumulative impacts associated with existing water delivery systems are similar in nature to those discussed above related to pipeline and storage facility projects. Impacts of operational water delivery systems include past alterations to terrestrial vegetation, wildlife habitat, land use, and visual resources. Cumulative impacts are possible across these resources where existing systems, both aboveground facilities (e.g., pump stations, treatment facilities, and storage tanks) and water pipeline ROWs, occur within geographic proximity of the proposed Project.

Electrical Transmission Lines

The most notable impacts associated with existing electrical transmission lines are the permanent effects on terrestrial vegetation, land use, and visual resources. Additional impacts to soils (compaction and erosion), wetlands, and wildlife (particularly raptor and other avian species) could also be expected, as well as indirect air quality and GHG impacts in the region associated with the generation of electricity that would be transmitted through power lines. The potential for cumulative impacts exists where multiple or large existing electrical transmission lines occur

within geographic proximity of the proposed Project. As discussed above related to pipeline and storage facility projects, the nature and degree of cumulative impacts depends, in part, on the proximity of the proposed Project facilities to existing electrical transmission line ROWs as well as impacts associated with the transmission lines themselves. Cumulative impacts would primarily be associated with permanent alterations to rangeland/grassland vegetation, land use, and visual resources.

Railroads

Cumulative impacts associated with existing railroad features are similar in nature to those discussed above related to various linear features. Impacts of operational railroads include past alterations to terrestrial vegetation, wildlife habitat, land use, noise, and visual resources. Cumulative impacts are possible across these resources where existing systems occur within geographic proximity of the proposed Project.

Wind Farms

Primary long-term and/or permanent impacts associated with operating wind farms include effects on terrestrial vegetation, wildlife (notably avian species and bats) and habitat, and visual resources. Additional minor impacts to soils (compaction and erosion), wetlands, noise, and land use could also be expected associated with existing wind farms; however, cumulative effects to these resources are not expected based on the minor nature of these impacts and the nature of the long-term and permanent impacts associated with the proposed Project. Cumulative impacts would primarily be associated with permanent alterations to terrestrial vegetation, habitat fragmentation, and visual resources where existing wind farms occur within geographic proximity of the proposed Project.

Landfills

Three landfills were identified within the PCIC of the proposed Project. Two of the landfills in Montana are closed, and one active landfill is located in Nebraska. Primary long-term and/or permanent impacts associated with landfills include permanent alterations to land use and visual resources, as well as potentially long-term impacts to water resources from leachate. The likelihood of water resource impacts associated with landfills is in large part related to the age of the landfill. Historic landfills (in contrast to newer facilities) have a greater potential to contribute to cumulative effects to water resources as a result of potentially inadequate design and leachate controls. Additional minor impacts to soils (compaction and erosion), terrestrial vegetation, wildlife, and wetlands could also be expected and associated with existing landfills. Additional impacts associated with the active landfill would include effects on air quality (particularly dust) and noise from operations. Given the discrete and localized extent of landfills and their associated impacts, cumulative impacts would primarily be associated with permanent alterations to land use, visual resources, and habitat fragmentation where existing landfills occur within geographic proximity of the proposed Project. Additional cumulative impacts to water resources, air quality, and noise could potentially occur in proximity to older active landfill sites.

Power Plants

One power generation facility was identified within the PCIC of the proposed Project in York, York County, Nebraska. Primary long-term and/or permanent impacts associated with power plants include alterations to terrestrial vegetation, water resources (intakes and thermal discharges), fisheries, land use, air quality and GHG emissions, noise, and visual resources. Additional minor impacts to soils (compaction and erosion), wildlife, and wetlands could also be expected associated with existing power plants; however, cumulative impacts to these resources are not expected. The majority of the primary long-term and/or permanent impacts associated with power plants are localized. As a result, potential cumulative impacts would primarily be associated with permanent alterations to land use, air quality, noise, and visual resources where existing power plants occur within geographic proximity of the proposed Project. Additional cumulative impacts to GHG emissions and climate change could occur on a regional scale.

Grazing Lands

Land use data indicate that the majority of undeveloped land in Nebraska, South Dakota, and Montana is used for grazing herd animals. Grazing lands are present within the PCIC in undeveloped portions of the counties through which the proposed pipeline would run. Primary long-term and/or permanent impacts of the use of lands for grazing include alterations to soils (erosion), terrestrial vegetation, and water resources (water quality). Cumulative impacts are possible across these resources where existing grazing lands occur within geographic proximity of the proposed Project.

Oil and Gas Well Fields

Multiple oil and gas well fields are located in proximity to the proposed Project. The Williston Basin is located in northwestern South Dakota and northeastern Montana; the Buffalo field, located in Harding County, South Dakota, contains many wells within the PCIC of the proposed Project. Primary long-term and/or permanent impacts associated with oil and gas well field activities include alterations to geological resources, soils (erosion), terrestrial vegetation, water resources, land use, air quality and GHG emissions, noise, and visual resources. Additional minor impacts to wildlife and wetlands could also be expected associated with oil and gas well field activities; however, cumulative impacts to these resources are not expected. The majority of the primary long-term and/or permanent impacts associated with oil and gas well field activities are localized. As a result, potential cumulative impacts would primarily be associated with permanent alterations to geological resources, soils (erosion), terrestrial vegetation, water resources, land use, air quality, noise, and visual resources where existing oil and gas well fields occur within geographic proximity of the proposed Project. Additional cumulative impacts to GHG emissions and climate change could occur on a regional scale.

Mine and Mineral Extraction Sites

Numerous active and abandoned mine and mineral extraction sites are located within the PCIC in Montana, South Dakota, and Nebraska. Primary long-term and/or permanent impacts associated with mine and mineral extraction sites include alterations to geological resources, soils, terrestrial vegetation, water resources, land use, air quality, noise, and visual resources. Additional minor impacts to wildlife and wetlands could also be expected associated with mine and mineral extraction activities; however, cumulative impacts to these resources are not expected. The majority of the primary long-term and/or permanent impacts associated with mine

and mineral extraction sites are localized. As a result, potential cumulative impacts would primarily be associated with permanent alterations to geological resources, soils, terrestrial vegetation, fisheries, water resources, land use, air quality, noise, and visual resources where existing mine and mineral extraction activities occur within geographic proximity of the proposed Project.

Feedlots

A feedlot is a type of animal feeding operation that is used in high-density industrial farming (sometimes called factory farming). Very large feedlots are classified as concentrated animal feeding operations (CAFOs) and are used to increase the size of livestock before slaughter (National Agricultural Statistics Service 2012). Primary long-term and/or permanent impacts associated with feedlot sites include direct effects to soils (compaction and erosion), terrestrial vegetation, land use, air quality, noise, and visual resources, and potential indirect effects to fisheries, wetlands, and water resources through storm water runoff. The majority of the primary long-term and/or permanent impacts associated with feedlots are localized. Cumulative impacts are possible across these resources where existing feedlots occur within geographic proximity of the proposed Project.

Grain and Agronomy Hubs

Grain and agronomy hubs offer fertilizers, chemicals, insecticides, seed and seed treatments, custom application, precision technology, and scouting services to the agricultural sector in central Nebraska (Central Valley Agriculture 2011 and 2012). Primary long-term and/or permanent impacts associated with grain and agronomy hubs include alterations to terrestrial vegetation, land use, and visual resources. Additional minor impacts to soils (compaction and erosion), wildlife, and wetlands could also be associated with grain and agronomy hubs; however, cumulative impacts to these resources are not expected. The majority of the primary long-term and/or permanent impacts associated with grain and agronomy hubs are localized. As a result, potential cumulative impacts would primarily be associated with permanent alterations to terrestrial vegetation, land use, visual resources, and habitat fragmentation where existing grain and agronomy hubs occur within geographic proximity of the proposed Project.

4.15.2.2 Cumulative Impacts from Present Projects

Present projects and activities considered in the CEA are those that have been approved and are under construction. Potential long-term and/or permanent effects from these projects/activities are considered to be potentially cumulative with the effects of the proposed Project. These projects are further described in Table 4.15-2 below.

Table 4.15-2 Representative Present Projects Considered in the Cumulative Effects Assessment

Project Name	Description	Localities Impacted	Geographic Relationship to Proposed Project
Crude Oil Pipelines and Storage Facilities			
TransCanada Gulf Coast Pipeline and Oil Storage Facility	The Gulf Coast Pipeline consists of 485 miles of new crude-oil pipeline from Cushing, Oklahoma, to Nederland, Texas, and a new tank farm on an approximately 74-acre site at Cushing, Oklahoma.	Oklahoma, Texas	Approximately 395 miles (81 percent) is within approximately 300 feet of existing pipelines, utilities, or road ROWs. The remaining 90 miles (19 percent) of the route is in new ROWs. A tank farm would be constructed on an approximately 74-acre site at Cushing, Oklahoma, adjacent to the existing Cushing Oil Terminal.
Water Delivery Systems			
Dry Prairie Rural Water System	System to provide drinking water to approximately 27,434 people in eastern Montana. The system would consist of 12- to 15-inch-diameter polyvinyl chloride water delivery pipelines throughout the service area. Project is 30% complete (off-reservation portions); fiscal year 2013 funded and construction on-going.	Montana: Daniels, Sheridan, and Roosevelt counties and portions of Valley County	Portions of the water system west of the Fort Peck Indian Reservation may be within the PCIC in northeastern Montana, specifically in Valley County
Highway Construction[a]			
US-12 Maintenance	The State of Montana is undertaking highway repairs and maintenance along US-12.	Along US-12 in Montana	Highway construction would be within the PCIC in Fallon County, near Baker, Montana.
MT-200 Construction	The State of Montana is undertaking highway repairs and maintenance along MT-200.	Along MT-200 in Montana	Highway construction would be within the PCIC in McCone County, near Circle, Montana.
US-18 Construction	The State of South Dakota is undertaking highway repairs and maintenance along US-18.	Along US-18 in South Dakota	Highway construction would be within the PCIC in Tripp County, near Winner, South Dakota.

[a] Source: Montana Department of Transportation 2013; Nebraska Department of Roads 2013a; Nebraska Department of Roads 2013b; South Dakota Department of Transportation 2013; Theodore Roosevelt Expressway 2013

The impacts associated with the general types of other present projects listed in Table 4.15-2, as well as the potential for these impacts to be cumulative with the effects of the proposed Project, are discussed below.

For the Gulf Coast Pipeline and Natural Gas Pipelines, the long-term and/or permanent impacts associated with operation of these types of facilities were previously described in the Pipeline and Storage Facility Projects section of Section 4.15.2.1, Cumulative Impacts from Past Projects. However, additional details on the construction of Gulf Coast Pipeline Project are provided below. The long-term and/or permanent impacts associated with operation of the water delivery

system projects and grain and agronomy hubs presented in Table 4.15-2 were previously described in Section 4.15.2.1, Cumulative Impacts from Past Projects, related to past (existing) projects, and are not repeated here. The remaining projects in Table 4.15-2 are highway construction projects. A summary of the long-term and/or permanent impacts associated with existing highway construction projects is provided below.

In addition to operational impacts associated with the projects listed in Table 4.15-2, when considering the cumulative impacts of these projects in terms of present activities, additional short-term impacts associated with concurrent and/or successive construction schedules also need to be addressed. Cumulative impacts associated with concurrent construction projects within geographic proximity of the proposed Project include short-term alterations to soils, terrestrial vegetation, wildlife, wetlands, land use, visual resources, water resources, air quality (primarily dust), noise, and socioeconomics (predominantly positive impacts on local economies). Where construction projects are successive (as opposed to concurrent) and within geographic proximity of the proposed Project, similar short-term impacts would occur across these resources. While successive construction timeframes would result in reduced magnitude of concurrent short-term impacts, the time period over which short-term impacts would occur would increase.

Crude Oil Pipelines and Storage Facilities

Construction on the TransCanada Gulf Coast pipeline began in August 2012 and was completed in late 2013. The Gulf Coast project constructed 485 miles of new pipeline through Oklahoma and Texas, and will transport crude oil from Cushing, Oklahoma, south to Nederland, Texas. Approximately 81 percent of the total pipeline length would be within approximately 300 feet of existing pipelines, utilities, or road ROWs. The Gulf Coast project affected approximately 8,542 acres during construction. After project completion, the temporary 110-foot ROW that was necessary during construction activities was reduced to a 50-foot-wide permanent ROW, which would be maintained for the life of the project. Total acreage that was permanently affected is 3,121 acres. Additionally, the pipeline required the construction of several ancillary facilities such as pump stations, tank farms, intermediate mainline valves (MLVs), and access roads.

The vast majority of the impacts associated with the construction and operation of the Gulf Coast Pipeline Project are short-term, temporary impacts caused during pipeline installation. Extensive effort went into routing pipeline around sensitive areas such as wetlands and critical habitats to minimize potential impacts to these resources. As stated in the Final EIS, after completion, the total wetland area affected by pipeline operations was anticipated to be approximately 217 acres. The Gulf Coast Pipeline Project impacted several diverse land areas known to be or potentially inhabited by federal- and state-protected species of flora and fauna. Most impacts would have been short term and related to construction activities; however, conversion of mature forest to other habitat types would cause long-term to permanent effects on species that rely on this habitat. Careful planning was done to ensure that the timing of intrusive construction activities coincided with critical migration or mating periods.

Highway Construction Projects

Present highway construction projects include highway repairs and maintenance (some large-scale) and not the construction of large-scale new infrastructure projects. Primary impacts of these highway construction projects are similar to those discussed above for general construction projects and include short-term alterations to soils, visual resources, water resources, air quality

(primarily dust), and noise. Cumulative impacts are possible across these resources where highway construction projects occur within geographic proximity of the proposed Project.

4.15.2.3 Cumulative Impacts from Reasonably Foreseeable Future Projects

Future projects and activities considered in the CEA are those that are reasonably likely to be constructed or take place in the foreseeable future (based on permit applications or similar indication of significant intent). Potential long-term and/or permanent effects from these projects/activities are considered to be cumulative with the effects of the proposed Project. These projects are further described in Table 4.15-3 below. The impacts associated with the general types of projects listed in Table 4.15-3, as well as the potential for these impacts to be cumulative with impacts of the proposed Project, are discussed by resource in Section 4.15.3, Cumulative Impacts by Resource, below. For the types of projects presented in table 4.15-3, the long-term and/or permanent impacts associated with construction and operation of these facilities will be similar to those previously described regarding past and present projects. Cumulative impacts of these projects in terms of future activities would occur where long-term and/or permanent impacts of the proposed Project are additive with long-term and/or permanent impacts of construction and operation of the above projects.

Table 4.15-3 Representative Future Projects Considered in the Cumulative Effects Assessment

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
Crude Oil Pipelines and Storage Facilities			
BakkenLink Pipeline	Approximately 144-mile-long,12-inch-diameter oil gathering system to move Bakken crude within North Dakota to a rail loading station that is being developed near Fryburg, about 30 miles west of Dickinson in southwestern North Dakota	Western North Dakota and southeastern Montana	The BakkenLink Pipeline would be within the PCIC near Baker, Fallon County, Montana.
Water Delivery Systems			
Dry-Redwater Water Authority	Proposed water pipeline with initial feasibility study and appraisal investigation completed; currently working with U.S. Bureau of Reclamation on a feasibility study	Richland, Dawson, McCone, Garfield, and Prairie counties, Montana	Proposed water pipeline route falls within the PCIC in McCone and Dawson counties, Montana.
Electrical Transmission Lines			
Big Bend to Witten 230-kV Transmission Line (connected action)	Proposed 70-mile transmission line from a new substation near the Big Bend Dam to an existing substation in Witten, South Dakota	Lyman and Tripp counties, South Dakota	The proposed transmission line would cross the PCIC of the proposed Project route.

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
Chinook Project (proposed, on hold)	A 500-kV electrical transmission line over 1,000 miles long; Estimated in-service date is 2015; The line would be rated approximately 3,000 MW	Montana, Idaho, and Nevada	The Chinook project would extend to southeastern Montana and is not likely within the PCIC. No specific city is provided as the starting point for the transmission line.
New 765-kV Lines (proposed)	Proposed expansion of the U.S. electric grid that would create new 765-kV lines throughout the country	Multiple	The PCIC would be affected in Fallon, Prairie, Dawson, and McCone counties, Montana; Haakon, Jones, and Lyman counties, South Dakota; and Greeley and York counties, Nebraska.
Highway Construction[a]			
I-94 Construction	The State of Montana is proposing major rehabilitation of I-94.	Along I-94 in Montana	Highway construction would be within the PCIC in Dawson County, near Fallon, Montana.
MT-117 Construction	The State of Montana is proposing major rehabilitation of MT-117.	Along MT-117 in Montana	Highway construction would be within the PCIC in Valley County, near Nashua, Montana.
US-85 Construction	The State of South Dakota is proposing bridge repair on US-85.	Along US-85 in South Dakota	Highway construction would be within the PCIC in Harding County, near Buffalo, South Dakota.
SD-20 Construction	The State of South Dakota is proposing resurfacing on SD-20.	Along SD-20 in South Dakota	Highway construction would be within the PCIC in Harding County, near Buffalo, South Dakota.
US-85 Construction	The State of South Dakota is proposing widening of US-85.	Along US-85 in South Dakota	Highway construction would be within the PCIC in Harding County, near Buffalo, South Dakota.
SD-73 Construction	The State of South Dakota is proposing pavement preservation of SD-73.	Along SD-73 in South Dakota	Highway construction would be within the PCIC in Haakon County, near Billsburg, South Dakota.
SD-16 Construction	The State of South Dakota is proposing pavement preservation of SD-16.	Along SD-16 in South Dakota	Highway construction would be within the PCIC in Jones County, near Draper, South Dakota.
I-90 Construction	The State of South Dakota is proposing construction of I-90.	Along I-90 in South Dakota	Highway construction would be within the PCIC in Jones County, near Draper, South Dakota.
I-90 Construction	The State of South Dakota is proposing bridge repair at I-90 and 277th Avenue.	Along I-90 in South Dakota	Highway construction would be within the PCIC in Jones County, near Draper, South Dakota.

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
I-90 Construction	The State of South Dakota is proposing bridge repair at I-90 and 279th Avenue.	Along I-90 in South Dakota	Highway construction would be within the PCIC in Jones County, near Draper, South Dakota.
US-18 Construction	The State of South Dakota is proposing bridge repair of US-18.	Along US-18 in South Dakota	Highway construction would be within the PCIC in Pierre County, near Winner, South Dakota.
US-183 Construction	The State of South Dakota is proposing pavement preservation of US-183.	Along US-183 in South Dakota	Highway construction would be within the PCIC in Tripp County, near Colome, South Dakota.
NE-11 Construction	The State of Nebraska is proposing resurfacing of US-11.	Along US-11 in Nebraska	Highway construction would be within the PCIC in Holt County, near Atkinson, Nebraska.
US-281 Construction	The State of Nebraska is proposing resurfacing of US-281.	Along US-281 in Nebraska	Highway construction would be within the PCIC in Holt County, near O'Neill, Nebraska.
NE-56 Construction	The State of Nebraska is proposing resurfacing of NE-56.	Along NE-56 in Nebraska	Highway construction would be within the PCIC in Boone County, near St. Edward, Nebraska.
NE-39 Construction	The State of Nebraska is proposing resurfacing and bridge repair of NE-39.	Along NE-39 in Nebraska	Highway construction would be within the PCIC in Boone County, near Albion, Nebraska.
NE-91 Construction	The State of Nebraska is proposing resurfacing of NE-91.	Along NE-91 in Nebraska	Highway construction would be within the PCIC in Boone County, near Albion, Nebraska.
NE-22 Construction	The State of Nebraska is proposing resurfacing and bridge repair of NE-22.	Along NE-22 in Nebraska	Highway construction would be within the PCIC in Nance County, near Fullerton, Nebraska.
US-34 Construction	The State of Nebraska is proposing resurfacing and shoulder repair of US-34.	Along US-34 in Nebraska	Highway construction would be within the PCIC in York County, near York, Nebraska.
I-80 Construction	The State of Nebraska is proposing resurfacing of I-80.	Along I-80 in Nebraska	Highway construction would be within the PCIC in York County, near York, Nebraska.
NE-15 Construction	The State of Nebraska is proposing resurfacing and bridge repair of NE-15.	Along NE-15 in Nebraska	Highway construction would be within the PCIC in Jefferson County, near Daykin, Nebraska.

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
Wind Farms			
New Underwood North & South	Proposed wind farms located in southeastern Haakon County, South Dakota; Planned capacity of 10 to 50 MW each	Southeastern Haakon County, South Dakota	New Underwood North is potentially located north of the proposed Project and possibly within the PCIC. New Underwood South is potentially located south of the proposed route, and possibly within the PCIC in Haakon County, South Dakota.
Basin Electric SD-2	Proposed wind farm located in central Tripp County, South Dakota, with generating power of 125 to 200 MW	Central Tripp County, South Dakota	Potentially within PCIC through Tripp County, South Dakota
Basin Electric SD-3	Proposed wind farm located in south-central Jones County, South Dakota, with generating power of 125 to 200 MW	South-central Jones County, South Dakota	Potentially within PCIC through Jones County, South Dakota
Grand Prairie	50,000+ acre site; Approximately 12 miles northeast of O'Neill, Nebraska, in Holt County; Proposed project is in process of completing EIS and public review; Project construction is expected to begin in early 2014, with the farm operational by fall 2014	Holt County, Nebraska	Within the PCIC in Holt County, Nebraska
Unnamed Wind Farm Project	Proposed to be constructed on state-owned land and is anticipated to have a 100-299 MW capacity	Valley County, Montana	Potentially within the PCIC
Oil and Gas Well Fields			
Wildcat Fields	Oil and natural gas wells outside of high-production field areas; Located throughout South Dakota and Montana	Throughout South Dakota and Montana	New wells permitted on a regular basis by Montana and South Dakota regulators. Possibility for future well installation and development within the PCIC through South Dakota and Montana.
Buffalo	Oil and gas field in western South Dakota	Northwestern Harding County, South Dakota	New wells permitted on a regular basis by South Dakota regulators; Possibility for future well installation and development within the PCIC in northwestern Harding County, South Dakota
Fallon County Fields	Gas Light, Plevna, Plevna South, Cedar Creek, and Wildcat Fallon oil and gas fields in southeastern Fallon County, Montana	Southeastern Fallon County, Montana	Oil and gas wells within the PCIC in southeastern Fallon County, Montana

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
McCone County Fields	Weldon and Wildcat McCone oil and gas wells in central and southeastern McCone County, Montana	Southeastern McCone County, Montana	Oil and gas wells within the PCIC of the proposed Project in southeastern McCone County, Montana

[a] Source: Montana Department of Transportation 2013; Nebraska Department of Roads 2013a; Nebraska Department of Roads 2013b; South Dakota Department of Transportation 2013; Theodore Roosevelt Expressway 2013

4.15.2.4 Cumulative Impacts from Connected Actions[2]

There are three actions separate from the proposed Project that are included in the evaluation of potential cumulative impacts to the extent that information on the projects is available:

- Bakken Marketlink Project: Construction and operation of the Bakken Marketlink Project would consist of a 16-inch pipeline approximately 5 miles in length, additional piping, booster pumps, meter manifolds, and two 250,000-barrel tanks that would be used to store crude from connecting third-party pipelines and terminals. The proposed Bakken Marketlink Project facilities would be located within private land currently used as pastureland and hayfields.
- Big Bend to Witten 230-kV Transmission Project: The Big Bend to Witten 230-kV Transmission Project is located in Lyman and Tripp counties in south-central South Dakota. The project would consist of replacing the existing Big Bend-Fort Thompson No. 2 230-kV Transmission Line Turning Structure on the south side of the Big Bend Dam on Lake Sharpe; constructing a new double-circuit 230-kV transmission line for approximately 1 mile southwest of the dam; and constructing a new Lower Brule Substation south of the dam. The existing Witten Substation would be expanded immediately to the northeast to accommodate the new 230-kV connection.
- Electrical Distribution Lines and Substations: Multiple private power companies or cooperatives would construct distribution lines to deliver power to 20 pump stations located along the length of the pipeline in the United States. These distribution lines would range in length from approximately 0.1-mile to 62 miles, with the average being 13 miles long, and are estimated to extend about 377 miles combined. The distribution lines would range in capacity from 69 kV to 240 kV, but the majority would have a capacity of 115 kV. The lines would be strung on a single-pole and/or on H-frame wood poles.

Connected action project details are presented in Section 2.1.12, Connected Actions, and also in Appendix W, Project Descriptions. Cumulative impacts of these projects in terms of future activities would occur where long-term and/or permanent impacts of the proposed Project are additive with long-term and/or permanent impacts of construction and operation of the above projects. The long-term and/or permanent impacts associated with operation of these types of facilities were previously described in Section 4.15.2.1, Cumulative Impacts from Past Projects, related to past (existing) projects; a summary of general construction impacts was previously described in Section 4.15.2.2, Cumulative Impacts from Present Projects.

[2] Connected actions are those that 1) automatically trigger other actions which may require environmental impact statements, 2) cannot or will not proceed unless other actions are taken previously or simultaneously, 3) are interdependent parts of a larger action and depend on the larger action for their justification.

4.15.2.5 Summary of Key Geographically Overlapping Project Areas

Past, present, and future projects and development activities are heavily concentrated in key areas of the PCIC. These key areas are characterized by larger populations, which generally have greater transportation (road, rail), energy source (oil, gas, wind, mineral, electrical) generation and transmission, and waste disposal demands.

Montana

Fallon County, Montana, has been identified as a primary area for the occurrence of cumulative impacts because of its proximity to the Williston Basin oil and gas fields and its population center in Baker. One closed landfill associated with the town of Baker is located within the PCIC of the proposed Project. The area is served by the BNSF rail line, which runs northwest-southeast across Fallon County. The area also supports mining; one active bentonite mine and six abandoned coal fields were identified within the PCIC in Fallon County. In addition, Fallon County supports wind farm developments, including the Diamond Willow Wind Farm located southeast of Baker and within the PCIC.

The Williston Basin oil and gas fields extend from South Dakota through North Dakota and Montana, and into Canada. Several highly productive gas fields are located in Fallon County; as a result, a large number of gas wells are located within the PCIC of the proposed Project route in the county. Because of the proximity to these well fields, a number of natural gas and oil-related transmission, storage, and associated facilities are also located in Fallon County. An underground natural gas storage field is operated by WBI Energy Transmission (formerly Williston Basin Interstate Pipeline Company) near Baker, which is tied in with WBI's total 3,700 miles of natural gas transmission lines, portions of which also cross the PCIC in and around Baker (WBI Energy Transmission 2012). A portion of another natural gas pipeline, the Bison pipeline, also crosses the proposed Project PCIC in southeastern Fallon County. Lastly, Oneok Partners is currently constructing an approximately 500-mile-long NGL pipeline that would cross the PCIC near Baker, Montana.

In addition to natural gas, crude oil from the Williston Basin is transported via a number of pipelines owned and operated by True Companies, which include the Belle Fourche, Butte, Four Bears, and Poplar[3] pipelines (Bridger Pipeline LLC 2012). These pipelines converge in Fallon County, Montana, at the Bridger Gathering station near Baker and cross within the PCIC at several locations. Oneok Partners has proposed to construct a crude oil pipeline, the Bakken Crude Express, through Fallon County near Baker. The town of Nashua in southern Valley County, Montana, is also a primary cumulative impact area. Linear and non-linear projects within the PCIC in southern Valley County include a section of the BNSF rail line, portions of the WBI Energy Transmission natural gas pipeline system, a closed landfill, three active surface gravel pits, a wind farm, and several water delivery pipelines associated with the Dry Prairie Rural Water system, which is currently under construction.

Keystone was issued a Certificate of Compliance in 2008 by the Montana Department of Environmental Quality under the Major Facility Siting Act, Section 75-20-101, et seq., Montana Code Annotated. The Certificate of Compliance authorizes the construction, operation, and maintenance of the Montana portion of the proposed Project. The certification report indicates

[3] Plains All American, LP owns the Poplar Pipeline from the Canadian border to Raymond Station, Montana (6 miles south of the border).

that an increase in the development of wind power projects in the central plains region, as well as increased need for electrical power, is likely to increase the number of electrical transmission lines in the vicinity of the proposed Project. Cumulative impacts of the proposed Project and operation of new transmission lines could include impacts to air quality, viewshed degradation, changes to land uses and vegetation, and impacts to migratory birds. The Montana Department of Environmental Quality specifies the mitigation measures to be implemented in order to minimize potential impacts. Their findings concluded that final location for the proposed Project would result in fewer cumulative adverse environmental impacts and economic cost than siting the facility in another reasonable location. Figure 4.15.2-1 shows the known locations of past, present, and reasonably foreseeable future projects in Montana.

South Dakota

In general, the proposed Project route through South Dakota does not coincide with other past, present, and future projects and development areas. Therefore, the potential for cumulative impacts within South Dakota is not anticipated to be significant. Figure 4.15.2-2 shows the known locations of past, present, and reasonably foreseeable future projects in South Dakota.

Nebraska

Due to its central location between northern oil and gas fields and southern refineries, numerous natural gas, crude oil, and refined product pipelines crisscross the state of Nebraska. Specifically, existing infrastructure/development is concentrated in the southern portion of the PCIC, which is the primary area for the occurrence of cumulative impacts.

Steele City in Jefferson County, Nebraska, is a natural gas and oil transfer location through which the proposed Project crosses, and through which the Rockies Express West, Express-Platte, Northern Natural Gas Company, and Natural Gas Pipeline Co. of America pipelines cross. A segment of the UP rail line also passes through Steele City and within the PCIC of the proposed Project. Additionally, several abandoned and one active sand and gravel pit were identified within the PCIC in southern Jefferson County near Steele City.

Other areas of concentrated infrastructure occur in Nebraska. Projects within the PCIC of the proposed Project in Saline County, Nebraska, include the Trailblazer and Northern Natural Gas Company natural gas transmission lines, the Keystone Mainline crude oil pipeline, a section of BNSF rail line, abandoned sand and gravel pits, and highway construction on US-6 and I-80. Projects with cumulative impact within the PCIC of the proposed Project in Fillmore County, Nebraska, include the KMIGT system, NuStar refined products pipeline, BNSF rail line, and abandoned sand and gravel pits. Projects within the PCIC of the proposed Project in York County, Nebraska, include the Magellan and NuStar refined petroleum products pipelines, the NuStar anhydrous ammonia pipeline, portions of the KMIGT, the BNSF rail line, a petroleum-operated power generation facility, and abandoned sand and gravel pits. Cumulative impact projects within the PCIC of the proposed Project in Merrick County, Nebraska, include sections of the UP and NCRC rail lines as well as abandoned sand and gravel pits. Cumulative impact projects within the PCIC of the proposed Project in Boone County, Nebraska, include portions of the KMIGT, SourceGas natural gas transmission lines, the NCRC rail line, and the Laredo Ridge wind farm. Figure 4.15.2-3 shows the known locations of past, present, and reasonably foreseeable future projects in Nebraska.

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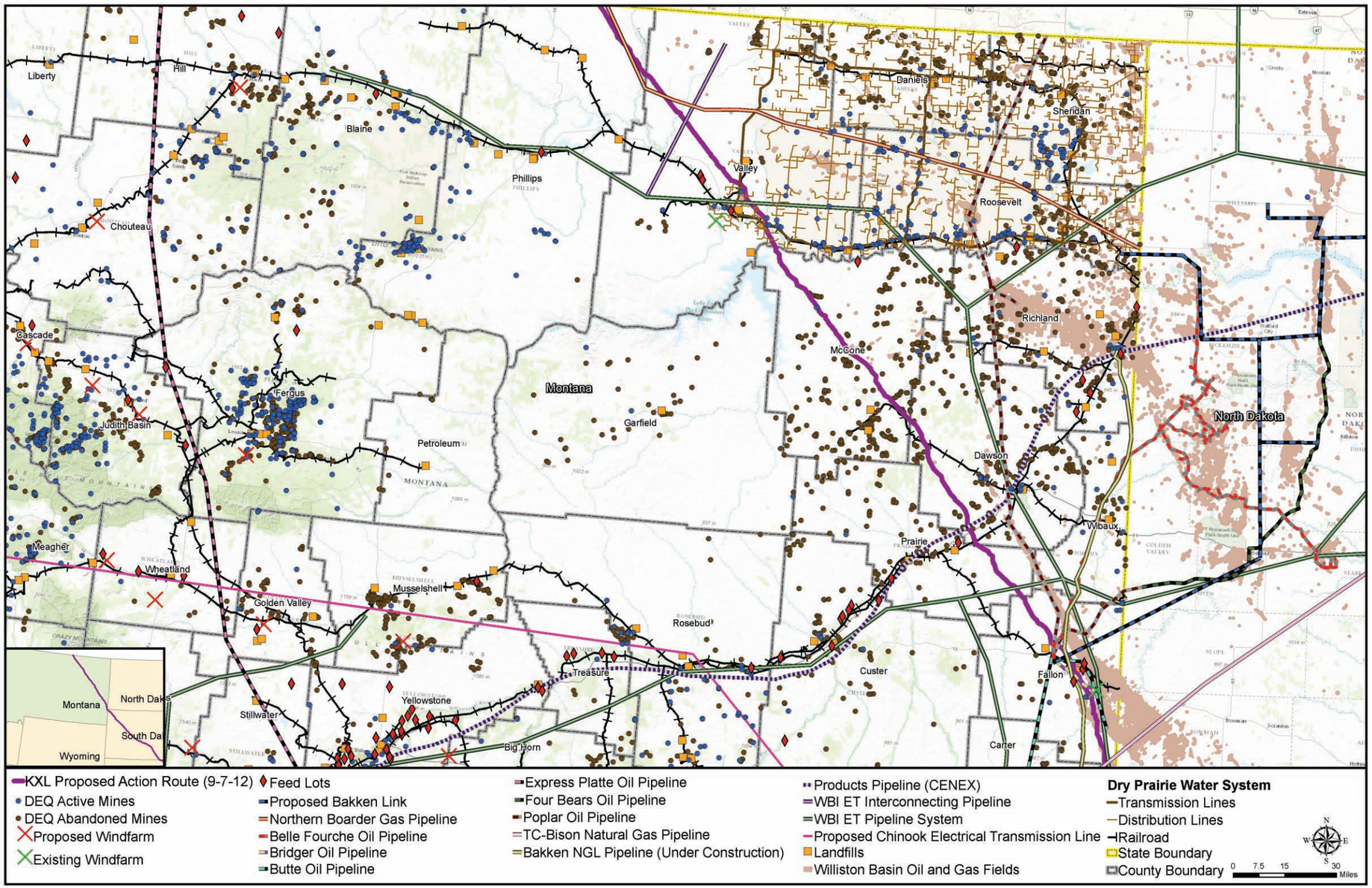

Source: See Appendix W, Project Descriptions; Esri 2013

Figure 4.15.2-1 Known Locations of Past, Present, and Reasonably Foreseeable Future Projects in Montana

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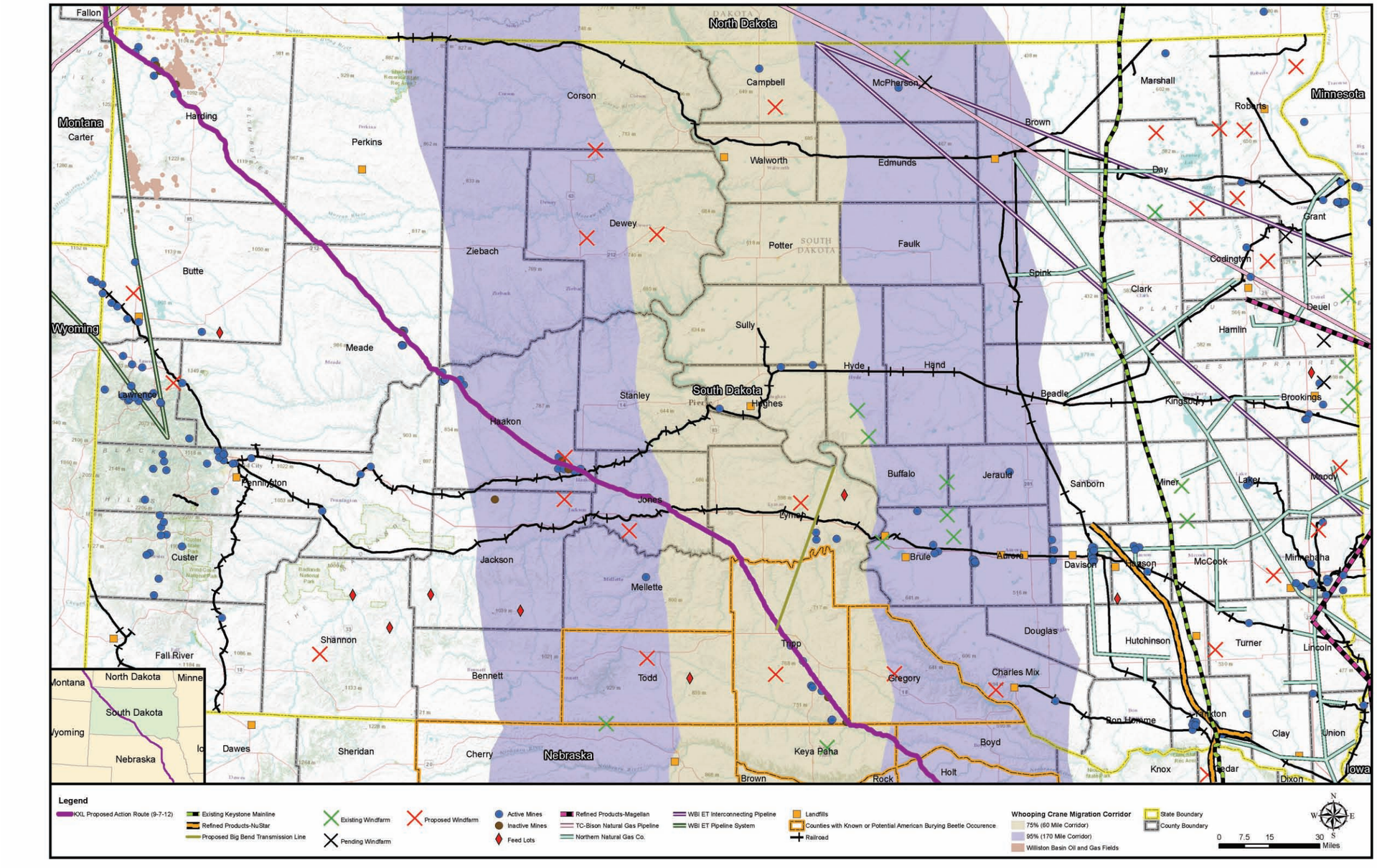

Source: See Appendix W, Project Descriptions; Esri 2013

Figure 4.15.2-2 Known Locations of Past, Present, and Reasonably Foreseeable Future Projects in South Dakota

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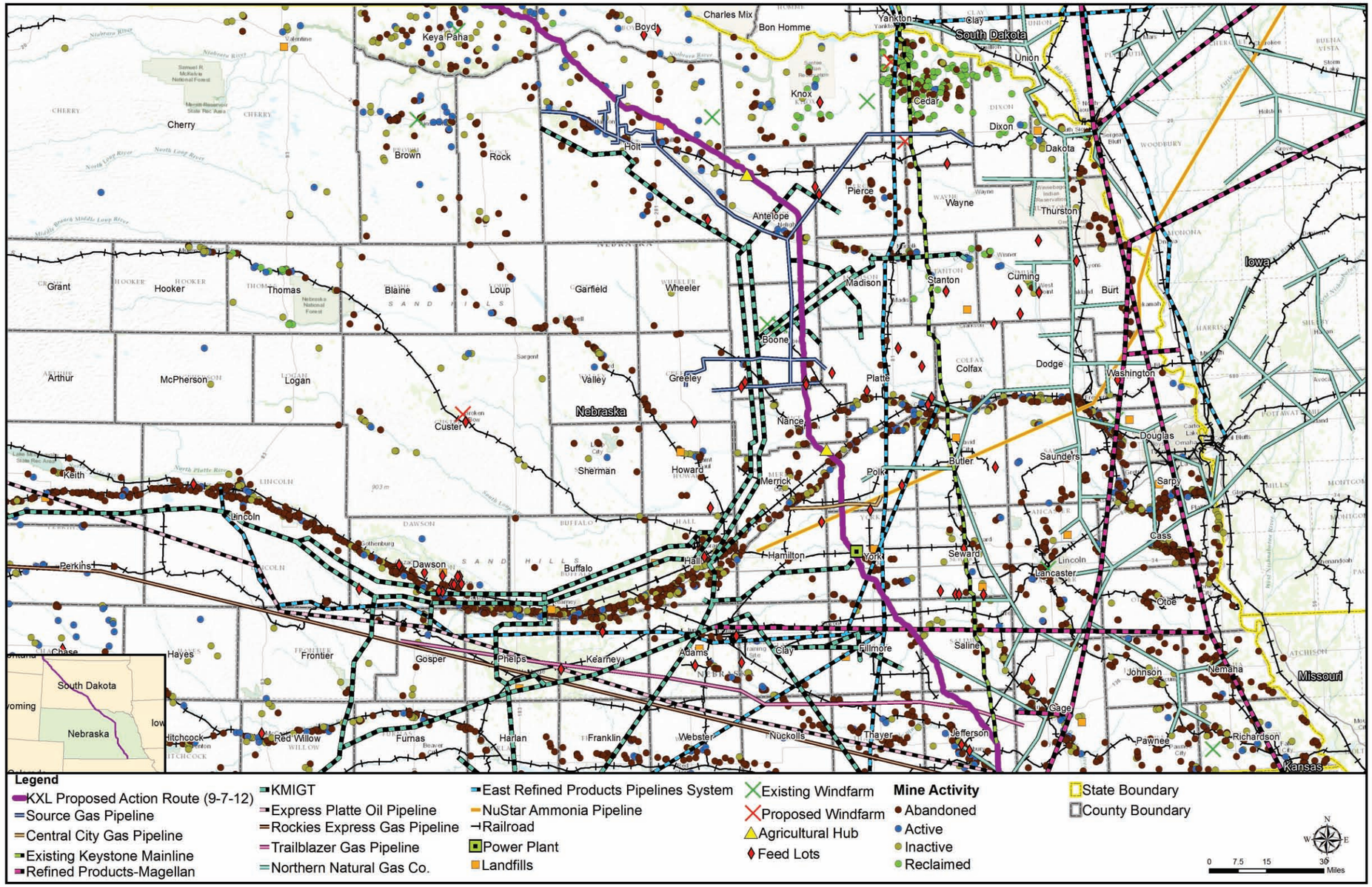

Source: See Appendix W, Project Descriptions; Esri 2013

Figure 4.15.2-3 Known Locations of Past, Present, and Reasonably Foreseeable Future Projects in Nebraska

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4.15.3 Cumulative Impacts by Resource

An analysis of the resources potentially sensitive to cumulative effects from past, present, and reasonably foreseeable future projects is addressed in this section. To organize the discussion, a CEA matrix is presented at the beginning of each resource section that identifies the primary resource components that are subject to potential adverse effects from the proposed Project and connected action activities, whether these effects are direct or indirect, and the anticipated duration and geographic extent of the effects. The last column in the CEA matrix indicates if the resource component is potentially subject to cumulative impacts based on this information.

The discussion associated with each matrix focuses on the identified resource areas with potential cumulative impacts and their significance, both for the proposed Project and overall in the context of effects from past, present, and reasonably foreseeable future projects described in Section 4.15.2, Past, Present, and Reasonably Foreseeable Projects. The CEA matrix serves as a tool for the consistent and transparent documentation of the CEA process, and supports the conclusions regarding the assessment of cumulative effects to important resource areas. It should be noted that the matrices provide a preliminary indication as to the potential for cumulative effects based on whether or not long-term and/or permanent impacts are anticipated for a particular resource area. This does not represent a conclusive determination that cumulative effects are, in fact, occurring. Rather, it directs the discussion of the resource area that follows, where an indication of the significance of the potential for cumulative effects is provided.

Potential spills are not discussed on a resource-specific level. For an assessment of the potential short- and long-term effects of oil releases to the environment, see Section 4.13, Potential Releases; for a discussion of potential cumulative effects of oil releases to the environment, see Section 4.15.3.13, Potential Releases.

4.15.3.1 Geology

A summary of potential environmental consequences of the proposed Project and connected action activities to geological resources is presented in Table 4.15-4. As further discussed below, the anticipated overall absence of long-term and/or permanent impacts to geological resources from the proposed Project indicates that cumulative effects to this resource area are not expected. Although, as indicated in Table 4.15-4, permanent access restrictions to mineral/fossil fuel resources within the pipeline ROW may occur, these effects are considered negligible in the context of the amounts that would not be available for extraction underneath the proposed Project permanent ROW and ancillary facilities (e.g., access roads, pump stations, and construction camps). Where long-term and/or permanent impacts are absent, the potential for additive cumulative effects with other past, present, and reasonably foreseeable future projects is also negligible.

Table 4.15-4 CEA Matrix: Geology

Potential Impact Area	Proposed Project and Connected Action Impacts		Geographic Extent	Cumulative Impact Potential (Yes/No)
	Construction	Operation		
Rock Ripping/Horizontal Directional Drilling	D	N	PA	No
Access to Mineral/Fossil Fuel Resources	D	D	PA	Yes
Paleontological Resources	(D)	N	PA	No
Geologic Hazards (seismic, landslides, subsidence, floods)	(I)	N	PA	No

Duration of Impact
- —Negligible
- —Temporary/Short Term (<3 yr.)
- —Long-Term (>3 yr.)
- —Permanent

Type of Impact
- N —Negligible Impact
- D —Direct Impact
- I —Indirect Impact

Notes: Parentheses around impact indicates that it would be addressed by implementation of CMRP, additional mitigations, and/or existing laws and regulations.
Geographic Extent of Potential Impact: Project Area (PA)—Defined by limits of ROW and ancillary facilities (e.g., access roads, pump stations, and construction camps).

The majority of the potential effects to geological resources are short term, limited in geographic extent, and associated with the construction phase of the proposed Project only. Potential effects to geological resources could include direct impacts to the subsurface through rock ripping (the break-up and removal of rock material with an excavator) or horizontal directional drilling (HDD). These activities would involve some disturbance and modification of the shallow subsurface geology, but would not have substantive impacts to the local geology. Although the proposed Project would cross oil- and gas-producing areas, it would not cross any active surface mines or quarries, or the well-pads of any active oil and gas wells.

The proposed Project route would cross underlying coal-bearing formations in South Dakota. Therefore, although not currently planned, if surface mining was proposed for this area in the future, the proposed Project could limit access to these resources. Overall, however, the acreage of deposits underneath the proposed Project and ancillary facilities (e.g., access roads, pump stations, and construction camps) is minimal when compared to the amounts available for extraction throughout the proposed Project route. Paleontological resources could be damaged or destroyed during construction by excavation activities, erosion of fossil beds exposed due to grading, and unauthorized collection (i.e., direct impacts to paleontological resources). Keystone would prepare a Paleontological Monitoring and Mitigation Plan prior to construction on federal and certain state and local government lands to offset the potential for these impacts. In addition, several existing laws and regulations apply to paleontological resources to offset the potential for these impacts. Paleontological resources identified on federal lands are managed and protected under the Paleontological Resources Preservation Act as part of the Omnibus Public Land Management Act of 2009, and both Montana and South Dakota have enacted legislation to manage and protect paleontological resources on state-managed lands. With these mitigations and regulations in place, direct impacts to paleontological resources are considered minimal.

Based on the evaluation of potential seismic hazards along the proposed Project, the risk of the proposed Pipeline rupture from earthquake ground motion is considered to be minimal. The proposed Project route would not cross any known active faults and is located outside of known zones of high seismic hazard. In addition, the pipeline would be designed to withstand probable seismic events within the seismic risk zones crossed by the proposed Project (according to

existing regulations). Erosion control measures such as trench breakers, slope breakers or water bars, erosion control matting, and mulching would reduce the likelihood of construction-triggered landslides. In addition, areas disturbed by construction along the proposed Project would be revegetated consistent with the Keystone's CMRP (see Appendix G) and specific landowner or land manager requirements. Further, regulations require that the pipeline facilities be designed and constructed in a manner to provide adequate protection from washouts, floods, unstable soils, landslides, or other hazards that could cause the proposed pipeline facilities to move or sustain abnormal loads. Because there no appreciable limestone areas in states along the proposed Project route, the risk of subsidence from karst[4] features along the proposed Pipeline route is negligible.

Impacts to geological resources from the construction and operation of the connected actions (Bakken Marketlink Project, Big Bend to Witten 230-kV Transmission Line, and Electrical Distribution Lines and Substations) are not substantially different from the proposed Project. The duration of impacts is primarily temporary and short term with negligible effects on geological resources, with the possible exception of access to mineral and/or fossil fuel resources located below permanent structures and the pipeline ROW. In summary, with respect to geological resources, long-term and/or permanent impacts are limited to the restriction of access to mineral and/or fossil fuel resources located within the permanent pipeline ROW (50 feet wide) and under ancillary facilities (e.g., access roads, pump stations, and construction camps). Thus, this is the only potential area for cumulative impacts to occur with other past, present, and reasonably foreseeable future projects.

Past projects would concurrently affect this aspect of geological resources to the extent that there is a high density of past project activity in a geographic area having a similar impact. As shown in Figures 4.15.2-1 and 4.15.2-3, southern and eastern Nebraska and the east/southeastern region of Montana are candidate areas for cumulative impacts associated with concurrent projects, including the proposed Project. For current projects, construction of the TransCanada Gulf Coast Pipeline Project could also permanently limit access to some mineral resources in Oklahoma and Texas. Approximately 81 percent of the Gulf Coast Pipeline Project was planned to be constructed within approximately 300 feet of existing pipelines, utilities, or road ROWs, which could potentially increase the area of restricted access to mineral and/or fossil fuel resources beyond the typical 50-foot ROW width. No other current projects identified have a potential to significantly add to cumulative impacts to geological resources with the proposed Project.

Future projects could potentially contribute to cumulative impacts to mineral and/or fossil fuel resources including the BakkenLink pipeline, the Bakken Marketlink, and the Bakken Crude Express pipeline projects, in addition to water delivery and wind power projects, particularly where they might overlap geographically with the proposed Project in east/southeastern Montana and southeastern Nebraska. Overall, however, with respect to the proposed Project in combination with the past, present, and foreseeable future projects, including the Gulf Coast Pipeline Project, the acreage of restricted mineral and/or fossil fuel resources is minimal when compared to the amounts available for extraction surrounding the areas directly affected by these projects.

[4] According to the U.S. Geological Survery, a *karst* is defined as "A terrain, generally underlain by limestone or dolomite, in which the topography is chiefly formed by the dissolving of rock and which may be characterized by sinkholes, sinking streams, closed depressions, subterranean drainage, and caves" (Monroe 1970).

4.15.3.2 Soils

A summary of potential environmental consequences of the proposed Project activities to soil resources is presented in Table 4.15-5.

Table 4.15-5 CEA Matrix: Soils

Potential Impact Area	Proposed Project and Connected Action Impacts		Geographic Extent	Cumulative Impact Potential (Yes/No)
	Construction	Operation		
Soil Erosion	(D)	I	PA	No
Soil Compaction	(D)	N	PA	No
Loss of Topsoil/Topsoil Degradation	(I)	N	PA	No
Agricultural, Range, Pasture Land Soil Degradation	(I)	N	PA	No
Fragile Soils	(D)	N	PA	No
Soil Productivity (Temperature)	N	D	PA	Yes

Duration of Impact
—Negligible
—Temporary/Short Term (<3 yr.)
—Long-Term (>3 yr.)
—Permanent

Type of Impact
N —Negligible Impact
D —Direct Impact
I —Indirect Impact

Notes: Parentheses around impact indicates that it would be addressed by implementation of Keystone's CMRP, additional mitigations, and/or existing laws and regulations.
Geographic Extent of Potential Impact: Project Area (PA)—Defined by limits of ROW and ancillary facilities (e.g., access roads, pump stations, and construction camps).

Potential effects to soil resources from the proposed Project are limited to the general footprint of the proposed Project ROW and ancillary facilities (e.g., access roads, pump stations, and construction camps). As a result, the potential for additive cumulative effects to these resources is also limited. Change to soil productivity due to localized increased temperature is the one area considered to have potential permanent effects when the pipeline is in operation. Potential effects on other aspects of soil resources from the proposed Project are limited in geographic extent, and the majority are associated with the construction phase of the proposed Project only. As further discussed below, potential cumulative effects to soil resources are localized and otherwise considered negligible. Due to the relatively high temperature of the oil in the pipeline, increased pipeline operation temperatures may cause a localized increase in soil temperatures and a decrease in soil moisture content, causing indirect affects to terrestrial vegetation. This is the only potential impact to soil that is considered permanent for the design life of the proposed Project. Permanent changes to soil productivity within the pipeline ROW are considered to have low cumulative impacts, assuming effective restoration efforts and when considered in the context of the large quantity of soil resources throughout the proposed Project route.

Outside of productivity issues, potential direct effects to soil resources include clearing, grading, trench excavation, backfilling, equipment traffic, and restoration along the proposed Project ROW and ancillary facilities during construction activities. Potential impacts could include temporary and short-term direct impacts associated with soil erosion and soil compaction; and short- to long-term direct and indirect impacts associated with topsoil loss and/or degradation (including fragile soils and agriculture, range, or pasture soils). Impacts to soil resources during operation include temporary and short-term indirect impacts associated with soil erosion (from pipeline maintenance traffic and incidental repairs). However, Keystone's proposed Project CMRP (see Appendix G) includes construction procedures that are designed to reduce the

likelihood and severity of proposed Project impacts to soil resources. For example, the CMRP requires the use of erosion control measures (such as the installation of sediment barriers, trench plugs, temporary slope breakers, drainage channels or ditches, and mulching), as well as soil compaction control and topsoil salvage measures. Special handling and additional soil salvage techniques would be implemented to conserve agricultural soil capability where appropriate. Special considerations and measures would also be undertaken in proposed Project areas in southern South Dakota and northern Nebraska where the soils are fragile (i.e., sandy soils that are highly susceptible to erosion by wind). These embedded controls would serve to reduce the severity and duration of potential impacts to soil resources during construction and operation activities.

Impacts to soil resources from the construction and operation of the connected actions (Bakken Marketlink Project, Big Bend to Witten 230-kV Transmission Line, and Electrical Distribution Lines and Substations) are not substantially different from the proposed Project with the exception of impacts associated with soil temperature and potential impacts to fragile soils. These soil resources would not be impacted by the connected actions to the proposed Project. Where remaining impacts listed in Table 4.15-5 overlap between the proposed Project and the connected actions, these are considered collectively in the overall discussion of the proposed Project.

In summary, long-term/permanent impacts are limited to potential productivity issues (defined as localized increases in soil temperatures and decrease in soil moisture content), which are localized to the area of the permanent pipeline ROW and ancillary facilities. Past projects would concurrently affect soil productivity and its indirect effect on terrestrial vegetation to the extent that there is a high density of activity in a geographic area having a similar impact. As shown on Figures 4.15.2-1 and 4.15.2-3, southern and eastern Nebraska and the east/southeastern region of Montana are candidate areas for cumulative impacts associated with concurrent projects, including the proposed Project. The project type affecting soil productivity through temperature would be limited to crude oil pipelines. However, to the extent that past projects also have soil productivity concerns through other direct or indirect alteration of terrestrial vegetation, they could also be considered cumulative. Reclamation measures are available for this resource within the context of all of these activities, thus reducing the possibility for permanent impacts and lessening their significance to overall cumulative impacts.

Currently, although not within the PCIC, construction of the TransCanada Gulf Coast Pipeline Project is included in the consideration of soil productivity impacts. However, year-round soil surface temperatures over the Gulf Coast pipeline route in Oklahoma and Texas will not be affected by this pipeline. Other current projects such as water delivery systems and highway maintenance and repair are also not expected to result in permanent impacts to terrestrial vegetation. Therefore, current projects would not contribute to cumulative impacts to soil productivity or the associated indirect impacts to terrestrial vegetation.

Future projects that could potentially contribute to cumulative impacts to soil productivity include the BakkenLink pipeline, the Bakken Marketlink, and the Bakken Crude Express pipeline projects. Electrical transmission lines, wind power projects, and oil and gas mining activities may also contribute to cumulative impacts to soil productivity through the indirect alteration of terrestrial vegetation, particularly where projects could overlap geographically with the proposed Project in east/southeastern Montana and southeastern Nebraska.

Overall, however, with respect to the proposed Project in combination with the past, present, and foreseeable future projects, including the Gulf Coast Pipeline Project, permanent changes to soil productivity within the pipeline ROW are considered negligible assuming effective restoration efforts and in the context of the large extent of soil resources throughout the proposed Project route. Where restoration efforts are not feasible, landowner compensation for demonstrated losses from decreased productivity resulting from pipeline operations would be implemented to the extent required by easement or ROW agreements.

4.15.3.3 Water Resources

Surface Water

A summary of potential environmental consequences of the proposed Project activities to surface water resources is presented in Table 4.15-6.

Table 4.15-6 CEA Matrix: Surface Water

Potential Impact Area	Proposed Project and Connected Action Impacts		Geographic Extent	Cumulative Impact Potential (Yes/No)
	Construction	Operation		
Bank Stability	(D)	N	PA	No
Channel Morphology	(D)	N	LA	No
Channel Bed Scour	(D)	N	LA	No
Increased Sedimentation	(D)	(I)	LA	No
Water Temperature Alteration (Channel Construction)	D	N	LA	No
Water Temperature Alteration (Pipe Testing)			LA	No
Reduced Flow			LA	No
Dewatering	D	N	LA	No
Transportation of Invasive Plant Species	(I)	(I)	R	Yes
Introduction of Invasive Aquatic Species	(I)	I	R	Yes
Increased Total Dissolved Solids	(D)	I	R	No
Increased Total Suspended Solids (Riparian)	(D)	(D)	R	No
Increased Total Suspended Solids (General ROW)	(D)	(I)	R	No

Duration of Impact
—Negligible
—Temporary/Short Term (<3 yr.)
—Long-Term (>3 yr.)
—Permanent

Type of Impact
N —Negligible Impact
D —Direct Impact
I —Indirect Impact

Notes: Parentheses around impact indicates that it would be addressed by implementation of Keystone's CMRP, additional mitigations, and/or existing laws and regulations.
Geographic Extent of Potential Impact: Project Area (PA)—Defined by limits of ROW and ancillary facilities (e.g., access roads, pump stations, and construction camps); Local Area (LA)—Defined as a 2-mile distance on either side of the pipeline ROW and ancillary facilities; Regional (R)—Defined by resource (e.g., home ranges of wildlife species, bird migration corridor, regional airshed, etc.).

As further discussed below, routine proposed pipeline operation and maintenance activities would have negligible effect on surface water resources with properly implemented and maintained mitigations; therefore, the overall potential for cumulative effects to surface water resources is considered low. No permanent effects during the operation of the pipeline are expected. Generally speaking, the proposed Project route has been selected and modified to minimize the potential for impacts to surface water resources, as well as other sensitive

environments, by avoiding them whenever possible and shifting the route to limit the area affected. There are a number of waterbodies that would be crossed by the proposed pipeline where mitigation measures would be used to reduce or minimize impacts. To the extent that one or more projects cross the same waterbody in the same watershed, implementation of appropriate construction practices as well as permit and project planning processes through, for example, the U.S. Army Corps of Engineers (USACE) could serve to minimize the potential for localized cumulative impacts. The introduction and transportation of invasive aquatic and plant species, respectively, are considered the only potential long-term, indirect impacts when the pipeline is in operation. The remaining surface water resource areas are potentially affected on a long-term basis primarily during the period of construction, with low potential to persist in the pipeline operation phase.

Depending on the type of stream crossing, one of six construction methods would be used: non-flowing open cut, flowing open cut, dry flume, dry dam-and-pump, HDD, or horizontal bore crossing. At 14 major and sensitive waterbody crossings, the HDD method would be used. Where conditions warrant the use of the HDD crossing method, waterbody impacts of construction would be minimal because no direct contact would occur with stream banks, channel bed, or waters. In the event that a frac-out (i.e., accidental release of drilling fluids from the borehole up to the surface) were to occur during HDD, there would be short-term impacts within the proposed Project cumulative impact corridor, but conditions would be expected to return to pre-construction conditions after mitigation and restoration measures were implemented, making their overall contribution to cumulative impacts negligible.

Potential impacts on surface water resources during construction activities would include temporary increases in total suspended solids concentrations and sedimentation during non-HDD stream crossings or at upland locations with soil erosion and transport to streams; temporary to long-term changes in channel morphology and stability caused by channel and bank modifications; temporary to long-term decrease in bank stability and resultant increase in total suspended solids concentrations from bank erosion as vegetation removed from banks during construction is re-establishing; and temporary reduced flow in streams and potential other adverse effects during hydrostatic testing activities and stream crossing construction. Full shrub and vegetation restoration in riparian areas is expected to take more than 3 years; however, the establishment of herbaceous ground cover and other temporary stabilization measures very soon after completion of crossings would ensure that there are no long-term effects to bank stability and sedimentation.

Keystone's proposed Project CMRP (see Appendix G) includes construction procedures that are designed to reduce the likelihood and severity of proposed Project impacts to surface water resources. For example, the CMRP identifies procedures to limit erosion and land disturbances, including the use of buffer strips, drainage diversion structures, sediment barrier installations, and clearing limits, as well as procedures for waterbody restoration at crossings. In floodplain areas adjacent to waterbodies, the contours would be restored to as close to previously existing contours as practical and the disturbed area would be revegetated during construction of the ROW in accordance with the CMRP. Implementation of CMRP construction and operating requirements would lead to minimal impacts to waterbodies under normal construction and operating conditions; therefore, the contribution to cumulative impact would be negligible.

Potential surface water impacts associated with the connected actions are similar to those for the proposed Project construction components. Where remaining impacts listed in Table 4.15-6

overlap between the proposed Project and the connected actions, these are considered collectively in the overall discussion of the proposed Project.

In summary, with respect to surface water resources, permanent impacts are not expected. In the short term, bank and channel impacts from construction that would not regain full stability or equilibrium in the construction period would be expected to do so in 1 to 3 years post-construction. Operational impacts would be from maintenance activities (most likely in the event of pipe repair), but could also occur in previously impacted areas that are susceptible to the effects of large storm/runoff events. The introduction and transportation of invasive aquatic and plant species is the primary long-term impact concern, and is the only potential area for cumulative impacts to occur with other past, present, and reasonably foreseeable future projects. Past projects would concurrently affect invasive species to the extent that there is a high density of activity in a geographic area having a similar impact. As shown on Figures 4.15.2-1 and 4.15.2-3, southern and eastern Nebraska and the east/southeastern region of Montana are candidate areas for cumulative impacts associated with concurrent projects, including the proposed Project. Although existing projects are not noted to have had long-term impacts to surface water with respect to invasive species, mitigation and restoration measures are available to address these concerns within the context of all of these project activities; thus the overall significance to cumulative impacts is low.

Currently, although not within the PCIC, construction of the TransCanada Gulf Coast Pipeline Project is included in the consideration of invasive species impacts on surface water resources. However, similar to that described above, mitigation and restoration measures would reduce the likelihood of these concerns. Other current projects such as water delivery systems and highway maintenance and repair are also not expected to result in long-term impacts with respect to invasive species. Therefore, current projects would not contribute to cumulative impacts to surface water resources.

Future projects that could potentially contribute to cumulative impacts to surface water resources with respect to invasive species include the BakkenLink pipeline, the Bakken Marketlink, and the Bakken Crude Express pipeline projects. Other future projects such as electrical transmission lines, wind power projects, and oil and gas development and mining activities may also contribute to cumulative impacts where projects could overlap geographically with the proposed Project in east/southeastern Montana and southeastern Nebraska. However, similar to those described above, mitigation and restoration measures are available to address these concerns.

Overall, with respect to the proposed Project in combination with the past, present, and foreseeable future projects, including the Gulf Coast Pipeline Project, permanent changes to surface water resources within the pipeline ROW are considered negligible assuming effective mitigation and restoration efforts with the proposed Project and other projects throughout the proposed Project route.

Groundwater/Hydrogeology

A summary of potential environmental consequences of the proposed Project activities to groundwater resources and hydrogeology is presented in Table 4.15-7. Permanent direct impacts to groundwater/hydrogeology from the proposed Project include the direct continuous or intermittent contact of the pipeline with groundwater in shallow water settings. In addition, permanent impacts would occur to existing wells that are within the proposed Project ROW or at ancillary facilities, which would be decommissioned. Long-term impacts to groundwater could

result from groundwater mixing (between aquifers) during HDD, although this would be minimized by the drilling fluids and muds that would seal the pipe in place. These aspects, however, are not considered significant with respect to cumulative effects because they would be generally localized to the footprint of proposed Project activities and are not likely to be additive between past, present, or future projects. Groundwater/hydrogeology impacts are further discussed below.

Table 4.15-7 CEA Matrix: Groundwater/Hydrogeology

Potential Impact Area	Proposed Project and Connected Action Impacts		Geographic Extent	Cumulative Impact Potential (Yes/No)
	Construction	Operation		
Water used for HDD	(D)	N	LA	No
Water extraction and use for construction housing camps and hydrostatic testing	D	N	LA	No
Groundwater mixing	I	I	PA	Yes
Dust suppression along access roads	(D)	N	PA	No
Dewatering during construction	(D)	N	PA	No
Decommissioning of existing wells within the alignment	(D)	(D)	PA	Yes
Water disposal during hydrostatic testing of pipeline and at the construction camps	(D)	(D)	R	No
Changes to characteristics of shallow groundwater aquifers	I	I	LA	No
Pipeline in direct contact with shallow groundwater	D	D	PA	Yes

Duration of Impact
—Negligible
—Temporary/Short Term (<3 yr.)
—Long-Term (>3 yr.)
—Permanent

Type of Impact
N —Negligible Impact
D —Direct Impact
I —Indirect Impact

Notes: Parentheses around impact indicates that it would be addressed by implementation of Keystone's CMRP, additional mitigations, and/or existing laws and regulations.
Geographic Extent of Potential Impact: Project Area (PA)—Defined by limits of ROW and ancillary facilities (e.g., access roads, pump stations, and construction camps); Local Area (LA)—Defined as a 2-mile distance on either side of the pipeline ROW and ancillary facilities; Regional (R)—Defined by resource (e.g., home ranges of wildlife species, bird migration corridor, regional airshed, etc.).

The remaining potential impacts to groundwater/hydrogeological resources are short term in duration. In addition, Keystone's proposed Project CMRP includes construction procedures that are designed to reduce the likelihood and severity of proposed Project impacts to water resources. The proposed Project would be required to adhere to applicable local, state, and federal regulations and permit conditions. All water resources used for hydrostatic testing, construction camp use, dust suppression, or HDD would be approved by the appropriate permitting agencies and water rights holders prior to initiation of any withdrawal activities. As described in the proposed Project CMRP, surface and/or groundwater withdrawal methods would be implemented and followed, including screening of intake hoses to prevent the entrainment of fish or debris, keeping the hose at least 1 foot off the bottom of the water resource, prohibiting the addition of chemicals into the test water, and avoiding discharging any water that contains visible oil or sheen (from pipe manufacturing activities) following testing activities. Required water analyses would be obtained prior to any water discharging operations associated with hydrostatic testing or construction camp water disposal.

Impacts to groundwater/hydrogeological resources from the construction and operation of the connected actions (Bakken Marketlink Project, Big Bend to Witten 230-kV Transmission Line, and Electrical Distribution Lines and Substations) are not substantially different from the proposed Project. No significant large-scale potable water aquifers underlie the Bakken Marketlink Project area, and well depths are typically greater than 50 feet. Because of the limited amount of potable water directly beneath the Bakken Marketlink Project area and the significant depth to groundwater in this area, it is not likely that potential releases would significantly impact groundwater resources in the area. Where remaining impacts listed in Table 4.15-7 overlap between the proposed Project and the connected actions, these are considered collectively in the overall discussion of the proposed Project.

In summary, with respect to groundwater/hydrogeological resources, long-term/permanent impacts are related to contact of the pipeline with groundwater in shallow water settings, the decommissioning of existing wells that would be impacted by the proposed Project, and groundwater mixing (between aquifers) during HDD. Where avoidance of an existing groundwater well is not feasible, compensation for the loss resulting from pipeline and ancillary facility construction would be implemented to the extent required by easement or ROW agreements. Pipeline contact with shallow groundwater and groundwater mixing between aquifers are localized impacts with little to no significant cumulative impact potential with other projects. Therefore, with respect to the proposed Project in combination with the past, present, and foreseeable future projects, including the Gulf Coast Pipeline Project, cumulative impacts to groundwater resources are considered negligible.

4.15.3.4 Wetlands

A summary of potential environmental consequences of the proposed Project activities to wetland resources is presented in Table 4.15-8 below. Table 4.15-8 summarizes the estimated duration, geographic extent, and cumulative impact potential for proposed Project-related wetland impacts. This discussion focuses on those wetlands that would be affected on a long-term and/or permanent basis and could potentially contribute to cumulative wetland impacts regionally. Refer to Section 4.4, Wetlands, for a detailed discussion of the wetlands that would be affected by the proposed Project as well as the proposed impact minimization and restoration measures. Temporary, short-term, long-term, and permanent impacts discussed here and in Section 4.4, Wetlands, are based on the assumptions that post-construction restoration efforts would be successful and that no unforeseen conditions resulting from proposed pipeline operations (e.g., pipeline soil temperature effects, potential spills) delay anticipated recovery rates. Note that a long-term and/or permanent effect or impact does not necessarily mean a permanent loss of wetland habitat. For example conversion of scrub-shrub or forested wetlands to herbaceous wetlands is considered a permanent impact to those woody wetland classes, but does not represent a complete loss of wetland habitat, whereas a permanent wetland loss would be a conversion of a wetland community to an upland as a result of the construction of a pump station or access road.

Table 4.15-8 CEA Matrix: Wetlands

Potential Impact Area	Proposed Project and Connected Action Impacts		Geographic Extent	Cumulative Impact Potential (Yes/No)
	Construction	Operation		
Wetland loss (conversion of wetland to upland communities)	(D)	(D)	PA	Yes
Conversion of forested to emergent wetlands	(D)	D	PA	Yes
Conversion of scrub-shrub to emergent wetlands	(D)	D	PA	Yes
Loss of or change in hydrology	(I)	(I)	LA	No
Loss of or change in hydric soil integrity	(I)	(I)	PA	No
Change in forested wetland function (non-HDD areas)	(D)	D	LA	Yes
Change in forested wetland function (HDD areas)	(D)	(D)	LA	Yes
Change in scrub-shrub wetland function (non-HDD areas)	(D)	D	LA	Yes
Change in scrub-shrub wetland function (HDD areas)	(D)	(D)	LA	Yes
Change in emergent wetland function	(D)	(D)	LA	Yes
Change in wetland species diversity (not including PFO or PSS conversion issues)[a]	(D) and (I)	(D) and (I)	LA	No
Changes in water quality	(D) and (I)	(D) and (I)	PA	No
Soil biological, chemical, hydrologic conditions/activity (above pipeline resulting from pipe-generated heat)	N	D	PA	Yes
Increased weed infestation	(I)	(I)	LA	Yes

Duration of Impact
- —Negligible
- —Temporary/Short Term (<3 yr.)
- —Long-Term (>3 yr.)
- —Permanent

Type of Impact
- N —Negligible Impact
- D —Direct Impact
- I —Indirect Impact

Notes: Parentheses around impact indicates that it would be addressed by implementation of Keystone's CMRP, additional mitigations and/or existing laws and regulations.
Geographic Extent of Potential Impact: Project Area (PA)—Defined by limits of ROW and ancillary facilities (e.g., access roads, pump stations, and construction camps); Local Area (LA)—Defined as a 2-mile distance on either side of the pipeline ROW and ancillary facilities.
[a] PFO = palustrine forested wetland; PSS = palustrine scrub shrub wetland

Impacts to emergent wetlands affected within the proposed construction corridor width, which would encompass the permanently maintained operations ROW, would range from short-term to permanent, with likely successful re-establishment for most wetlands within 3 to 5 years, assuming mitigation is successful and near pre-construction conditions are restored and maintained within the anticipated timeframes. All impacted emergent wetlands within the construction and permanent ROW would be restored to near pre-construction conditions following proposed pipeline installation. Emergent wetlands would be allowed to persist outside of and within the permanent operations ROW for the life of the proposed Project. Herbaceous wetland vegetation in the proposed pipeline ROW generally would not be mowed or otherwise maintained, although the CMRP (see Appendix G) allows for annual maintenance of a 50-foot-wide strip centered over the pipeline to mow or clear tall vegetation if necessary. The only permanent loss of emergent wetlands would be associated with the construction of

permanent ancillary facilities such as permanent access roads, emergency response staging areas, and pump stations.

In forested and scrub-shrub wetlands, the effects of proposed construction would be extended due to the longer period needed to regenerate a mature forest or shrub community. Prior to proposed pipeline installation, scrub-shrub and forested wetland vegetation within the construction corridor (area between the approximate 50-foot permanently maintained ROW and 110-foot construction corridor limit) would be cut to ground level, and root systems would be left in place. Once construction activities were completed, woody vegetation outside of the permanent wetland operations ROW would be restored to near pre-construction conditions and woody vegetation would be allowed to regrow. This would be considered a long-term impact based on the slower growth rate of trees and shrubs, which may require decades for complete regeneration. The 50-foot-wide permanently-maintained ROW would be kept free of tall woody vegetation for the life of the proposed Project. Tall woody vegetation within the permanent ROW would be completely removed and not allowed to regrow. Scrub-shrub and forest wetlands within the permanent ROW would be converted to emergent wetlands, which represents a permanent impact to the woody wetland class, but does not represent a permanent loss of wetland habitat. The only exception to this would be at HDD locations where shrubs and trees would be allowed to regenerate within the permanent ROW after construction activities are complete. In this case, impacts to scrub-shrub and forested wetlands at HDD locations would be considered long-term. The only permanent conversion of scrub-shrub and forested wetlands to uplands would be associated with the construction of permanent ancillary facilities such as permanent access roads, emergency response staging areas, and pump stations.

Construction and operation of ancillary facilities would result in short-term, long-term, and permanent impacts. Impacts associated with non-permanent ancillary facilities (i.e., temporary access roads) would be similar to those described above for emergent wetlands (short-term to long-term with recovery in 3 to 5 years), and long-term to permanent for scrub-shrub and forested wetlands. The construction of permanent ancillary facilities (i.e., permanent access roads, emergency response staging areas, and pump stations) would require wetland fills and represent a permanent wetland loss (wetland to upland conversion); however, these areas are small. Permanent wetland losses due to operational ancillary facilities are estimated to be 0.8 acres in Montana, 1.2 acres in South Dakota, and none in Nebraska (see Wetland to Upland Conversion in Table 4.4-2 in Section 4.4, Wetlands).

With respect to long-term and permanent impacts in Montana, there are an estimated 32.3 acres of wetlands (herbaceous, scrub-shrub, forested, and riverine-openwater) that would be affected by the permanent operations of the proposed Project (see Table 4.4-1 in Section 4.4, Wetlands). Of the 32.3 acres, approximately 7.1 acres of scrub-shrub and forested wetlands would be converted to emergent wetlands, and 0.8 acres of wetlands (all types) would be permanently filled and converted to upland as a result of the construction of ancillary facilities. Similarly in South Dakota, there are an estimated 56.1 acres of wetlands that would be affected by the permanent operations of the proposed Project. Of these 56.1 acres, approximately 8.4 acres of scrub-shrub and forested wetlands would be converted to emergent wetlands, and 1.2 acres of wetlands (all types) would be permanently filled and converted to upland as a result of the construction of ancillary facilities (see Table 4.4-1 in Section 4.4, Wetlands). In Nebraska, approximately 32 acres of wetlands would be affected by the permanent operations of the proposed Project. Of that total, approximately 10.8 acres of scrub-shrub and forested wetlands would be converted to emergent wetlands. Where required, all permanent wetland impacts would

be mitigated by following standard USACE-required mitigation protocols and ratios, negotiated during the proposed Project permitting. As noted in Section 4.4.2, Impact Assessment Methodology, there are limitations to the data presented in the potential wetland impact analysis, and the acreages noted above may underestimate the potential wetland impacts associated with the proposed Project for certain wetland types. Wetland types that may be under-represented include narrow wetland fringe along small streams and rivers; seasonal wetlands in topographic depressions; small depressional wetlands, particularly in the Prairie Pothole Region; wetland mosaics in forested areas, particularly in floodplains; wetlands in areas that are managed for agricultural purposes; and small riverine/open water features.

The long-term and permanent impacts described above and presented in Table 4.15-8 have the potential to contribute towards the cumulative impacts on wetlands as summarized below:

- Potential cumulative effects associated with wetland to upland conversion would be considered to have low overall cumulative significance considering the relatively small total wetland losses due to the proposed Project. In addition, the proposed Project would attempt to mitigate for these losses per local, state, and federal requirements.
- Potential cumulative effects associated with conversion of forested to emergent wetlands would be considered to have a greater overall cumulative significance because forested wetlands are a limited resource within the proposed Project area. The proposed Project would attempt to mitigate for these losses according to the CMRP and in accordance with local, state, and federal requirements.
- Impacts associated with conversion of scrub-shrub to emergent wetlands would have the potential to contribute to overall cumulative impacts. The proposed Project would attempt to mitigate for these losses according to the CMRP and in accordance with local, state, and federal requirements.
- Change in forested wetland function (e.g., wildlife habitat) would be long-term (>3 years) in areas where regrowth would be allowed and permanent in areas where regrowth would be prohibited. Impacts to function would be minimized according to the CMRP; however, there remains the potential for general degradation of forested wetland functions due to the difficulty in successfully restoring long-standing functions with short-term restoration efforts. There is a greater potential for cumulative impacts due to forested wetland conversion because forested wetlands are a limited resource in the proposed Project area.
- Change in scrub-shrub wetland function (e.g., wildlife habitat) would be long-term (>3 years) in areas where regrowth would be allowed and permanent in areas where regrowth would be prohibited. Impacts to function would be minimized according to the CMRP; however, there remains the potential for general degradation of scrub-shrub wetland functions due to the difficulty in successfully restoring long-standing functions with short-term restoration efforts. Impacts to scrub-shrub wetland functions would have the potential to contribute to overall cumulative impacts.

- Emergent wetland vegetation (e.g., wildlife habitat) would be allowed to regrow in the construction and operations ROW with recovery expected in 3 to 5 years; therefore, impacts to emergent function would be long term, but not permanent. Impacts to function would be minimized according to the CMRP; however, there remains the potential for general degradation of emergent wetland functions due to the difficulty in successfully restoring long-standing functions with short-term restoration efforts. Impacts to emergent wetland functions would have the potential to contribute to overall cumulative impacts.
- Potential cumulative effects associated with the increased soil temperatures in wetlands located directly over the pipeline would have the potential to contribute to overall cumulative effects for all wetland types. The increased soil temperatures may result in beneficial and/or negative impacts to biological, chemical, and hydrologic conditions in affected wetlands (see examples in Section 4.4.3, Potential Wetland Impacts).
- Weeds would be controlled during the construction and operational phases per the CMRP. Weeds have the potential to encroach within disturbed areas despite control efforts over the long term and spread into areas adjacent to the proposed Project area. Potential cumulative effects would be considered to have low overall cumulative significance considering the proposed Project's stated commitments to controlling weeds.

The potential for a given impact to contribute to cumulative impacts is based on the assumption that the CMRP (see Appendix G) is successful and near pre-construction conditions are restored and maintained within the anticipated timeframes. Impacts to wetland resources from the construction and operation of the connected actions (Bakken Marketlink Project, Big Bend to Witten 230-kV Transmission Line, and Electrical Distribution Lines and Substations) are not substantially different from the proposed Project. Most wetlands would be spanned, avoided, minimized, and/or mitigated.

In summary, with respect to wetland resources, the primary impact concern with respect to potential cumulative effects is the conversion of forested wetlands to emergent wetlands and the general degradation of wetland functions and values for all wetland types (e.g., wildlife habitat, water quality, erosion control, etc.). These impacts represent the primary area for cumulative impacts to occur with other past, present, and reasonably foreseeable future projects. As described above, the proposed Project would mitigate for wetland losses per local, state, and federal requirements, as well as the CMRP (see Appendix G). However, it is noted that there is a greater potential for cumulative impacts to forested wetlands, because forested wetlands are a limited resource in the proposed Project area.

Historical activities and past projects are linked to wetland losses. Approximately 53 percent of the wetlands in the conterminous United States were lost between the 1780s and the 1980s (USACE 2012). Since the mid-1970s the rate of loss has decreased dramatically, primarily through the implementation and enforcement of wetland protection measures, public outreach/education, and restoration programs (U.S. Environmental Protection Agency [USEPA] 2012a). Currently, it is estimated that only 40 to 50 percent of the original Prairie Pothole wetlands remain undrained today, and only about 10 percent of the original Rainwater Basin wetlands remain. In Montana (particularly in north-central and eastern Montana), South Dakota (notably in the prairie pothole region), and Nebraska, wetlands conversion to agricultural use (assumed to include livestock grazing) accounts for most historic wetland losses (U.S. Geological Survey 1996); other development activities and urbanization follow in significance.

Based on the known limitations of the wetland impact analysis and the proposed mitigation measures that would be used to avoid and minimize wetland impacts (see Section 4.4.3, Potential Wetland Impacts), the proposed Project has the potential to contribute to cumulative wetland impacts, particularly in southeastern Nebraska and east/southeastern Montana regions that are considered candidate areas for cumulative impacts associated with past projects, including the proposed Project (as shown in Figures 4.15.2-1 and 4.15.2-3).

Although not within the PCIC, wetland impacts associated with the concurrent construction of the TransCanada Gulf Coast Pipeline Project were considered. Similar to that described above, this pipeline project was designed to mitigate for wetland losses per local, state, and federal requirements. Other current projects such as water delivery systems and highway maintenance and repair in Montana, South Dakota, and Nebraska would be required to avoid, minimize, and mitigate for wetland impacts according to local, state, and federal regulations. Enforcement of these regulations would likely limit the contribution of those projects to cumulative impacts.

Future projects that could potentially contribute to cumulative impacts to wetland resources include the BakkenLink pipeline, the Bakken Marketlink, and the Bakken Crude Express pipeline projects. Other future projects such as electrical transmission lines, wind power projects, and oil and gas mining activities may also contribute to cumulative impacts where projects could overlap geographically with the proposed Project in east/southeastern Montana and southeastern Nebraska. However, similar to those described above, future projects would be required to implement avoidance and mitigation measures designed to minimize potential impacts to wetland resources, which would likely limit the contribution of those projects to cumulative impacts.

Overall, with respect to the proposed Project in combination with the past, present, and foreseeable future projects, including the Gulf Coast Pipeline Project, long-term and permanent changes to wetland resources within the pipeline ROW have the potential to contribute to cumulative wetland impacts.

4.15.3.5 Terrestrial Vegetation

A summary of potential environmental consequences of the proposed Project activities to terrestrial vegetation resources is presented in Table 4.15-9. Permanent effects to terrestrial vegetation resources from the proposed Project are limited to the general footprint of the proposed Project ROW and ancillary facilities (e.g., access roads, pump stations, and construction camps). As a result, the potential for additive cumulative effects to these resources is also limited. Forested habitats, including biologically unique forested habitats, could be permanently impacted by the construction and operation of the pipeline. Additionally, shrublands (including Sagebrush Steppe communities) and grasslands could be impacted for the long term due to the slow recovery from the impacts of construction. However, most of the land affected by the proposed Project is used for agriculture and rangeland (approximately 90 percent). Disturbed agricultural land and rangeland would be returned to approximate pre-construction use and capability. Permanent impacts to 51.5 acres of forested areas spaced across Montana, South Dakota, and Nebraska (includes forested upland and wetland acres) would occur within the 50-foot-wide permanent easements centered on the pipeline; this acreage represents forest conversion to other habitat.

Table 4.15-9 CEA Matrix: Terrestrial Vegetation

Potential Impact Area	Proposed Project and Connected Action Impacts		Geographic Extent	Cumulative Impact Potential (Yes/No)
	Construction	Operation		
General Vegetation Impacts				
Cultivated Crops	D	D	PA	No
Grassland/Pasture	(D)	(D)	PA	Yes
Upland Forest	(D)	D	PA	Yes
Open Water	D	D	PA	No
Woody Wetlands	(D)	D	PA	Yes
Herbaceous Emergent Wetlands	(D)	(D)	PA	No
Shrub/Scrub	(D)	(D)	PA	Yes
Developed Land	D	D	PA	No
Potential Impacts to Biologically Unique Landscapes and Vegetation Communities of Conservation Concern				
Forest Communities	(D)	D	PA	Yes
Riparian Forest	(D)	D	PA	Yes
Native Grasslands	(D)	(D)	PA	Yes
Sagebrush Steppe	(D)	(D)	PA	Yes

Duration of Impact

—Negligible
—Temporary/Short Term (<3 yr.)
—Long-Term (>3 yr.)
—Permanent

Type of Impact

N —Negligible Impact
D —Direct Impact
I —Indirect Impact

Notes: Parentheses around impact indicates that it would be addressed by implementation of Keystone's CMRP, additional mitigations, and/or existing laws and regulations. Geographic Extent of Potential Impact: Project Area (PA)—Defined by limits of ROW and ancillary facilities (e.g., access roads, pump stations, and construction camps).

Forested habitats within the ROW of the proposed Project would be permanently converted to herbaceous habitats so that pipeline access and maintenance is manageable. During the construction phase, larger expanses of habitat would be cleared for access and use. Forested areas that are not within the permanent ROW would be replanted, reseeded, and restored. The proposed pipeline route would also cross an estimated 356 miles of 1,054 individual native grassland communities through Montana, South Dakota, and Nebraska. Clearing of native grasslands along portions of the proposed Project ROW could contribute to the cumulative decline of native grasslands. Although native grasslands would be reseeded with native seed, construction effects on previously untilled native prairies could be long term, as destruction of the prairie sod during trenching may require more than 100 years for recovery. Short grass prairie and mixed-grass prairie areas may take 5 to 8 or more years to re-establish due to poor soil conditions and low moisture levels. Construction would also involve removal of woody shrubs in sagebrush grasslands. Restoration of these habitats would be long term. Conservation efforts implemented to offset potential losses would reduce the cumulative impacts associated with the proposed Project.

The proposed pipeline route would cross an estimated approximate 56 miles of Inter Mountain Basins Big Sagebrush Steppe ecosystem habitat. Construction through this ecosystem habitat would remove sagebrush shrubs. The sagebrush shrubland disturbed in the construction phase would typically re-establish within 5 to 15 years. The sagebrush shrubland in the permanent easement would not be regularly mowed and would also be allowed to revegetate with

sagebrush. As some minimal maintenance would be necessary in this portion of the ROW, the sagebrush may require more time (20 to 50 years) to re-establish.

Introduced, non-native species and noxious weeds could compete with native vegetation in native habitats. Invasive plants and noxious weeds could be introduced into habitats and could be spread by improperly cleaned vehicles and equipment. Some invasive organisms are able to live in dry equipment for several days. To reduce the potential for transfer of non-native species and noxious weeds, mitigation measures would be implemented. Mitigation efforts implemented would reduce the cumulative impacts associated with the proposed Project. Any additional projects located within the vicinity would likely require similar conservation methods and mitigations, thus reducing overall cumulative impacts associated with the spread of invasive species and noxious weeds.

Impacts to terrestrial vegetation resources from the construction and operation of the connected actions (Bakken Marketlink Project, Big Bend to Witten 230-kV Transmission Line, and Electrical Distribution Lines and Substations) are not substantially different from the proposed Project.

In summary, with respect to terrestrial vegetation resources, the primary impact concern with respect to potential cumulative effects is the conversion of forested uplands to herbaceous habitats (reducing and fragmenting forested habitats) and long-term impacts to shrublands and grasslands (which would be restored). These impacts represent the primary areas for cumulative impacts to occur with other past, present, and reasonably foreseeable future projects. Past projects in the area that have historically reduced and fragmented forested habitat may provide the potential for additive cumulative effects; however, the relatively low numbers of forested acres permanently impacted by the proposed Project heavily influences the evaluation of cumulative effects to this habitat overall. The relative contribution to woody wetland loss or conversion (as discussed in the Section 4.15.3.4, Wetlands) or upland forest conversion (approximately 6.3, 3, and 11.8 acres in Montana, South Dakota, and Nebraska, respectively) by the proposed Project in the larger regional context is small. Therefore, even though southeastern Nebraska and east/southeastern Montana are candidate areas for cumulative impacts associated with past projects, including the proposed Project (as shown on Figures 4.15.2-1 and 4.15.2-3), the incremental effect of the proposed Project is negligible. Long-term impacts to shrublands and grasslands (which would be restored) are considered to have low cumulative significance overall when considered in combination with the effects of other past projects based on the assumption that near pre-construction conditions are restored and maintained within the anticipated timeframes.

Although not within the PCIC, terrestrial vegetation impacts associated with the concurrent construction of the TransCanada Gulf Coast Pipeline Project are also considered. Impacts to woody wetland conversions were discussed in Section 4.15.3.4, Wetlands, and were not considered to be significant with respect to cumulative impacts. Forested upland impacts are greater for the TransCanada Gulf Coast Pipeline Project (approximately 900 acres permanently impacted). Forest fragmentation in Oklahoma and Texas is mitigated by the fact that large portions of the TransCanada Gulf Coast Pipeline Project was constructed in existing pipeline ROWs, minimizing new impacts in undeveloped areas. In addition, the total amount of forested upland vegetation that may be affected is relatively small compared to the abundance of similar vegetation in these areas. Forest fragmentation and conversion impacts are not directly cumulative with the proposed Project because impacts are limited to the footprint of pipeline operations. Other current projects such as water delivery systems and highway maintenance and

repair in Montana, South Dakota, and Nebraska are also not expected to result in significant impacts to forested habitats. These projects would be required to implement mitigation and conservation measures designed to minimize potential impacts to forested habitats, which would limit the contribution of those projects to cumulative impacts. Therefore, current projects would not contribute to cumulative impacts to terrestrial vegetation resources.

Future projects that could potentially contribute to cumulative impacts to terrestrial vegetation include the BakkenLink pipeline, the Bakken Marketlink, and the Bakken Crude Express pipeline projects. Other future projects such as electrical transmission lines, wind power projects, and oil and gas mining activities may also contribute to cumulative impacts where projects could overlap geographically with the proposed Project in east/southeastern Montana and southeastern Nebraska. Although the predominant vegetation type is agricultural and rangeland through much of the geographic region (which would be restored to pre-construction conditions) where reductions and fragmentation of forested habitat occurs, this could result in cumulative impacts to this resource. However, similar to that described above, future projects would be required to implement avoidance, mitigation, and conservation measures designed to minimize potential impacts to terrestrial vegetation resources, which would likely limit the contribution of those projects to cumulative impacts.

Overall, with respect to the proposed Project in combination with the past, present, and foreseeable future projects, including the Gulf Coast Pipeline Project, changes to terrestrial vegetation within the pipeline ROW are considered to have low cumulative impact significance, assuming effective mitigation and restoration efforts with the proposed Project and other projects throughout the proposed Project route. It should be noted that the potential for a given impact to contribute to cumulative impacts is based on the assumption that the CMRP (see Appendix G) is successful and near pre-construction conditions are restored and maintained within the anticipated timeframes.

4.15.3.6 Wildlife

A summary of potential environmental consequences of the proposed Project activities to wildlife resources is presented in Table 4.15-10. Impacts associated with federal threatened, endangered, proposed and candidate species, BLM sensitive species, state threatened and endangered species, and species of conservation concern are addressed in Section 4.15.3.8, Threatened and Endangered Species. The anticipated overall absence of permanent impacts to wildlife resources from the proposed Project indicates that cumulative effects to this resource area are expected to be minimal. Although, as indicated in Table 4.15-10, anticipated long-term impacts include the increase in invasive plants, animals, and nest parasites; creation of edge effects; and the facilitation of predator movements. These indirect effects to the local area may be small given the mitigation efforts associated with the proposed Project as well as the small size of the affected areas. Where long-term and/or permanent impacts are absent, the potential for additive cumulative effects with other past, present, and reasonably foreseeable future projects is also small. These conclusions are further discussed below.

Table 4.15-10 CEA Matrix: Wildlife

Potential Impact Area	Proposed Project and Connected Action Impacts		Geographic Extent	Cumulative Impact Potential (Yes/No)
	Construction	Operation		
Habitat loss, alteration, and fragmentation	I	N	LA	No
Direct mortality during construction and operation	D	N	PA	No
Indirect mortality because of stress or avoidance of feeding due to exposure to construction and operations noise, low-level helicopter or airplane monitoring overflights, and from increased human activity	I	I	LA	No
Reduced breeding success from exposure to construction and operations noise and from increased human activity	I	I	LA	No
Reduced survival or reproduction due to less edible plants or reduced cover	I	I	LA	No
Reduction in patch size of remaining available habitats	I	I	LA	No
Creation of edge effects	I	I	LA	Yes
Creation of barriers to movement	I	N	PA	No
Intrusion of invasive plants, animals, and nest parasites	(I)	(I)	LA	Yes
Facilitation of predator movements	I	I	LA	Yes
Habitat disturbance	I	I	LA	No
Intrusion of humans	I	I	PA	No

Duration of Impact
—Negligible
—Temporary/Short Term (<3 yr.)
—Long-Term (>3 yr.)
—Permanent

Type of Impact
N —Negligible Impact
D —Direct Impact
I —Indirect Impact

Notes: Parentheses around impact indicates that it would be addressed by implementation of Keystone's CMRP, additional mitigations, and/or existing laws and regulations.
Geographic Extent of Potential Impact: Project Area (PA)—Defined by limits of ROW and ancillary facilities (e.g., access roads, pump stations, and construction camps); Local Area (LA)—Defined as a 2-mile distance on either side of the pipeline ROW and ancillary facilities; Regional (R)—Defined by resource (e.g., home ranges of wildlife species, bird migration corridor, regional airshed, etc.).

The majority of the potential effects to wildlife resources are indirect, short term or negligible, limited in geographic extent, or associated with the construction phase of the proposed Project. Indirect and short-term impacts associated with construction of the proposed Project may include reduced wildlife use due to increase human interaction; habitat fragmentation, alteration, and loss; stress and reduced breeding success due to noise, vibration, and human activity; creation of barriers to movement; and reduction in patch size of available habitat.

Potential direct impacts to wildlife resources are the short-term direct impacts associated with small and/or immobile wildlife that may not be able to relocate out of construction activities. The overall impacts to populations of wildlife species, on a regional level, are not expected to be significant and cumulatively should be negligible.

The proposed Project would produce a minor contribution to the cumulative effects on resident and migrant wildlife potentially resulting in somewhat reduced abundance and productivity within the proposed Project cumulative impact corridor. Displacement of wildlife that depends

on the carrying capacity of habitats that would be disturbed by the proposed Project could result in reduction of reproductive effort or survival, thus producing a minor contribution to cumulative impacts on wildlife within the proposed Project cumulative impact corridor. This potential is greater for wildlife for which suitable habitat is limited in the proposed Project area or that are otherwise sensitive to disturbance.

Impacts to wildlife resources from the construction and operation of the connected actions (Bakken Marketlink Project, Big Bend to Witten 230-kV Transmission Line, and Electrical Distribution Lines and Substations) are not substantially different from the proposed Project. The duration of impacts is temporary to short term, with negligible effects on wildlife resources. The issues that may cause a cumulative effect are an increase in invasive plants, animals, and nest parasites; creation of edge effects; and the facilitation of predation.

Commenters have suggested that mitigations for cumulative effects to migratory bird species should be considered. In response to these suggestions, the Department requested that Keystone provide broad scale mitigations for cumulative impacts to migratory species. In response, TransCanada provided the information below.

TransCanada has partnered with Ducks Unlimited to provide assistance for the Oak Hammock Marsh Interpretative Centre, educational laboratories, and the Watershed Legacy program, all located in Winnipeg, Manitoba. TransCanada has contributed $1 million to Ducks Unlimited as part of a 5-year commitment running from 2009-2013 to launch the Ducks Unlimited/ TransCanada Partnership regarding Habitat Conservation in the Missouri Coteau conservation in Saskatchewan and the Grand Bayou Hydrology Restoration project in Louisiana.

The Missouri Coteau is a 25,000-square-mile tract stretching across south-central Saskatchewan and is internationally recognized as a critical wildlife habitat area. The region consists mainly of native grassland and pothole wetlands capable of supporting vast populations of breeding waterfowl and providing prime habitat for other wildlife. This project would focus on retaining existing uplands and wetland habitat through conservation easements and land purchases; restoring lost habitats through forage conversion programs; and delivering rangeland stewardship programs by working with landowners to improve ecological function and reduce the risk of native habitat loss.

The Grand Bayou project is located on the Pointe-aux-Chenes Wildlife Management area in Louisiana and includes two management units totaling 4,568 acres of coastal marsh habitat. The area is managed for furbearers, waterfowl, alligators, and other wildlife as well as being open to the public for recreational purposes. The area has seen significant habitat deterioration due, in part, to damaged levees from Hurricane Rita and to increased salinity levels and excessive tidal fluctuations. Coastal marsh restoration would involve the installation of levees and installation of new water control structures in order to manage salinity and water levels and encourage production of desirable vegetation. This project would focus on restoration of approximately 4,575 acres of coastal marsh; construction of one 24,000-foot earthen levee and one 25,000-foot earthen levee; installation of three new water control structures; and backfilling portions of an abandoned oilfield access canal.

In summary, with respect to wildlife, permanent impacts are not expected. Indirect effects associated with invasive plants, animals, and nest parasites; creation of edge effects; and the facilitation of predator movements are the primary long-term impact concerns. These are the same potential concerns for cumulative impacts to occur with other past, present, and reasonably foreseeable future projects.

Past projects would concurrently affect invasive species, edge effects, and predator movements to the extent that there is a high density of activity in a geographic area having similar impacts. As shown on Figures 4.15.2-1 and 4.15.2-3, the southeastern region of Nebraska and the east/southeastern region of Montana are candidate areas for cumulative impacts associated with concurrent projects, including the proposed Project. Existing pipelines, active and abandoned mining sites, Williston Basin oil and gas fields, railroads, and landfill sites could have long-term impacts to these wildlife resource aspects. However, mitigation and restoration measures are available to help address these concerns within the context of all of these project activities. The anticipated area of potential impacts as a result of the proposed Project is relatively small; most impacts are not expected to be permanent, thus reducing the possibility for long-term impacts and lessening their significance to overall cumulative impacts.

Although not within the PCIC, the current construction of the TransCanada Gulf Coast Pipeline Project is included in the consideration of wildlife impacts. Long-term impacts associated with invasive species, edge effects, and predator movements are considered to have low overall cumulative significance. In addition, similar to that described above, mitigation and restoration measures are available to help address these concerns. Other current projects such as water delivery systems and highway maintenance and repair are also not expected to result in permanent impacts with respect to wildlife. Therefore, current projects would not contribute to cumulative impacts to wildlife resources.

Future projects that could potentially contribute to cumulative impacts to wildlife with respect to invasive species include the BakkenLink pipeline, the Bakken Marketlink, and the Bakken Crude Express pipeline projects. Other future projects such as electrical transmission lines, wind power projects, and oil and gas mining activities may also contribute to long-term impacts where projects could overlap geographically with the proposed Project in east/southeastern Montana and southeastern Nebraska. However, similar to those described above, mitigation and restoration measures are available to address these concerns.

Overall, with respect to the proposed Project in combination with the past, present, and foreseeable future projects, including the Gulf Coast Pipeline Project, permanent changes to wildlife resources within the pipeline ROW are considered cumulatively negligible assuming effective mitigation and restoration efforts with the proposed Project and other projects throughout the proposed Project route.

4.15.3.7 Fisheries

A summary of potential environmental consequences of the proposed Project activities to fisheries resources is presented in Table 4.15-11. Potential long-term and/or permanent impacts to fisheries resources from the proposed Project are limited to a potential rise in water temperature; loss of shading, nutrients, and cover; and transfer of non-native or invasive plants, animals, and pathogens. However, the potential impacts to these fisheries resources would likely be reduced through protection, mitigation, and remediation measures in the CMRP. The aggregate contribution of impacted fisheries resources during the life of the proposed Project would be small in relation to the overall resources available within the cumulative project impact corridor. As a result, the potential for additive cumulative effects to these resources is limited. Potential effects on other aspects of fisheries resources from the proposed Project are either short term or negligible and cover a limited geographic extent. As further discussed below, potential cumulative effects to fisheries resources are localized and otherwise considered negligible.

Table 4.15-11 CEA Matrix: Fisheries

Potential Impact Area	Proposed Project and Connected Action Impacts		Geographic Extent	Cumulative Impact Potential (Yes/No)
	Construction	Operation		
Increased sedimentation	(D)	(N)	LA	No
Increase in total suspended sediment	(D)	(N)	R	No
Streambed scouring and disturbance	(D)	N	PA	No
Fish behavioral changes, avoidance, stress	(D)	N	PA	No
Restriction or delay of fish movement	(D)	N	LA	No
Disruption of fish spawning	D	N	LA	No
Direct mortality of fish, eggs, and larvae	(D)	N	LA	No
Direct mortality of other aquatic organisms	(D)	N	LA	No
Water temperature alteration	(D)	(D)	PA	Yes
Transfer of non-native or invasive plants, animals or pathogens	(D)	(D)	R	Yes
Bank/flood plain alteration, loss of shading, nutrients, cover	(D)	(D)	PA	Yes
Reduction of aquatic habitat	(D)	N	LA	No

Duration of Impact
—Negligible
—Temporary/Short Term (<3 yr.)
—Long-Term (>3 yr.)
—Permanent

Type of Impact
N —Negligible Impact
D —Direct Impact
I —Indirect Impact

Notes: Parentheses around impact indicates that it would be addressed by implementation of Keystone's CMRP, additional mitigations, and/or existing laws and regulations.
Geographic Extent of Potential Impact: Project Area (PA)—Defined by limits of ROW and ancillary facilities (e.g., access roads, pump stations, and construction camps); Local Area (LA)—Defined as a 2-mile distance on either side of the pipeline ROW and ancillary facilities; Regional (R)—Defined by resource (e.g., home ranges of wildlife species, bird migration corridor, regional airshed, etc.).

With regard to the permanent effects of a potential rise in water temperature due to the pipeline temperature, an increase in water temperature could affect fish by decreasing oxygen supply, causing premature movements of juvenile fish and reduced food supply. Aquatic insects could mature more rapidly and be less available as food for the local fish population outside the immediate vicinity of the crossing. The burial depth of the proposed pipeline could mitigate these potential temperature impacts. Typical pipeline burial depth is 48 inches; however, Keystone has indicated that burial depth under streams would be a minimum of 60 inches. Additionally, HDD, where used, would bury the pipeline well below the river bottom, further mitigating potential impacts. If impacts were to occur, they would be expected to be minor to fish populations because of the isolated nature of the potentially impacted stream section and the likelihood of few fish in the stream reaches. Larger rivers with sufficient stream flow would not be affected by water temperature changes because the volume of water flowing over the proposed pipeline would be great enough to compensate for any increases in the local temperature profile. Therefore, the cumulative impact associated with water temperature increases on fisheries is expected to be negligible.

Removal of bank vegetation (including overhead cover) could lead to bank instability and erosion. Loss of riparian vegetation reduces shading, 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 could increase vulnerability of certain species to predation. Loss of riparian vegetation and disturbance to the bank and substrate could alter benthic communities and change food availability (Brown et al. 2002). Planned

mitigation measures include revegetation of riparian areas upon construction completion (as described in Section 4.5, Terrestrial Vegetation), limiting the extent of riparian vegetation loss during construction, and maintaining a 50-foot ROW width. These mitigation measures would likely minimize the potential impacts associated with the loss of shading, nutrients, and cover by making them short term. Therefore, the cumulative impact associated with the loss of shading, nutrients, and cover on fisheries is expected to be negligible.

Introduced non-native species could compete with native species and transmit diseases (e.g., whirling disease), which could adversely impact sensitive fish species. Invasive aquatic species (either plant or animal) could be introduced into waterways and wetlands and could be spread by improperly cleaned vehicles and equipment operating in water, stream channel, or wetlands (Cowie and Robinson 2003, Fuller 2003). Some invasive organisms are able to live on dry equipment for several days. To reduce the potential for transfer of aquatic pathogens, temporary vehicle bridges would be used to cross waterbodies to limit vehicle contact with surface waters and sediments. During open-cut pipeline installation, in-stream activities would be conducted outside of the waterbody channel as much as practical and would limit the use of equipment within waterbodies. Workspaces would be located at least 10 feet from waterbodies and would implement erosion-control measures to reduce suspended sediment loading in waterbodies. These measures would also limit waterbody contact with vehicles and mud that could potentially serve as vectors for invasive species and disease.

Impacts to fisheries resources from the construction and operation of the connected actions (Bakken Marketlink Project, Big Bend to Witten 230-kV Transmission Line, and Electrical Distribution Lines and Substations) are not substantially different from the proposed Project. Impacts listed in Table 4.15-11 overlap between the proposed Project and the connected actions, and are considered collectively in the overall discussion of the proposed Project.

Overall, considerations such as construction impact mitigation, site-specific crossing techniques, seasonal conditions, contingency plans, water quality testing, and water quality compliance would result in the proposed Project having low potential to adversely affect recreationally or commercially important fisheries as a result of construction and normal operation. As discussed in Section 4.15.3.3, Water Resources, past projects would concurrently affect invasive species to fisheries resources to the extent that there is a high density of activity in a geographic area having a similar impact. As shown on Figures 4.15.2-1 and 4.15.2-3, southeastern Nebraska and east/southeastern Montana are candidate areas for cumulative impacts associated with concurrent projects, including the proposed Project. Existing pipelines, active and abandoned mining sites, Williston basin oil and gas fields, and landfill sites are not observed to have had long-term impacts to fisheries with respect to invasive species. However, mitigation and restoration measures are available to address these concerns within the context of all of these project activities, thus the overall significance to cumulative impacts is low.

Potential impacts to fisheries associated with the current construction of the TransCanada Gulf Coast Pipeline Project are considered to have low overall cumulative significance. The low potential for cumulative impacts is based on the assumption that the planned mitigation measures are successful and near pre-construction conditions are restored and maintained within the anticipated timeframes. Similarly, other current water delivery system or highway maintenance and repair projects that would be constructed within or in the vicinity of the proposed Project cumulative impact corridor could result in small cumulative impacts to fisheries resources to the extent that projects are temporally concurrent. However, concurrent activities are not generally

expected, and mitigation measures are available to address these concerns within the context of all of these project activities, thus the overall significance to cumulative impacts is low.

Similarly, future projects could be constructed within or in the vicinity of the proposed Project cumulative impact corridor. However, future projects would likely occur after streams impacted by the proposed Project have recovered; therefore, cumulative impacts on fisheries from reasonably foreseeable future projects are not anticipated. This conclusion is based on the assumption that the planned mitigation measures are successful and near pre-construction conditions are restored and maintained within the anticipated timeframes.

4.15.3.8 Threatened and Endangered Species

Consultation with the U.S. Fish and Wildlife Service (USFWS), BLM, and state natural heritage programs and wildlife agencies identified 14 federally protected, proposed, or candidate species that could be impacted by the proposed Project. Federally protected species are listed as threatened or endangered under the Endangered Species Act (ESA); proposed species are species that have been proposed for listing for ESA; and candidate species are candidates for ESA listing. Also, 25 state-listed species (including federally listed species) could also be impacted by the proposed Project.

Types of potential impacts to threatened and endangered (special status) species include:

- Habitat loss, alteration, and fragmentation;[5]
- Direct mortality during construction and operation, including collision with power lines;
- Indirect mortality due to stress or avoidance of feeding, and/or reduced breeding success due to exposure to noise and/or increased human activity; and
- Reduced survival or reproduction due to decreased abundance of food species or reduced cover.

A detailed discussion of the types of potential impacts to threatened and endangered species listed above is provided in Section 4.8, Threatened and Endangered Species and Species of Conservation Concern, and a summary of these potential impacts of the proposed Project are presented in Table 4.15-12. As indicated in Table 4.15-12, the anticipated overall absence of long-term and permanent impacts to most of the threatened and endangered species resources from the proposed Project indicates that cumulative effects to these species are expected to be minimal. However, the proposed Project may cumulatively contribute to impacts to the whooping crane (*Grus americana*) and the American burying beetle (*Nicrophorus americanus*), as further discussed below.

[5] *Fragmentation* is the splitting of a large continuous expanse of habitat into numerous smaller patches of habitat with a smaller total habitat area, and isolation within a matrix of habitats that are unlike the original (Wilcove et al. 1986).

Table 4.15-12 CEA Matrix: Threatened and Endangered Species

Potential Species Impacted[a,b,c]	Proposed Project and Connected Action Impacts		Geographic Extent	Cumulative Impact Potential (Yes/No)
	Construction	Operation		
Mammals				
Black-footed ferret (*Mustela nigripes*)—F	(I)	(I)	PA	No
Gray wolf (*Canis lupus*)—F	(I)	(I)	LA	No
River otter (*Lontra canadensis*)—SD, NE	(I)	(I)	PA	No
Swift fox (*Vulpes velox*)—MT, SD, NE	(I)	(I)	PA	No
Northern long-eared bat— (*Myotis septentrionalis*) —F	(I)	(I)	LA	No
Birds				
Eskimo curlew (*Numenius borealis)*—F	N	N	*	No
Greater sage grouse (*Centrocercus urophasianus*)—F	(D)	(I)	R	No
Least tern (*Sterna antillarum*)—F, MT, SD, NE, KS	(I)	(I)	LA	No
Piping plover (*Charadrius melodus)*—F	(I)	(I)	LA	No
Sprague's pipit (*Anthus spragueii)*—F	(I)	(I)	LA	No
Whooping crane (*Grus americana*)—F	(I)	(D)	LA	Yes
Bald eagle (*Haliaeetus leucocephalus*)—MT, SD, KS	(I)	(I)	LA	No
Peregrine falcon (*Falco peregrinus*)—MT, SD	(I)	(I)	LA	No
Fish				
Pallid sturgeon (*Scaphirhynchus albus)*—F	(I)	(I)	PA	No
Topeka shiner (*Notropis topeka)*—F	(I)	(I)	PA	No
Black nose shiner (*Notropis heterolepis*)—SD, NE	(I)	(I)	PA	No
Blackside darter (Percina maculata)—KS	(I)	(I)	PA	No
Finsecale dace (*Phoxinus neogaeus*)—SD, NE	(I)	(I)	PA	No
Northern redbelly dace (*Phoxinus eos*)—MT, SD, NE	(I)	(I)	PA	No
Northern redbelly dace x finescale dace hybrid) (*Phoxinus eos* x *Phoxinus neogaeus* hybrid)—MT	(I)	(I)	PA	No
Pearl dace (*Margariscus margarita*)—MT, SD	(I)	(I)	PA	No
Sicklefin chub (*Macrhybopsis meeki*)—MT, SD, KS	(I)	(I)	PA	No
Sturgeon chub (*Macrhybopsis gelida*)—MT, SD, NE, KS	(I)	(I)	PA	No
Invertebrates				
American burying beetle (*Nicrophorus americanus)*—F	(D)	(D)	LA	Yes
Reptiles				
Massasauga (*Sistrurus catenatus*)—NE	(D)	(I)	LA	No

Potential Species Impacted[a,b,c]	Proposed Project and Connected Action Impacts		Geographic Extent	Cumulative Impact Potential (Yes/No)
	Construction	Operation		
Plants				
Blowout penstemon (*Penstemon haydenii)*—F	(I)	(I)	LA	No
White fringed prairie orchid (*Platanthera praeclara)*—F	(D)	(I)	LA	No
White lady's slipper (*Cypripedium candidum*)—NE	(D)	(I)	LA	No

Duration of Impact

—Negligible

—Temporary/Short Term (<3 yr.)

—Long-Term (>3 yr.)

—Permanent

Type of Impact

N —Negligible Impact

D —Direct Impact

I —Indirect Impact

Notes: Parentheses around impact indicates that it would be addressed by implementation of Keystone's CMRP, additional mitigations, and/or existing laws and regulations.
Geographic Extent of Potential Impact: Project Area (PA)—Defined by limits of ROW and ancillary facilities (e.g., access roads, pump stations, and construction camps); Local Area (LA)—Defined as a 2-mile distance on either side of the pipeline ROW and ancillary facilities; Regional (R)—Defined by resource (e.g., home ranges of wildlife species, bird migration corridor, regional airshed, etc.); *—The Eskimo curlew has not been found in Nebraska since 1926 (Gollop et al. 1986).
[a] Federally listed species are presented in alphabetical order first, followed by the state-listed species in alphabetical order.
[b] An F following the species name indicates a federal listing or proposed federal listing (may or may not also be a state-listed species).
[c] MT, SD, NE, KS following the species name indicates the state(s) in which the species is state-listed.

The American burying beetle could likely experience some direct mortality during construction with reduced habitat causing long-term impacts and a delay in population recovery. To minimize this impact, several avoidance and mitigation measure (as discussed in Section 4.8, Threatened and Endangered Species and Species of Conservation Concern) would be implemented. Additionally, Keystone has agreed to develop, in conjunction with the USFWS, an American Burying Beetle Trust. This trust would provide monetary compensation that would be used by a third-party nonprofit organization for habitat acquisition or other conservation measures as compensatory mitigation. Funds would be used to support conservation efforts of the American burying beetle within its historical range. Conservation efforts implemented to offset potential losses would reduce the cumulative impacts associated with the proposed Project. Any future projects in the area that reduce and fragment preferred habitat for the American burying beetle may provide the potential for additive cumulative effects to this species. Any additional potential losses would likely require similar conservation methods and mitigations, thus reducing overall cumulative impacts on the American burying beetle.

The whooping crane may experience long-term impacts associated with riparian areas that may be used for roosting and feeding. The use of the HDD method at major river crossings would reduce the probability of roosting and feeding habitat loss or alteration. In other areas along the corridor, revegetation (particularly within riparian zones and in wetland habitats) would reduce habitat impacts. The regeneration of revegetated areas may be slow, which may cause long-term roosting and feeding habitat loss. Keystone has committed to follow recommended conservation measures identified by the USFWS. Additionally, power providers have committed to consult with the USFWS regarding ways to minimize or mitigate impacts to the whooping crane and follow recommended avoidance and conservation measures of the USFWS. As a result, no direct impacts are expected to result from construction. Indirect impacts from disturbance of migrating whooping cranes during proposed Project construction and hydrostatic testing are expected to be

avoided and minimized through Keystone's commitment to follow recommended conservation measures identified by the USFWS. Future projects in the area that reduce and fragment preferred roosting and feeding habitat for the whooping crane may provide the potential for additive cumulative effects to this species. Due to the whooping crane's rarity and status as a migrant through the region, other future projects would likely incorporate similar conservation measures to avoid and minimize affects to the whooping crane.

Other than the whooping crane and the American burying beetle, the majority of the potential effects of the proposed Project to protected, proposed, or candidate species would be indirect, short term or negligible, limited in geographic extent, and associated with the construction phase of the proposed Project only. Indirect and short-term impacts associated with construction of the proposed Project may include reduced threatened and endangered species use due to increased human interaction; habitat fragmentation, alteration, and loss; stress and reduced breeding success due to noise, vibration, and human activity; creation of barriers to movement; and reduction in patch size of available habitat. Thus, there is limited potential for effects of these impacts to be cumulative with other projects. Additional discussion of threatened and endangered species and species of conservation concern is presented below.

Incremental loss or alteration of black-tailed prairie dog *(Cynomys ludovicianus)* colonies through prior project construction and operation in addition to similar effects from the proposed Project could lead to cumulative impacts on the black-footed ferret (*Mustela nigripes*) and the mountain plover (*Charadrius montanus),* which nests in prairie dog colonies, in Montana and South Dakota. However, suitable black-tailed prairie dog colonies that would be crossed by the proposed Project were determined to be too small to support black-footed ferrets. Short, medium, or long-term loss or alteration of native grassland and sagebrush habitats through the spread of invasive plants in Montana and South Dakota from previous projects in addition to similar impacts from the proposed Project could contribute to cumulative habitat impacts for federal candidate-for-listing birds, including the greater sage-grouse (C*entrocercus urophasianus*) and Sprague's pipit (*Antus spragueii)*.

Concerns were expressed regarding potential habitat loss from the Project on the swift fox *(Vulpes velox)*. Surveys were conducted in Montana and South Dakota in the area of the proposed Project route, and no swift foxes were observed. In Nebraska, the proposed Project route would be outside of the known distribution of the swift fox. Therefore, cumulative impacts to this species would be unlikely.

Incremental impacts to streams and riparian habitats from future linear project construction and the accidental spread of exotic aquatic invasive plants and animals could increase cumulative impacts to threatened and endangered species habitat. Increased competition from invasive species could contribute to cumulative impacts to native freshwater mollusks and prairie stream fishes, which have been increasingly recognized as vulnerable. Multiple stream and wetland crossings, especially those associated with small clear springs and streams or freshwater mussel beds, could result in impacts to habitat quality that could, in conjunction with the impacts of the proposed Project, affect federally protected aquatic species of conservation concern. The spread of invasive plants could also result in cumulative habitat impacts to federally and state-listed plants, if present, including the western prairie fringed orchid (*Platanthera praeclara*) and the small white lady's slipper (*Cypripedium candidum*).

The proposed Project could potentially affect migratory birds within their migration range from Texas to Montana and/or within their breeding habitats. Conservation measures proposed for

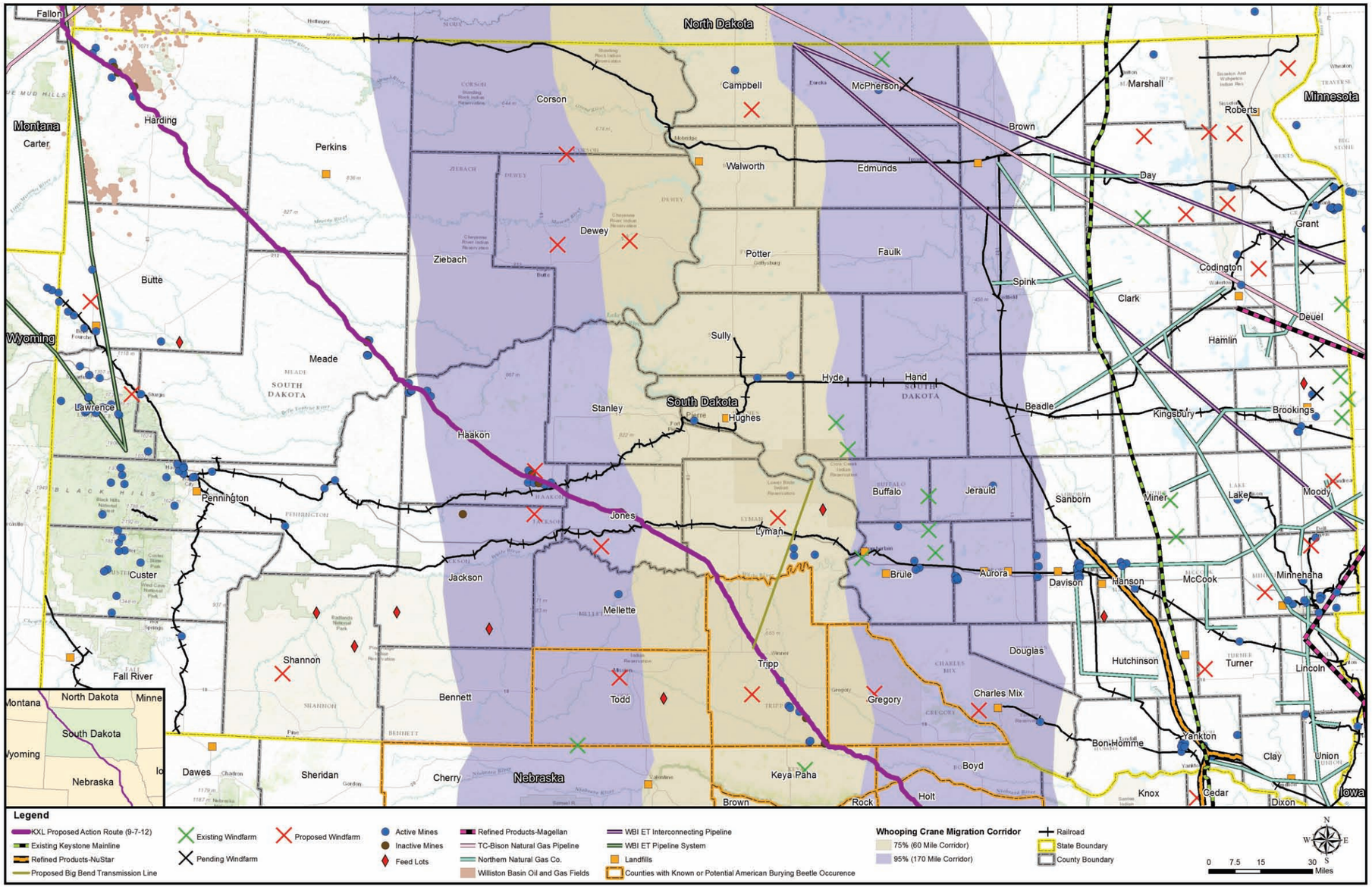
three of these birds (i.e., whooping crane, piping plover [*Charadrius melodus*], and interior least tern [*Sterna antillarum athalassos*]) include protection of river and riparian nesting and migration staging habitats through use of HDD crossing methods and site-specific surveys to avoid disturbance to migration staging, nesting, and brood-rearing individuals. Habitat and disturbance impacts at major river crossings from future linear projects would likely incorporate similar conservation measures to avoid and minimize affects to these birds.

Implementation of appropriate conservation measures as determined through consultations with federal, state, and local agencies for state-protected sensitive species and federally protected threatened, endangered, or candidate species for the proposed Project and for future projects would include habitat restoration, impact avoidance, and impact minimization, which would likely mitgate long-term cumulative impacts. Proposed Project reclamation includes restoration of native vegetation and soil conditions as well as the prevention and control of noxious weeds for disturbed areas. Unavoidable alteration and maintenance of vegetation to ensure pipeline safety and to allow for visual inspection would result in some conversion of tall shrub and forested habitats to herbaceous habitats. These conversions are not expected to adversely affect or contribute to cumulative impacts for any federally protected threatened or endangered species.

Impacts to federal threatened, endangered, proposed and candidate species, BLM sensitive species, state threatened and endangered species, and species of conservation concern from the construction and operation of the connected actions (Bakken Marketlink Project, Big Bend to Witten 230-kV Transmission Line, and Electrical Distribution Lines and Substations) would be long term and/or permanent. The greater sage-grouse, Sprague's pipit, and threatened, endangered, or otherwise special-status species may be impacted by habitat loss resulting from construction of the Bakken Marketlink project, along with future projects in the area that reduce and fragment preferred habitat for these species. However, habitat loss would be mitigated and any additional potential habitat loss would likely require similar conservation methods and mitigations, thus reducing overall cumulative impacts on these species.

The transmission line, electrical distribution lines, and substations could result in long-term increased bird collisions, bird predation, and habitat loss. However, with implementation of mitigation measures described in Section 4.8, Threatened and Endangered Species and Species of Conservation Concern, it is not expected that these lines would have cumulative impacts on birds protected under the U.S. Migratory Bird Treaty Act (MBTA) or Bald and Golden Eagle Protection Act. Future electrical power transmission lines and the distribution lines that would serve pump stations and MLVs of the proposed Project or any other future projects would likely incorporate similar conservation measures to avoid and minimize affects to these birds. However, perches provided by towers and poles could increase the cumulative predation mortality for ground-nesting birds, including the greater sage-grouse, interior least tern, mountain plover, piping plover, and Sprague's pipit.

In summary, the primary impact concerns with respect to potential cumulative effects to threatened and endangered species is the direct mortality of the American burying beetle during construction and operation of the proposed Project, and the reduction and fragmentation of preferred roosting and feeding habitat (riparian areas) for the whooping crane. These impacts represent the primary areas for cumulative impacts to occur with other past, present, and reasonably foreseeable future projects, and could occur where there is potential geographic overlap. Occurrences of these species, along with the known locations of past, present, and reasonably foreseeable future projects, are shown on Figure 4.15.3-1 and Figure 4.15.3-2 for South Dakota and Nebraska, respectively (these species are not of concern in Montana).



Source: See Appendix W, Project Descriptions; Esri 2013

Figure 4.15.3-1 Known Locations of Past, Present, and Reasonably Foreseeable Future Projects in South Dakota with American Burying Beetle Areas of Potential Occurrence and Central Flyway Whooping Crane Migration Corridor

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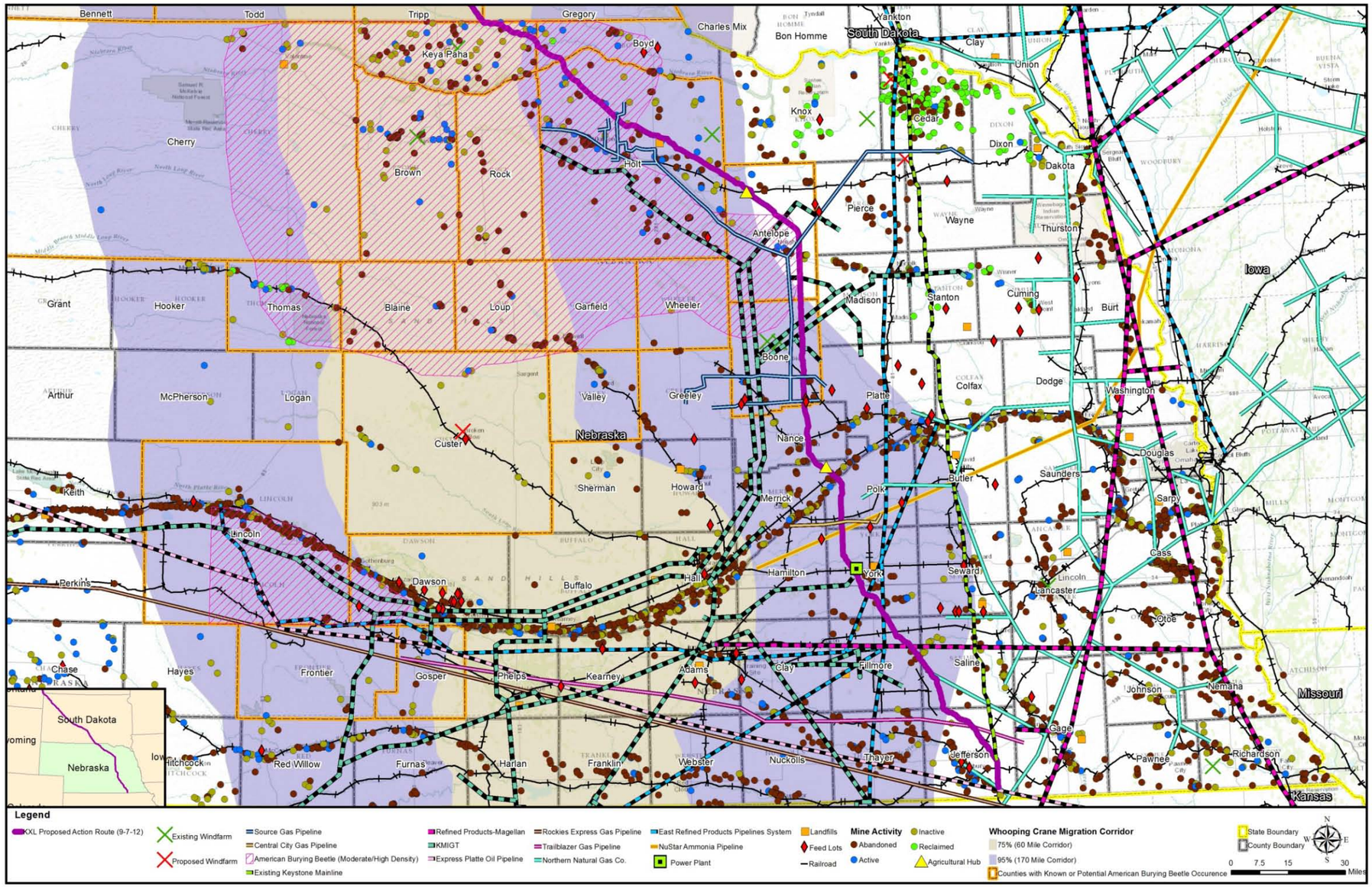

Source: See Appendix W, Project Descriptions; Esri 2013

Figure 4.15.3-2 Known Locations of Past, Present, and Reasonably Foreseeable Future Projects in Nebraska with American Burying Beetle Areas of Potential Occurrence and Central Flyway Whooping Crane Migration Corridor

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Other past, present, and foreseeable future projects in South Dakota (as indicated on Figure 4.15.3-1) are relatively sparse with significant geographic separation. However, American burying beetle locations in Nebraska occur within the proposed Project area in addition to there being several other projects in proximity to these locations. Furthermore, there were potential impacts to the American burying beetle associated with the construction of the TransCanada Gulf Coast Pipeline Project. Construction of new pipelines or other ground-disturbing projects through southern South Dakota and north-central Nebraska could contribute to cumulative mortality and loss of habitat for the American burying beetle. Any additional potential losses within this species would likely require conservation methods and mitigations, thus reducing overall cumulative impacts on the American burying beetle. The central flyway whooping crane migration corridor overlaps with the proposed Project in Nebraska. Cumulative impacts to the whooping crane associated with the construction of the TransCanada Gulf Coast Pipeline Project are also considered, although these additional impacts are believed to be insignificant due to the small aerial extent of overlap between the whooping crane migratory corridor and the TransCanada Gulf Coast Pipeline Project. The potential for a given impact to contribute to cumulative impacts is based on the assumption that the CMRP (see Appendix G) is successful and near pre-construction conditions are restored and maintained within the anticipated timeframes.

4.15.3.9 Land Use, Recreation, and Visual Resources

A summary of potential environmental consequences of the proposed Project activities to land use, recreation, and visual resources is presented in Table 4.15-13.

Table 4.15-13 CEA Matrix: Land Use, Recreation, and Visual Resources

Potential Impact Area	Proposed Project and Connected Action Impacts		Geographic Extent	Cumulative Impact Potential (Yes/No)
	Construction	Operation		
Land Ownership	(D)	(D)	PA	Yes
Agricultural Land, Rangeland, Prime Farmland	(D)	(D)	PA	No
Developed Land	(D)	(D)	PA	No
Forest	(D)	(D)	PA	Yes
Recreation and Special Interest Areas	(D)	(D)	PA	No
Visual Resources	(D)	(D)	LA	Yes

Duration of Impact
—Negligible
—Temporary/Short Term (<3 yr.)
—Long-Term (>3 yr.)
—Permanent

Type of Impact
N —Negligible Impact
D —Direct Impact
I —Indirect Impact

Notes: Parentheses around impact indicates that it would be addressed by implementation of Keystone's CMRP, additional mitigations, and/or existing laws and regulations.
Geographic Extent of Potential Impact: Project Area (PA)—Defined by limits of ROW and ancillary facilities (e.g., access roads, pump stations, and construction camps); Local Area (LA)—Defined as a 2-mile distance on either side of the pipeline ROW and ancillary facilities.

The proposed Project would require the acquisition of permanent easements from landowners and land managers along the pipeline ROW and at the locations of proposed ancillary facilities (approximately 5,569 acres). Long-term impacts are associated with changes in land use; however, most of the land affected by the proposed Project is used for agriculture and rangeland (approximately 90 percent). Disturbed agricultural land and rangeland would be returned to approximate pre-construction use and capability. Therefore, potential cumulative effects to land use are primarily localized and are considered to have low overall significance.

Permanent impacts to forested lands are associated with the clearing of trees and shrubs within the ROW, and permanent impacts to visual resources are associated with aboveground structures such as pump stations and transmission lines associated with connected actions to the proposed Project. These aspects are further discussed below.

Visual effects, particularly those associated with ROW disturbance in agricultural areas, would likely be substantially reduced with the first crop growth. Over the long-term, perceptible visible changes resulting from construction and operation would contribute, in the presence of similar facilities from past or future projects, to an intensified industrial character within the proposed Project cumulative impact corridor that could adversely affect the visual quality of the area. However, the proposed Project alignment has been selected to reduce adverse aesthetic impacts where possible, and measures to reduce long-term visual impacts to insignificant levels would be implemented as described in the proposed Project CMRP (see Appendix G). Visual effects would largely be limited to travelers along the major transportation corridors in the vicinity of the proposed Project. Their views would typically be limited to short periods of time and small portions of the ROW. Visual effects to the night sky due to anthropogenic light is expected to be minimal. Operations impacts would consist of lights at pump stations, which would be similar to existing utility buildings of the same size. At a regional scale, the cumulative impacts of such lighting (at 20 buildings along an 875-mile pipeline corridor) would be negligible. Overall, as further discussed below, potential cumulative effects to land use, recreation, and visual resources are primarily localized and are considered to have low overall significance.

Temporary changes in land use due to construction would include loss of agricultural productivity, potential damage to drain tiles or other irrigation systems, visual impacts from the removal of vegetation within the ROW and anthropogenic light used during construction, increased noise and dust, and disturbance of contracted conservation benefits during the construction period and until any contracted conservation benefits are restored. If the ROW requires maintenance, it may not be possible to restore certain types of contracted conservation benefits. Sightseers, hikers, wildlife viewers, fishers and hunters, and other recreationists would be temporarily dislocated, although impacts are expected to be short term. There are no major recreation areas in the vicinity of the proposed route; recreational use access would not be affected by proposed Project operations within special management areas; and the proposed Project would not cross rivers within any reaches that have been designated by federal, state, or local authorities as wild and/or scenic. Therefore, few recreationists would be affected. The proposed Project alignment has been selected to reduce adverse aesthetic impacts where possible, and measures to reduce long-term visual impacts to insignificant levels would be implemented as described in the proposed Project CMRP. In addition, potential adverse impacts to forestland would be reduced through protection, reclamation, and remediation measures in the CMRP. The aggregate contribution of lands committed to industrial uses during the life of the proposed Project would be small in relation to the number of acres available for these land uses.

Impacts to land use, recreation, and visual resources from the construction and operation of the connected actions (Bakken Marketlink Project, Big Bend to Witten 230-kV Transmission Line, and Electrical Distribution Lines and Substations) are not substantially different from the proposed Project. Potential impacts to land use, recreation, or visual resources of the Bakken Marketlink Project would be evaluated and avoided, minimized, or mitigated in accordance with applicable regulations during the environmental reviews for these projects. The analysis of environmental effects associated with the proposed 230-kV transmission line would be handled under a separate environmental review. Based on currently available information, it is likely that changes to visual resources would be both temporary (e.g., digging the foundations for power poles) and permanent (e.g., erection of power poles and lines). Most of the landscape changes caused by the proposed Project would be visible as linear changes to vegetation patterns. Due to the need for a cleared power distribution line ROW, operational impacts in forested lands are greater than for other land uses. As above, however, the aggregate contribution of forest lands converted to other land uses during the life of the proposed Project would be small in relation to the number of acres available. Where remaining impacts listed in Table 4.15-5 overlap between the proposed Project and the connected actions, these are considered collectively in the overall discussion of the proposed Project.

In summary, with respect to land use, recreation, and visual resources, long-term/permanent impacts include land use, forested lands within the ROW (already addressed in Section 4.15.3.4, Wetlands, and 4.15.3.5, Terrestrial Vegetation, and not further discussed here), and visual resources associated with aboveground structures such as pump stations and transmission lines associated with connected actions to the proposed Project. These are potential areas for cumulative impacts to occur with other past, present, and reasonably foreseeable future projects.

Past projects would concurrently affect land use and visual resources to the extent that there is a high density of activity in a geographic area having a similar impact. As shown on Figures 4.15.2-1 and 4.15.2-3, southeastern Nebraska and east/southeastern Montana are candidate areas for cumulative impacts associated with concurrent projects, including the proposed Project. Existing and abandoned mining sites, Williston basin oil and gas fields, railroads, and landfill sites may all have a mixture of long-term to permanent impacts on land use and visual resources. However, given that most of the land affected by the proposed Project is used for agriculture and rangeland (approximately 90 percent), which would likely be returned to near pre-construction use and capability, potential cumulative effects to land use and visual resources are considered to have low overall significance. Although not within the PCIC, construction of the TransCanada Gulf Coast Pipeline Project is included in the consideration of land use and visual resource impacts. However, effects to land use and visual resources are primarily evaluated on a local level, and would not contribute to a geographically meaningful cumulative impact. Other current projects such as highway maintenance and repair (which does not involve new construction) would not cumulatively combine with land use and visual resources of the proposed Project. Water delivery systems are also not expected to result in significant impacts to land use and visual resources due to limited associated aboveground structures. Therefore, current projects would not contribute to cumulative impacts on land use and visual resources.

Future projects that could potentially contribute to cumulative impacts to land use and visual resources include the BakkenLink pipeline, the Bakken Marketlink, and the Bakken Crude Express pipeline projects. In addition, electrical transmission lines, wind power projects, and oil and gas mining activities could all have perceptible changes to land use and visual resources resulting from construction and operation, and would contribute to an intensified industrial character within the proposed Project cumulative impact corridor that could adversely affect the visual quality of the area. This effect may be particularly prominent where projects overlap geographically with the proposed Project in east/southeastern Montana and southeastern Nebraska.

4.15.3.10 Socioeconomics

The focus of the CEA is long-term and/or permanent adverse cumulative effects; as noted at the beginning of this section, cumulative beneficial impacts are not addressed in this CEA. However, as discussed in Sections 3.10, Socioeconomics (Affected Environment), and 4.10, Socioeconomics (Environmental Consequences), it is noted that the positive economic impacts of the proposed Project as well as past and most present projects (up to 2010) are already reflected in existing conditions. Insufficient information is available for other present and reasonably foreseeable projects to quantify cumulative positive impacts of these projects in combination with the proposed Project; however, it should be noted that the proposed Project alone has significant temporary positive impacts (see Section 4.10, Socioeconomics). A summary of potential environmental consequences of the proposed Project activities to socioeconomic resources is presented in Table 4.15-14.

Table 4.15-14 CEA Matrix: Socioeconomics

Potential Impact Area	Proposed Project and Connected Action Impacts		Geographic Extent	Cumulative Impact Potential (Yes/No)
	Construction	Operation		
Population	N	N		No
Housing	N	N		No
Economic Activity	D	N	R	No
Environmental Justice	(D)	D	LA	No
Public Services, Tax Revenues, Property Values	D	D	R	Yes
Traffic and Transportation	(D)	N	PA	No

Duration of Impact

—Negligible

—Temporary/Short Term (<3 yr.)

—Long-Term (>3 yr.)

—Permanent

Type of Impact

N —Negligible Impact

D —Direct Impact

I —Indirect Impact

Notes: Parentheses around impact indicates that it would be addressed by implementation of Keystone's CMRP, additional mitigations, and/or existing laws and regulations.
Geographic Extent of Potential Impact: Project Area (PA)—Defined by limits of ROW and ancillary facilities (e.g., access roads, pump stations, and construction camps); Local Area (LA)—Defined as a 2-mile distance on either side of the pipeline ROW and ancillary facilities; Regional (R)—Defined by resource (e.g., home ranges of wildlife species, bird migration corridor, regional airshed, etc.).

The only permanent socioeconomic impacts associated with the proposed Project under normal operations would be the beneficial effects associated with property tax revenues and the small amount of employment and earnings associated with operations and maintenance of the pipeline. During construction with respect to employment, the construction, accommodations and food services, professional services, and manufacturing sectors would be the largest beneficiaries of the proposed Project, followed by trade and health and social services. Other industries with impacts exceeding 1,000 jobs would be real estate and rental, administrative and waste services, finance and insurance, transportation and warehousing, and other services. As further discussed below, the anticipated overall absence of long-term and/or permanent adverse socioeconomic impacts from the proposed Project indicates that adverse cumulative effects to this resource area are not expected. Where long-term and/or permanent adverse impacts are absent, the potential for additive cumulative effects with other past, present, and reasonably foreseeable future projects is also negligible.

The proposed Project area is predominantly rural and sparsely populated. The population density for the pipeline corridor counties is approximately eight persons per square mile (mi^2). Keystone proposes to meet the housing need through a combination of construction camps and local housing. The influx of construction workers into local communities has the potential to generate additional demands on local public services (e.g., emergency response, medical, police, and fire protection services). The construction camps would reduce impacts on basic public services in nearby communities that could otherwise be incurred without construction camps. Therefore, impacts to proposed Project area population and housing during construction would be minor and temporary. Operation of the proposed Project would require relatively few permanent employees; thus, there would be little contribution to long-term cumulative impacts on population, housing, municipal services, or traffic in the proposed Project area.

Construction of the proposed Project could lead to short-term impacts to property values due to short-term visual, noise, and land disturbance effects. Keystone has committed to restore land disturbed by the proposed Project, to the extent practicable; repair or restore drain tiles, fences, and land productivity damaged or adversely affected during construction; and compensate property owners for any additional damages caused by proposed Project construction. The Final EIS concluded it did not appear that the proposed Project would have a major impact on residential and agricultural property values; the analysis in this Final Supplemental EIS does not change this conclusion. Therefore, long-term impacts and the potential for cumulative impacts to property values with other past, present, and reasonably foreseeable future projects are considered negligible.

Keystone would work with local law enforcement, fire departments, and emergency service providers, including medical aid facilities, to establish appropriate and effective emergency response measures. This information would be included in the Emergency Response Plan developed prior to the implementation of the proposed Project, with special emphasis on considerations of low income and minority communities in those preparedness efforts.

Similarly, construction activities could result in short-term impacts to traffic and transportation infrastructure. However, these impacts would be minor and temporary. Keystone's proposed Project CMRP (see Appendix G) includes measures to reduce or avoid traffic and transportation impacts on local communities. In addition, Keystone would submit a road use plan prior to mobilization of construction vehicles and a monitoring plan that would include inspection of roadways and roadway structures, repair of damage that may occur to those facilities,

establishment of an approved Traffic Management Plan, and coordination with state and local transportation agencies. Permanent access roads constructed as part of the proposed Project would not change traffic patterns on public roads.

With respect to environmental justice considerations, impacts to minority and low-income populations during construction could include exposure to construction dust and noise, disruption to traffic patterns, and increased competition for medical or health services in underserved populations. A total of 17 areas with environmental justice populations were identified as being potentially affected by construction activity or by the pipeline itself after it became operational. In areas in Montana, South Dakota, and Nebraska where construction camps would be provided, minor medical needs of workers would be handled in these camps, thus reducing the potential need for medical services from the surrounding communities. As a result, the impact of increased demand for medical services on local minority and low-income populations would be small and short term. In addition to avoidance and mitigation measures that Keystone proposes to minimize negative impacts to all populations in the proposed Project area, specific mitigation for environmental justice communities would involve ensuring that adequate communication in the form of public awareness materials regarding the construction schedule and construction activities is provided.

Socioeconomic impacts, including environmental justice considerations, from the construction and operation of the connected actions (Bakken Marketlink Project, Big Bend to Witten 230-kV Transmission Line, and Electrical Distribution Lines and Substations) are not substantially different from the proposed Project. Where impacts listed in Table 4.15-5 overlap between the proposed Project and the connected actions, these are considered collectively in the overall discussion of the proposed Project.

In summary with respect to socioeconomics, permanent impacts associated with the proposed Project under normal operations would be the beneficial effects associated with property tax revenues and the small amount of employment and earnings associated with operations and maintenance of the pipeline. Additional consideration of beneficial impacts in combination with the effects of past, present, or reasonably foreseeable future projects is not addressed in this CEA. With respect to adverse effects, short-term impacts to minority and low-income populations may occur during construction of the proposed project. When considered in combination with other past, present, and reasonably foreseeable future projects, cumulative impacts would only occur where there are concurrent and/or successive construction schedules of other geographically overlapping projects. Thus, environmental justice cumulative impacts are not expected in association with past and future projects where construction is complete or proposed in the future. With respect to short-term cumulative impacts associated with concurrent construction of geographically overlapping present projects, these projects include water delivery systems, highway maintenance and repair projects, and grain and agronomy hubs, and potential cumulative impacts are expected to be small and short-term. In addition to avoidance and mitigation measures that Keystone proposes to minimize negative impacts to all populations in the proposed Project area, specific mitigation for environmental justice communities would involve ensuring that adequate communication in the form of public awareness materials regarding the construction schedule and construction activities is provided.

4.15.3.11 Cultural Resources

A summary of potential environmental consequences of the proposed Project activities to cultural resources is presented in Table 4.15-15. Direct permanent impacts to cultural resources could include damage to cultural resources within the construction footprint, the loss of community access to cultural resources, and visual impacts to properties such as historic or traditional cultural properties within or immediately adjacent to the permanent ROW and ancillary facilities. However, the proposed Project route was designed to avoid disturbing historic properties to the maximum extent possible. Therefore, only a small number of properties designated as *culturally significant* are potentially impacted by the proposed Project based on current survey information.[6] As a result, the potential for additive cumulative effects in terms of direct damage, access, and visual impacts to cultural resources is also limited. This is further discussed below.

Table 4.15-15 CEA Matrix: Cultural Resources

Potential Impact Area	Proposed Project and Connected Action Impacts		Geographic Extent	Cumulative Impact Potential (Yes/No)
	Construction	Operation		
Damage/destruction of cultural resources, including previously undiscovered	(D)	(D)	PA	Yes
Vibrations from equipment during earthmoving activities	I	I	PA	No
Loss of access to cultural resources	(D)	(D)	PA	Yes
Visual impacts to cultural resources	I	(I)	LA	Yes
Increased dust and noise	(I)	(I)	PA	No

Duration of Impact
—Negligible
—Temporary/Short Term (<3 yr.)
—Long-Term (>3 yr.)
—Permanent

Type of Impact
N —Negligible Impact
D —Direct Impact
I —Indirect Impact

Notes: Parentheses around impact indicates that it would be addressed by implementation of Keystone's CMRP, additional mitigations, and/or existing laws and regulations.
Geographic Extent of Potential Impact: Project Area (PA)—Defined by limits of ROW and ancillary facilities (e.g., access roads, pump stations, and construction camps); Local Area (LA)—Defined as a 2-mile distance on either side of the pipeline ROW and ancillary facilities.

The determination of significance for cultural resources is determined by a resource's eligibility for inclusion in the National Register of Historic Places (NRHP), although the NRHP status of some cultural resources remains undetermined in much of the proposed Project area and surveying is ongoing. Direct impacts, such as unanticipated discovery of previously unknown cultural resources during construction, could have a permanent impact on that resource. For all cultural resources listed in the NRHP, considered to be eligible for the listing in the NRHP, or unevaluated, avoidance would continue to be the preferred mitigation strategy. For any historic properties unavoidably adversely affected by the proposed Project, mitigation measures would be developed as part of a Treatment Plan to be incorporated into the Programmatic Agreement.

[6] Additional cultural resources surveys within the proposed Project corridor, access roads, and ancillary facilities are ongoing. The Department will continue to consult with state and federal agencies as well as Indian tribes about the significance of the sites and work to avoid any adverse effects to the resources to the extent practicable.

To mitigate potential impacts, Keystone has committed whenever feasible to avoid known cultural resources, minimize impacts when avoidance is not possible, and mitigate impacts when minimization is not sufficient. Avoidance would be achieved by keeping construction activities away from NRHP-eligible properties, limiting the effect on existing demonstrated disturbance areas, and avoiding cultural resources by boring or HDD. In addition, the proposed Project plans to implement Unanticipated Discovery Plans, as feasible and appropriate, in order to minimize impacts to unknown cultural resources that may be inadvertently encountered during construction or operation of the proposed Project. Should a cultural resource discovered in this fashion appear to be significant, additional mitigation measures would be considered.

Indirect potential impacts during proposed construction such as noise, dust, vibrations, and heavy equipment traffic would be temporary, and would be expected to last for the duration of construction in specific areas for discrete periods of time. Given the temporary nature of construction of the pipeline and ancillary facilities, such as pipe and contractor yards, no permanent noise, dust, vibrations, and heavy equipment traffic effects to cultural resources, specifically historic structures, are anticipated.

During operation of the proposed Project, only previously disturbed areas would be expected to require periodic disturbance; therefore, the potential for additional direct impacts to cultural resources would be very limited. Indirect impacts during operations could consist of a permanent change in viewshed to historic or traditional cultural properties near permanent ancillary facilities, such as pump stations and MLVs, and an increase in noise, vibration, and dust created by pump stations or vehicular traffic conducting operation and maintenance activities. Given the nature, location, and setting of permanent ancillary facilities, however, these facilities are unlikely to significantly visually impact the setting and feeling of historic or traditional cultural properties, due to their distance, the low-lying nature of these facilities, and various vegetative and topographic elements of the landscape in such areas. Similarly, periodic increase in noise, vibration, and dust created by ancillary facilities or vehicular traffic conducting operation and maintenance activities would not be expected to cause any adverse effects to such cultural resources.

Cultural resource impacts from the construction and operation of the connected actions (Bakken Marketlink Project, Big Bend to Witten 230-kV Transmission Line, and Electrical Distribution Lines and Substations) are not substantially different from the proposed Project. Where impacts listed in Table 4.15-15 overlap between the proposed Project and the connected actions, these are considered collectively in the overall discussion of the proposed Project.

In summary, permanent impacts to cultural resources could include direct damage to cultural resources within the construction footprint, the loss of community access to cultural resources, and visual impacts to properties such as historic structures or traditional cultural properties within or immediately adjacent to the permanent ROW and ancillary facilities. These are potential areas for cumulative impacts to occur with other past, present, and reasonably foreseeable future projects.

Past projects in the area that have historically impacted cultural resources may provide the potential for additive cumulative effects; however, the relatively low likelihood of cultural resource impacts by the proposed Project, combined with the implementation of Unanticipated Discovery Plans (minimizing impacts to unknown cultural resources that may be inadvertently encountered), heavily influences the evaluation of cumulative effects to cultural resources overall.[7] There would be little incremental additive effect to cultural resources from the proposed Project with other past projects; therefore, overall cumulative significance is considered low.

Currently, although not within the PCIC, construction of the TransCanada Gulf Coast Pipeline Project is included in the consideration of impacts to cultural resources. However, effects to cultural resources are primarily evaluated on a local level, and would not contribute to a geographically meaningful cumulative impact. Other current projects such as highway maintenance and repair (which does not involve new construction) would not cumulatively combine with land use and visual resources of the proposed Project. In addition, known sites would be avoided or mitigated to the degree practicable as required by Section 106 of the National Historic Preservation Act of 1986 during implementation of all current projects.

Contribution to cumulative impacts on cultural resources could result from future projects to the extent that they disturb known or currently unidentified archaeological sites and historic structures, or degrade in-place mitigation for previously disturbed historical properties. However, known sites would be avoided or mitigated to the degree practicable as required by Section 106 of the National Historic Preservation Act of 1986 during future project implementation. Therefore, future projects are not expected to significantly contribute to cumulative impacts on cultural resources.

Overall, with respect to the proposed Project in combination with the past, present, and foreseeable future projects, including the Gulf Coast Pipeline Project, permanent changes to cultural resources within the pipeline ROW are considered negligible assuming effective mitigation and restoration efforts with the proposed Project and other projects throughout the proposed Project route.

[7] Additional cultural resources surveys within the proposed Project corridor and ancillary facilities (e.g., access roads, pump stations, and construction camps) are ongoing. The Department will continue to consult with state and federal agencies and Indian tribes about the significance of the sites and work to avoid any adverse effects to the resources, to the extent practicable.

4.15.3.12 Air Quality and Noise

A summary of potential environmental consequences to air quality and due to noise from the proposed Project activities is presented in Table 4.15-16.

Table 4.15-16 CEA Matrix: Air Quality and Noise

Potential Impact Area	Proposed Project and Connected Action Impacts		Geographic Extent	Cumulative Impact Potential (Yes/No)
	Construction	Operation		
Combustion emissions from contractor camp backup emergency generators (criteria pollutants and hazardous air pollutants)	(D)		R	No
Combustion emissions from non-road and on-road sources and open burning (criteria pollutants and hazardous air pollutant s)	(D)		R	No
Fugitive dust emissions from disturbed land and paved roads (PM, PM_{10} and $PM_{2.5}$)[a]	(D)		R	No
Fugitive volatile organic compound (VOC) emissions from storage tanks, valves, pumps, flanges, and connectors	**N**	**N**	R	No
Combustion emissions from offsite electricity usage at construction camps and pump stations (as CO_2 equivalents)	(I)	(I)	R	Yes
Fugitive methane emissions from valves, pumps, flanges and connectors (as CO_2 equivalents)	**N**	**N**	R	No
Noise from heavy construction equipment and vehicles	(D)		LA	No
Noise from HDD	(D)		LA	No
Noise from blasting	(D)		LA	No
Noise from pump stations	(D)	(D)	LA	Yes
Noise from substations	(D)		LA	No

Duration of Impact

—Negligible
—Temporary/Short Term (<3 yr.)
—Long-Term (>3 yr.)
—Permanent

Type of Impact

N —Negligible Impact
D —Direct Impact
I —Indirect Impact

Note: Parentheses around impact indicates that it would be addressed by implementation of Keystone's CMRP, additional mitigations, and/or existing laws and regulations.
Geographic Extent of Potential Impact: Local Area (LA)—Defined as a 2-mile distance on either side of the pipeline ROW and ancillary facilities; Regional (R)—Defined by resource (e.g., home ranges of wildlife species, bird migration corridor, regional airshed, etc.).
[a] PM = particulate matter; PM_{10} = particulate matter with aerodynamic diameter of 10 microns and less; $PM_{2.5}$ = particulate matter with aerodynamic diameter of 2.5 microns and less

Noise

As further discussed below, the anticipated relative absence of permanent impacts due to noise generated from the proposed Project indicates that cumulative effects to this resource area are not expected. As indicated in Table 4.15-16, there may be long-term impacts due to noise from pump stations; however, these effects are considered negligible due to the low levels of noise generated at the pump stations throughout the proposed Project route. Where long-term and/or permanent impacts are absent, the potential for additive cumulative effects with other past, present, and reasonably foreseeable future projects is also negligible.

Most of the potential effects from noise are short term and associated with the construction phase of the proposed Project only. Short-term noise impacts may be generated during the construction phase by construction equipment and vehicles, HDD, blasting, pump stations, and substations. Potential effects from noise could include direct impacts to wildlife, residences, recreation, special interest areas, and livestock. The noise levels could be perceived as moderately loud with a significant effect over existing levels; however, any peak noise levels would be temporary and intermittent, generally limited to daylight hours, and would decrease with distance. Nighttime noise levels would normally be unaffected because most construction activities would be limited to daylight hours. Potential exceptions include completion of critical tie-ins on the ROW; HDD operations if determined by the contractor to be necessary; and other work if determined necessary based on weather conditions, safety, or other proposed Project requirements. To protect property and livestock, Keystone would provide adequate notice to adjacent landowners or tenants in advance of blasting. Blasting activity would be performed during daylight hours and in compliance with federal, state, and local codes and ordinances and manufacturer-prescribed safety procedures and industry practices. In areas near residences and businesses where construction activities or noise levels may be considered disruptive, pipeline work schedules would be coordinated to minimize disruption. During operation, the proposed Project would have no direct noise impacts on National Park Service units; therefore, the proposed Project would have no cumulative noise impacts on National Park Service units. In addition, noise mitigation would be implemented in accordance with Keystone's CMRP (see Appendix G) and specific landowner or land manager requirements.

Noise generated from the pump stations may be a source of long-term impacts to nearby resources. Keystone would consider the following noise abatement options: aboveground pipe lagging, pump blankets, motor air intake enclosures, and engineering sound barriers. To the extent practicable, Keystone would not site pump stations close to noise-sensitive receptors. For all pump stations, Keystone would observe the USEPA noise standard of 55 decibels on the A-weighted scale (day-night sound level) for each pump station, as measured from the closest receptor. Recommended noise mitigation measures from operating the pump stations listed in Section 4.12.3.2, Noise, would be implemented. Mitigation efforts implemented to offset noise impacts would likely reduce the cumulative impacts associated with the proposed Project.

Impacts from noise associated with the construction of the connected actions (Bakken Marketlink Project, Big Bend to Witten 230-kV Transmission Line, and Electrical Distribution Lines and Substations) are not substantially different from the proposed Project. The duration of noise impacts from transmission and distribution line projects are all temporary, short term, and associated with construction activities. All booster pumps associated with the Bakken MarketLink Project would be electric-driven; therefore, noise impacts are not expected to be significant.

In summary, there is the potential for noise impacts from the long-term operation of pump stations to be cumulative with other past, present, and reasonably foreseeable future projects. However, because of planned mitigation measures (see Section 4.12.3.2, Noise), only low levels of noise would be generated at the pump stations throughout the proposed Project route, and the relative contribution (and incremental additive effect) of noise generated by the proposed Project is negligible. Currently, although not within the PCIC, construction of the TransCanada Gulf Coast Pipeline Project is included in the consideration of impacts to noise. However, because noise impacts are primarily evaluated on a local level, they would not contribute to a geographically meaningful cumulative impact in combination with the proposed Project. Other current or future projects in the area with potential long-term/permanent noise impacts may provide the potential for additive cumulative effects of noise. Here too, the relative contribution (and incremental additive effect) of noise generated by the proposed Project is negligible. Furthermore, additional potential noise contributors would likely implement similar mitigations, thus reducing overall cumulative impacts from noise.

Overall, with respect to the proposed Project in combination with the past, present, and foreseeable future projects, including the Gulf Coast Pipeline Project, permanent changes to noise levels within the pipeline ROW are considered negligible assuming effective mitigation efforts with the proposed Project and other projects throughout the proposed Project route.

Air Quality

Pipeline Construction and Operation

Contribution to cumulative air quality impacts resulting from construction of the proposed Project would be from activities that generate fugitive dust (e.g., excavation and materials handling) and combustion air emissions (criteria pollutants and GHGs) from construction camp generators, non-road sources, on-road sources, and open burning. Commercial power supply would be available for the construction camps; therefore, indirect GHG emissions from electricity usage at the camps could be significant while direct GHG emissions from backup generators would be negligible. Contractors would be required to implement dust-minimization practices to control fugitive dust during construction as described in Section 4.12.3.1, Air Quality, and follow local or state ordinances, including the application of water sprays and surfactant chemicals as well as the stabilization of disturbed areas. Contractors would also be required to maintain all fossil-fueled construction equipment in accordance with manufacturer's recommendations to minimize construction-related emissions. In general, construction activity would occur over a 6- to 8-month seasonal construction period; however, the majority of pipeline construction activity associated with land disturbance (i.e., clearing, trenching, and excavation) would generally pass by a specific location within a 30-day period before final grading, seeding, and mulching takes place, thereby resulting in minor short-term contributions to cumulative air quality impacts.

There would be no current contribution to cumulative impacts from the construction of past or future projects since the impacts of these projects are short-term and occur at the time of construction only. As a result, contributions to cumulative air quality impacts within the proposed Project cumulative impact corridor from construction of the proposed Project and past or reasonably foreseeable future projects would be negligible.

Contribution to cumulative air quality impacts resulting from operation of the proposed Project would include minimal fugitive emissions from intermediate MLVs along the proposed pipeline route and from valves, pumps, flanges, and connectors at the pump stations. Proposed pipeline pumps would be electric-powered. MLVs and pump stations would have backup emergency generators, which would only be used during times of power interruption; therefore, emissions from these sources would be negligible. Mobile sources such as maintenance vehicles would be used at least twice per year, and aircraft for aerial inspections would be used at least once every 2 weeks during proposed Project operations; therefore, emissions from these maintenance/mobile sources would be negligible and were not calculated.

Contribution to cumulative air quality impacts from ongoing operations of past projects within the proposed Project cumulative impact corridor, including existing oil and natural gas pipelines, and reasonably foreseeable future projects would likely be limited to emissions from any project facilities (pump stations, intermediate MLVs) and from vehicles and aircraft used during inspection and maintenance of project facilities.

As described in Section 4.14, Greenhouse Gases and Climate Change, the total annual GHG emissions from operation of the pipeline amount to 1.44 million metric tons per year or 1.58 million tons per year of carbon dioxide (CO_2) equivalent (see Table 4.14-2).[8] This is equivalent to annual GHG emissions from the combustion of fuels in approximately 300,000 passenger vehicles or the CO_2 emissions from combusting fuels used to provide the electricity consumed by approximately 71,928 homes for 1 year.[9]

Refineries

While the proposed Project does not include construction, retrofit, or operation of any refineries that could receive crude oil transported through the proposed Project, refinery operations could contribute to increased cumulative or indirect impacts to air quality in the vicinity of the proposed Project and/or in the areas around the refineries if changes in the type or quantity of refinery emissions occurred in the future as a direct result of refining crude oil transported by the proposed Project. As explained in Section 1.4, Market Analysis, the amount of crude processed by Petroleum Administration for Defense District (PADD) 3 refineries (including the amount of heavy crude refined on the Gulf Coast) do not appear to be impacted by whether the proposed Project is implemented.

Nonetheless, information is presented below regarding potential air pollution impacts associated with changes in refinery operations. Such changes could occur if the proposed Project induced construction of a new refinery, induced expansions of capacity in existing refineries, induced existing refineries to add new downstream processing units (such as cokers or fluid catalytic cracking units), and/or induced the refineries to process a different crude oil slate (e.g., one that was higher in sulfur content and lower in American Petroleum Institute [API] gravity with different heavy metals content). Potential air pollution implications of changes to the crude oil slate at existing refineries are also discussed below.

[8] In 2010 total, U.S. GHG emissions (CO_2 equivalent from anthropogenic activities) amounted to 6,821.2 million metric tons. Globally, approximately 30,313 million metric tons of CO_2 emissions were added to the atmosphere via the combustion of fossil fuels in 2009 (USEPA 2012b).
[9] Equivalencies based on USEPA's GHG Equivalency calculator (USEPA 2012c)

Sulfur Dioxide

The vast majority of sulfur entering a refinery leaves as product sulfur, with lesser amounts leaving in refined products or being burned as part of fuel gas within the refinery. Western Canadian Sedimentary Basin (WCSB) crude has a higher sulfur content than light to medium crude oils, resulting in the potential for increases in sulfur compound emissions (primarily sulfur dioxide [SO_2]) in the event WCSB displaces such crude slates. As noted in Section 1.4, Market Analysis, and addressed above, for a variety of reasons it is expected that WCSB would largely displace other heavy crude slates rather than light to medium crude oils. Data indicate that WCSB heavy crude has a similar sulfur content to other heavy crude slates (see Table 3.13-2). Thus, any displacement that would occur from the use of WCSB crude at existing refineries is not expected to result in an impact on overall refinery SO_2 emissions.

Metals

WCSB crude has a higher content of metal compounds than is found in light to medium crude oils. Metal compounds are generally found in the highest concentrations in the heaviest cuts of crude oil, thus the concentration of metals is generally higher for heavier crudes where a large resid fraction (oil products that remain after petroleum has been distilled) is present. The resid fraction is generally processed in coking operations, and any metals are expected to concentrate in the product coke as opposed to increases in metal particulate emissions at refineries. As with SO_2 above, the market analysis shows that WCSB crude would be expected to largely displace other heavy crude slates rather than light to medium crude slates. As shown in Table 3.13-2, the metal content in WCSB heavy crude oil is comparable to that of other heavy crude slates. As a result, any displacement that would occur from the use of WCSB crude at existing refineries is not expected to result in an impact on overall refinery metal emissions.

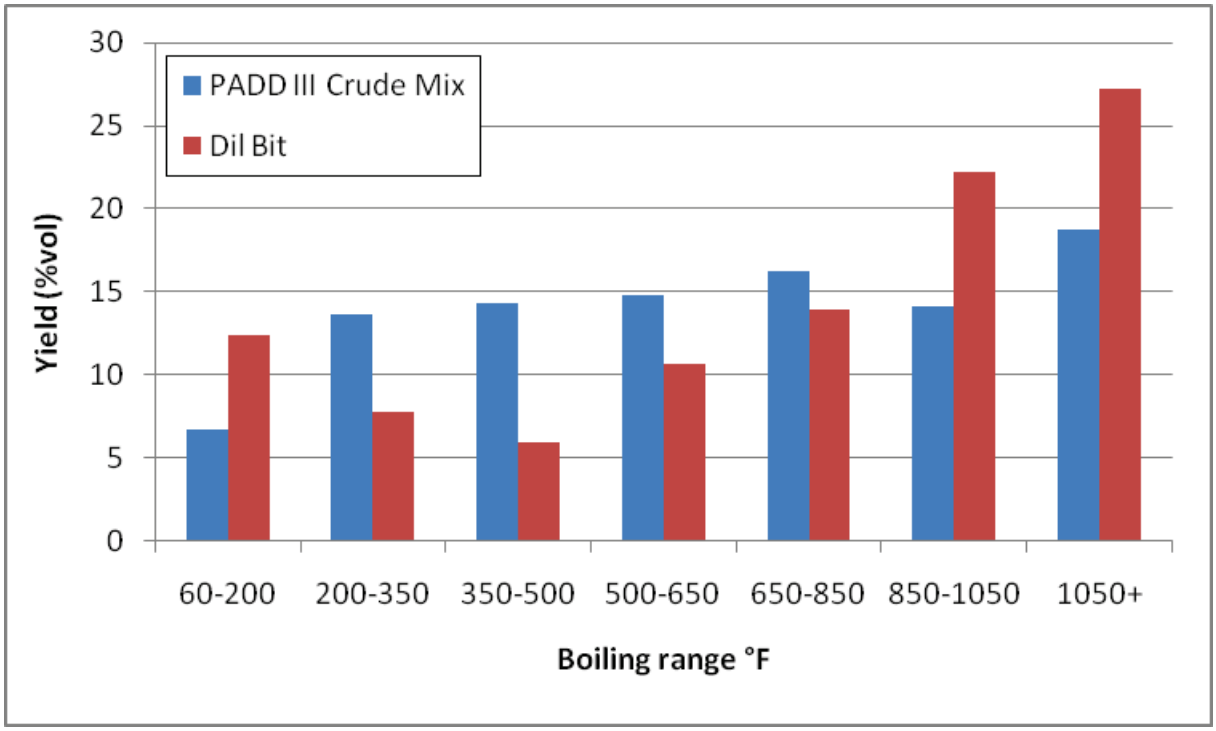
Organics

As a part of the proposed Project, diluents would be used to transport WCSB crude oils. These diluents would cause the dilbit to contain a higher fraction of volatile materials than would be present in other heavy crude slates. While the diluent could be recovered and used for another purpose or recovered and returned to Canada to allow reuse as part of dilbit, it is assumed for the purposes of this discussion that the diluent material would be processed at refineries.

If it were assumed that the dilbit would displace only heavy crude, the presence of such higher volatile materials would have the potential to lead to increases in volatile organic compound (VOC) emissions from storage tank and component leaks at refineries. It is anticipated, however, that if a refinery processed dilbit, it would also adjust and likely decrease other lighter crude(s) in proportion to the diluent content of the dilbit in order to maintain a consistent overall crude slate through the refinery. This is expected to be necessary in order to not overload a particular portion of the refinery (e.g., light ends processing, etc.). Lighter crude oils generally have much higher VOC content than heavy crude oils due to the higher concentrations of low molecular weight material present. As a consequence, it is expected that any displacement resulting from processing dilbit at existing refineries would not impact overall VOC emissions.

To further illustrate how dilbit material compares to existing crude slates, it is helpful to review Figure 4.15.3-3 below. When discussing the impacts of diluent, there has been concern about the amount of naphtha-like material present, which contains a significant amount of VOCs and boils between 30 and 200 degrees Celsius, or 86 and 392 degrees Fahrenheit. While there is a different distribution between the two lightest cuts shown in Figure 4.15.3-3, which represent most of the

VOC range, the total percentages from combining the two lightest cuts match up well. This comparison is limited because it only compares one crude against a current crude mix. It would be more appropriate to compare new crude mix where dilbit is present against the current crude slate mix, as there is no evidence to suggest that any refinery would only run dilbit. In fact, this type of crude slate analysis is part of what refineries do when evaluating crudes for potential processing at a given refinery in order to ensure that processing units present are run at their optimum capacities. See Section 2.2 of Appendix C, Supplemental Information to Market Analysis, for further discussion of how refineries evaluate crudes.



Source: Swafford 2010

Figure 4.15.3-3 Boiling Point Distribution for Typical Dilbit versus PADD 3 Crude

As discussed in Section 1.4, Market Analysis, crude oil delivered to PADD 2 and PADD 3 refineries would likely replace domestic crude oil supplies processed at these refineries or supplant existing supplies from overseas that are less stable, more costly, or otherwise less desirable to the refineries.

PADD 2 Refineries

The proposed Project would supply up to 155,000 bpd to the proposed Cushing tank farm in PADD 2. While the specific receiving refineries are not known at this time, there are some refineries or geographic areas proximal to the proposed Project that would be more likely to receive crude oil transported through the proposed Project. There are 27 refineries in PADD 2 that have a 2012 capacity to process almost 4 million bpd of crude oil (see Table 4.15-17), and heavy crude oil deliveries to these refineries totaled 3.38 million bpd in 2011 (U.S. Energy Information Administration [EIA] 2012). A significant portion of the heavy crude oil supply to PADD 2 is provided via pipelines from Canada.

Table 4.15-17 PADD 2 Refinery Crude Capacity: 2012

Refineries	Crude Oil Capacity (thousand bpsd)[a]
ExxonMobil, Joliet, Illinois	248
Marathon, Robinson, Illinois	215
PDV Midwest Refining, Lemont, Illinois	171
WRB Refining, Wood River, Illinois	322
BP, Whiting, Indiana	430
Countrymark, Mount Vernon, Indiana	28
Coffeyville Resources, Coffeyville, Kansas	120
Frontier, El Dorado, Kansas	140
NCRA, McPherson, Kansas	88
Marathon, Catlettsburg, Kentucky	253
Continental, Somerset, Kentucky (idle)	0
Marathon, Detroit, Michigan	114
Flint Hills, Saint Paul, Minnesota	320
St. Paul Park, Saint Paul, Minnesota	85
Tesoro, Mandan, North Dakota	62
BP-Husky, Toledo, Ohio	160
Lima Refining, Lima, Ohio	170
Marathon, Canton, Ohio	87
Toledo Refining, Toledo, Ohio	175
ConocoPhillips, Ponca City, Oklahoma	215
Holly Refining, Tulsa (East), Oklahoma	76
Holly Refining, Tulsa (West), Oklahoma	90
Valero, Ardmore, Oklahoma	87
Ventura, Thomas, Oklahoma (idle)	0
Wynnewood Refining, Wynnewood, Oklahoma	75
Premcor, Memphis, Tennessee	190
Calumet Lubricants, Superior, Wisconsin	45
PADD 2 GRAND TOTAL	**3,966**

Source: EIA 2012(these are 2012 capacities)

[a] bpsd = barrels per stream day; defined as the quantity of oil product produced by a single refining unit during continuous operation for 24 hours

Crude oil deliveries through the proposed Project to the Cushing tank farm would generally serve refineries in PADD 2, which includes 15 states in the Midwest from North Dakota to Oklahoma and east to Ohio. Crude oil refineries in those 15 states, including the crude oil capacity for each refinery, are presented in Table 4.15-17. In PADD 2, expansions and upgrades have been proposed or implemented in Oklahoma (Holly), Illinois (Wood River), Michigan (Marathon), and Indiana (Whiting). There is no indication that the availability of oil transported via the

proposed Project would directly result in specific expansions of existing refineries and development of new refineries (none have been built in the United States in 30 years).

PADD 3 Refineries

The proposed Project would supply up to 830,000 bpd of crude oil to customers along the Gulf Coast in PADD 3, which covers six states from New Mexico to Alabama. Because up to 100,000 bpd of capacity is reserved for crude oil from the Williston Basin, and 155,000 bpd of capacity is available to pick up crude oil from domestic producers that deliver to Cushing, Oklahoma, the quantity of oil sands crudes is more likely to be closer to 600,000 bpd maximum for the next decade or two. There are 57 refineries in PADD 3 with a 2012 refining capacity of approximately 9.2 million bpd (see Table 4.15-18). Heavy crude oil accounted for approximately 2.15 million barrels per day (mmbpd) of the crude oil refined in PADD 3 in 2006.

As identified in Table 4.15-18, a total of 15 refineries in PADD 3 would be connected directly to the hubs to which the proposed Project connects. These 15 refineries are in the Gulf Coast area[10] and have a total crude oil capacity of almost 4.2 mmbpd, including over 1.4 mmbpd of heavy crude oil capacity (EIA 2012). Oil transported via the proposed Project could be delivered to other refineries in PADD 3 through the existing pipeline network that extends throughout those general areas, or by tanker, barge, or rail. The other refineries in PADD 3 have a total crude oil refining capacity of almost 5 mmbpd. Thus, crude oil deliveries from the proposed Project could be processed at any of the refineries with direct or indirect access to the delivery points of the proposed Project.

The crude oil capacity for each refinery in PADD 3, including refineries with direct access to the proposed Project, without direct access to the proposed Project, and with possible pipeline connection to the proposed Project, are identified in Table 4.15-18.

Table 4.15-18 PADD 3 Refinery Crude Capacity: 2012

Refineries	Crude Oil Capacity (thousand bpsd)[a]
Gulf Coast Refineries with Direct Pipeline Access to the Proposed Project	
Motiva Enterprises LLC; Port Arthur, TX	600
Total Petrochemicals; Port Arthur, TX	140
Premcor Refining Group; Port Arthur, TX	415
Exxon Mobil; Beaumont, TX	359
Pasadena Refining; Pasadena, TX	107
Houston Refining; Houston, TX	302
Valero Energy Corp.; Houston, TX	90
Deer Park Refining; Deer Park, TX	340
Exxon Mobil; Baytown, TX	584
BP; Texas City, TX	475
Marathon Petroleum Co; Texas City, TX	84
Valero Energy Corp.; Texas City, TX	233
Calcasieu Refining; Lake Charles, LA	80
CITGO; Lake Charles, LA	440
ConocoPhillips; Lake Charles/Westlake, LA	252
Sub-Total Group I	**4,201**

[10] Unless otherwise specified, in this Final Supplemental EIS the Gulf Coast area includes coastal refineries from Corpus Christi, Texas, through the New Orleans, Louisiana, region. See Section 1.4, Market Analysis, for a description of refinery regions.

Refineries	Crude Oil Capacity (thousand bpsd)[a]
Gulf Coast Refineries in PADD 3 Without Direct Pipeline Access to the Proposed Project	
Hunt Refining Co.; Tuscaloosa, AL	40
Shell Chemical; Saraland, AL	85
ConocoPhillips; Belle Chasse, LA	260
Exxon Mobil; Baton Rouge, LA	523
Alon Refining Krotz Springs.; Krotz Springs, LA	83
Valero Energy Corp.; St. Charles/Norco, LA	210
Marathon Petroleum; Garyville, LA	518
Chalmette Refining; Chalmette, LA	195
Valero Energy Corporation; Meraux, LA	140
Motiva Enterprises LLC; Norco, LA	250
Motiva Enterprises LLC; Convent, LA	255
Placid Refining; Port Allen, LA	59
Shell Chemical; Saint Rose, LA	56
ChevronTexaco; Pascagoula, MS	360
ConocoPhillips; Sweeny, TX	260
CITGO; Corpus Christi, TX	165
Valero Energy Corp.; Three Rivers, TX	95
Flint Hills Resources; Corpus Christi, TX	288
Valero Energy Corp.; Corpus Christi, TX	205
Sub-Total Group 2	**4,047**
Inland PADD 3 Refineries with Possible Pipeline Connection to the Proposed Project	
Navajo Refining; Artesia, NM	115
WRB Refining; Borger, TX	154
Valero Energy Corp.; Sunray/McKee, TX	160
AlonUSA; Big Spring, TX	70
Delek; Tyler, TX	65
Sub-Total Group 3	**564**
Inland PADD 3 Refineries without Pipeline Access to the Proposed Project	
Other Refineries without Access	382
Sub-Total Group 4	**382**
PADD 3 GRAND TOTAL	**9,194**

Source: EIA 2012 (these are 2012 capacities, not 2013)

[a] bpsd = barrels per stream day; defined as the quantity of oil product produced by a single refining unit during continuous operation for 24 hours

Future Projections of Refinery Crude Oil Slates, Expansions and Investments in PADD 3

The existing refineries processing heavy crude oil in PADD 2 and PADD 3 are designed and permitted to refine heavy crude oil. Details about the PADD 3 refineries' imports of heavy crude oil are provided in Section 1.4, Market Analysis. As a result, the processing of heavy crude oil transported via the proposed Project would occur within existing permit thresholds, including USEPA consent decrees with the refiners that place additional limits on the emissions of many of the potential refinery customers.[11]

[11] In PADD 3, 91 percent of the refining capacity is subject to consent decrees with the USEPA (including all of the refineries in the Gulf Coast area except Lyondell in Houston), which requires the addition of better pollution control technologies and emissions monitoring systems.

Permitting of these facilities is under the authority of USEPA as the federal agency that implements and enforces the requirements of the Clean Air Act. State agencies with authorized or delegated authority to administer air quality programs and with approved State Implementation Plans include Texas and Louisiana. The permitting process is designed to avoid significant cumulative impacts to regional air quality associated with air emissions.

To address the potential that the proposed Project could induce changes in crude oil slates or induce refinery expansions and capital investments, an independent analysis of various aspects of the proposed Project was commissioned by the U.S. Department of Energy Office of Policy and International Affairs (EnSys Energy and Systems, Inc. [EnSys] 2010). This analysis incorporated projections of likely future PADD 3 refinery operations, including total refinery throughputs and potential refinery expansions and investments (i.e., adding downstream processing units to process a different crude slate) and the average crude slate quality (measured by average API gravity and sulfur content). That analysis indicated the average API gravity and the average sulfur content of crude oil refined in PADD 3 would be essentially the same with or without the proposed Project. Additionally, those modeling results suggested that construction of the proposed Project would not be expected to alter market conditions in PADD 3 to induce construction of a new refinery, to induce expansion of existing refineries, to induce significant differences in investment levels in refinery down-stream processing units, or to induce significant differences in average crude-slate quality. Therefore there would be little difference in emissions associated with crude oil refining in PADD 3 with or without the proposed Project.

Results from the updated modeling are consistent with those findings (see Section 1.4, Market Analysis, and Appendix C, Supplemental Information to Market Analysis). This modeling was done with a different set of scenarios to reflect evolving uncertainties and public comment on the Final EIS and Draft Supplemental EIS. Differences in the modeling included scenarios where no additional cross-border pipeline capacity growth—not just the proposed Project—were permitted (see Section 1.4.4, Updated Modeling, for more background). Within a given supply-demand case, the API average gravity under different pipeline configurations varied from 0 to 2 percent when pipeline capacity growth was constrained. It varied the most in response to the availability of pipelines within Canada, rather than the availability of cross border pipelines to the United States. Sulphur content varied by 0.2 percentage points or less. This was true both for PADD 3 and the United States as a whole. Average API gravity and sulphur varied more between supply-demand cases, but this was as a result of primarily of differing U.S. supply assumptions rather than transportation logistics.

There were also limited impacts on refinery construction and/or expansion. As with the changes in the crude slate, the availability of westbound pipelines was the significant factor, rather than cross border pipelines. In a given supply-demand case, PADD 3 refinery capacity could be 3.5 percent higher when transportation capacity for WCSB to reach the Canadian West Coast was not allowed to grow. Similarly, scenarios where westbound pipeline capacity within Canada is constrained had higher throughputs in the United States. Cross-border pipeline capacity has little impact on either refinery capacity in or refinery throughputs in the United States.

PADD 3 crude slate quality or heavy crude throughputs are not sensitive to the availability of cross-border pipelines because even in the absence of the proposed Project or any new cross-border pipelines, additional oil sands crude could reach PADD 3 in a variety of ways. It could be transported through capacity expansions on existing cross-border pipelines that have been proposed and/or by rail. (There are also new pipeline connections and expansions being made between PADD 2 and PADD 3 that will facilitate greater transport of crude south whether it is

from PADD 2 or WCSB.) When the availability of west-bound pipelines diverts oil sands crude to Asia (because total transport costs to Asia are less than to PADD 3), PADD 3 replaces much of the lost Canadian heavy supplies with similar quantities of heavy crude from Latin America and the Middle East. This is discussed in more detail in Section 1.4.4, Updated Modeling, and Appendix C, Supplemental Information to Market Analysis.

These results are consistent with certain known attributes of world crude oil markets that are discussed in Section 1.4, Market Analysis:

- Refiners in the United States primarily serve the U.S. market for finished transportation fuel (gasoline, diesel, etc.). But as U.S. demand for transportation fuel has declined, the Gulf Coast has sustained throughputs and exported increasing amounts of refined products.
- Crude oil is a widely traded commodity around the world with low marine-shipping costs relative to crude prices—prices which are set in a world market that consumes roughly 90 million bpd. Therefore, shipping 830,000 bpd from a particular source of crude oil to a particular set of refineries would not necessarily have a large impact on the overall crude market or PADD 3 refiners in particular, especially given the ability to ship WCSB crudes to foreign markets and the increasingly apparent viability of alternatives to pipeline transport (primarily rail) in North America.
- Refineries are optimized to process a particular crude slate into a particular set of refined products, and it is not easy or economically efficient for a refinery to make significant changes in its crude slate quality. Thus, refineries (particularly large refineries in the Gulf Coast) typically obtain crude oil from a variety of sources and blend those crude oils to achieve a consistent crude oil feedstock quality.
- Many of the refineries in PADD 3 and PADD 2 have already made significant capital investments in the downstream processing units necessary to refine a relatively heavier, more sulfurous crude oil blend. Having made those investments, to operate the refineries most efficiently, those refineries have significant incentive to seek out a heavier slate of crude oil, regardless of whether there is increased transport capacity to deliver WCSB oil sands-derived crude oils to PADD 3.

Impacts on Overall Refinery Emissions

The 2011 Final EIS also included analysis indicating that emissions from refineries are dependent not just upon the quality of the crude oil slate input and the quantity of crude oil processed in a refinery, but also on the emissions control technologies employed by individual refineries. Due to these factors, the data described in the Final EIS indicate that at both the national level and the Gulf Coast level, regional refinery emissions are not readily correlated with fluctuations in crude slate quality.

In addition to this information, in the 2011 Final EIS the Department provided a review of various refinery expansions and upgrades in PADD 2 associated with increasing the capacity of heavy crude oil processing. Specifically, the Department quantitatively reported on the change in emissions of criteria pollutants associated with proposed refinery expansions in Illinois, Indiana, and Michigan. Any refinery expansions or upgrades at refineries that could receive crude oil from the proposed Project would likely be required to adhere to similar regulatory standards.

Since there have been no new refineries built in the United States for over 30 years, most major upgrades result in shutting down older, generally less efficient and less clean burning equipment

as part of upgrading the refinery. These unit shutdowns provide the actual emission decreases often cited as creditable decreases in federal air permitting analyses. As a result of improvements in control technologies and the reductions from retiring older units, completed refinery upgrades generally result in a decrease in emissions of particulate matter (PM), SO_2, and nitrogen dioxides. Volatile organic emissions tend to decrease slightly but not consistently, and carbon monoxide (CO) emissions frequently increase.

As an example, BP's Whiting Refinery Modernization Project was designed to address a change in the crude feedstock or *slate* processed at the Whiting, Indiana, refinery. Modifications to the refinery were made to accommodate a significant increase in the amount of Canadian eXtra Heavy Oil, which has a higher sulfur content and a higher level of residual or coke content. The physical changes to the facility associated with this project included: a new coker; a new coke handling system; two new sulfur recovery trains; a new flare gas recovery system; a new hydrogen plant; a new hydroprocessing unit; modifications to a crude distillation unit; enhancements to the fuel gas system; three new cooling towers; and new and modified storage tanks. As part of the project there was a net increase in the total energy required to process the new crude slate. The project received air permits from the Indiana Department of Environmental Management in 2008.[12] Overall, the project showed a net decrease in emissions, including: 27 tons per year (tpy) of SO_2; 282 tpy PM; 42 tpy of PM_{10} (particulate matter with aerodynamic diameter of 10 microns and less); 6.3 tpy of VOC; 23.7 tpy of CO;[13] 28.9 tpy of Oxides of nitrogen (NOx); and 0.02 tpy of lead. Decreases in emissions from emission controls, unit modernizations, and shutdown of older emission units offset emissions increases due to increases in refined volumes from the new and modified equipment associated with the project. Other refinery upgrades have and will result in different overall changes to emissions, but the direction and magnitude of emission changes is unique to the refinery being upgraded and to impacts on the existing equipment at the refinery, including any older units that may be retired.

Cumulative air emissions in PADD 3 are likely to change over time as a result of ongoing and planned refinery expansions, whether or not the proposed Project is implemented. As described above and in the Market Analysis, it is not expected that refinery upgrade projects or construction of new refineries would occur solely due this project. However, to provide a perspective of the impact of emission changes if such events occur, a discussion of two recent projects is provided below.

The largest permitted refinery expansion for processing heavy crude oil in recent years occurred at the Motiva refinery in Port Arthur, Texas. This expansion, officially completed in 2012, increased the oil refining capacity of Motiva by 325,000 bpd (from the original capacity of 275,000 to 600,000 bpd). The Motiva refinery would have direct access to the proposed Project and would have the largest heavy oil refining capacity in PADD 3. This expansion is estimated to result in increases in most criteria pollutants, although there would be a reduction in VOCs (see Table 4.15-19). Due to the levels of emission increases, the project was subject to Clean Air Act permitting requirements, which included the modeling of nitrogen dioxide (NO_2), CO, and SO_2 to ensure the project did not cause an unacceptable impact on the local air quality. The likely reasons that this expansion would result in net increases in most emissions include the overall

[12] Permits included a Significant Source Modification (T089-25484-00453) issued May 8, 2008, and a Significant Permit Modification (T089-25488-00453) issued June 16, 2008.
[13] Frequently, CO increases follow facility upgrades; however, this specific improvement project resulted in decreased CO emissions due to updated equipment at this particular facility.

size of the expansion (more than doubling the overall crude capacity) and the fact that the existing refinery was already using relatively modern emission controls. Modifications to the existing refining processes would therefore not produce emission reductions in the same proportion as would occur for more outdated refineries. Specific emission estimates are unavailable for other refinery expansions under consideration in PADD 3.

Table 4.15-19 Net Emissions for the Motiva Refinery Expansion

NO_x (tons)	CO (tons)	VOC (tons)	SO_2 (tons)	PM (tons)	C_6H_6 (tons)	H_2SO_4 (tons)	H_2S (tons)	NH_3 (tons)	Cl_2 (tons)
592.74	1,489.53	-116.73	1679.73	464.37	-0.47	22.24	4.33	125.69	3.77

[a] NO_x = Oxides of nitrogen; CO = Carbon monoxide; VOC = Volatile organic compounds; SO_2 = Sulfur dioxide; PM = Particulate matter; C_6H_6 = Benzene; H_2SO_4 = Sulfuric acid; NH_3 = Ammonia; Cl_2 = Chlorine

Cumulative air impacts along the proposed Project cumulative impact corridor could change if new refineries are constructed in the future, although EnSys (2010) indicates such potential refinery construction is not sensitive to whether the proposed Project is implemented or not. There are currently no new refineries planned within approximately 500 miles of any delivery point for the proposed Project, although one new refinery is proposed in the northern portion of PADD 2: the Hyperion Energy Center in South Dakota. While no new refinery has been permitted and built in the United States in the past 30 years, estimates of emissions used in the permitting process for the proposed Hyperion project can be used to allow quantification of potential emissions from upgraded PADD 3 refineries that would use modern technology to process heavy crude oil. In fact, the calculated emissions presented in the permitting process for the proposed Hyperion refinery are generally comparable to those calculated for the recent 325,000-bpd Motiva expansion. The calculated emissions resulting from processing up to 400,000 bpd for the proposed Hyperion refinery (South Dakota Department of Environment and Natural Resources 2011) are:

- 687 tons of NO_X;
- 810 tons of CO;
- 183 tons of SO_2;
- 536 tons of VOCs; and
- 1,035 tons of PM.

It is expected that most of the oil transported by the proposed Project would replace historic crude oil supplies or supplant supplies from less stable or more costly sources for the following reasons:

- The maximum volume of oil that would be transported by the proposed Project (830,000 bpd) represents approximately 6 percent of the overall crude oil refining capacity of PADD 2 and PADD 3 (over 13 million bpd);
- The current supply of heavy crude oil delivered to PADD 3 from current overseas sources is either declining or at risk for political reasons; and
- There is a well-developed existing regional infrastructure to facilitate distribution of crude oil transported by the proposed Project among existing PADD 2 and PADD 3 refineries.

Although both the EnSys (2010) findings and the economic analysis in Section 1.4, Market Analysis, indicate that the construction of the proposed Project is not likely to impact imported amounts of WCSB crude oil or refinery emissions, the following hypothetical emissions estimate is presented for illustrative purposes. A conservative hypothetical maximum emissions estimate could be developed by assuming that the entire crude oil volume transported by the proposed Project would be heavy crude oil and that it would be refined at upgraded refineries. Using the emissions estimates discussed above for the Motiva refinery upgrade and the proposed Hyperion refinery project, this hypothetical maximum emissions estimate can be calculated by multiplying the maximum proposed Project throughput (830,000 bpd) by the emission rates per barrel reported for Motiva or Hyperion since these refineries are assumed to be typical for recently upgraded refineries implementing best available control technology. Hypothetical maximum annual emissions of NO_x would range between about 1,514 and 1,604 tons; CO emissions would range between about 3,804 and 4,148 tons; SO_2 emissions would range between about 1,791 and 4,290 tons; PM emissions would range between 1,186 and 2,170 tons; and VOC emissions would be about 1,718 tons.

However, because the crude oil transported by the proposed Project would be replacing or displacing crude oil from other sources, the majority of the emissions generated from refining crude oil transported by the proposed Project would not result in incremental increases to refinery emissions in either PADD 2 or PADD 3. Further, as illustrated in the BP Whiting case, any upgrades or expansions that could hypothetically occur need to consider the net impact to the overall refinery, which is impacted by the retirement of older equipment (typical of a major refinery upgrade). Additionally, it is expected that approximately 12 percent of the volume transported by the proposed Project would not be heavy crude oil, particularly in light of the Bakken Marketlink connected action.

End Use

Some commenters on the 2013 Draft Supplemental EIS expressed concerns relative to indirect contributions to cumulative air quality impacts related to the combustion or other use of petroleum products refined from the crude oil that would be transported to PADD 2 by the proposed Project. The end use of refined petroleum products could include combustion (e.g., vehicles, power generation, or other industrial facilities) or non-combustion uses (e.g., asphalt, petroleum coke, liquefied refinery gases, and lubricants). The ultimate use of refined product originating from crude oil transported by the proposed Project would not produce different end use emissions. This conclusion is based on the results of the Market Analysis, which indicates that the heavy oil transported via the Project would displace other heavy oils currently processed at PADD 2 and PADD 3 refineries, which have similar key properties. Criteria pollutant emissions from consumer and manufacturing use of refined petroleum products are regulated under permits for some uses (e.g., mass transportation vehicles and petrochemical processing) and not for others (e.g., private vehicles) beyond standard quality rules designed to reduce pollutants (e.g., oxygenated fuels, low-sulfur diesel, Corporate Average Fuel Economy standards).

4.15.3.13 Potential Releases

The potential for cumulative impacts associated with the unintended operational releases from the proposed Project are addressed qualitatively because effects are heavily dependent upon how large the spills would be and where they might occur. Small to medium spills (up to 1,000 barrels), would more likely occur on construction sites or at operations and maintenance facilities, where in general, surface spreading is contained and infiltration into the ground reduced by responders that are at these locations. For medium to large spills (greater than 1,000 barrels), the response time between the spill event and arrival of the response contractors would influence potential magnitude of impacts to environmental resources. Once the responders are at the spill scene, the efficiency, effectiveness, and environmental sensitivity of the response actions (e.g., containment and cleanup of oil, protection of resources from further oiling) would substantively influence the type and magnitude of potential additional environmental impacts.

Oil and hazardous materials spills as well as any inadvertent releases are a concern for fisheries habitats along the pipeline. Fish and aquatic invertebrates could experience toxic impacts of spilled oil, and the potential impacts would generally be greater in standing water habitats (e.g., wetlands, lakes, and ponds) than in flowing rivers and creeks. Also, in general, the impacts would be lower in larger rivers and lakes and much lower under flood conditions since the toxic hydrocarbon components would likely be relatively rapidly diluted. Even when major fish kills have occurred as a result of oil spills, population recovery has been observed and long-term changes in fish abundance have not been reported (Kubach et al. 2011); therefore, impacts of oil spills on fisheries resources is not expected to contribute significantly to cumulative effects.

Despite the uncertainty associated with the prediction of potential impacts from spills, historical pipeline incident[14] data on existing crude oil pipelines indicate that impacts are typically localized, with short- and long-term effects to resources. If multiple spills occurred concurrently (geographically and temporally) in a region with a high density of oil pipeline routes and associated facilities, cumulative effects could occur to shallow groundwater and surface water resources, aquatic and/or terrestrial habitats, and wildlife. As shown in Figures 4.15.2-1 and 4.15.2-3, the southeastern region of Montana and the Steele City, Nebraska, area are candidate areas for cumulative impacts associated with concurrent spills. The probability of concurrent events within shared pipeline corridors and crossings is further discussed below. Larger spills could cause both local and regional disruption of human uses, as well as local and regional impacts to biological populations and communities. However, the effects would still be expected to diminish over time, and would not be expected to have permanent effects to resources, ecosystems, and human communities. Furthermore, the combined implementation of industry standards and practices, combined with design standards and the addition of the Special Conditions developed by the PHMSA and agreed to by Keystone, aid in reducing the potential for spill incidents associated with the proposed Project.

[14] The terms *incident* and *accident* can be used interchangeably or with specified definitions in various agency reports and databases. For the purposes of this report, the term *incident* has been selected for consistency.

Probability of Multiple Releases Within Shared Pipeline Corridors and Pipeline Crossings

When pipelines share the same corridor as in parallel pipelines or when pipelines cross, there is the potential for cumulative effects from multiple spills from multiple pipelines. The cumulative effects are restricted to an area of overlapping spill plumes created by releases from multiple pipelines and/or multiple spills affecting the same resource; therefore, the probability of such a condition is lower than a single spill.

For example, using the PHMSA historical data, a spill greater than 1,000 bbls could be as frequent as once in 18 years for a 875 mile, 16-inch or larger crude oil pipeline (0.056 spills/year) (see Appendix K, Historical Pipeline Incident Analysis). In the case of two identical 875-mile pipelines that are parallel to each other and sharing the same corridor, the potential spill frequency from either pipeline is once in 9 years (0.112 spills/year or 2*0.056 spills/year). For a cumulative spill effect to exist, there needs to be not only two spills, but the two spills need to be near enough such that the plumes have some overlap. This overlap distance used in this evaluation is based on the 1,214-foot potential plume size discussed in Section 4.13, Potential Releases; Appendix T, Screening Level Oil Spill Modeling; and the third-party consultant review conducted by E^{x}ponent (E^{x}ponent 2013).

Although the probability of a single release occurring anywhere over the two pipelines is once in 9 years, the probability of two spills occurring at a distance that they create a plume with some overlap and at the same time is much lower than that of the single spill frequency. For example, using the 1,214-foot spill plume for a large release surface spill (Appendix T, Screening Level Oil Spill Modeling), the probability of a spill from a second pipeline occurring within 1,214 feet of first spill location but at a different time (i.e., the first plume was cleaned up) is equivalent to one spill in 68,000 years (0.000015 spills/year). The probability of both spills plumes existing within 1,214 feet of each other and at the same and therefore having cumulative effects (overlapping plumes) is equivalent to one event in 600,000 years (0.000002 events per year). This is a remote probability. The probability for a small or medium spill event would be of similar magnitude. This example is represented in Table 4.15-20.

Table 4.15-20 Probability of an Overlapping Oil Spill from Parallel or Crossing Pipelines

Item	Value	Approximate Years/Incident
Reported incident rate per mile-year (16-inch or greater crude oil pipelines)	0.00025[a]	4000
Percentage of large spill incidents > 1000 barrels	26%[a]	-
Single pipeline length (miles)	875	-
Incident rate for single large spill for one 875-mile pipeline (spills/year)	0.056	18
Incident rate for single large spill for two identical 875-mile pipelines (spills/year)	0.112	9
Conditional Probability of 2nd parallel pipeline leaking in a spill buffer (with full overlap of plume), given that 1st Pipeline is already leaking in one year [b]	0.000015	68,000
Joint Probability of 1st and 2nd Pipeline leaking in one year, with cumulative effects [c]	0.000002	600,000

[a] PHMSA 16-inch and larger mainline crude oil pipe (January 2002 to July 2012)
[b] Conditional probability of A given B: $P(A\backslash B)$
[c] Joint probability of A and B: $P(A \cap B) = P(A\backslash B)P(B)$

This example assumes pipelines that share the same corridor are of equal length, which in the case of the proposed Project would not occur. Therefore, the cumulative effect estimate is a conservative estimate. The probability of an 875-mile pipeline sharing the same corridor with a shorter pipeline would have a lower probability and would have an event occurrence greater than 600,000 years. Additionally, in the case of two pipelines crossing, the resulting probability is much lower because the first spill must occur at a specific 1,214-foot portion of the pipeline (i.e., where the two pipelines cross) instead of anywhere along the 875-mile stretch of pipeline).

Probability of Multiple Releases Within Pipeline Stream Crossings

It is possible to have a cumulative effect condition where pipelines in separate or shared corridors cross the same or connected streams. This could occur in three different types of situations:

- The first situation is if a pipeline were to have a spill at a stream crossing (includes 500 foot for each bank as a buffer) (see Section 4.13, Potential Releases), and a second pipeline sharing the same pipeline corridor were also to have a spill at the same stream crossing and at the same time for a cumulative effect.
- The second situation is if one pipeline crosses the same stream within 10 miles of another pipeline (i.e., within the potential stream spill migration distance; see Section 4.13, Potential Releases), and both pipelines have spills at their respective crossings at approximately similar timeframes. In this case, the upstream spill could reach the downstream spill location, and the effects could be cumulative.
- The third situation is if one pipeline crosses a tributary and another pipeline crosses a different tributary, and both tributaries join within 10 miles. In this case, a release occurs at each pipeline stream crossing at approximately the same time, and the oil flows downstream, meeting at the confluence for a cumulative effect.

In all three of the above situations, the probability is much lower than for the effects of a single spill and lower than from a simultaneous spill from two parallel pipelines because a release must occur as a specific location along each pipeline and the release must occur at approximately the same time for the effects to be cumulative. As a result, the combined probability of two or more pipeline spills crossing a stream would be much lower than that for a shared corridor (i.e., one event occurs once in more than 600,000 years).

For example, using the PHMSA historical data, a spill of any size occurs once in 4,000 years for a given single mile of a 16-inch or greater diameter crude oil pipeline. In the three situations described, the spill event would take place somewhere within the length of the respective stream crossing and the buffer length of the stream crossing. Given a stream buffer length of 1,000 feet (500 feet for each bank) plus 100 feet for a stream width, the probability of a single spill of any size into the buffer is once in 19,000 years. In the case of two such stream crossings (assuming identical pipelines), the probability of a single spill of any size into either stream is once in 10,000 years (double that of a single pipeline). However, for a cumulative effect to occur there needs to be two releases, both of which must occur within the same stream buffer, at the same time. Therefore, the probability of both spills occurring in such buffers, from separate pipelines, with cumulative effects is equivalent to one event in 550 million years.

Wider streams plus the buffer lengths would increase the chances of such simultaneous events because greater length of pipeline in the crossing means greater chance of a spill into a crossing. Using a buffer length of 1,000 feet, which is equal to 500 feet on either side of a river crossing plus a width of a wide river (e.g., the Niobrara River in northern Nebraska can be over 1,500 feet wide), the resulting probabilities are once in 4,000 years for a single spill, a probability of once in 8,500 years for a spill from a second pipeline that crosses the same river, and a joint probability of once in a 110 million years for a dual spill event with cumulative effect. This example is represented in Table 4.15-21.

Table 4.15-21 Probability of an Overlapping Oil Spill to the Same Water Crossing

Item	Value	Approximate Years/Incident
Reported incident rate per mile-year (16-inch or greater crude oil pipelines)	0.00025[a]	4000
Single pipeline stream crossing length (feet)	1500	-
Single pipeline stream crossing length (miles)	0.28	-
Incident rate for single spill for one 2500-foot crossing (spills/year)	0.0001	8500
Incident rate for single spill for two 2500-foot crossings (spills/year)	0.00023	4,000
Conditional Probability of 2nd pipeline leaking in 2500-foot crossing, given that 1st pipeline is already leaking in one year [b]	0.0001	8,500
Joint Probability of 1st and 2nd Pipeline leaking in one year, with cumulative effects [c]	0.000000009	110,000,000

[a] PHMSA 16-inch and larger mainline crude oil pipe (January 2002 to July 2012)
[b] Conditional probability of A given B: P(A\B)
[c] Joint probability of A and B: $P(A \cap B) = P(A\backslash B)P(B)$

4.15.4 Extraterritorial Concerns

As a matter of policy, in addition to its environmental analysis of the proposed Project in the United States, the Department has included information regarding potential impacts in Canada. In so doing, the Department was guided by EO 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. The Canadian government conducted an environmental review of the portion of the proposed Keystone XL pipeline in Canada. As a result, and consistent with EO 12114, the Department did not conduct an in depth assessment of the potential impacts of the Canadian portion of the proposed pipeline. The Department has included information in this section regarding environmental analyses and regulations related to the Canadian portion of the proposed pipeline and WCSB oil sands production. This section 1) addresses the NEB environmental analysis of the proposed Keystone XL pipeline in Canada, and 2) presents a summary of issues related to the broader issue of oil sands extraction.

4.15.4.1 Canadian National Energy Board Environmental Analysis of the Proposed Project

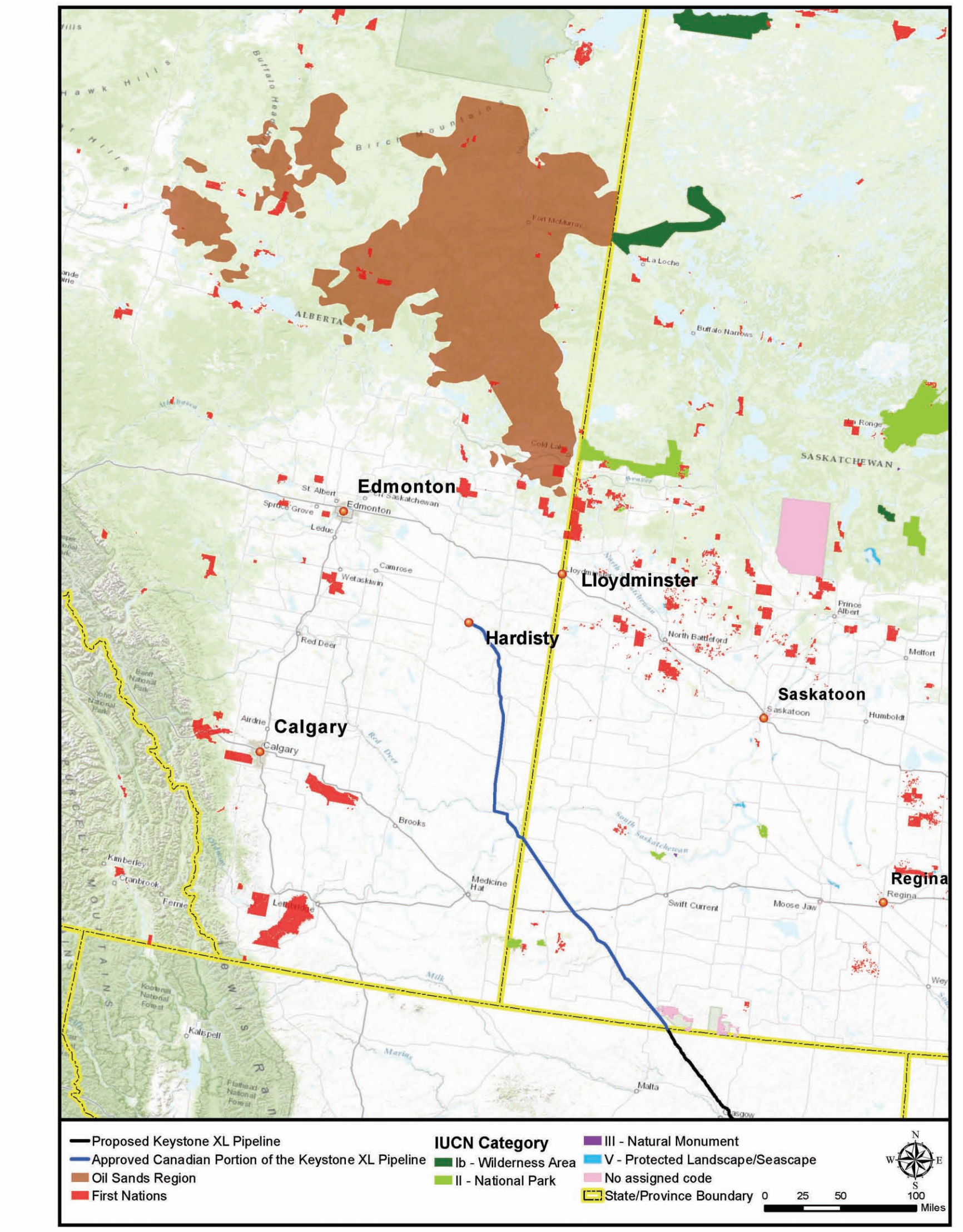
The analysis of the environmental effects of the overall proposed Keystone XL pipeline has been in progress on both sides of the international border under appropriate authorities (see Appendix X, Canadian Environmental Assessment Act and Canadian Regulatory Review of Keystone XL). The NEB and other provincial and federal authorities in Canada are responsible for determining the appropriate mitigations required for the Canadian portion of the proposed

pipeline and overseeing their implementation. The NEB conducted that analysis, held public hearings in September 2009, and issued its findings in March 2010.

The Canadian portion of the proposed pipeline consists of the construction of approximately 529 kilometers (km) (329 miles) of pipeline from Hardisty, Alberta, to Monchy, Saskatchewan (see Figure 4.15.4-1). The Canadian portion would also include related ancillary facilities: eight pump stations, storage tanks, and other related elements, including 32 MLVs, cathodic protection for the pipeline, and pig launcher and receiver facilities. The NEB identified the nine key issues listed below relative to the proposed pipeline in Canada:

- The need for the proposed facilities;
- The economic feasibility of the proposed facilities;
- The potential commercial impacts;
- The potential environmental and socioeconomic effects of the proposed facilities, including those to be considered under the Canadian Environmental Assessment Act (see Appendix X, Canadian Environmental Assessment Act and Review);
- The appropriateness of the general route of the pipeline;
- The method of toll and tariff regulation;
- The suitability of the design of the proposed facilities;
- The terms and conditions to be included in any approval the NEB may issue; and
- Potential impacts of the project on Aboriginal interests.

The primary land use traversed by the Canadian portion of the proposed Keystone XL pipeline is agricultural and includes cropland, reseeded pasture, and rangeland. The most agriculturally productive areas traversed by the proposed pipeline are Aspen Parkland and Moist Mixed Grassland ecoregions. The pipeline route also intersects the Canadian Great Sand Hills area. However, it is more than 15 km (9 miles) away from the Canadian Great Sand Hills Reserve core area protected under the Provincial Lands Act of Saskatchewan. Other land uses include oil and gas resources and recreational activities. The proposed pipeline is routed through rural areas of Alberta and Saskatchewan with low population densities and which have experienced conventional oil and gas extraction activities in the past.



Source: Esri 2013

Figure 4.15.4-1 Proposed Keystone XL Pipeline Route in Canada

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With respect to the potential environmental and socioeconomic effects of the Canadian portion of the proposed pipeline, the NEB ESR evaluated the following elements:

- Physical Environment – Unique Landforms (Canadian Great Sand Hills area)
- Soil and Soil Productivity
- Vegetation and Rare Plants
- Water Quality and Quantity
- Fish and Fish Habitat
- Wetlands
- Wildlife and Wildlife Habitat
- Species at Risk Act (SARA) Listed Species (Faunal)
- Air Quality
- Human Occupancy/Resource Use
- Heritage Resources
- Traditional Land and Resource Use
- Socio and Cultural Well-Being
- Human Health/Aesthetics
- Accidents/Malfunctions
- Effects of the Environment

The NEB concluded that if Keystone followed the agreed-upon design and mitigative measures, then the potential adverse environmental effects would be addressed and are not likely to be significant. However, the NEB identified eight of the above elements that required more detailed assessment due to public concern, a monitoring program, follow-up program, or non-standard mitigation measures, or that required the implementation of specific recommendations. These eight areas of concern included:

- Wildlife, Wildlife Habitat, and Faunal Species at Risk: Adverse effects on wildlife and wildlife habitat during construction and operation include mortality risk, changes in habitat availability due to vegetation clearing, and indirect effects such as sensory disturbance and habitat connectivity.
- Rare Plants, Rare Ecological Communities, SARA Plant Species, and Native Vegetation: Clearing and construction of the pipeline has the potential to result in fragmentation and direct loss of valued components of native vegetation. Weeds and non-native species could become established and compete against native vegetation or hinder reclamation efforts.
- Fish and Fish Habitat: Fish and fish habitat could be impacted by a loss of drilling mud and cuttings to surface water due to failure of HDD or horizontal directional bore.
- Groundwater: Groundwater could be impacted through the improper management or disposal of affected groundwater.

- Wetlands: Wetlands could be adversely affected during the construction and operation of the proposed pipeline due to the loss or alteration of wetland communities and species.
- Atmospheric Environment—Operations Related Air Emissions from Hardisty B Tank Terminal: Operations-related air emissions could be produced from evaporation of volatile components of the oil products contained in the tanks and could leak from the headspaces of the tanks. Air emissions could be greatest during tank-filling episodes when the vapor space inside the tanks is replaced with the product, and would have the potential to cause nuisance odors and adverse human health effects.
- Canadian Great Sand Hills: The project traverses through the Canadian Great Sand Hills area, a rare ecosystem; however, the proposed pipeline is located more than 15 km (9 miles) away from the Canadian Great Sand Hills Ecological Reserve core area. Concerns include disturbance during construction under non-frozen conditions, post-construction erosion control, and invasion by weeds.
- Increased Noise Levels During Operations: Potential health effects on local residents could occur in close proximity to the Grassy Creek pump station from changes to the acoustic environment as a result of pump station operations.

Cumulative effects of the Canadian portion of the proposed Keystone XL pipeline were also considered in the NEB ESR, which entailed considering the impact of the long-term and/or permanent effects associated with the proposed pipeline in combination with the long-term and/or permanent effects from other projects and activities that have been or that are likely to be carried out within appropriate times and distances and ecological context. The NEB cumulative effects assessment of the Canadian portion of the proposed pipeline identified other existing or planned project facilities in proximity of the proposed pipeline having long-term and/or permanent effects that may interact with the proposed pipeline. These included:

- The existing Keystone Pipeline, for a segment in Alberta from the southeast corner of Gooseberry Lake to the Saskatchewan border;
- The existing Foothills Pipeline in Saskatchewan;
- Existing, approved and planned storage tanks (89 in total) at the Hardisty complex; and
- Pump station associated with existing TransCanada Keystone Hardisty A Terminal.

The elements included in the assessment of potential cumulative effects included 1) the alteration, fragmentation, and loss of native vegetation and wildlife habitat; 2) the loss of rare plants and ecological communities; 3) the increase in air contaminants; and 4) the increased cumulative noise levels at Hardisty and at pump station sites. Of these elements considered in the cumulative assessment, the NEB found that the losses of plant species or ecological communities that are already listed as *rare* could be potentially significant. The NEB recommended that Keystone either achieves no loss, per the appropriate mitigations, or that it provide sufficient offsets to compensate for any loss. In addition, as part of the ESR, the NEB developed recommended conditions for authorization as part of the regulatory decision on the proposed Keystone XL pipeline under the NEB Act (see Table 4.15-22).

Table 4.15-22 NEB Conditions for Authorization (Canadian Portion, Proposed Keystone XL Pipeline)

Condition	Description
A	Keystone shall implement or cause to be implemented all of the policies, practices, programs, mitigation measures, recommendations, and procedures for the protection of the environment included in or referred to in its application or as otherwise agreed to during questioning in the OH-1-2009 proceeding or in its related submissions.
B	Keystone shall maintain at its construction office(s): a) an updated Environmental Commitments Tracking Table listing all regulatory commitments, including but not be limited to all commitments resulting from: i) the NEB application and subsequent filings; ii) undertakings made during the OH-1-2009 proceedings; and iii) conditions from permits, authorizations and approvals. Keystone shall also file the updated Environmental Commitments Tracking Table with the Board 15 days prior to construction. b) copies of any permits, approvals or authorizations for the applied-for facilities issued by federal, provincial or other permitting agencies, which include environmental conditions or site-specific mitigative or monitoring measures; and c) any subsequent variances to any permits, approvals or authorizations.
C	Keystone shall file with the Board either: a) upon successful completion of the Horizontal Directionally Drilled (HDD) or HD bore watercourse crossing for the Red Deer, South Saskatchewan, and Frenchman Rivers and Piapot Creek, confirmation of their completion; or b) in the event of any changes to the proposed HDD/HD bore watercourse crossing method for the Red Deer, South Saskatchewan or Frenchman Rivers or Piapot Creek, at least 10 days prior to crossing, i) notification in writing of such change to the proposed crossing method and the reason for that change; ii) evidence of consultation with appropriate provincial and federal regulatory authorities that have an interest in the watercourse crossings and provide copies of all relevant correspondence from them; and iii) file for approval, at least 10 days prior to implementing the revised watercourse crossing method, a description of: 1) amended reclamation and re-vegetation measures; 2) amended mitigation measures for the protection of Aboriginal heritage and traditional resources; and 3) fish and fish habitat monitoring for the affected watercourse crossings.
D	Keystone shall file with the Board for approval, at least 60 days prior to starting each preconstruction survey: a) a methodology for conducting the surveys for rare and SARA listed plants and rare ecological communities; b) a methodology for conducting the confirmatory surveys for faunal species of management concern (including Ord's Kangaroo Rat, Swift Fox, Ferruginous Hawk, Burrowing Owl, Black-tailed Prairie Dog, sharp tailed grouse, loggerhead shrike and SARA listed amphibians); and c) evidence of consultation on the above methodologies with appropriate provincial and federal regulatory authorities and provide copies of correspondence from these regulatory authorities regarding the methodology.

Condition	Description
E	Keystone shall file with the Board for approval, at least 60 days prior to construction: a) the results of the confirmatory surveys for species of management concern, including Ord's kangaroo rat, swift fox, ferruginous hawk, burrowing owl, black tailed prairie dog, sharp tailed grouse, loggerhead shrike and SARA listed amphibians; b) a detailed mitigation plan for each of the above species affected by construction and operation activities; c) evidence of consultation with appropriate provincial and federal regulatory authorities and copies of correspondence from these regulatory authorities regarding satisfaction with the proposed mitigation; and d) confirm that the Environmental Protection Plan (EPP) has been updated to include the mitigation measures. Construction shall not commence until Keystone has received approval of its SARA survey results and mitigation plans from the Board.
F	Keystone shall file with the Board for approval, at least 60 days prior to construction: a) the results of the surveys for rare and SARA listed plants and rare ecological communities; b) a detailed mitigation plan for each of these species affected by construction activity, including but not limited to: i) measures to be implemented during construction; ii) measures and a monitoring survey protocol for post-construction reclamation; and iii) a survey methodology for determining the extent of non-avoidable impacts on rare and SARA listed plants and rare ecological communities. c) evidence of consultation with appropriate provincial and federal regulatory authorities and copies of correspondence from these regulatory authorities regarding satisfaction with the proposed mitigation plan; and d) confirmation that the EPP has been updated to include the relevant mitigation measures. Construction shall not commence until Keystone has received approval of its SARA survey results and mitigation plans from the Board.
G	Keystone shall file with the Board for approval, at least 120 days prior to leave to open, a plan for the provision and implementation of offset measures for all non-avoidable impacts on rare and SARA listed plants and rare ecological communities. The plan shall include but not be limited to, the results from surveys for determining the extent of nonavoidable impacts, and evidence of consultations with appropriate government agencies and relevant stakeholders.
H	Keystone shall file with the Board for approval, at least 60 days prior to construction, a comprehensive wetland survey. The survey shall include: a) the methodology for conducting the survey; b) the results of the survey; c) the criteria, and the rationale for the criteria, for the crossing methods and mitigation measures to be employed; d) evidence demonstrating consultation with appropriate provincial and federal regulatory authorities; and e) confirmation that the EPP has been updated to include the mitigation measures.
I	Keystone shall file with the Board for approval, at least 60 days prior to construction, additional surveys and assessments committed to in its 28 August 2009 Supplemental evidence necessary to address facility location and route changes extending beyond the 1 km wide study corridor assessed for the ESA. The surveys and assessments shall include: a) the methodology for conducting the surveys (for those methodologies not otherwise conditioned); b) the results of the surveys; c) mitigation measures; d) evidence of consultation with appropriate provincial and federal regulatory authorities; and e) confirmation that the EPP has been updated to include the mitigation measures.

Condition	Description
J	Keystone shall file with the Board for approval, at least 60 days prior to construction: a) the results of the pre-construction weed surveys to identify the presence and density of weeds in areas that will be affected by the construction of the Keystone XL pipeline; b) the methodology for conducting the surveys; c) evidence demonstrating consultation with appropriate provincial and federal regulatory agencies regarding the methodology and results; and d) confirmation that the EPP has been updated to include the mitigation measures.
K	Keystone shall file with the Board for approval: a) at least 90 days prior to the commencement of construction, a draft Project-specific EPP. The EPP shall be a comprehensive compilation of all environmental protection procedures, mitigation measures, and monitoring commitments, as set out in Keystone's application for the Project, subsequent filings or as otherwise agreed to during questioning in the OH-1-2009 proceeding or in its related submissions. The EPP shall also include measures arising from additional studies conducted in 2009 & 2010 with updated Environmental Alignment Sheets. The EPP, as appropriate, shall include but not be limited to: i) seed mixes and criteria for their use in the reclamation of the project and confirmation that appropriate provincial and federal regulatory agencies have commented on the proposed seed mixes; ii) evidence that landowners have been consulted on seed mixes to be applied to their directly affected land; iii) an updated Weed Management Plan, including evidence demonstrating consultation with appropriate provincial and federal regulatory agencies, and directly affected landowners in developing the plan; iv) a Canadian Great Sand Hills Reclamation plan for pipeline construction, developed in consultation with appropriate provincial and federal regulatory agencies; v) a Traffic Management Plan to minimize total activity including, where relevant, construction within a 500 m buffer zone of Prairie dog colonies; and vi) special trenchwater management procedures in areas where there is a likelihood of encountering shallow brine-impacted groundwater during dewatering for pipeline construction. b) at least 45 days prior to the commencement of construction, a final EPP for approval, which shall include but not be limited to, updated mitigations and any other updates resulting from survey results, and any changes resulting from consultation on the previous draft EPP. Keystone shall also provide evidence of consultations and describe how any outstanding concerns will be addressed. Construction shall not commence until Keystone has received approval of its EPP.
L	Keystone shall continue to consult with Aboriginal groups who have expressed interest in the Project regarding the details of construction phase of the project as well as its plan for monitoring procedures for the protection of Aboriginal heritage and traditional resources. Keystone shall file with the Board, at least 60 days prior to the commencement of construction, an update on its consultations with Aboriginal people, including: a) concerns raised by Aboriginal people; b) a summary indicating how Keystone will address any concerns raised during these consultations; and c) its plan describing monitoring procedures for the protection of Aboriginal heritage and traditional resources during construction.
M	Keystone shall file with the Board, at least 30 days prior to commencement of construction. a) a copy of clearance received under the Alberta Historical Resources Act; b) all comments and recommendations received from the provincial authorities in Saskatchewan and Alberta regarding the Heritage Resources Impact Assessments; and c) for approval, the mitigation measures that Keystone proposes to address the comments and recommendations in b).

Condition	Description
N	For the duration of construction and for a period of at least five years following leave to open, Keystone shall maintain and upon request file with the Board a construction consultation and complaint monitoring report that provides a Landowner Consultation Tracking Table that will include, but not be limited to: a) a description of any landowner consultations undertaken including the method of consultation, dates, and a summary of any comments or concerns raised by landowners or potentially affected persons or groups; b) a summary of actions undertaken by Keystone to address each of the comments or concerns raised by potentially affected persons or groups; and c) a description of how Keystone intends to measure whether and to what extent it is achieving its stated objectives regarding consultation.
O	In the event of construction or clearing activities within restricted activity periods for migratory birds, Keystone shall retain a qualified avian biologist to carry out a preconstruction survey to identify any migratory birds and active nests in areas immediately surrounding the site (30 metres for migratory birds and 100 metres for raptors) and shall file with the Board within 15 days following the construction or clearing activities: a) the results of the survey; b) mitigation, including monitoring, developed in consultation with Environment Canada and Canadian Wildlife Service, to protect any identified migratory birds or their nests; c) mitigation, including monitoring, developed in consultation with Environment Canada and Canadian Wildlife Service to protect any identified Species at Risk Act (SARA) birds or their nests; and d) evidence to confirm that the appropriate provincial and federal regulatory authorities were consulted, on the proposed methodology for the survey, the results from the survey and the mitigation and monitoring to be used, and a description of any outstanding concerns they may have. If no construction or clearing activities occur within restricted activity periods for birds, Keystone shall notify the Board of this within 15 days following the last restricted activity period to occur during construction.
P	Keystone shall file with the Board, 6 months after the commencement of operation, and on or before the 31st January for each of the subsequent 5 years, a post-construction environmental monitoring report that: a) describes the methodology used for monitoring, the criteria established for evaluating success and the results found; b) assesses the effectiveness of the mitigation measures applied during construction against the criteria for success; c) identifies deviations from plans and alternate mitigation applied as approved by the Board; d) identifies locations on a map or diagram where corrective action was taken during construction and the current status of corrective actions; and e) provides proposed measures and the schedule Keystone shall implement to address any unresolved concerns.
Q	Keystone shall comply with all of the conditions contained in this Certificate unless the Board otherwise directs.

In conclusion, the NEB ESR determined that with the implementation of Keystone's environmental protection procedures and mitigation measures as well as the NEB's conditions and recommendations, the proposed Keystone XL pipeline was not likely to cause significant adverse environmental effects in Canada. Furthermore, project effects on air quality, water, wetlands, habitat fragmentation, biodiversity, wildlife, and other socio-economic elements were not widespread enough to interact with or meaningfully cumulate with effects from upstream or downstream projects or activities. Therefore, it is NEB's position that the Canadian portion of

the proposed pipeline would not likely result in significant adverse cumulative environmental effects in combination with other projects or activities that have been or would be carried out.

Relative to impacts to Aboriginal people, the NEB carried out Enhanced Aboriginal Engagement activities. Five Aboriginal communities participated in proceedings as intervenors, and one Aboriginal community and one organization filed letters of comment. The Blood Tribe and Federation of Saskatchewan Indian Nations filed letters of comments, and the intervenors included the following communities:

- Neekaneet First Nation No. 380;
- Red Pheasant Band No. 108;
- Alexander First Nation;
- Sweetgrass First Nation; and
- Moosomin First Nation.

Potential impacts of the proposed Keystone XL pipeline on Aboriginal people identified through this engagement process and considered by NEB include potential environmental, spiritual, cultural, and historical impacts, as well as impacts on treaty and Aboriginal rights. Specific concerns identified included impacts to traditional territories and traditional uses and the proximity of the proposed pipeline to important cultural sites, including the Canadian Great Sand Hills, tipi circles, and medicine wheels. Interest was also expressed during the engagement process related to Aboriginal people opportunities for economic benefits from the proposed pipeline, including training/education, business, contracting, and general employment.

In their review, NEB found no specific evidence of traditional use over the proposed pipeline route and no evidence that there would be impacts on areas where traditional activities are currently carried out. Regarding potential impacts to sacred, historical, archaeological, and otherwise significant sites, NEB noted Keystone's commitment to ongoing Aboriginal consultation and engagement during construction and operation of the proposed pipeline, and NEB imposed conditions to this effect, as outlined above in Table 4.15-22.

Additional information and detail related to Aboriginal Consultation conducted as part of the NEB review is provided in Appendix X, Canadian Environmental Assessment Act and Review. Chapter 9 of this report discusses Aboriginal Consultation and includes a summary of the views and positions expressed by both Aboriginal people and TransCanada during the Enhanced Aboriginal Engagement related to both the engagement process and potential impacts of the proposed pipeline on Aboriginal people.

Regarding the Canadian Great Sand Hills area, NEB noted Keystone's commitments to work collaboratively with Aboriginal communities and develop a detailed reclamation plan for the pipeline route. NEB imposed conditions to this effect, as outlined above in Table 4.15-22. In addition, Keystone stated in its application that it would take part in capacity-building efforts with Aboriginal communities, including training and jobs related to the proposed pipeline.

In the March 2010 finding, the NEB determined that the proposed Keystone XL Project is required in Canada to meet the present and future public convenience and necessity. This finding was predicated on meeting the NEB terms and conditions presented in the project certificate, including all commitments made by Keystone during the hearing process. Pertinent NEB documents are provided in Appendix X, Canadian Environmental Assessment Act and Review.

4.15.4.2 Concerns Related to Oil Sands Extraction

To the extent that the proposed Project would contribute to indirect or cumulative environmental impacts within Canada, the Department could choose as a matter of policy to evaluate those impacts. The proposed Project begins at the international boundary where the pipeline would exit Saskatchewan, Canada, and enter the United States near Morgan, Montana. The purpose of the CEA is to evaluate cumulative effects of the proposed Project with past, present, and reasonably foreseeable future projects. A substantial number of comments were received on the Draft Supplemental EIS raising concerns regarding impacts associated broadly with bitumen extraction. Impacts associated with bitumen extraction are not considered potentially cumulative with the proposed Project because bitumen extraction predominantly occurs in northeastern Alberta (east, north, and northwest of Edmonton), and the Canadian portion of the proposed Keystone XL pipeline begins in Hardisty, southeast of Edmonton (see Figure 4.15.4-1). Thus, the proposed Project would not contribute to cumulative impacts associated with bitumen extraction activities.

The proposed Project could also theoretically have indirect effects or cumulative effects in Canada by inducing greater growth in production of the oil sands. Indirect effects of an action include those that are caused by an action and occur later in time or farther away in distance but that are still reasonably foreseeable. As noted in Section 1.4, Market Analysis, approval or denial of any one crude oil transport project, including the proposed Keystone XL pipeline, is unlikely to significantly impact the rate of extraction in the oil sands or the continued demand for heavy crude oil at refineries in the United States.[15]

However, due to the volume of comments received raising these issues, this Final Supplemental EIS addresses significant concerns expressed by commenters that relate to issues in Canada other than the potential cumulative effects of the proposed Project, including the influence of the proposed pipeline on oil sands development, environmental impacts of oil sands extraction, impacts to migratory birds (including impacts associated with tailings ponds), boreal forest reclamation, and impacts to Aboriginal Groups, as further discussed below.

Governmental and Non-Governmental Oversight

Canadian government regulations regarding oil sands activities provide regional standards for air quality, water quality and consumption, and land impacts based on a cumulative effects approach. Oil sands environmental regulations are administered by federal and provincial governments including the Ministry of the Environment, the Canadian Environmental Assessment Agency (which administers the Canadian Environmental Assessment Act), and the Alberta Department of Environment and Sustainable Resource Development. Oil sands deposits are located primarily in Alberta (but also extend into Saskatchewan). The Canadian Government

[15] The 2013 Draft Supplemental EIS estimated how oil sands production would be affected by long-term constraints on pipeline capacity (if such constraints resulted in higher transportation costs and if long-term West Texas Intermediate-equivalent oil prices were less than $100). The Draft Supplemental EIS also estimated a change in GHG emissions associated with such changes in production. The additional data and analysis included in this Final Supplemental EIS provide greater insights into supply costs and the range of prices in which pipeline constraints would be most likely to impact production. If West Texas Intermediate-equivalent prices fell to around approximately $65 to 75 per barrel, if there were long-term constraints on any new pipeline capacity, and if such constraints resulted in higher transportation costs, then there could be a substantial impact on oil sands production levels. This is discussed further in Section 1.4.5.4, Implications for Production.

and the Government of Alberta have a cooperative agreement to minimize regulatory overlap (the Canada-Alberta Agreement for Environmental Assessment Cooperation). Oil sands development projects undergo an environmental review under Alberta's Environmental Protection and Enhancement Act and the Water Act, as well as the Canadian Environmental Assessment Act and the SARA. Other federal and provincial agencies may participate in the review as Responsible Authorities or as Federal Authorities with specialist advice.

A prominent advisory group in the oil sands region is the Cumulative Environmental Management Association (CEMA), which is a multi-stakeholder planning forum for the Regional Municipality of Wood Buffalo (RMWB), Alberta. CEMA is comprised of more than 50 members from both the public and private sectors that includes First Nations and Métis Groups,[16] municipal, provincial and federal governments, environmental advocacy groups, educational institutions, and surface mining and *in situ* oil sands operators. CEMA has an annual budget of over 5 million Canadian dollars and produces recommendations and management frameworks pertaining to the cumulative impact of oil sands development in northeastern Alberta. These recommendations are forwarded to the provincial and federal government regulators as key advisory documents (CEMA 2013a).

Monitoring and research groups that support provincial and federal government regulators in addition to CEMA include:

- The University of Alberta's Oil Sands Research and Information Network (OSRIN), which is a university-based, independent organization operating within the School of Energy and the Environment. OSRIN compiles, interprets and analyzes available information about the reclamation of land and water impacted by oil sands mining. OSRIN's mission is to provide independent, objective, and credible information to facilitate the development of regulations, best practices, and technology (University of Alberta 2013a).
- The Regional Aquatics Monitoring Program (RAMP), which is an industry-funded, multi-stakeholder environmental monitoring program initiated in 1997. RAMP monitors the aquatic environment in different locations in the Athabasca oils sands region to identify long-term trends, regional issues, and potential cumulative effects related to oil sands and other development.
- The Alberta Biodiversity Monitoring Institute (ABMI), which is an independent organization that collects information on about 2,000 species via site visits, aerial photography, and satellite imagery in order to monitor change in important species, habitats, and land use.
- The Wood Buffalo Environmental Association, which is a multi-stakeholder, not-for-profit, science-based monitoring organization, headquartered in Fort McMurray, Alberta, responsible for monitoring air quality and terrestrial environmental effects from industrial emissions to the atmosphere in the Athabasca Oil Sands Region.
- The Canadian Oil Sands Network for Research and Development, which is a network of companies, universities, and government agencies organized to facilitate collaborative research in science and technology for Alberta Oil Sands.

[16] Métis Groups are one of the recognized Aboriginal people in Canada.

- The Helmholtz-Alberta Initiative, which is an independent international research partnership that joins the scientific and technical expertise of the Helmholtz Association of German Research Centres (Germany) in collaboration with the University of Alberta (Canada) to address problems in the area of energy and the environment, ecosystem and resource informatics, and health.
- The Boreal Research Institute, which is a public and private partnership whose mission is to promote the "wise use of boreal resources through applied research, knowledge exchange, and community relations" (The Northern Alberta Institite of Technology 2013). The Boreal Research Institute informs government policy and industry practices at the Provincial level.

In addition, the Joint Canada-Alberta Implementation Plan for Oil Sands Monitoring was announced in 2012 and established a scientifically rigorous, comprehensive, integrated, and transparent environmental monitoring program for the oil sands region. The program was designed to provide an improved understanding of the long-term cumulative effects of oil sands development (Government of Alberta and Government of Canada 2013).

The Oil Sands Monitoring Plan has a number of objectives:

- Support sound decision-making by governments as well as stakeholders;
- Ensure transparency through accessible, comparable, and quality-assured data;
- Enhance science-based monitoring for improved characterization of the state of the environment and collect the information necessary to understand cumulative effects;
- Improve analysis of existing monitoring data to develop a better understanding of historical baselines and changes; and
- Reflect the trans-boundary nature of the issue and promote collaboration with the Governments of Saskatchewan and the Northwest Territories.

Monitoring activities initiated to date include:

- Water quality monitoring to quantify and assess the sources, transport, loadings, fate, and types of oil sands contaminants found in the Athabasca River and their effects on key aquatic ecosystem components. Monitoring activities have included snow and atmospheric deposition sampling, monthly water quantity/quality sampling in the lower Athabasca River and its tributaries, sediment core sampling to assess historical aerial deposition/contaminant loading, invertebrate sampling, and fish and invertebrate toxicity testing.
- Air quality monitoring to quantify and assess the fate of contaminants from the point of emission to the point of deposition into aquatic and terrestrial ecosystems. Monitoring activities have included the assessment of air pollutants (NO_2 and SO_2) concentrations over the oil sands region and the installation of air samplers at bird nest boxes.
- Biodiversity monitoring to quantify and assess terrestrial and aquatic biodiversity and the potential impacts of contaminants and habitat disturbance. Monitoring activities have included collecting biodiversity information from 64 wetland and 64 terrestrial monitoring sites across the oil sands region using a suite of more than 30 data collection protocols. Data on more than 1,000 species are being collected including for mammals, migratory birds, vascular plants, moss, lichens, and soil invertebrates. Additional emphasis is being placed on collecting data to predict the impact of industrial development and climate change on birds within the oil sands area, which has included data collection on bird health and toxicology as

well as contaminant studies. Data collection on amphibian health and toxicology and contaminant studies is also underway. Human disturbance footprint monitoring and habitat monitoring have also been initiated, including plant health and contaminant studies.

In August 2012, the Government of Alberta approved a development plan for the Lower Athabascan oil sands region. This is the first regional plan developed under the Alberta Land Stewardship Act's Land-Use Framework. The Land-use Framework facilitates the development of province-wide strategies for establishing monitoring systems, promoting efficient use of lands, reducing impact of human activities, and including Aboriginal people in land-use planning. The Lower Athabasca Regional Plan would require cancellation of about 10 oil sands leases, set aside nearly 20,000 square kilometers (7,700 mi^2) for conservation, and set new environmental standards for the region in an effort to protect sensitive habitat, wildlife, and forest land.

Oil Sand Extraction Statistics and Monitoring Data to Date

Bitumen, a heavy oil extract, is recovered from oil sands by either *in situ* (in place) recovery or surface mining. Most bitumen (80 percent) is recovered using *in situ* techniques that use steam-assisted gravity drainage to pump steam underground through a horizontal well to liquefy the bitumen, which is recovered by an extraction well. *In situ* recovery is less disturbing to the land surface than surface mining and does not require tailings ponds. Oil sands underlie 140,200 square kilometers (km^2) (54,132 mi^2) in three areas of northeast Alberta. To date, about 715 km^2 (276 mi^2) of land have been disturbed by oil sands mining activity (0.5 percent of the total oil sands area). Surface mining requires an open pit similar to many coal, iron ore, copper, and diamond mines. Mined oil sands are then transported to a cleaning facility where they are mixed with hot water to separate the oil from the sand. As of January 2013, there were 127 operating oil sands projects in Alberta. Only five of these projects are mining projects (Government of Alberta—Energy 2013).

As of 21010, Alberta's boreal forest natural region includes: 12 percent cultivation; 6 percent forestry; 3 percent residential, commercial, and energy infrastructure; and 1 percent transportation infrastructure, leaving 78 percent of the region with no human footprint (ABMI 2012). Alberta-Pacific Forest Industries Forest Management Agreement Area (Al-Pac FMA), a 57,331 km^2 (22,136 mi^2) area centered on the Athabasca oil sand deposit, includes: 4 percent forestry, 2 percent energy, and 1 percent transportation infrastructure, leaving 93 percent with no footprint (ABMI 2009). Cumulative impacts from oil sands development include GHG emissions and land surface alteration. Land surface alteration includes mine sites, tailings ponds, well sites, industrial roads, pipelines, power lines, seismic cut lines, and facilities. Biodiversity indicators evaluate ecosystem intactness or the proportion of human disturbance by assessing when common species become rare or disappear and when weedy or invasive species become common. Intactness indices for the Al-Pac FMA indicate:

- Intactness for 12 old-forest bird species ranged from 96 to 100 percent with 7 of 12 old-forest bird species less abundant than expected;
- Intactness for 11 winter-active mammal species ranged from 89 to 100 percent with 3 of 11 winter-active mammal species less abundant than expected;
- Percent occurrence of 16 non-native weed species ranged from 2 to 28 percent with non-native weed species detected across 39 percent of the Al-Pac FMA;

- For 4 of 17 species at risk that were evaluated, intactness was 97 or 98 percent, and 3 of the 4 species were less abundant than expected (the monitoring system is not designed to evaluate the other 13 species at risk);
- Intactness for four old-forest habitats ranged from 91 to 95 percent, and for all old-forest habitats was 92 percent; and
- Intactness for live trees was 97 percent, for snags (standing deadwood) was 95 percent, and for downed deadwood was 98 percent (AMBI 2009).

The following cumulative statistics related to environmental effects from oil sands development in Alberta are derived from the records of the province of Alberta (Government of Alberta 2010 and Government of Alberta – Energy 2013):

- Alberta's oil sands account for about 6.8 percent of Canada's overall GHG emissions (as of 2010) and Canada is responsible for about 2 percent of global emissions.
- Oil sands mining projects have reduced GHG emissions intensity by an average of 26 percent between 1990 and 2010 and are working toward further reductions.
- All existing and approved oil sands projects may withdraw no more than 3 percent of the average annual flow of the Athabasca River (2010 usage was 0.74 percent of the long-term average annual flow); during periods of low river flow water consumption is limited to no more than 1.3 percent of annual average flow.
- Water use by oil sands mining operations continues to decrease despite significant increases in production.
- Many *in situ* projects recycle up to 90 percent of the water used in their operations and use deep-well saline water as an alternative to freshwater wherever possible.
- Since 1995, long-term air quality monitoring shows improved or no change in CO, ozone, fine PM, and SO_2 as well as an increasing trend in NO_2.
- Air quality in the oil sands region is rated *good* 95 percent of the time.
- Tailings (water, fine silts, left-over bitumen, salts and soluble organic compounds) ponds are constructed with groundwater seepage-capture facilities and are closely monitored.;
- Tailings settling ponds are designed and located after environmental review and bird deterrents are used to prevent birds from landing on tailings ponds.
- Currently, processing 1 tonne (1.1 tons) of oil sand produces about 94 liters (25 gallons) of tailings.
- About 715 km^2 (276 mi^2) of land has been disturbed by oil sands mining activity. To date, over 71 km^2 (27 mi^2) of disturbed lands are in the process of being reclaimed. Industry has planted more than 7.5 million tree seedlings towards reclamation efforts. Mine operators must provide reclamation security bonds to ensure reclamation requirements are met, which includes the demonstration that the reclaimed lands meet the Alberta Environment criteria for return to self-sustaining ecosystems over time.
- Alberta's boreal forest covers over 381,000 km^2 (147,100 mi^2), of which the maximum area available for oil sands mining is 4,800 km^2 (1,854 mi^2) or about 1.25 percent of Alberta's boreal forest area.

Data generated from all monitoring activities within the Joint Canada-Alberta Implementation Plan for Oil Sands Monitoring program are subject to scientific peer review. To date, the results of environmental monitoring indicate that while oil sands development-related contaminants are present in both air and water at low levels, the levels of contaminants were, for the most part, below relevant environmental guidelines and show a decreasing trend with increasing distance from oil sands development. The Government of Alberta has concluded that the levels of contaminants in water and in air are not a cause for concern (Government of Alberta and Government of Canada 2013).

Other available monitoring data include a joint study by Queen's University in Kingston, Ontario and Environment Canada, which was published online in early January 2013 in the Proceedings of the National Academy of Sciences of the United States of America Early Edition. The study examined the effect of Athabasca Oil Sands development on lake ecosystems and found evidence of local industrial contributions of polycyclic aromatic hydrocarbons (PAHs) in aquatic ecosystems in the Athabasca oil sands region. It concluded that atmospheric deposition of PAHs from upgrader emissions and unweathered bitumen dust from surface mining areas are likely major sources of PAHs entering regional aquatic ecosystems. However, negative impacts associated with increased PAH deposition to the targeted zooplankton species evaluated in the study have not yet been observed. Coincidently, the study also found climate-driven increases in primary production. The ultimate ecological consequences to lakes in the oil sands region resulting from the combination of increased PAH deposition and increased primary production is unknown and requires further assessment (Kureka et al. 2013).

Migratory Bird Protection in Canada

Oil sands projects and oil transportation pipelines are evaluated and permitted by Canadian federal and provincial Canadian governments. Canada's version of the MBTA is called the Migratory Bird Convention Act (MBCA). Both the U.S. and Canadian acts are based on the Migratory Birds Convention treaty signed in 1916 by the United States and the United Kingdom (on behalf of Canada). The Canadian Wildlife Service handles wildlife matters that are the responsibility of the Canadian federal government. Canadian regulations supporting the MBCA are available at http://laws.justice.gc.ca/en/M-7.01/C.R.C.-c.1036/. In addition, Canada's rare and endangered migratory birds are protected under the SARA (see http://www.sararegistry.gc.ca/default_e.cfm). Canadian protections for migratory birds are parallel to U.S. migratory bird protections. Canada also provides for protection of migratory bird habitat within government-recognized sanctuaries. Losses of migratory birds at WCSB oil sands tailings ponds may be cited as violations of the MBCA and prosecuted by the Canadian government.[17]

Bird resources (waterfowl, waterbirds, shorebirds, and landbirds) are shared on a continental scale. The Tri-National North American Bird Conservation Initiative Committee was established to increase cooperation and effectiveness of bird conservation efforts among Canada, the United States, and Mexico. Partnership-based bird conservation initiatives have produced national and international conservation plans for birds that include species status assessments, population goals, habitat conservation threats, issues and objectives, and monitoring needs. Multi-national

[17] Since 2009, one known case has been prosecuted (Syncrude Canada, Ltd.) for the loss of 1,606 watefowl on Aurora Tailings Pond in April 2008. A $3 million penalty was assessed as part of the conviction (Government of Canada 2013).

North American bird conservation plans include the North American Waterfowl Management Plan, North American Landbird Conservation Plan, United States and Canadian Shorebird Conservation Plans, Waterbird Conservation for the Americas, North American Grouse Management Strategy, and Northern Bobwhite Conservation Initiative. At the request of the Department, Keystone provided a synopsis of the TransCanada Corporation's participation in North American migratory bird conservation efforts.

The Partners in Flight conservation assessment concluded that nearly half of native landbirds in Canada, Mexico, and the United States depend on habitats in at least two of the countries and more than 200 species (more than 80 percent of all individual landbirds) use habitats in all three countries in at least one season (Berlanga et al. 2010). Steep declines in 42 common bird species have occurred over the past 40 years with the majority of steeply declining species breeding in the northern United States and southern Canada, and wintering in the southern United States and Mexico (Berlanga et al. 2010). Declining bird populations face a diversity of threats on breeding grounds from land-use policies and practices related to agriculture, livestock grazing, urbanization, energy development, and logging (Berlanga et al. 2010). Migratory species are threatened on their wintering grounds by loss of grasslands in northern Mexico and tropical forests in southern Mexico (Berlanga et al. 2010).

Oil sands development alters habitats through land surface alteration including: mine sites, tailings ponds, well sites, industrial roads, pipelines, power lines, seismic cut lines, and facilities. These land alterations reduce both the amount and the suitability of adjacent habitat available for migratory birds. Proposed Keystone XL pipeline components such as roads and power lines increase migratory bird collision mortality. Tailings ponds contain residual bitumen and are an exposure risk especially for migratory waterbirds. Alberta's oil sands lease areas cover about 21 percent of the 418,325 mi^2 Boreal Taiga Plains Bird Conservation Region (Government of Alberta—Energy 2010, U.S. North American Bird Conservation Initiative Committee 2000). One hundred seventy migratory birds (49 waterbirds, 121 landbirds) have been recorded on 19 breeding bird survey routes concentrated within the southern portions of the leased area (Sauer et al. 2011, Government of Alberta—Energy 2010). Population trends for 9 of these 49 waterbirds and 29 of these 121 landbirds experienced significant declines within the Boreal Taiga Plains Region from 1999 to 2009; while nearly 70 percent of these birds showed no significant population trends (Sauer et al. 2011). Waterbirds and landbirds of moderate to high conservation concern present in the oil sands lease area based on the breeding bird survey data are listed in Table 4.15-23 (Kushlan et al. 2002, Berlanga et al. 2010, Brown et al. 2001, Sauer et al. 2011).

Table 4.15-23 Waterbirds and Landbirds of Conservation Concern Present in Alberta's Oil Sands Lease Areas

Common Name	Species Name	1999-2009 Trend	Relative Abundance	Average Birds/Route
Waterbirds				
Eared grebe	*Podiceps nigricollis*	NS +	4.0	0.93
Western/Clark's Grebe	*Aechmophorus spp.*	NS +	0.2	1.42
American White Pelican	*Pelecanus erythrorhynchos*	NS +	6.4	1.88
Brack-crowned Night-heron	*Nycticorax nycticorax*	UK	UK	0.17
Killdeer	*Charadrius vociferus*	-3.3	5.0	2.95
American Avocet	*Recurvirostra americana*	NS +	0.4	0.44
Greater Yellowlegs	*Tringa melanoleuca*	NS -	0.1	0.45
Lesser Yellowlegs	*Tringa flavipes*	-5.4	1.1	0.84
Solitary Sandpiper	*Tringa solitaria*	NS +	0.1	1.10
Willet	*Catoptrophorus semipalmatu*	NS -	0.2	0.91
Upland Sandpiper	*Bartramia longicauda*	NS +	0.1	0.17
Marbled Godwit	*Limosa fedoa*	NS +	0.5	0.81
Common Snipe	*Gallinago gallinago*	NS +	15.3	4.86
Wilson's Phalarope	*Phalaropus tricolor*	NS -	0.3	0.70
Franklin's Gull	*Larus pipixcan*	-6.0	UK	34.51
California Gull	*Larus californicus*	NS -	11.7	1.77
Forster's Tern	*Sterna forteri*	NS +	0.3	0.25
Black Tern	*Chlidonias niger*	-1.6	11.1	8.16
Landbirds				
Olive-sided Flycatcher	*Contopus cooperi*	-2.8	0.9	0.53
Sprague's Pipit	*Anthus spragueii*	NS +	0.9	0.59
Canada Warbler	*Wilsonia canadensis*	NS +	0.5	3.93
Chestnut-collared Longspur	*Calcarius ornatus*	UK	UK	0.07

Source: Government of Alberta - Energy 2010; Sauer et al. 2011; Kushlan et al. 2002; Berlanga et al. 2010; Brown et al. 2001

Notes: 1999 to 2009 Population Trends in the Boreal Taiga Plains Bird Conservation Region: NS + = non-significant positive, NS - = non-significant negative, UK = unknown, numeric values are significant trends
Numeric scale rating for relative abundance within the Boreal Taiga Plains 0 = least abundant
Average number of birds recorded for the 19 routes within the lease area

Oil sand operations are required to have plans to minimize their effects on wildlife and biodiversity, and Alberta's government monitors and verifies that industry adheres to these plans. ABMI collects data and reports on thousands of species, habitats, and human footprint activities for evaluating changes to achieve responsible environmental management in the oil sands area. Techniques used to minimize impacts to migratory birds include: restricting industrial activity during nesting; maintaining the integrity of large river corridors for migration staging; restoring land in key habitat areas; deterring birds from industrial areas; reducing industrial footprints and use of low impact technology for seismic exploration; and constructing nesting sites to replace lost natural sites (Government of Alberta 2011).

As stated in Section 1.7, Environmental Review of the Canadian Portion of the Keystone XL Project, as a matter of policy, the Department has included information regarding potential impacts in Canada. In Canada, SARA-protected species that could potentially occur along the U.S. and Canadian portions of the proposed Keystone XL pipeline include one threatened

species (Sprague's pipit [*Antus spragueii*]) and three endangered species (Piping plover [*Charadrius melodus*], Whooping crane [*Grus americana*], and Greater sage-grouse [*Centrocercus urophasianus*]). In Canada, required mitigation, including seasonal restrictions, to minimize impacts of the proposed Keystone XL pipeline to SARA-protected species is available in Appendix X, Canadian Environmental Assessment Act and Review.

In the United States, federal ESA-protected species that could potentially occur along the U.S. and Canadian portions of the proposed Keystone XL pipeline include one threatened species (Piping plover) and one endangered species (Whooping crane). Conservation measures developed to reduce impacts to these species for the proposed Project are described in Section 4.8, Threatened and Endangered Species and Species of Conservation Concern, and the 2012 Biological Assessment provided in Appendix H, 2012 Biological Assessment, 2013 USFWS Biological Opinion, and Associated Documents. Two U.S. federal candidate species (Greater sage-grouse [*Centrocercus urophasianus*] and the Sprague's pipit [*Antus spragueii*]) occurring in Montana and South Dakota do not receive ESA protection since they are candidates for ESA listing, and not listed species. As noted in Section 4.8, Threatened and Endangered Species and Species of Conservation Concern, a migratory bird conservation plan is being developed, in consultation with the USFWS, consistent with the MBTA and the Bald and Golden Eagle Protection Act and consistent with provisions of EO 13186. The conservation plan would include avoidance and mitigation measures for migratory birds and bald and golden eagles and their habitats within the states where the proposed Project would be constructed, operated, and maintained.

Impacts of Tailings Ponds on Birds

As of January 2013, five of the 127 operating oil sand projects in the Alberta were mining projects (Government of Alberta - Energy 2013). Tailings ponds are a feature in the extraction of bitumen by surface mining. They function as settling basins to separate solids from the tailings streams (water, fine silts, left-over bitumen, salts, and soluble organic compounds) and allow for the recycling of water for re-use in the bitumen extraction process. The risk to birds from tailings ponds arises from the fact that the smaller particles of silt and clay in tailings streams tend to remain in suspension, take decades to slowly settle, and only settle to a consistency of soft mud. Migratory birds that attempt to alight on tailings ponds become entrained and trapped in the soft muds and residual bitumen. In 2009, Alberta's Energy Resources Conservation Board (ERCB), now the Alberta Energy Regulator,[18] passed Directive 74, which set the first industry-wide standards to reduce the size and number of tailings ponds. The Directive requires that companies commit resources to research, develop, and implement fluid tailings reduction technologies and integrate tailings management with mine planning and bitumen production activities. Under this Directive, companies are required prepare and comply with a tailings management plan that includes the development of methods to capture, remove, and dry fine particulates in the ponds and transform tailings areas into reclaimed land (ERCB 2013).

To date, the available particulate capture technologies have not been sufficient to meet the standards within the timelines set forth in the Directive (ERCB 2013). According to the Edmonton Journal, the ERCB has decided not to penalize companies for non-compliance with the Directive at this time because the companies have shown significant progress, they are

[18] Effective June 17, 2013, the ERCB has been succeeded by the Alberta Energy Regulator.

actively engaged in developing new technologies, and they are sharing their innovations (Pratt 2013). The Minister of Environment and Sustainable Resource Development in Alberta is expected to release an independent Tailings Management Framework to operate alongside the ERCB rules. The Framework aims to reduce the number tailings ponds in operation and address environmental issues associated with long-term containment and reclamation (Government of Alberta 2013c).

In addition to the regulatory drivers to reduce the number of tailings ponds and accelerate pond reclamation efforts, and as a direct response to a 2008 incident where approximately 1,600 migratory birds perished in a tailings pond in Alberta, the Research on Avian Protection Project was created to monitor and address the impacts to birds from tailings ponds. The Research on Avian Protection Project is operated out of the University of Alberta, with the goal of generating a compendium of information of bird use in the oil sands region and bird deterrence practices in the bitumen extraction industry and other industries. The project team conducts field study research and analysis in the area monitoring, deterrence, and toxicology, with the aim of identifying the best practices to protect migratory birds in the oil sands region (University of Alberta 2013b).

Boreal Forest Reclamation

Many commenters on the 2013 Draft Supplemental EIS expressed concerns about impacts of bitumen extraction on the boreal forest in Canada. As a whole, the boreal forest in Canada covers approximately 6 million km^2 (2.3 million mi^2) of land, and is considered to be one of the largest intact forest ecosystems on Earth. Alberta's boreal forest area is approximately 465,000 km^2 (180,000 mi^2) in size, representing approximately 8 percent of Canada's overall boreal forest area. Oil sands underlie 140,200 km^2 (54,132 mi^2) of boreal forest in three areas of northeast Alberta. Surface impacts from *in situ* extraction projects are approximately one-seventh the size of a surface mining operation, and do not require the use of tailings ponds. As a result, reclamation occurs more quickly on *in situ* sites with less remediation required (Government of Canada 2011). The government of Alberta estimates that approximately 80 percent of the oil sands reserves would be accessed using *in situ* extraction techniques (Government of Alberta—Energy, 2013).

Mine operators are required to obtain reclamation certification under the Environmental Protection and Enhancement Act, and provide security bonds to ensure reclamation requirements are met. As mentioned previously, CEMA is an advisory group that assists federal and provincial agencies in framing regulatory policies, which includes providing information and recommendations relating to the long-term recovery of the boreal forest impacts from bitumen extraction activities. Within CEMA, these concerns are the focus of the Reclamation Working Group, whose stated mandate is "to produce and maintain guidance documents that provide recommendations and best practices to ensure that reclaimed landscapes meet regulatory requirements, satisfy the needs and values of stakeholders, and are environmentally sustainable" (CEMA 2013c). The Reclamation Working Group recently issued their Criteria and Indicators Framework for Oil Sands Mine Reclamation Certification, which is under review by the government of Alberta. The goal of the Criteria and Indicators Framework is to provide consistent and transparent measures with which to evaluate reclamation efforts, and clarify the criteria for reclamation certificate approval (CEMA 2013c). Numerous organizations in addition to CEMA also provide monitoring and research information to support provincial and federal government regulators in decision-making relative to boreal forest reclamation (as described

previously): OSRIN, WEBA, RAMP, ABMI, Canadian Oil Sands Network for Research and Development, Helmholtz-Alberta Initiative, and the Boreal Institute. Alberta Environment states that progressive reclamation (initiating ecosystem reclamation on those portions of a disturbance that are no longer needed for the immediate operational activities) is a key policy initiative (Government of Alberta 2013d).

For information on boreal forest impacts related to CO_2 sequestration, see Section 4.14, Greenhouse Gases and Climate Change.

Impacts to Aboriginal Groups

With respect to Aboriginal communities, the majority of Alberta's oil sands deposits are found in the RMWB. This is the largest regional municipality in Canada with a population of 104,300, of which 76,800 live in the region's largest community, Fort McMurray (Government of Alberta, 2013a). Approximately 23,000 Aboriginal people live in Alberta's oil sands areas, with 18 First Nations and six Métis Settlements located in the region (Government of Alberta 2013b). In 2009, the province released a 20-year strategic plan for the oil sands titled, *Responsible Actions: A Plan for Alberta's Oil Sands*, which outlines an integrated approach for all levels of government, industry, and communities to address the economic, social, Aboriginal, and environmental challenges and opportunities in the oil sands.

One of the key concerns of regional communities is health impacts of oil sands development. In 2009, the Royal Society of Canada convened an Expert Panel to review and assess available evidence related to environmental and health impacts of oil sands development. The findings of the Panel were documented in a December 2010 report titled, *Environmental and Health Impacts of Canada's Oil Sands Industry* (The Royal Society of Canada 2010). One of the questions asked by the Expert Panel was, "Does oil sands development cause serious human health effects in regional communities?" They examined the impacts of production of population health in Wood Buffalo, as well as impacts of oil sands development on downstream residents. With respect to Wood Buffalo, the Panel reviewed a public health profile for the former Northern Lights Health Authority, which largely coincides with the RMWB. The Panel found that for many indicators of community health, this region fares worse than the provincial average, and there is population level evidence that residents of the RMWB experience a range of health indicators that are classic indicators of the *boom town* impacts and community infrastructure deficits. With respect to potential health impacts associated with exposure to environmental contaminants, the Panel concluded that it is unlikely that current levels of exposures would result in major health impacts for the general population, and projected additional emissions from expanded operations are not likely to change this expectation. Specifically, the Panel found no credible evidence of public reports of elevated cancer rates occurring in Fort Chipweyan associated with exposure to contaminants released by oil sands operations.

As of February 2009, the Alberta Health Services cancer surveillance confirmed two cases of cholangiocarcinoma (a rare form of bile cancer) in Fort Chipweyan between 1995 and 2006 (six cases were initially reported). Alberta's Chief Medical Officer of Health concurs with the Panel's findings of insufficient evidence to link these cancer incidences to oil sands operations (Government of Alberta 2013b). In September 2011, Alberta Health and Wellness announced a plan to undertake a comprehensive health study for Fort McKay First Nations and Métis communities; those communities would determine what health issues the study would focus on, how it would proceed, and when it would commence. In addition, Alberta Environment and Sustainable Resource Development is supporting an Aboriginal community-based study looking

at potential health impacts associated with exposure to environmental contaminants in oil sands. The study was scheduled to begin in the summer of 2012, with results originally expected sometime in 2013 (Government of Alberta 2013b). As of December 2013, no additional publicly available details were identified regarding the status of this study.

Lastly, CEMA has established a Traditional Knowledge Working Group (TKWG) whose goal is to promote the inclusion of traditional knowledge (TK) within CEMA and its work. It is tasked with developing the appropriate methods to include and use TK along with western science to ensure meaningful and equal Aboriginal input in environmental management frameworks and recommendations. In addition, the TKWG is tasked with completing TK projects considered to be important by the Aboriginal Coordinating Committee (advisor to the TKWG) and other CEMA Working Groups. The TKWG seeks to maintain effective relationships between CEMA and member Aboriginal communities within and adjacent to the RMWB to ensure the land, forest, air, water, wildlife and biodiversity in the RMWB will be protected and reclaimed for long-term sustainability (CEMA 2013b).

Oil Sands Extraction Impact Summary

A substantial number of comments were received, raising issues related to the influence of the proposed Keystone XL pipeline on oil sands development in Canada. As noted in Section 1.4, Market Analysis, approval or denial of any one crude oil transport project, including the proposed Keystone XL pipeline, is unlikely to significantly impact the rate of extraction in the oil sands or the continued demand for heavy crude oil at refineries in the United States. To date, the results of environmental monitoring indicate that while oil sands development-related contaminants are present in both air and water at low levels, the levels of contaminants were, for the most part, below relevant environmental guidelines and show a decreasing trend with increasing distance from oil sands development. The Government of Alberta has concluded that the levels of contaminants in water and in air are not a cause for concern (Government of Alberta and Government of Canada 2013). For information on boreal forest impacts related to CO_2 sequestration, see Section 4.14, Greenhouse Gases and Climate Change.

Alberta's boreal forest covers over 381,000 km^2 (147,100 mi^2), of which the maximum area available for oil sands mining is 4,800 km^2 (1,854 mi^2), or about 1.25 percent of Alberta's boreal forest area. About 715 km^2 (276 mi^2) of land has been disturbed by oil sands mining activity. To date, over 71 km^2 (27 mi^2) of disturbed lands are in the process of being reclaimed. Industry has planted more than 7.5 million tree seedlings towards reclamation efforts. Mine operators are required to obtain reclamation certification under the Environmental Protection and Enhancement Act, and provide security bonds to ensure reclamation requirements are met.

Oil sands development alters bird habitats through land surface alteration, including: mine sites, tailings ponds, well sites, industrial roads, pipelines, power lines, seismic cut lines, and facilities; these operations are required to have plans to minimize their effects on wildlife and biodiversity. Alberta's government monitors and verifies that industry adheres to these plans. ABMI collects data and reports on thousands of species, habitats, and human footprint activities for evaluating changes to achieve responsible environmental management in the oil sands area. Specific risks to birds from tailings ponds arise from the fact that the smaller particles of silt and clay in tailings streams tend to remain in suspension, take decades to slowly settle, and only settle to a consistency of soft mud. Migratory birds that attempt to alight on tailings ponds become entrained and trapped in the soft muds and residual bitumen. Directive 74 passed in 2009 requires that companies commit resources to research, develop, and implement fluid tailings

reduction technologies, and integrate tailings management with mine planning and bitumen production activities. Under this Directive, companies are required prepare and comply with a tailings management plan, which includes the development of methods to capture, remove, and dry fine particulates in the ponds and transform tailings areas into reclaimed land (ERCB 2013).

Finally, one of the key concerns of regional communities is health impacts of oil sands development. In 2009, the Royal Society of Canada convened an Expert Panel to review and assess available evidence related to environmental and health impacts of oil sands development. The Panel found that for many indicators of community health, this region fares worse than the provincial average, and there is population level evidence that residents of the RMWB experience a range of health indicators that are classic indicators of the *boom town* impacts and community infrastructure deficits. With respect to potential health impacts associated with exposure to environmental contaminants, the Panel concluded that it is unlikely that current levels of exposures would result in major health impacts for the general population, and projected that additional emissions from expanded operations are not likely to change this expectation. Specifically, the Panel found no credible evidence of public reports of elevated cancer rates occurring in Fort Chipweyan associated with exposure to contaminants released by oil sands operations. As of February 2009, the Alberta Health Services cancer surveillance confirmed two cases of cholangiocarcinoma (a rare form of bile cancer) in Fort Chipweyan between 1995 and 2006 (six cases were initially reported). Alberta's Chief Medical Officer of Health concurs with the Panel's findings of insufficient evidence to link these cancer incidences to oil sands operations (Government of Alberta 2013b).

4.15.5 References

Alberta Biodiversity Monitoring Institute (AMBI). 2009. The Status of Biodiversity in Alberta-Pacific Forest Industries' Forest Management Agreement Area: Preliminary Assessment 2009. Website: http://www.oilsands.alberta.ca/reports.html. Accessed November 6, 2012.

Alberta Energy Resources Conservation Board (ERCB). 2013. 2012 Tailings Management Assessment Report: Oil Sands Mining Industry. June 2013.

AMBI. See Alberta Biodiversity Monitoring Institute.

Berlanga, H., J.A. Kennedy, T.D. Rich, M.C. Arizmendi, C.J. Beardmore, P.J. Blancher, G.S. Butcher, A.R. Couturier, A.A. Dayer, D.W. Demarest, W.E. Easton, M. Gustafson, E. Iñigo-Elias, E.A. Krebs, A.O. Panjabi, V. Rodriguez Contreras, K.V. Rosenberg, J.M. Ruth, E. Santana Castellón, R. Ma. Vidal, and T. Would. 2010. Saving Our Shared Birds: Partners in Flight Tri-National Vision for Landbird Conservation. Cornell Lab of Ornithology, Ithaca, NY.

Bridger Pipeline LLC. 2012. Bridger Pipelines. Website: http://www.truecos.com/bridger/. Accessed October 25, 2012.

Brown, C.M., R.D. Revel, and J.R. Post. 2002. Effects of pipeline rights-of-way on fish habitat at two Alberta stream crossings. pp. 509–516 in Seventh International Symposium Environmental Concerns in Rights-of-Way Management. J.W. Goodrich-Mahoney, D.F. Mutrie, and C.A. Guild (eds.). Elsevier Science Ltd., NY.

Brown, S., C. Hickey, B. Harrington, and R. Gill, eds. 2001. The U.S. Shorebird Conservation Plan, 2nd edition. Manomet Center for Conservation Sciences, Manomet, MA.

CEMA. See Cumulative Environmental Management Association.

Central Valley Agriculture. 2011. New Grain and Agronomy Hub—Royal, NE. Website: http://www.cvacoop.com/news/detail.cfm?NewsArticleID=6. Accessed November 2012.

_____. 2012. Site Locations. Website: http://www.cvacoop.com/locations/. Accessed November 5, 2012.

Cowie, R.H., and D.G. Robinson. 2003. Pathways of introduction of non-indigenous land and freshwater snails and slugs. pp. 93–122 in Invasive Species: Vectors and Management Strategies. G.M. Ruiz and J.T. Carlton (eds.). Island Press, Washington, DC.

Council on Environmental Quality. 1997. Considering Cumulative Effects under the National Environmental Policy Act. January 1997. 122 pp.

_____. 2005. Memo from James L. Connaughton to the Heads of Federal Agencies regarding Guidance on the Consideration of Past Actions in Cumulative Effects Analysis. 4 pp. June 24, 2005.

Cumulative Environmental Management Association (CEMA). 2013a. The Insider. Dated February 2013. Website: http://cemaonline.ca/index.php/news-a-events/the-insider. Accessed July 2013.

_____. 2013b. Traditional Environmental Knowledge (TEK). Website: http://cemaonline.ca/index.php/working-groups/tek. Accessed July 2013.

_____. 2013c. Reclamation Working Group (RWG). Website: http://cemaonline.ca/index.php/working-groups/rwg. Accessed July 2013.

EIA. See U.S. Energy Information Administration.

EnSys. See EnSys Energy and Systems, Inc.

EnSys Energy and Systems, Inc. (EnSys). 2010. *Keystone XL Assessment, Final Report*. Prepared for the U.S. Department of Energy, Office of Policy & International Affairs. December 23, 2010.

ERCB. See Alberta Energy Resources Conservation Board.

Esri. 2013. World Imagery (Aerial Photography), USA Topo Maps (Topographic Mapping), and World Street Map (Administrative and Political Boundaries and Transportation). Contributing Data Sources, World Imagery: DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community. Contributing Data Sources, USA Topo Maps: DeLorme, Copyright © 2013 National Geographic Society, i-cubed, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community. Contributing Data Sources, World Street Map: DeLorme, NAVTEQ, USGS, Intermap, iPC, METI, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, Bing Maps.

E^{x}ponent, Inc. 2013. Third-Party Consultant Environmental Review of the TransCanada Keystone XL Pipeline Risk Assessment. April 26, 2013.

Fuller, P.L. 2003. Freshwater aquatic vertebrate introductions in the United States: Patterns and pathways. pp. 123–151 in Invasive Species: Vectors and Management Strategies. G.M. Ruiz and J.T. Carlton (eds.). Island Press, Washington, DC.

Gollop, J.B., T.W. Barry, and E.H. Iversen. 1986. Eskimo curlew a vanishing species? Saskatchewan Natural History Society Special Publication No. 17. Regina, Saskatchewan. Northern Prairie Wildlife Research Center Online. Website: http://www.npwrc.usgs.gov/resource/birds/curlew/index.htm (Version 16JUL97). Accessed September 23, 2009.

Government of Alberta. 2010. Alberta's Leased Oil Sands Area. Published July 30, 2010. GIS Services About Oil Sands. Facts and Statistics, Department of Energy, Government of Alberta. Website: http://www.energy.alberta.ca/oilsands/791.asp. Accessed November 6, 2012.

_____. 2011. Alberta's Oil Sands: Fact Sheets. Wildlife and Biodiversity. Updated July 2011. Website: http://www.oilsands.alberta.ca/facts.html. Accessed November 6, 2012.

_____. 2013a. Alberta's Oil Sands: Community: Website: http://www.oilsands.alberta.ca/community.html. Accessed June 2013.

_____. 2013b. Alberta's Oil Sands: Aboriginal People: Website: http://www.oilsands.alberta.ca/aboriginalpeople.html. Accessed December 2013.

_____. 2013c. Alberta's Oil Sands: Tailings: Website: http://oilsands.alberta.ca/tailings.html. Accessed July 2013.

_____. 2013d. Alberta's Environment and Sustainable Resource Development Website: http://environment.alberta.ca/03389.html. Accessed July 2013.

Government of Alberta - Energy. 2010. Alberta's Leased Oil Sands Area. Published July 30, 2010. GIS Services, Department of energy, Government of Alberta. Website: http://www.energy.alberta.ca/LandAccess/pdfs/OSAagreesStats_July2010.pdf. Accessed July 2011.

_____. 2013. Alberta's Oil Sands: Facts and Statistics: Website: http://www.energy.alberta.ca/OilSands/791.asp. Accessed June 2013.

Government of Alberta and Government of Canada. 2012. Joint Canada-Alberta Implementation Plan for Oil Sands Monitoring. © Her Majesty the Queen in Right of Canada, represented by the Minister of the Environment, 2012.

_____. 2013. Canada-Alberta Oil Sands Environmental Monitoring Information Portal. Website: http://www.jointoilsandsmonitoring.ca/pages/latestdata.aspx?lang=en. Accessed June 2013.

Government of Canada. 2011. Oil Sands: A strategic resource for Canada, North America and the global market. Land Use and Reclamation. © Her Majesty the Queen in Right of Canada. Cat. No. M164-4/7-1-2011E-PDF (On-line). ISBN 978-1-100-18895-9.

_____. 2013. Environment Canada – Environmental Offenders Registry. Website: http://ec.gc.ca/alef-ewe/default.asp?lang=En&n=1F014378-1. Accessed August 29, 2013.

Kubach, K.M., M.C. Scott, and J.S. Bulak. 2011. Recovery of a temperate riverine fish assemblage from a major diesel oil spill. *Freshwater Biology* (2011) 56, pp. 503–518.

Kurek, J., Jane L. Kirk, Derek C. G. Muir, Xiaowa Wang, Marlene S. Evans, and John P. Smol. 2013. Legacy of a half century of Athabasca oil sands development recorded by lake ecosystems. Proceedings of the National Academy of Sciences of the United States of America. Website: http://www.pnas.org/content/110/5/1761.

Kushlan, J.A., M.J. Steinkamp, K.C. Parsons, J. Capp, M.A. Cruz, M. Coulter, I. Davidson, L. Dickson, N. Edelson, R. Elliot, R.M. Erwin, S. Hatch, S. Kress, R. Milko, S. Miller, K. Mills, R. Paul, R. Phillips, J.E. Saliva, B. Sydeman, J. Trapp, J. Wheeler, and K. Wohl. 2002. Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan. Version 1. Waterbird Conservation for the Americas, Washington, DC, 78 pp.

Monroe, W.H. 1970. A glossary of karst terminology: U.S. Geological Survey, Water-Supply Paper 1899. Washington D.C.: U.S. Government Printing Office.

Montana Department of Transportation. 2013. Montana Department of Transportation, Brochures, Reports, and Studies. Website: http://www.mdt.mt.gov/publications/brochures.shtml#corridor. Accessed September 2, 2013.

National Agricultural Statistics Service. 2012. Nebraska Charts and Maps. Website: http://www.nass.usda.gov/Statistics_by_State/Nebraska/Charts_and_Maps/index.asp. Accessed November 5, 2012.

Nebraska Department of Roads. 2013a. Nebraska Department of Roads Highway Projects Info. Website: http://www.transportation.nebraska.gov/projects/. Accessed September 2, 2013.

_____. 2013b. Nebraska Department of Roads Surface Transportation Program. Website: http://www.transportation.nebraska.gov/hwy-pgm/index.htm. Accessed September 2, 2013.

Ohmart, R.D., and B.W. Anderson. 1988. Riparian habitats. Inventory and monitoring of wildlife habitat pp. 169-199. A.Y. Cooperrider, R.J. Boyd, and H.R. Stuart (eds.). U.S. Department of Interior, Bureau of Land Management Service Center. Denver, CO. 858 pp.

Pratt, Sheila. 2013. Oilsands companies failed to meet ERCB tailings rules, report says. *Edmonton Journal* Online, June 11, 2013. Website: http://www.edmontonjournal.com/business/Oilsands+companies+failed+meet+ERCB+tailings+rules/8509761/story.html.

Sauer, J.R., J.E. Hines, J.E. Fallon, K.L. Pardieck, D.J. Ziolkowski, Jr., and W.A. Link. 2011. The North American Breeding Bird Survey, Results and Analysis 1966–2009. Version 3.23.2011 USGS Patuxent Wildlife Research Center, Laurel, MD. Website: http://www.mbr-pwrc.usgs.gov/bbs/bbs.html. Accessed November 6, 2011.

South Dakota Department of Environment and Natural Resources. 2011. DENR's Response to Comments Received on Extension Request and Amended Draft Prevention of Significant Deterioration Preconstruction Air Quality Permit, Table 2-1. 80 pp. May 2, 2011.

South Dakota Department of Transportation. 2013. South Dakota Department of Transportation STIP. Website: http://www.sddot.com/transportation/highways/planning/stip/Default.aspx. Accessed September 2, 2013.

Swafford, Pat. 2010. Evaluating Canadian Crudes in US Gulf Coast Refineries. Sprial Software. Presentated at the Crude Oil Quality Association Meeting, February 11, 2010. Website: http://www.coqa-inc.org/20100211_Swafford_Crude_Evaluations.pdf. Accessed July 7, 2013.

The Northern Alberta Institute of Technology. 2013. The Boreal Research Institute: Mission. Website: http://www.nait.ca/47691.htm. Accessed September 2013.

The Royal Society of Canada. 2010. Environmental and Health Impacts of Canada's Oil Sands Industry. December 2010.

Theodore Roosevelt Expressway. 2013. Theodore Roosevelt Expressway – About Us. Website: http://www.trexpressway.com/AboutUs.aspx. Accessed September 2, 2013.

USACE. See U.S. Army Corps of Engineers.

U.S. Army Corps of Engineers. 2012. Decision Document Nationwide Permit 12. Website: http://www.usace.army.mil/Portals/2/docs/civilworks/nwp/2012/NWP_12_2012.pdf Accessed May 29, 2013.

USEPA. See U.S. Environmental Protection Agency.

U.S. Department of Transportation. 2012. Pipeline and Hazardous Materials Safety Administration (PHMSA), National Pipeline Mapping System. Office of Pipeline Safety. Website: https://www.npms.phmsa.dot.gov/. Accessed November, 2012.

U.S. Energy Information Administration (EIA). 2012. Refinery Capacity Report. June 2012, with Data as of January 1, 2012. Website: http://www.eia.gov/petroleum/refinerycapacity/. Accessed November 2012.

U.S. Environmental Protection Agency (USEPA). 2012a. Wetlands—Status and Trends. Website: http://water.epa.gov/type/ wetlands/vital_status.cfm. Accessed November 2012.

_____. 2012b. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2010. 481 pp. April 15, 2012.

_____. 2012c. Greenhouse Gas Equivalencies Calculator. Website: http://www.epa.gov/cleanenergy/energy-resources/calculator.html. Updated October 2012. Accessed February 14, 2012.

U.S. Geological Survey. 1996. National water summary on wetland resources. Compiled by Fretwell, J. D.; Williams, John S.; Redman, Phillip J. USGS Water Supply Paper: 2425. Website: http://pubs.er.usgs.gov/publication/wsp2425. Accessed November 2012.

U.S. North American Bird Conservation Initiative Committee. 2000. Bird Conservation Region Descriptions: A Supplement to the North American Bird Conservation Initiative Bird Conservation Regions Map. Available from the U.S. Fish and Wildlife Service, Division of Bird Habitat Conservation, Arlington, Virginia.

University of Alberta. 2013a. The Oil Sands Research and Information Network (OSRIN). Website: http://www.osrin.ualberta.ca/. Accessed July 2013.

_____. 2013b. The Research on Avian Protection Project. Website: https://hocking.biology.ualberta.ca/oilsands/?Page=8348. Accessed July 2013.

WBI Energy Transmission. 2012. A Long Legacy of Pipeline Service. Website: http://www.wbienergy.com/wbienergy/transmission. Accessed October 25, 2012.

Wilcove, D.S., C.H. McLellan, and A.P. Dobson. 1986. Habitat fragmentation in the temperate zone. Pp. 237-256 in Conservation Biology: The science of scarcity and diversity. M.E. Soulé (editor) Sinauer Associates, Inc., Sunderland, MA.

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